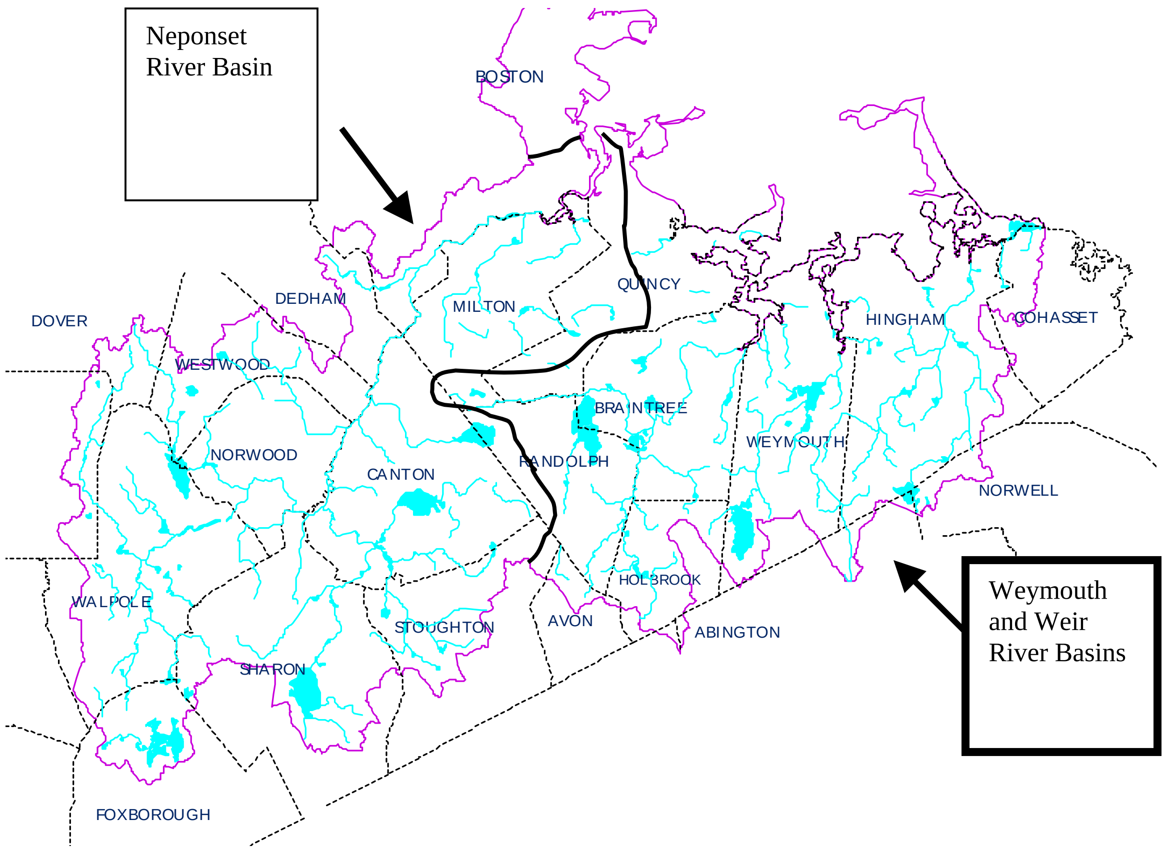
Total Maximum Daily Loads of Bacteria for Neponset River Basin



COMMONWEALTH OF MASSACHUSETTS
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NOTICE OF AVAILABILITY

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Division of Watershed Management
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Worcester, MA 01608

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www.state.ma.us/dep/brp/wm/wmpubs.htm

A complete list of reports published since 1963 is updated annually and printed in July. This report, titled, "Publications of the Massachusetts Division of Watershed Management – Watershed Planning Program, 1963-(current year)", is also available by writing to the DWM in Worcester.

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Executive Summary

The Massachusetts Department of Environmental Protection (DEP) is responsible for monitoring the waters of the Commonwealth, identifying those waters that are impaired, and developing a plan to bring them back into compliance with the Massachusetts Water Quality Standards. The list of impaired waters, better known as the “303d list” identifies river, lake, and coastal waters and the reason for impairment.

Once a water body is identified as impaired, DEP is required by the Federal Clean Water Act to essentially develop a “pollution budget” designed to restore the health of the impaired body of water. The process of developing this budget, generally referred to as a Total Maximum Daily Load (TMDL), includes identifying the source(s) of the pollutant from direct discharges (point sources) and indirect discharges (non-point sources), determining the maximum amount of the pollutant that can be discharged to a specific water body to meet water quality standards, and developing a plan to meet that goal.

This report represents a TMDL for (fecal coliform) bacteria in the Neponset River. Fecal coliform bacteria are indicators of contamination with sewage and or the feces of warm-blooded wildlife (mammals and birds). Such contamination may pose a risk to human health. Therefore, in order to prevent further degradation in water quality and to ensure that the river meets state water quality standards, the TMDL establishes bacterial limits and outlines corrective actions to achieve that goal.

The likely sources and goals for limiting bacterial contamination are summarized in the following table:

Fecal Coliform Waste Load Allocations (WLAs) and Load Allocations (LAs) for the Neponset River and Identified Tributary Streams

Surface Water Classification	**Bacteria Source Category**	**WLA** (organisms per 100 ml)	**LA** (organisms per 100 ml)
B	Illicit Discharges to Storm Drains	0	N/A
B	Leaking Sanitary Sewers	0	0
B	Failing Septic Systems	N/A	0
B	Storm Water Runoff	GM $\leq$ 200 90% $\leq$ 400	GM $\leq$ 200 90% $\leq$ 400
B	Sanitary Sewer Overflows	0	0
SB	Illicit Discharges to Storm Drains	0	N/A
SB	Failing Septic Systems	N/A	0
SB	Storm Water Runoff (Boston, Milton and Quincy)	GM $\leq$ 88 90% $\leq$ 260	GM $\leq$ 88 90% $\leq$ 260
SB	Sanitary Sewer Overflows	0	0
SB	Combined Sewer Overflows	0	N/A

GM means geometric mean
N/A means not applicable

While specific locations (segments) of the Neponset River have been identified as not meeting the relevant bacterial standard, the control measures represent best management practices and should be applied throughout the watershed. Priority, however, should be given to those areas currently not meeting standards. Note that bacteria from wildlife would be considered a natural condition unless some form of human inducement, such as feeding, is causing congregation of wild birds or animals.

In most cases, authority to regulate nonpoint source pollution and thus successful implementation of this TMDL is limited to local government entities and will require cooperative support from local volunteers, watershed associations, and local officials in municipal government. Those activities can take the form of expanded education, obtaining and/or providing funding, and possibly local enforcement. In some cases, such as subsurface disposal of wastewater from homes, the Commonwealth provides the framework, but the administration occurs on the local level. Among federal and state funds to help implement this TMDL are, on a competitive basis, the Non Point Source Control (Section 319) Grants, Water Quality (Section 604(b)) Grants, and the State Revolving (Loan) Fund Program (SRF). Most financial aid requires some local match as well. The programs mentioned are administered through the Department of Environmental Protection (DEP). Additional funding and resources available to assist local officials and community groups can be referenced within the Massachusetts Nonpoint Source Management Plan-Volume I Strategic Summary (2000) "Section VII Funding / Community Resources". This document is available on the DEP's website at: www.state.ma.us/dep/brp/wm/wmpubs.htm, or you may contact the DEP's Nonpoint Source Program at (508) 792-7470 to request a copy.

Final Total Maximum Daily Loads of Bacteria for Neponset River Basin

DEP, DWM TMDL Report MA73-01-2002 CN 121.0   May 31 2002

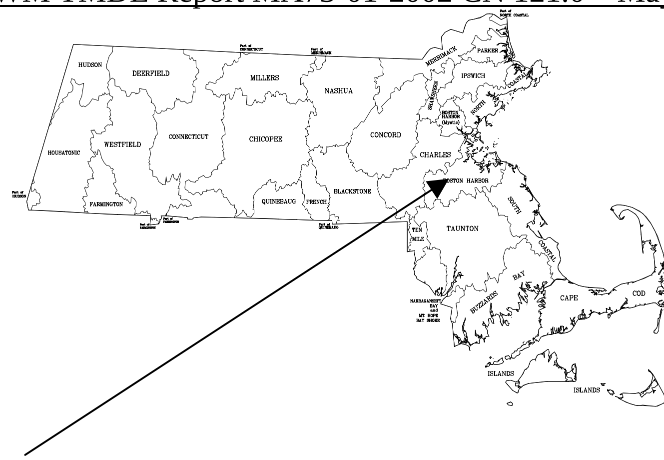

Figure 1: Location of Neponset Basin in Massachusetts.

Key Feature: **Fecal Coliform Bacteria TMDL for the Neponset River Watershed.**
Location: **EPA Region 1.**
Land Type: **New England Upland**
303d Listings: **Fecal coliform (MA73-01, MA73-02, MA73-03, MA73-04, MA73-05, MA72-13, MA73-15, MA73-16, MA73-17, MA73-20, MA73-22, MA73-24, MA73-026, MA73-27, MA73-29, and MA73-30)**
2002 303d Listings: **(Anticipated) MA73-06, MA73-09, MA73-13,** and **MA73-31**
Data Sources: **Neponset River Watershed Association, Massachusetts Department of Environmental Protection, and Land Use information.**
Data Mechanism: **Massachusetts Surface Water Quality Standards for Fecal Coliform, Ambient Data, and Best Professional Judgment**
Monitoring Plan: **Neponset River Watershed Association and Massachusetts Watershed Initiative Five-Year Cycle**
Control Measures: **Watershed Management, Storm Water Management, Illicit Discharge Detection and Elimination, Combined and Sanitary Sewer Overflow Abatement, and Septic system maintenance.**

ACKNOWLEDGMENTS

This Total Maximum Daily Load (TMDL) has been prepared through the collective efforts of many individuals including staff from both EPA and DEP as well as support from local stakeholder groups. Although the Department would like to recognize each individual who took part in its development it is impossible to do so. However, DEP would like to specifically recognize the tireless work provided by the staff at the Neponset River Watershed Association who collected the vast amount of data over the last several years needed to conduct this analysis. Special recognition must also go to Mark Voorhees from EPA Region 1 for the many hours he provided drafting portions of this document and providing technical assistance for this TMDL evaluation. It is our hope that this TMDL will be used as a tool and stepping-stone to take corrective actions and improve the health of our waterways to meet water quality standards.

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INTRODUCTION

Section 303(d) of the Clean Water Act (CWA) requires States to develop Total Maximum Daily Loads (TMDLs) for waters where required point and nonpoint source pollution controls are not stringent enough to attain or maintain compliance with applicable State water quality standards. Developing a TMDL involves calculating a loading capacity (the amount of pollutant loading that the water can receive without violating water quality standards) and allocating allowable loads among point, nonpoint and background sources.

Once TMDLs are established and approved by EPA, Section 303(e) of the CWA and 40 CFR 130.6 and 130.7 require that TMDLs are incorporated into the State's current Water Quality Management (WQM) plan. WQM plans are used to direct implementation activities. According to the August 8, 1997 memorandum from Robert Perciasepe, EPA Assistant Administrator, on New Policies for Establishing and Implementing TMDLs, "States may submit implementation plans to EPA as revisions to State water quality management plans, coupled with a proposed TMDL, or as part of an equivalent watershed or geographic planning process." In Massachusetts, the Watershed Initiative 5-year process will be used for this purpose.

The purpose of this report is to establish a fecal coliform TMDL for segments of the Neponset River and tributaries, which are currently not meeting Massachusetts' fecal coliform standards, and outline an implementation strategy to abate bacteria sources so that indicator bacteria standards can ultimately be attained. The goal of the Neponset River TMDL is to improve water quality and protect human health by reducing indicator bacteria loading from all sources, including deteriorating sewer pipes, illicit sanitary connections to storm drains, inadequate on-site sewage disposal systems, and storm water runoff, and ultimately restore the beneficial uses of the Neponset River and tributaries. The implementation strategy for controlling bacteria sources in the Neponset River Basin is attached to this TMDL report. Consolidating the implementation plan with the fecal coliform TMDL allows the public the opportunity to comment simultaneously on each of these aspects of the Neponset River Basin fecal coliform control strategy.

NEPONSET RIVER BASIN

The Neponset River Basin is located in eastern Massachusetts within the metropolitan Boston area (see Figure 1 on cover page). The basin encompasses portions of Boston, Quincy, Milton, Dedham, Westwood, Dover, Medfield, Walpole, Foxborough, Sharon, Stoughton, and Randolph, while the entire towns of Canton and Norwood are located within its boundaries. The Neponset River is 29.5 miles in length and drains approximately 117 square miles. At its most downstream point, the Neponset River is tidally influenced for three miles from Baker Dam, in Milton to its confluence with Dorchester Bay in Boston Harbor (MADEP, 1995). The Neponset River Basin including subwatershed and community boundaries are illustrated in Figure 2.

Several types of communities lie in the Neponset Watershed, ranging from urban-residential Boston to the rural residential community of Sharon. Boston, Quincy, Dedham, and Milton comprise the lower basin and are primarily urbanized with a wide variety of residential, industrial, commercial land uses. The middle portion of the basin – Westwood, Norwood, and Canton – includes similar land uses, as well as extensive wetland areas, adjacent to the Neponset River. Residential uses compose the vast majority of the developed portions of the upper basin – Walpole, Sharon, Foxborough, Dover, and Medfield. Based on the 1991 land use coverage map (Figure 3) of the Neponset watershed, a significant portion of the watershed is forested, mostly in the upper basin and along headwaters of tributaries. Table 1 summarizes the distribution of land use categories in each subwatershed.

Based on the Logan Airport rainfall gage, the annual precipitation averages 41.5 inches in the vicinity of the Neponset River Basin. November and December are the wettest months with average monthly precipitations of 4.2 and 4.0 inches, respectively; whereas June and July are the driest months with average monthly precipitations of 3.1 and 2.8 inches, respectively.

FIGURE 2

Neponset River Basin and Surrounding Communities

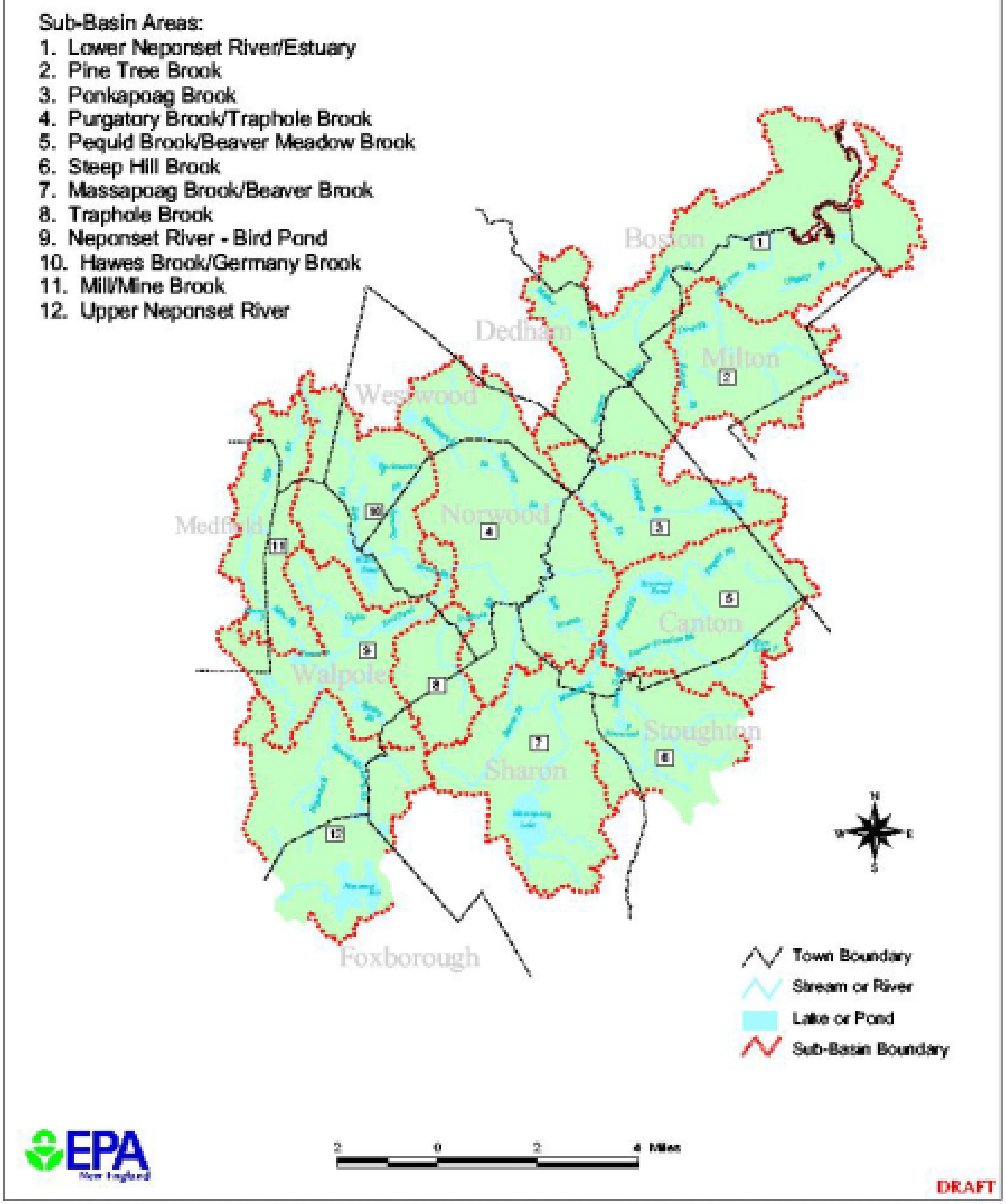
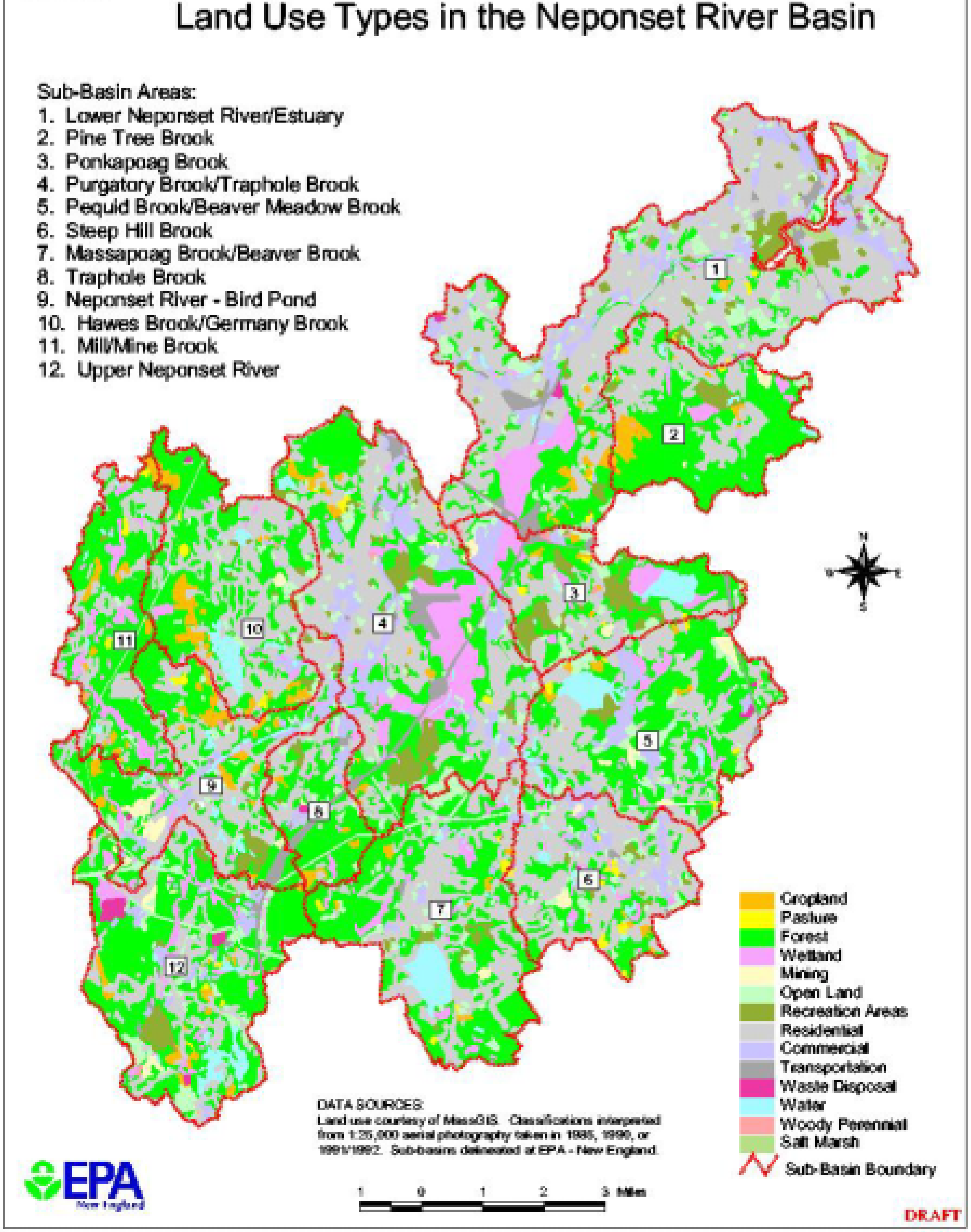


FIGURE 3



Land Use Types in the Neponset River Basin
Sub-Basin Areas:
1. Lower Neponset River/Estuary
2. Pine Tree Brook
3. Ponkapoag Brook
4. Purgatory Brook/Traphole Brook
5. Pequid Brook/Beaver Meadow Brook
6. Steep Hill Brook
7. Massapoag Brook/Beaver Brook
8. Traphole Brook
9. Neponset River - Bird Pond
10. Hawes Brook/Germany Brook
11. Mill/Mine Brook
12. Upper Neponset River
1
2
3
4
5
6
7
8
9
10
11
12
N
W
E
S
Cropland
Pasture
Forest
Wetland
Mining
Open Land
Recreation Areas
Residential
Commercial
Transportation
Waste Disposal
Water
Woody Perennial
Salt Marsh
Sub-Basin Boundary
DATA SOURCES:
Land use courtesy of MassGIS. Classifications interpreted from 1:25,000 aerial photography taken in 1985, 1990, or 1991/1992. Sub-basins delineated at EPA - New England.
1 0 1 2 3 Miles
EPA
New England
DRAFT

Table 1
NEPONSET RIVER SUB-BASINS
Land Use Distribution in Acres

SUB BASIN	COMMERCIAL	CROPLAND	FOREST	INDUSTRIAL	MINING	NO DATA	OPEN LAND	PASTURE	RESIDENTIAL Smallerr 1/4 acre lots	Larger than 1/2 Acre lots	1/4 to 1/2 Acre lots	Multi Family
Hawes Brook/Germany Brook	25.75	319.27	2196.98	45.75	23.78	0.04	74.92	34.91	164.35	750.7	1264.42	81.83
Lower Neponset R./Estuary	761.63	133.94	1733.59	546.39	0.05	1.05	196.51	36.35	3519.5	788.73	1445.01	1717.49
Massapoag Brook/Beaver Brook	63.77	52.21	3103.35	30.09	20.01	0.05	175.68	38.37	14.04	728.57	1653.88	92.26
Mill/Mine Brook	2.49	167.13	2134.83		0.25	1.33	71.32	27.81		978.76	23.97	
Neponset River - Bird Pond	108.06	248.38	2007.29	222.4	157.93	0.21	167.67	24.22	140.3	624.08	1028.86	81.54
Pequid Brk./Beaver Meadow Brk.	59.48	64.14	2690.38	447.38	113.47	0.15	200.58	35.56	42.1	805.79	1006.93	90.09
PineTree Brook	9.42	208.16	2492.75	6.55	37.23		43.57	5.74	223.35	607.81	377.44	32.81
Ponkapoag Brook	17.8	43.4	1205.56	231.49	43.2	0	76.34	26.93	52.86	282.07	651.68	1.92
Purgatory Brook/Traphole Brook	388.79	131.34	2935.22	760.69	21.24	4.15	211.23	40.5	1202.98	717.38	1408.48	121.32
Steep Hill Brook	179.12	39.75	925.95	209.77	49.12	0.16	136.59	78.13	249.31	218.65	1569.08	200.59
Traphole Brook	102.37	62.62	1005.23	47.45	5.91	0.37	114.96			94.99	513.99	2.75
Upper Neponset River	50.06	154.83	3460.82	228.19	93.25	6.87	399.27	19.68		773.14	735.34	12.27
Totals:	**1768.71**	**1625.17**	**25891.94**	**2776.13**	**565.43**	**14.38**	**1868.63**	**368.19**	**5608.78**	**7370.67**	**11679.09**	**2434.87**

SUB BASIN	RECREATION Participation	Spectator	Water Based	SALT WETLAND	TRANS-PORTATION	URBAN OPEN	WASTE DISPOSAL	WATER	WETLAND	WOODY PERENNIAL	TOTALS
Hawes Brook/Germany Brook		57.2	1.78			109.76	6.85	264.61	98.05	7.53	5528.46
Lower Neponset R./Estuary	375.6	214.36	37.96	279.21	524.61	691.77	40.85	107.98	558.29	2.52	13713.39
Massapoag Brook/Beaver Brook	65.76	59.89	15.67		7.68	182.31		407.58	212.01	0.73	6923.89
Mill/Mine Brook		2.07	4.79			1.37		23.82	385.48	7.65	3833.07
Neponset River - Bird Pond	138.93	42.15	0.04		95.97	101.31	5.4	135.69	158.9	11.92	5501.26
Pequid Brk./Beaver Meadow Brk.	73.34	11.05	2.31		49.52	199.59	19.02	325.37	232.55	2.16	6470.93
PineTree Brook	127.54	13.29				19.74		28.1	107.88	1.36	4342.74
Ponkapoag Brook	453.26	38.57			136.62	164.12		213.61	361.47	26.84	4027.75
Purgatory Brook/Traphole Brook	456.05	117.38			511.73	302.36		59.92	1155.3	13.73	10559.77
Steep Hill Brook	1.37	76.54			21.59	122.69	6.27	65.5	122.73		4272.9
Traphole Brook	37.69	4.91			106.92	12.62	10.54		47.44	6.38	2177.13
Upper Neponset River	6.82	210.06			125.78	222.75	111.92	306.72	392.78	19.33	7329.89
Totals:	**1736.36**	**847.48**	**62.54**	**279.21**	**1580.42**	**2130.38**	**200.84**	**1938.92**	**3832.88**	**100.14**	**74681.18**

PROBLEM ASSESSMENT

Extensive water quality data are available for the Neponset River and tributaries. In 1994 the Massachusetts Department of Environmental Protection (MADEP), in cooperation with several other state agencies and citizen monitoring groups, initiated a comprehensive assessment of the Neponset River Basin. The results of this work identified that numerous waterbody segments, including lakes and ponds, in the Neponset River Basin were not attaining the State's water quality standards. The most pervasive water quality problem identified was, and remains, due to excessive levels of fecal coliform indicator bacteria.

Since the 1994 study, the Neponset River Watershed Association (NepRWA), a non-profit organization, has collected annual water quality data at numerous locations throughout the basin. Beginning in 1996, all of NepRWA's monitoring activities have been conducted according to EPA approved Quality Assurance Project Plans (QAPP) developed by NepRWA. Establishing a QAPP represents a significant accomplishment by NepRWA that has resulted in the collection of credible data used to identify waterbody segments that do not attain water quality standards, and identify specific pollutant sources requiring control measures.

This TMDL report addresses fecal coliform contamination originating from the Neponset watershed. It does not address other pollutants identified on the 303(d) list that may be contributing to the non-attainment of Water Quality Standards. Additional TMDL reports will be prepared, as necessary, to address those pollutants in the future. Data collected by MADEP and NepRWA beginning in 1994 to the present, document consistent exceedences of fecal coliform standards. Thus, most of the Neponset River, and tributaries, do not fully support the designated Class B and SB uses for primary and secondary contact recreation, nor its class SB designated use of restricted shellfish harvesting. Figures 4 and 5 provide the locations of MADEP (1994) and the NepRWA (1997 through 1999) sampling stations, respectively. Based on the fecal coliform data, sixteen waterbody segments, as identified in Table 2, are listed in the Massachusetts' 1998 Section 303(d) list for pathogens.

Analysis of bacterial monitoring conducted since Massachusetts prepared the last 303(d) list in 1998 have identified four additional waterbody segments, listed in Table 3, that are in non-attainment with the fecal coliform criteria. All aspects of this TMDL apply to these four segments that are anticipated to be included on Massachusetts' next 303(d) list due in 2002.

Table 2: Neponset River Basin Segments Listed for Pathogens on Massachusetts' 1998 303(d) List	
Segment ID	Waterbody Name and Description
MA72-13	Mother Brook, Mother Brook Dam, Dedham to confluence with Neponset River, Boston.
MA73-01	Neponset River, Outlet of Neponset Reservoir, Foxborough to confluence with East Branch, Canton.
MA73-02	Neponset River, Confluence with East Branch, Canton to confluence with Mother Brook, Boston.
MA73-03	Neponset River, Confluence with Mother Brook, Boston to Milton Lower Falls Dam, Milton/Boston.
MA73-04	Neponset River, Milton Lower Falls Dam, Milton/Boston to mouth at Dorchester Bay, Boston/Quincy.
MA73-30	Gulliver Creek, From confluence Unquity Brook to confluence Neponset River, Milton.
MA73-26	Unquity Brook, Headwaters to confluence with Gulliver Creek, Milton.
MA73-29	Pine Tree Brook, Outlet Pine Tree Brook Reservoir to confluence Neponset River, Milton.
MA73-27	Ponkapoag Brook, Outlet Ponkapoag Pond to confluence with Neponset River, Canton.
MA73-24	Purgatory Brook, Headwaters, Westwood, to confluence with Neponset River, Norwood.
MA73-05	East Branch, Outlet Forge Pond, Canton, to confluence with Neponset River.
MA73-22	Pequid Brook, Headwaters through Reservoir Pond to the inlet of Forge Pond, Canton.
MA73-20	Beaver Meadow Brook, Outlet of Glenn Echo Pond, Stoughton to the inlet of Bolivar pond, Canton.
MA73-17	Traphole Brook, Headwaters, Sharon to confluence with Neponset river, Sharon/Norwood.
MA73-16	Hawes Brook, Outlet of Ellis Pond to confluence with Neponset River, Norwood.
MA73-15	Germany Brook, Headwaters to inlet of Ellis Pond, Norwood.

Table 3: Additional Neponset River Basin Segments Anticipated To Be Listed for Pathogens on the Massachusetts 2002 303(d) List	
Segment ID	Waterbody Name and Description
MA73-06	School Meadow Brook, Walpole.
MA73-09	Mine Brook, Medfield.
MA73-13	Mill Brook upstream of Willet Pond.
MA73-31	Massapoag Brook at outlet of Lake Massapoag, Sharon.

WATER QUALITY STANDARDS

Fecal coliform bacteria are found in the intestinal tract of warm-blooded animals and their presence in surface waters is an indication of fecal contamination. The Surface Water Quality Standards for the Commonwealth of Massachusetts are described in 314 CMR 4.00. For Class B waters, such as the Neponset River and tributaries, the water quality standards require that fecal coliform bacteria shall not exceed a geometric mean of 200 organisms per 100 ml in any representative set of samples, nor shall more than 10 percent of the samples exceed 400 organisms per 100 ml. Where waters are approved for shellfish harvesting with depuration (Restricted Shellfish Areas), such as the Neponset Estuary, the fecal coliform standards are more stringent to protect this designated use. The standards for these waters require a fecal coliform median or geometric mean MPN (most probable number) equal to or less than 88 organisms per 100 ml, nor shall more than 10 percent of the samples exceed a MPN of 260 organisms per 100 ml.

Fecal coliform bacteria are indicator organisms that are measured to assist water resource managers in identifying the potential presence of pathogens in surface waters. At the present time, Massachusetts is planning to revise its Water Quality Standards and replace fecal coliform with E. *coli* and enterococci as the bacterial indicator organisms. Massachusetts anticipates adopting E. *coli* for fresh waters and enterococci for marine waters. Although this TMDL was developed to attain Massachusetts' current criteria for fecal coliform, the ultimate purpose is to eliminate the presence of pathogens to protect human health. Therefore, in the event that Massachusetts adopts new indicator organism criteria into its Water Quality Standards, the intent of this TMDL will still apply. Massachusetts believes that the magnitude of bacteria loading reductions outlined in this TMDL will be both necessary and sufficient to attain the criteria for E. *coli* and/or enterococci that are recommended by EPA.

FECAL CONTAMINATION OF THE NEPONSET RIVER BASIN

The NepRWA annual water quality monitoring program and the 1994 MADEP monitoring efforts provide an extensive bacterial monitoring coverage through out the basin. Between 1997 and 1999, NepRWA established and monitored 57 surface water stations, and MADEP monitored 41 stations for bacteria in 1994. The locations of the MADEP and NepRWA (1997-1999) bacteria monitoring stations are provided in Figures 4 and 5, respectively, illustrating the extensive coverage of the monitoring programs. Individual data may be found in *The Neponset River Watershed, 1994 Resource Assessment Report, dated October 1995* and the NepRWA annual monitoring reports. The figures illustrate the extent of non-attainment of the fecal coliform standards in the Neponset River and tributaries. Monitoring stations are depicted where the geometric means exceed 200 organisms per 100 ml and/or where more than 10 % of the samples have values exceeding 400 organisms per 100ml. For the NepRWA stations (1997 – 1999), Figure 5 indicates the highest geometric mean of the three years. As indicated, the entire length of the Neponset River, starting near Route 1 in Foxborough downstream to the estuary, and several tributaries do not meet the fecal coliform standards. Also, numerous tributaries were found to be in non-attainment. Exceedences of the fecal coliform criteria were observed at 60% of the NepRWA stations for one or more years, and at 51% of the 1994 MADEP stations. The high percentage of NepRWA stations exceeding fecal coliform criteria is not surprising, considering that, to aid in source identification efforts, NepRWA targeted its monitoring activities in areas with known or suspected problems.

Tables 4 through 7 present the calculated geometric means and percent of samples exceeding 400 organisms per 100 ml for each location in 1994, 1997, 1998, and 1999. Consistent with the Water Quality Standards for fecal coliform, data are summarized and presented in terms of a geometric mean, which is often used as a measure of central tendency for bacteria data. Review of these data reveal that many of the same segments continuously exceed standards indicating the presence of relatively consistent bacteria sources. These data clearly illustrate the impacts of urbanization on ambient bacteria levels since the more developed areas of the watershed typically have the higher bacteria levels. By contrast, low fecal coliform levels are observed in the less developed subwatersheds (i.e., Mine Brook). These data are useful for estimating the natural background contribution for both dry and wet weather conditions.

The majority of the existing data represent dry weather conditions. These data are valuable for identifying dry weather sources of bacteria such as leaking sewers and illicit sewer connections, but are limited for assessing the overall quality of surface waters because there are also impacts associated with wet weather sources. NepRWA was successful in monitoring four wet weather events during the 1998 sampling season. These data are extremely useful to begin documenting the magnitude of wet weather impacts, and give a more complete assessment of the waterbodies during all weather and flow conditions. To illustrate the relative magnitudes of dry and wet weather bacteria levels, Table 6 provides separate geometric means for dry and wet weather conditions. As expected, the wet weather geometric means are typically significantly greater than the dry weather geometric means reflecting the inputs of wet weather sources such as storm water runoff and the flushing of materials from piped drainage systems.

Also, the 1997 data are particularly informative because they are representative of drought-like conditions when river flows and the pollutant assimilative capacity were very low.

Comparison of the 1997 and 1998 dry weather geometric means reveals that, for most stations, the 1997 dry weather geometric means are notably higher than the 1998 dry weather geometric means.

Stream Base Flow and In-Stream Fecal Coliform Levels. The Neponset River Basin fecal coliform data illustrate the relationship between stream base flow quantity and in-stream bacteria concentrations. As stream base flow (flow in stream channel during dry weather conditions) declines bacteria concentrations typically increase. This relationship is due primarily to the fact that stream base flow is composed mostly of ground water flow entering the stream channel. The very low concentrations of bacteria in ground water due to the natural filtering action of the soil matrix through which ground water flows effectively dilutes bacterial wastes from other sources that may be entering the stream during dry weather conditions.

Individual bacteria data collected from the Meadow Brook system in Norwood clearly illustrate this relationship. Based on bacteria data collected during the summer of 1997, NepRWA reported the following in their comments on the draft TMDL document:

> A "The Summer of 1997 was unusually dry. As the summer drought intensified fecal counts in the brook rose from 6500 organisms/100 ml to a peak of 86,600 organisms/100 ml. The levels returned to A"normal"@ in September, as stream levels temporarily recovered, then spike upwards again to 14,000 organsms/100 ml during a shorter dry spell in October, finally subsiding again as streamflow levels recovered in the fall and winter."@

Small urbanized watershed systems like Meadow Brook are particularly vulnerable to declining base flows following extended dry weather conditions. In the case of Meadow Brook the highly impervious cover of the watershed and the presence of an antiquated sewer system which carries sanitary sewage and ground water infiltration out of the basin to the MWRA=s Deer Island Wastewater Treatment Facility contribute to reduced base flow. The high percentage of impervious cover in the watershed significantly reduces the opportunity for rainwater to percolate into the ground and recharge ground water which in turn recharges stream base flow. Instead much of the rainfall is converted to storm water runoff which quickly passes out of the system.

The importance of maintaining and restoring stream base flow through protecting and enhancing ground water recharge to protect and improve water quality as well as effectively manage municipal storm water will be discussed in the TMDL implementation section of this document.

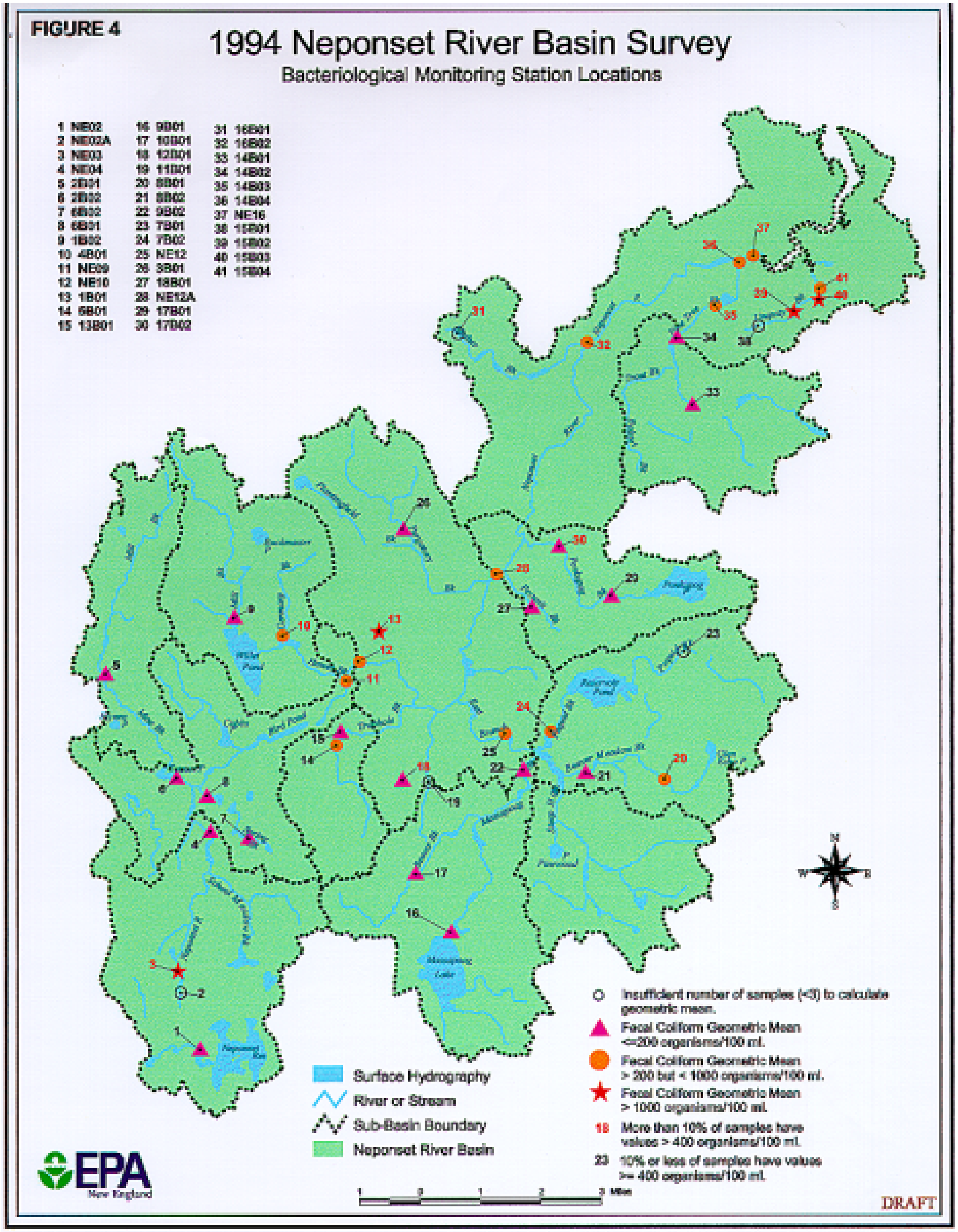


FIGURE 4
1994 Neponset River Basin Survey
Bacteriological Monitoring Station Locations
1 NE02
2 NE02A
3 NE03
4 NE04
5 2B01
6 2B02
7 6B02
8 6B01
9 1B02
10 4B01
11 NE09
12 NE10
13 1B01
14 5B01
15 13B01
16 9B01
17 10B01
18 12B01
19 11B01
20 8B01
21 8B02
22 9B02
23 7B01
24 7B02
25 NE12
26 3B01
27 18B01
28 NE12A
29 17B01
30 17B02
31 16B01
32 16B02
33 14B01
34 14B02
35 14B03
36 14B04
37 NE16
38 15B01
39 15B02
40 15B03
41 15B04
Surface Hydrography
River or Stream
Sub-Basin Boundary
Neponset River Basin
Insufficient number of samples (<3) to calculate geometric mean.
Fecal Coliform Geometric Mean <=200 organisms/100 ml.
Fecal Coliform Geometric Mean > 200 but < 1000 organisms/100 ml.
Fecal Coliform Geometric Mean > 1000 organisms/100 ml.
18 More than 10% of samples have values > 400 organisms/100 ml.
23 10% or less of samples have values >= 400 organisms/100 ml.
EPA
New England
3 Miles
DRAFT

FIGURE 5

1997, 1998, and 1999 Neponset River Watershed Association
Fecal Coliform Monitoring Stations

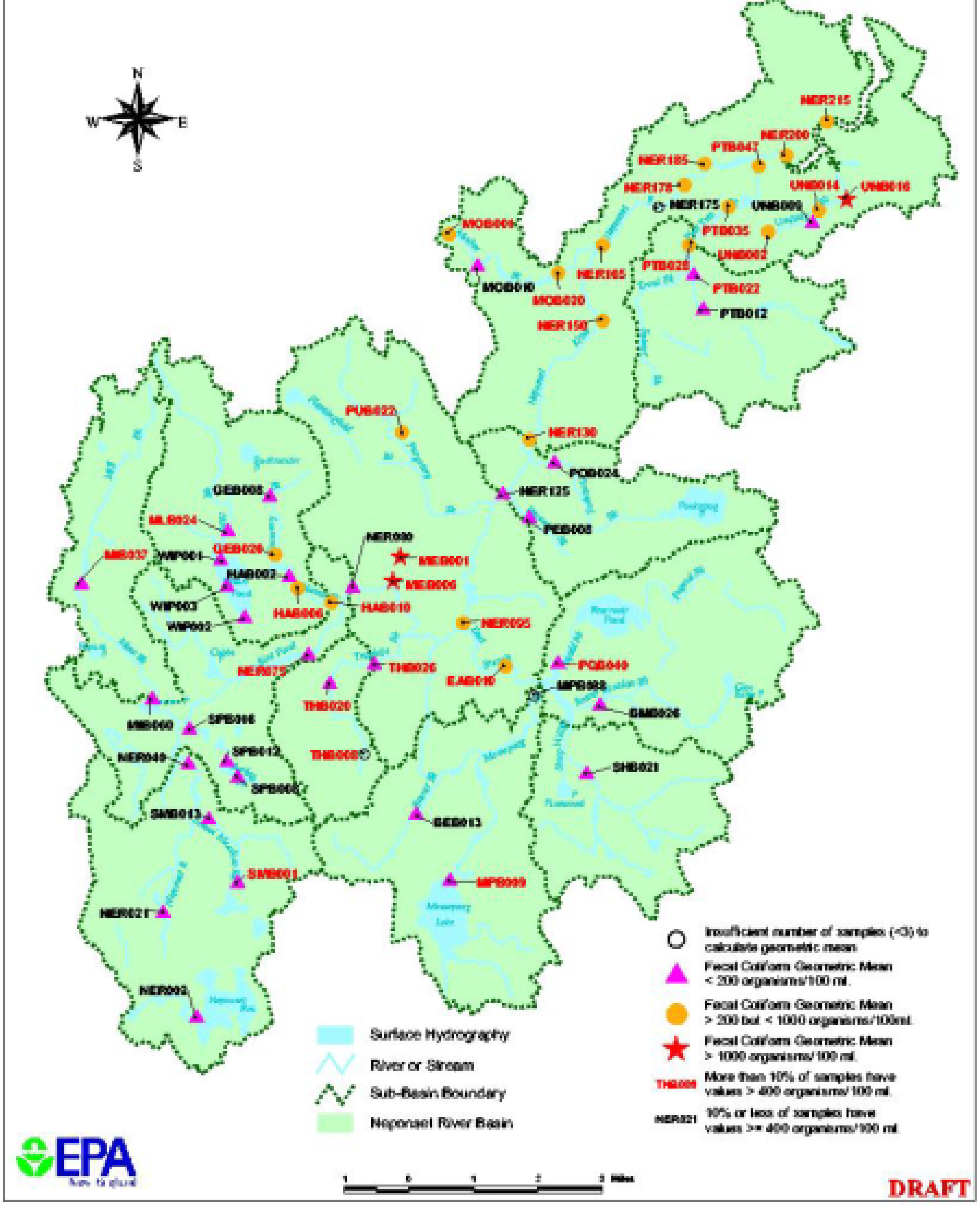


TABLE 4: 1994 DEP NEPONSET RIVER SURVEY FECAL COLIFORM				
STATION ID	**STATION LOCATION**	**NO. OF SAMPLES COLLECTED**	**GEOMETRIC MEAN**	**% OF SAMPLES > 400 (cfu/100 ml)**
NE02	Neponset River, outlet of Crackrock Pond, Foxborough	3	36	33
NE02A	Neponset River, Route 1, Foxborough	2	-	0
NE03	Neponset River, Summer Street, Walpole	4	1544	100
NE04	Neponset River, South Street, Walpole	3	47	0
2B02	Mine Brook, Mill Pond Road, Walpole	3	<20	0
2B01	Mine Brook, Elm Street, Medfield	3	106	0
6B01	Spring Brook, off Route 27, near playground, Walpole	2	23	0
6B02	Spring Brook, Washington Street, Walpole	3	34	0
NE09	Hawes Brook, Washington Street, Norwood	3	212	33
4B01	Germany Brook, Inlet Ellis Pond, Nichol Street, Norwood	3	410	67
1B02	Mill Brook, inlet Pettee Pond off Clearwater Drive, Brook Street, Westwood	3	92	0
NE10	Neponset River, Pleasant Street Bridge, Norwood	3	855	100
1B01	Meadow Brook, off Meadow Brook Road/Pleasant Street, Norwood	4	85,225	100
5B01	Traphole Brook, Cooney Street, Walpole	3	298	33
12B01	Unnamed Traphole tributary, Union Street and Edge Hill Road, Sharon	3	99	33
13B01	Unnamed Traphole tributary, Union Street, Walpole	3	108	0
11B01	Unnamed Neponset tributary, Edge Hill Road, Sharon	1	-	0
NE12	East Branch Neponset River, Neponset Street, Canton	3	300	0
9B02	Massapoag Brook, Walnut Street off Washington Street, Canton	3	20	0
10B01	Beaver Brook, Upland Road, Sharon	3	78	0
9B01	Massapoag Brook, outlet of Massapoag Lake, Sharon (Cedar, East & Massapoag Street)	3	58	0
7B02	Pequid Brook, Sherman Street, Canton	3	203	33
7B01	Pequid Brook, York Street, Canton	1	-	0
8B02	Beaver Meadow Brook, Pine Street, Canton	3	54	0
8B01	Beaver Meadow Brook, Route 138, Canton	3	288	67
3B01	Purgatory Brook, Route 1 near Everett Street, Norwood	3	154	33
NE12A	Neponset River, Dedham Street Bridge, Canton	3	456	33

TABLE 4: 1994 DEP NEPONSET RIVER SURVEY FECAL COLIFORM				
STATION ID	**STATION LOCATION**	**NO. OF SAMPLES COLLECTED**	**GEOMETRIC MEAN**	**% OF SAMPLES > 400 (cfu/100 ml)**
18B01	Pecunit Brook, Elm Street, Canton	3	43	0
17B02	Ponkapoag Brook, Elm Street, Canton	3	199	33
17B01	Ponkapoag Brook, Washington Street, Canton	3	56	0
16B02	Mother Brook, Hyde Park Avenue, Hyde Park	4	204	25
16B01	Mother Brook, Washington Street, Dedham	2	-	50
14B04	Pine Tree Brook, Central Avenue, Milton Village	3	420	67
14B03	Pine Tree Brook, Central Avenue, Milton	3	768	67
14B02	Pine Tree Brook, Blue Hills Parkway, Milton	3	113	0
14B01	Pine Tree Brook, Unquity Road and Harland Street, Milton	3	90	0
NE16	Neponset River, downstream of Baker Dam, Adams Street, Milton/Boston line	3	593	67
15B04	Gulliver Creek, Christopher Avenue, Milton	3	512	67
15B03	Unquity Brook, Adams Street, Milton	2	-	0
15B02	Unquity Brook, Brook Road, Milton	2	-	100
15B01	Unquity Brook, Gun Hill Street off Randolph Avenue, Milton	1	-	0

TABLE 5: 1997 NEPONSET RIVER FECAL COLIFORM DATA				
STATION ID	**STATION LOCATION**	**NO. OF SAMPLES COLLECTED**	**GEOMETRIC MEAN**	**% OF SAMPLES > 400 (cfu/100 ml)**
SMB001	School Meadow Brook at Pine Street, Walpole	6	5	0
SMB013	School Meadow Brook at Washington Street, Walpole	6	123	16.7
SPB008	Spring Brook at Washington Street, Walpole	6	11	0
SPB012	Spring Brook at Stone Street, Walpole	6	7	0
GEB008	Germany Brook at Sycamore Drive, Westwood	6	30	0
GEB020	Germany Brook at inlet of Ellis Pond, Norwood	5	961	80
NER075	Neponset River at Hollingsworth and Vose Dam, Walpole	5	33	0
HAB002	Hawes Brook at Walpole Street, Norwood	6	42	16.7
HAB006	Hawes Brook at Railroad Bridge/Endean Park, Norwood	6	771	83.3
HAB010	Hawes Brook at Washington Street, Norwood	5	651	80
MEB001	Meadow Brook at Sunnyside Road, Norwood	6	9432	100
MEB006	Meadow Brook at Dean Street, Norwood	5	1278	60
THB008	Traphole Brook at High Plain Street, Sharon	2	51	50
THB020	Traphole Brook at Coney Street, Walpole	6	87	16.7
THB026	Traphole Brook at Sumner Street, Norwood	6	141	16.7
NER095	Neponset River at Neponset Street, Canton	4	224	50
MOB001	Mother Brook at Route One Dam, Dedham	6	123	33.3
MOB010	Mother Brook at Bussey Street, Dedham	4	74	0
MOB020	Mother Brook at River Street, Hyde Park/Boston	3	391	33.3
NER130	Neponset River at Green Lodge Street, Canton	4	92	0
NER150	Neponset River at Paul’s Bridge, Milton	4	89	0
NER165	Neponset River at Dana Avenue, Hyde Park/Boston	3	655	100
NER175	Neponset River at Truman Parkway, Mattapan/Boston	1	110	0
NER185	Neponset River at Ryan Playground, Mattapan/Boston	6	1168	83.3
PTB012	Pine Tree Brook at Unquity Road, Milton	5	168	0
PTB022	Pine Tree Brook at Canton Avenue, Milton	5	194	20
PTB035	Pine Tree Brook at Brook Road, Milton	6	418	50
PTB047	Pine Tree Brook at Eliot Street, Milton	5	645	80
UNB002	Unquity Brook at Randolph Avenue, Milton	5	668	60

TABLE 5: 1997 NEPONSET RIVER FECAL COLIFORM DATA				
STATION ID	**STATION LOCATION**	**NO. OF SAMPLES COLLECTED**	**GEOMETRIC MEAN**	**% OF SAMPLES > 400 (cfu/100 ml)**
UNB009	Unquity Brook at Brook Road, Milton	5	76	0
UNB016	Unquity Brook at Squantum Street, Milton	6	1533	100
NER200	Neponset river at Adams Street Bridge, Milton/Boston Line	6	523	66.7

TABLE 6: 1998 NEPONSET RIVER SURVEY FECAL COLIFORM DATA							
Station ID	**Station Description**	**Dry Weather Geometric Mean**	**No. of Dry Samples**	**Wet Weather Geometric Mean**	**No. of Wet Samples**	**Overall Geometric Mean**	**Overall % > 400 cfu/100ml)**
NER021	Neponset River at Sumner Street, Walpole	132	6	247	4	170	10
MIB060	Mine Brook at Mill Pond Road, Walpole	10	6	12	4	11	0
NER075	Neponset River at Hollingsworth and Vose Dam, Walpole	71	6	93	3	78	0
GEB020	Germany Brook at inlet of Ellis Pond, Norwood	169	3	1111	4	495	57
HAB006	Hawes Brook at Railroad Bridge/Endean Park, Norwood	290	5	571	4	392	67
HAB010	Hawes Brook at Washington Street, Norwood	156	5	1212	4	388	44
MEB001	Meadow Brook at Sunnyside Road, Norwood	7573	6	9813	4	8400	100
MEB006	Meadow Brook at Dean Street, Norwood	1574	6	3812	4	2242	90
NER130	Neponset River at Green Lodge Street, Canton	158	6	314	4	208	20
EAB010	East Branch at Neponset Street, Canton	269	5	617	4	389	44
NER150	Neponset River at Paul's Bridge, Milton	119	5	825	4	281	44
NER165	Neponset River at Dana Avenue, Mattapan	265	6	718	4	395	50
NER178	Neponset river at Monponset Street, Mattapan	184	4	1259	2	349	33
NER185	Neponset River at Ryan Playground	607	5	1202	4	822	44
PTB022	Pine Tree Brook at Canton Avenue, Milton	117	6	307	4	172	30

TABLE 6: 1998 NEPONSET RIVER SURVEY FECAL COLIFORM DATA							
Station ID	**Station Description**	**Dry Weather Geometric Mean**	**No. of Dry Samples**	**Wet Weather Geometric Mean**	**No. of Wet Samples**	**Overall Geometric Mean**	**Overall % > 400 cfu/100ml)**
PTB028	Pine Tree Book at Blue Hill Parkway, Milton	128	4	474	4	246	50
PTB035	Pine Tree Brook at Brook Road, Milton	218	5	562	3	311	38
UNB002	Unquity Brook at Randolph Avenue, Milton	309	6	2424	4	704	50
UNB014	Unquity Brook at Adams Street, Milton	109	4	1849	4	449	50
UNB016	Unquity Brook at Squantum Street, Milton	487	6	4491	4	1293	60
NER200	Neponset River at Adams Street Bridge, Milton	179	4	1060	4	436	50
NER215	Neponset river at Granite Avenue, Milton	634	5	648	4	640	33

TABLE 7: 1999 NEPONSET RIVER FECAL COLIFORM DATA

STATION ID	STATION LOCATION	NO. OF SAMPLES COLLECTED	GEOMETRIC MEAN	% OF SAMPLES > 400 (cfu/100 ml)
PUB022	Purgatory Brook at Rte. 1A, near Everett St., Westwood	4	257	25
NER125	Neponset River at Dedham St. Bridge, Canton	4	164	0
PEB008	Pecunit Brook at Elm St., Canton	4	90	0
POB024	Ponkapoag Brook at Washington St., Canton	4	15	0
NER150	Neponset River at Paul's Bridge, Milton	3	94	0
MOB001	Mother Brook At Route One Dam, Dedham	4	358	50
NER165	Neponset River at Dana Avenue, Hyde Park/Boston	4	197	25
NER185	Neponset River at Ryan Playground, Mattapan/Boston	4	338	50
PTB028	Pine Tree Brook at Blue Hill Parkway, Milton	4	71	0
PTB035	Pine Tree Brook at Brook Road, Milton	5	125	0
PTB047	Pine Tree Brook at Central Ave., Milton	4	259	25
NER200	Neponset River at Adams Street Bridge, Milton	4	469	50
UNB002	Unquity Brook at Randolph Avenue, Milton	7	972	71
UNB014	Unquity Brook at Adams Street	5	309	40
UNB016	Unquity Brook at Squantum Street, Milton	3	452	67
NER002	Neponset River at Outlet of Crackrock Pond, Walpole	3	7	0
NER040	Neponset River at South St., Walpole	3	185	0
MIB037	Mine Brook at Elm St., Medfield	4	125	25
SMB013	School Meadow Brook at Washington Street, Walpole	4	173	0
SPB016	Spring Brook at Rte. 27, Walpole	4	165	0
NER075	Neponset River at Hollingsworth and Vose Dam, Walpole	4	55	0
MLB024	Mill Brook at inlet of Petee's Pond, Westwood	4	84	25
WIP001	Willett Pond, northern site, Walpole	4	53	0
WIP002	Willett Pond, Southern Site, Walpole	4	17	0
WIP003	Willett Pond, Eastern site, Walpole	4	11	0
GEB020	Germany Brook at inlet of Ellis Pond, Norwood	4	93	0

TABLE 7: 1999 NEPONSET RIVER FECAL COLIFORM DATA				
STATION ID	**STATION LOCATION**	**NO. OF SAMPLES COLLECTED**	**GEOMETRIC MEAN**	**% OF SAMPLES > 400 (cfu/100 ml)**
HAB002	Hawes Brook at Walpole Street, Norwood	4	60	0
HAB006	Hawes Brook at Railroad Bridge/Endean Park, Norwood	3	117	0
HAB010	Hawes Brook at Washington Street, Norwood	3	238	0
NER080	Neponset River at Pleasant St. Bridge, Norwood	4	152	0
MEB001	Meadow Brook at Sunnyside Road, Norwood	4	4086	100
THB020	Traphole Brook at Coney Street, Walpole	4	65	0
BEB013	Beaver Brook at Upland Road, Sharon	4	39	0
MPB009	Massapoag Brook at outlet Lake Massapoag, Sharon	4	101	25
MPB088	Massapoag Brook at Walnut St., Canton	2	-	0
SHB021	Steep Hill Brook, at Central St, & West St., Stoughton	4	69	0
BMB026	Beaver Meadow Brook at Pine St., Canton	4	166	0
PQB040	Pequit Brook at Sherman St., Canton	4	184	25
EAB010	East Branch at Neponset St., Canton	4	188	25

IDENTIFICATION OF FECAL COLIFORM BACTERIA SOURCES

Largely through the efforts of the NepRWA, the stream teams (citizen monitoring groups active in several subwatersheds of the Neponset River watershed), and MADEP field staff, numerous point and nonpoint sources of fecal contamination have been identified. Table 8 summarizes the river segments impaired due to measured fecal coliform contamination and identifies suspected and known sources. Dry weather sources include leaking sewer pipes, storm water drainage systems (illicit connections of sanitary sewers to storm drains), and failing septic systems. Wet weather sources include storm water runoff and sanitary sewer overflows.

The NepRWA has effectively used its monitoring program to identify bacteria sources and initiate the implementation of necessary controls. For example, the elevated fecal coliform levels in Meadow Brook have been traced to leaking sewers with under-drains that transport sewage to the storm drainage system and to Meadow Brook. Norwood has corrected portions of the faulty sewer system and obtained additional funding to continue repair work (NepRWA, 1999).

There are no permitted point source discharges of fecal coliform within the Neponset River Basin. However, a number of nonpoint and non-permitted point pollutant sources do exist. Non-permitted point sources include piped storm water drainages systems and sanitary sewer overflows. Possible nonpoint sources include, diffuse storm water runoff, leaking sewers, and failing or inadequate septic systems depending on the nature of the discharge to surface waters (discrete or diffuse).

It is difficult to provide accurate quantitative estimates of fecal coliform contributions from the various sources in the Neponset River Basin because many of the sources are diffuse and intermittent, and extremely difficult to monitor or accurately model. Therefore, a general level of quantification according to source category is provided. This approach is suitable for the TMDL analysis because it indicates the magnitude of the sources and illustrates the need for controlling them. Additionally, many of the sources (failing septic systems, leaking sewer pipes, sanitary sewer overflows, and illicit sanitary sewer connections) are prohibited because they indicate a potential health risk and, therefore, must be eliminated. However, estimating the magnitude of overall bacteria loading (the sum of all contributing sources) is achieved for wet and dry conditions using the extensive ambient data available that define baseline conditions (see Tables 4, 5, 6, and 7).

Table 8: Summary of Fecal Coliform Contamination in the Neponset River Watershed

Location	Known and Suspected Sources
Upper Neponset River	Storm water runoff and failing septic systems and
Hawes and Germany Brooks	Illicit sewer connections, sanitary sewer overflows, and storm water runoff.
East Branch Neponset River, Pequid & Beaver Meadow Brooks	Illicit sewer connections, storm water runoff, and failing septic systems.
Steep Hill Brook	Illicit sewer connections, storm water runoff, and failing septic systems.
Middle Neponset River and Meadow Brook	Leaking sewers, illicit sewer connections, storm water runoff, and failing septic systems.
Traphole Brook	Illicit sewer connections, storm water runoff, and failing septic systems.
Purgatory Brook	Illicit sewer connections, sanitary sewer overflows, storm water runoff, and failing septic systems.
Ponkapoag Brook	Illicit sewer connections, storm water runoff, and failing septic systems.
Lower Neponset River	Illicit sewer connections and storm water runoff.
Mother Brook	Illicit sewer connections and storm water runoff.
Pine Tree Brook	Sanitary sewer overflows, illicit sewer connections, storm water runoff, and failing septic systems.
Neponset River Estuary, Unquity & Gullivers Brooks	Illicit sewer connections, sanitary sewer overflows, storm water runoff, and failing septic systems.

Leaking sewer pipes, illicit sewer connections, sanitary sewer overflows (SSOs), and failing septic systems represent a direct threat to public health since they result in discharges of partially treated or untreated human wastes to the surrounding environment. Quantifying these sources is extremely speculative without direct monitoring of the source because the magnitude is directly proportional to the volume of the source and its proximity to the surface water. Typical values of fecal coliform in untreated domestic wastewater range from 10^4 to 10^6 MPN/100ml (Metcalf and Eddy, 1991).

Illicit sewer connections into storm drains result in direct discharges of sewage via the storm drainage system outfalls. The existence of illicit sewer connections to storm drains is well documented in many urban drainage systems, particularly older systems that may have once been combined. In collecting information to support its Municipal Storm Water NPDES Permit application, the Boston Water and Sewer Commission (BWSC) identified and eliminated fifty-seven illicit connections within the Neponset Basin during 1994 and 1995 (MADEP, 1995). Since 1997 BWSC has corrected nine illicit connections eliminating an estimated 12,550 gallons per day of sanitary sewage from the storm drainage system and there are two additional illicit connections that have been assigned to a contract for repair (BWSC, 2000). It is probable that numerous other illicit sewer connections exist in storm drainage systems serving the older developed portions of the basin. Monitoring of storm drain outfalls during dry weather is needed to document the presence or absence of sewage in the drainage systems. NepRWA has been active in monitoring storm drain outfalls that has led to the identification of several illicit connections. All communities in the Neponset Basin are subject to the Storm water Phase II Final Rule that will require the development and implementation of an illicit discharge detection and elimination plan.

Storm water runoff is another significant contributor of fecal coliform pollution. During rain events, fecal matter from domestic animals and wildlife are readily transported to surface waters via the storm water drainage systems and/or overland flow. The natural filtering capacity provided by vegetative cover and soils is dramatically reduced as urbanization occurs because of the increase in impervious areas (i.e., streets, parking lots, etc.) in the watershed.

Extensive storm water data have been collected and compiled both locally and nationally in an attempt to characterize the quality of storm water. Bacteria are easily the most variable of storm water pollutants, with concentrations often varying by factors of 10 to 100 during a single storm. Table 9 summarizes wet weather sampling results of five storm drain outfalls in the Neponset River Basin and Table 10 provides observed ranges of fecal coliform in storm water from different land uses during two storms monitored in the Wachusett Reservoir. Considering this variability, storm water bacteria concentrations are difficult to accurately predict. Caution must be exercised when using values from single wet weather grab samples to estimate the magnitude of bacteria loading because it is often unknown whether the sample is representative of the "true" mean. To gain an understanding of the magnitude of bacterial loading from storm water and avoid overestimating or underestimating bacteria loading, event mean concentrations (EMC) are often used. Typical storm water event mean densities for various indicator bacteria are provided in Tables 11 and 12. These EMCs illustrate that storm water bacteria concentrations from certain land uses (i.e., residential) are typically at levels sufficient to cause water quality problems.

NepRWA has begun to quantify the magnitude and extent of fecal contamination in the Neponset Basin during wet weather conditions. With the exception of two sampling stations, Mine Brook (MIB060) and the Neponset River at Hollingsworth and Vose (NER075), excessive levels of fecal coliform were observed at all stations highlighting the need for improved storm water management. The extent of urbanized land cover in the Neponset Basin (see Table 1 and Figure 3) in conjunction with the fecal coliform EMCs in Tables 11 and 12, supports the assertions that storm water runoff is a significant cause contributing to the non-attainment of designated uses, and that reductions of wet weather bacteria sources are warranted. However, since wet weather data in the Neponset Basin remains limited, ~~a~~ progressive implementation of the TMDL is proposed to address wet weather bacteria sources. This approach requires estimating the pollutant reductions necessary to meet water quality standards using the best available information and allows controls to be implemented while additional data are collected.

Table 9: Wet Weather Storm Drain Sampling – Neponset River Basin (1) (MA DEP, 2000)

Land Use Category	Fecal Coliform	Enterococcus	E. Coli
	Organisms / 100 ml		
Residential	< 16 – 25,000	340 – 70,000	<16 – 4,000
Forest/Urban Open	410 – 31,000	2,500 – 45,000	41 – 22,000
Commercial	16 – 5,600	120 – 2,300	<16 – 1,200
Industrial	600 – 3,600	880 – 11,000	130 – 3,000

(1) Grab samples collected for four storms between September 15, 1999 and June 7, 2000.

Table 10: Wachusett Reservoir Storm Water Sampling
MDC-CDM Wachusett Storm Water Study (June 1997)

Land Use Category	Fecal Coliform Bacteria (1) Organisms / 100 ml
Agriculture, Storm 1	110 - 21,200
Agriculture, Storm 2	200 - 56,400
"Pristine" (not developed, forest), Storm 1	0 - 51
"Pristine" (not developed, forest), Storm 2	8 - 766
High Density Residential (not sewered, on septic systems), Storm 1	30 - 29,600
High Density Residential (not sewered, on septic systems), Storm 2	430 - 122,000

Table 11: Storm Water Event Mean Bacteria Concentrations (2) The Lower Basin of the Charles River (U.S. Geological Survey, 2001)		
Land Use Category	**Fecal Coliform Bacteria** **Organisms / 100 ml**	**Enterococcus Bacteria** **Organisms / 100 ml**
Single Family Residential	2,845 – 93,950	5,456 – 86,679
Multifamily Residential	2,185 – 30,624	3,176 – 49,405
Commercial	682 – 27,670	2,134 – 35,489

(2) Event Mean Densities for eight storms sampled during 2000 by USGS.

Table 12: Storm Water Event Mean Fecal Coliform Concentrations (3) (Metcalf & Eddy, 1992)	
Land Use Category	**Fecal Coliform Bacteria (3)** **Organisms / 100 ml**
Single Family Residential	37,000
Multifamily Residential	17,000
Commercial	16,000
Industrial	14,000

(3) Derived from NURP study event mean concentrations and nationwide pollutant buildup data

Septic systems designed, installed and maintained in accordance with 310 CMR 15.000: Title 5, are not significant sources of fecal coliform bacteria. Studies demonstrate that wastewater located four feet below properly functioning septic systems contain on average less than one fecal coliform bacteria organism per 100 ml (Ayres Associates, 1993). Failed or non-conforming septic systems, however, can be a major contributor of fecal coliform to the Neponset River and tributaries. Wastes from failing septic systems enter surface waters either as direct overland flow or via groundwater. Wet weather events typically increase the rate of transport of pollutant loadings from failing septic systems to surface waters because of the wash-off effect from runoff and the increased rate of groundwater recharge.

TOTAL MAXIMUM DAILY LOAD DEVELOPMENT

Section 303 (d) of the Federal Clean Water Act (CWA) requires states to place water bodies that do not meet the water quality standards on a list of impaired waterbodies. The CWA requires each state to establish Total Maximum Daily Loads (TMDLs) for listed waters and the pollutant contributing to the impairment(s). TMDLs determine the amount of a pollutant that a waterbody can safely assimilate without violating the water quality standards. Both point and nonpoint pollution sources are accounted for in a TMDL analysis. Point sources of pollution (those discharges from discrete pipes or conveyances) receive a wasteload allocation (WLA) specifying the amount of pollutant each point source can release to the waterbody. Nonpoint sources of pollution (all sources of pollution other than point) receive a load allocation (LA) specifying the amount of a pollutant that can be released to the waterbody by this source. In accordance with the CWA, a TMDL must account for seasonal variations and a margin of safety, which accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality. Thus:

TMDL = WLAs + LAs + Margin of Safety

Where:

WLA = Waste Load Allocation which is the portion of the receiving water's loading capacity that is allocated to each existing and future point source of pollution.

LA = Load Allocation which is the portion of the receiving water's loading capacity that is allocated to each existing and future nonpoint source of pollution.

FECAL COLIFORM TMDL

Loading Capacity. The pollutant loading that a waterbody can safely assimilate is expressed as either mass-per-time, toxicity or some other appropriate measure (40 C.F.R. § 130.2(i)). Typically, TMDLs are expressed as total maximum daily loads. However, MADEP believes it is appropriate to express bacteria TMDLs in terms of concentration because the fecal coliform standard is also expressed in terms of the concentration of organisms per 100 ml. Since source concentrations may not be directly added, the previous equation does not apply. To ensure attainment with Massachusetts' water quality standards for bacteria, all sources (at their point of discharge to the receiving water) must be equal to or less than the standard. Expressing the TMDL in terms of daily loads is difficult to interpret given the very high numbers of bacteria and the magnitude of the allowable load is dependent on flow conditions and, therefore, will vary as flow rates change. For example, a very high number of bacteria are allowable if the volume of water that transports the bacteria is high too. Conversely, a relatively low number of bacteria may exceed water quality standard if flow rates are low. For all the above reasons the TMDL is simply set equal to the standard and may be expressed as follows:

TMDL = Fecal Coliform Standard = $\mathbf{WLA_{(p1)}}$ = $\mathbf{LA_{(n1)}}$ = $\mathbf{WLA_{(p2)}}$ = etc.

Where:

$WLA_{(p1)}$ = allowable concentration for point source category (1)
$LA_{(n1)}$ = allowable concentration for nonpoint source category (1)
$WLA_{(p2)}$ = allowable concentration for point source category (2) etc.

For Class B surface waters the fecal coliform TMDL includes two components: (1) the geometric mean of a representative set of fecal coliform samples shall not exceed 200 organisms per 100 ml; and (2) no more than 10 % of the samples shall exceed 400 organisms per 100 ml. For Class SB surface Waters the fecal coliform TMDL is more restrictive to protect the shellfish use goal and also includes two components: (1) the geometric mean of a representative set of fecal coliform samples shall not exceed 88 organisms per 100 ml; and (2) no more than 10 % of the samples shall exceed 260 organisms per 100 ml.

The goal to attain water quality standards at the point of discharge is environmentally protective, and offers a practical means to identify and evaluate the effectiveness of control measures. In addition, this approach establishes clear objectives that can be easily understood by the public and individuals responsible for monitoring activities. Also, the goal of attaining standards at the point of discharge minimizes human health risks associated with exposure to pathogens because it does not consider losses due to die-off and settling that are known to occur.

Wasteload Allocations (WLAs) and Load Allocations (LAs). Although, there are no permitted discharges of fecal coliform into the Neponset River and its tributaries, direct storm water discharges from numerous storm drainage systems occur. Piped discharges are, by definition, point sources regardless of whether they are currently subject to the requirements of NPDES permits. Therefore, a WLA set equal to the fecal coliform standard will be assigned to the portion of the storm water that discharges to surface waters via storm drains.

WLAs and LAs are identified for all known source categories including both dry and wet weather sources for Class B and SB segments within the Neponset River Basin. Establishing WLAs and LAs that only address dry weather bacteria sources would not ensure attainment of standards because of the significant contribution of wet weather bacteria sources to fecal coliform criteria exceedences. Illicit sewer connections and deteriorating sewers leaking to storm drainage systems represent the primary dry weather point sources of bacteria, while failing septic systems and possibly leaking sewer lines represent the nonpoint sources. Wet weather point sources include discharges from storm water drainage systems, sanitary sewer overflows (SSOs) and, until recently, combined sewer overflows (CSOs). Wet weather nonpoint sources primarily include diffuse storm water runoff.

Table 13 presents the fecal coliform bacteria WLAs and LAs for the various source categories. Source categories representing discharges of untreated sanitary sewage to receiving waters are prohibited, and therefore, assigned WLAs and LAs equal to zero. There are two sets of WLAs and LAs, one for Class B waters and the other for Class SB waters. The WLA and LA for storm water discharging to the lower fresh water portion of the Neponset River (Boston, Milton and Quincy) is set equal to the fecal coliform standard for SB waters in order to ensure that standards for restricted shellfish harvesting are met in the estuary.

The TMDL should provide a discussion of the magnitudes of the pollutant reductions needed to attain the goals of the TMDL. Since accurate estimates of existing sources are generally unavailable, it is difficult to estimate the pollutant reductions for specific sources. For the illicit sources, the goal is complete elimination (100% reduction). However, overall wet weather bacteria load reductions can be estimated using typical storm water bacteria concentrations, as presented in Tables 9 - 12, and the magnitude of the wet weather data observed in the Neponset Basin. This information indicates that two to three orders of magnitude (99 to 99.9%) reductions in storm water fecal coliform loadings will be necessary, especially in the developed areas draining to small tributaries.

In addition, overall reductions needed to attain water quality standards can be estimated using the extensive ambient fecal coliform data that are available from the Neponset Basin. Using ambient data is beneficial because it provides more realistic estimates of existing conditions and the magnitude of cumulative loading to the surface waters. Reductions are calculated using data from both wet weather conditions and combined wet and dry conditions and are presented in Table 14. Data from 1998 are used since it includes the greatest number of observations at a given location and includes the most wet weather observations. Examining wet weather data separately provides estimates of the magnitude of reductions from all sources during wet weather conditions. As indicated in Table 11, bacteria reductions of one to two orders of magnitude are needed to attain water quality standards. For example, when viewing the data in Table 14 at station MEB001 it would take a 98.9% reduction in fecal coliform during wet weather conditions to meet water quality standards. The 90% observation listed in the table means that 90% of the samples collected at that station fall below the value of 35,000 organisms per 100 ml. That value would have to be reduced to 400 organisms per 100 ml to meet water quality standards criteria (or stated another way a reduction of 98.9 % would be necessary).

Table 13: Fecal Coliform Wasteload Allocations (WLAs) and Load Allocations (LAs) for the Neponset River and Identified Tributary Streams

Surface Water Classification	Bacteria Source Category	WLA	LA
		(organisms per 100 ml)	
B	Illicit Discharges to Storm Drains	0	N/A
B	Leaking Sanitary Sewers	0	0
B	Failing Septic Systems	N/A	0
B	Storm Water Runoff	GM $\leq$ 200 10% $\leq$ 400	GM $\leq$ 200 10% $\leq$ 400
B	Sanitary Sewer Overflows	0	0
SB	Illicit Discharges to Storm Drains	0	N/A
SB	Failing Septic Systems	N/A	0
SB	Storm Water Runoff (Boston, Milton and Quincy)	GM $\leq$ 88 10% $\leq$ 260	GM $\leq$ 88 10% $\leq$ 260

SB	Sanitary Sewer Overflows	0	0
SB	Combined Sewer Overflows	0	N/A

Margin of Safety: For this analysis, margin of safety is implied. First, the TMDL does not account for mixing in the receiving waters and assumes that zero dilution is available. Realistically, influent water will mix with the receiving water and become diluted provided that the influent water concentration does not exceed the TMDL concentration. Second, the goal of attaining standards at the point of discharge does not account for losses due to die-off and settling that are known to occur.

Seasonal Variability: TMDLs must also account for seasonal variability. This TMDL has set WLAs and LAs for all known and suspected source categories equal to the fecal coliform criteria independent of seasonal conditions. This will ensure the attainment of water quality standards regardless of seasonal and climatic conditions. Any controls that are necessary will be in place throughout the year, and, therefore, will be protective of water quality year round.

Table 14: Estimates of Fecal Coliform Loading Reductions to the Neponset River and Tributaries

Station	MEB001	UNB002	NER185
Wet Weather Geo. Mean	9813	2424	1202
% reduction (1)	**98**	**92**	**83**
Overall Geo. Mean	8,400	704	822
% reduction (1)	**98**	**72**	**76**
90 % observation	35,000	3,500	58,000
% reduction (2)	**98.9**	**88.6**	**99.3**

(1) Geometric mean to be less than or equal to 200 organisms per 100 ml.
(2) No more than 10 % of the samples shall exceed 400 organisms per 100 ml.

TMDL IMPLEMENTATION

A comprehensive control strategy is needed to address the numerous and diverse sources of fecal coliform bacteria in the Neponset River Basin. Many of the sources in the Neponset Basin including sewer connections to drainage systems, leaking sewer pipes, sanitary sewer overflows, and failing septic systems, are prohibited and must be eliminated. Individual sources must be first identified in the field before they can be abated. Pinpointing sources typically requires extensive monitoring of the receiving waters, and tributary storm water drainage systems during both dry and wet weather conditions. A comprehensive program is needed to ensure illicit sources are identified and that appropriate actions will be taken to eliminate them. NepRWA has been successful in carrying out such monitoring, identifying sources, and, in some case, mobilizing the responsible municipality to begin to take corrective actions.

Storm water runoff represents another major source of fecal coliform to the Neponset River and tributaries, and the current level of control is clearly inadequate for standards to be attained. Improving storm water runoff quality is essential for restoring water quality and recreational uses. At a minimum, intensive application of non-structural BMPs is needed throughout the watershed to reduce fecal coliform loadings as well as loadings of other storm water pollutants (nutrients and solids) contributing to use impairments in the Neponset Basin. Depending on the success of the non-structural storm water BMP program, structural controls may become necessary.

For these reasons, a basin-wide implementation strategy is proposed. The strategy includes a mandatory program for implementing storm water BMPs and eliminating illicit sources. Implementing the fecal coliform TMDLs will be accomplished through the following mechanisms. The tasks and responsibilities for implementing the TMDL are shown in Table 15. The Department of Environmental Protection will use the Watershed Basin Team as the primary means for obtaining public comment and support for this TMDL. A number of local and state parties both public and private comprise the Watershed Basin Team. The DEP working with the Boston Harbor Watershed Team, Neponset River Watershed Association, and other team partners shall make every reasonable effort to assure implementation of this TMDL.

Storm Water Runoff and Illicit Discharge Connections. To address storm water runoff quality and illicit sanitary sewer discharges, a comprehensive watershed wide storm water management and illicit discharge elimination program is necessary. All communities in the Neponset Basin are subject to the Storm Water Phase II Rule, which requires designated municipalities and construction activities to obtain National Pollution Discharge Elimination System (NPDES) permit coverage. Regulated communities must develop, implement, and enforce a storm water management program designed to reduce the discharge of pollutants from their storm drainage systems to the maximum extent practicable to protect water quality.

Coverage under the Phase II Rule will require communities to develop and implement more comprehensive storm water management programs that must include, at a minimum, the following elements: (1) Public Education and Outreach; (2) Public Participation/Involvement; (3) Illicit Discharge Detection and Elimination; (4) Construction Site Runoff Control; (5) Post-Construction Runoff Control; and (6) Pollution Prevention/Good Housekeeping. A series of fact sheets describing the Storm Water Phase II Rule and details of the required elements are provided in Appendix 1.

Although the TMDL presents quantified WLAs for storm water that are set equivalent to the criteria in the Massachusetts Water Quality Standards, the Phase II NPDES permits will not include numeric effluent limitations. Phase II permits are intended to be BMP based permits that will require communities to develop and implement comprehensive storm water management programs involving the use of BMPs. Massachusetts and EPA believe that BMP based Phase II permits involving comprehensive storm water management together with specific emphasis on pollutants contributing to existing water quality problems can be consistent with the intent of the quantitative WLAs for storm water discharges in TMDLs.

It is expected that water quality will be maintained through the implementation of a storm water management plan even during wet weather when contributions of fecal coliform to the Neponset River and its tributaries increase. The Communities' storm water management programs must be developed to address fecal coliform contamination, as well as other storm water pollutants (solids and nutrients) causing use impairments. The programs must include, at a minimum, identification and implementation of storm water BMPs, including increased frequency of street sweeping and catch basin cleaning, public education programs, adoption of pet waste pick up laws, and where ever possible, the diversion of runoff to pervious areas for infiltration. Public education will be critical to the success of the plan since the predominant land use activity in the Neponset Basin is residential. Homeowners should be made aware of their contributions to the degradation of water quality and their role in improving it. For example, homeowners should be made aware of pet wastes as a source of bacteria in storm water and the need for the proper cleanup and disposal of such wastes.

The 1994 Neponset River Basin assessment report and the more recent NepRWA work demonstrate that storm water drainage systems from the watershed communities are significant contributors of pollutants causing use impairments during both dry and wet weather conditions. Compliance with the requirements of the storm water permit program by the watershed communities will result in dramatic improvements to water quality in the Neponset Basin. Since 1994, the Boston Water and Sewer Commission's (BWSC) NPDES Storm Water Permit program has resulted in the elimination of numerous sewer connections to drainage systems that discharge to the lower segments of the Neponset River. Storm water runoff not only contributes to in-stream fecal coliform violations but also contributes nutrients and solids that contribute to other documented use impairments.

Combined Sewer Overflows. Combined sewer overflows to the estuary are being addressed through MWRA's CSO facility planning program. Three CSOs permitted to the Boston Water and Sewer Commission have been eliminated. These discharges affected the estuary portion of the Neponset River.

Sanitary Sewer Overflows and Leaking Sewer Pipes. Sanitary Sewer overflows (SSOs) from sewer systems, such as those in the Town of Milton, need to be immediately addressed. The Town must develop and implement an aggressive plan to eliminate SSO's. All communities known to have leaking sewers and which are not currently taking corrective actions may be subject to future MADEP and/or EPA enforcement actions if deemed necessary.

Failing Septic Systems. Failing septic systems will be addressed through the local Boards of Health, which are responsible for implementing the Commonwealth's Title 5 sub-surface sewage disposal regulations. Where failing septic systems are known to contribute to water quality standards violations, prompt actions must be taken to eliminate the source. In certain cases, such as in Walpole, the sewer system is being extended to tie-in areas with failing septic systems. However, for the Neponset Basin proper septic system maintenance followed by regular inspections should be the first step towards correcting poorly performing systems. Extending sewer systems into non-sewered areas should be the last resort for addressing failing systems, as it will result in reduced groundwater recharge and possibly a reduction in stream base flows. Inadequate stream base flows are already considered to be a significant problem in some areas of the Neponset Basin.

Current regulations in Massachusetts require the inspection of septic systems at the time of transfer of property. A failed system has to be upgraded to current standards within two years of inspection. Therefore, unidentified septic systems failing to protect public health or the environment are upgraded when a property comes into the market. For those properties that will not come into the market, monitoring and stream bank surveys by local stream teams will be critical.

Table 15: Tasks And Responsibilities	
Task	**Responsible Group**
Writing TMDL	DEP/EPA
TMDL Public Meeting	DEP / Watershed Team
Response to public comments	DEP/EPA
Organization, contacts with volunteer groups	EOEA Watershed Team
Development of comprehensive storm water management programs including identification and implementation of BMPs	Neponset River Basin Communities
Illicit Discharge Detection and Elimination	Neponset River Basin Communities with NepRWA assistance
Leaking Sewer Pipes and Sanitary Sewer Overflows	Responsible Communities
Inspection and upgrade of on-site sewage disposal systems as needed	Homeowners and Neponset River Basin Communities
Organize implementation; work with stakeholders and local officials to identify remedial measures and potential funding sources	EOEA Watershed Team, NepRWA, and Neponset River Basin Communities
Organize and implement education and outreach program	NepRWA and Neponset River Basin Communities
Write grant and loan funding proposals	NEPRWA, Neponset River Basin Communities, and Planning Agencies with guidance from DEP
Inclusion of TMDL recommendations in EOEA Watershed Action Plan	EOEA Watershed Team
Surface Water Monitoring	NepRWA and DEP
Provide periodic status reports on implementation of remedial activities	EOEA Watershed Team and NepRWA

TMDL MONITORING

Long term monitoring will be important to assess the effectiveness of BMPs and whether or not standards are attained. In-stream monitoring at established ambient sampling stations will be used to assess standards attainment. NepRWA has a well established and effective monitoring program that provides quality assured data throughout the Neponset River and its tributaries. These data have been used to characterize fecal contamination during both dry and wet weather conditions and identify specific sources. NepRWA's monitoring program will continue during and following the implementation of necessary controls and will provide the majority of data to assess the effectiveness of controls and attainment of standards.

As part of the Storm Water Phase II Rule, and possibly enforcement actions, the Neponset River Basin communities will be required to identify illicit discharges from their storm drains. Wet weather data of discharges from storm drains is also necessary to further identify wet weather sources of bacteria within the drainage systems (e.g., in-system overflows between the sanitary sewer and the storm drains). The next round of DEP in-stream monitoring is scheduled to occur in 2004, the monitoring year for the Neponset Basin. A detailed monitoring plan will be developed prior to the sampling season. The 2004 data will be used to evaluate progress, and will serve as a baseline to evaluate future controls resulting from the implementation of a comprehensive storm water management, illicit sewer connection removal program, and other implementation activities identified in this TMDL.

REASONABLE ASSURANCES

Reasonable assurances that the TMDL will be implemented include both enforcement of current regulations, availability of financial incentives, and the various local, state and federal programs for pollution control. Storm water NPDES permit coverage will address discharges from municipal owned storm water drainage systems. Enforcement of regulations controlling nonpoint discharges include local enforcement of the states Wetlands Protection Act and Rivers Protection Act; Title 5 regulations for septic systems and various local regulations including zoning regulations. Financial incentives include Federal monies available under the 319 NPS program and the 604 and 104b programs, which are provided as part of the Performance Partnership Agreement between DEP and the USEPA. Additional financial incentives include state income tax credits for Title 5 upgrades, and low interest loans for Title 5 septic system upgrades through municipalities participating in this portion of the state revolving fund program.

PUBLIC PARTICIPATION / PUBLIC OUTREACH

PUBLIC PARTICIPATION

Public Meetings

At the request of the Neponset River Watershed Association (NepRWA) and the Boston Harbor Watershed Team, two public meetings were held to present the bacteria TMDL for the Neponset River. Both meetings were held at the Audubon office on the grounds of the Metropolitan District Commission's (MDC) Blue Hills Trailside Museum in Milton. The first meeting was held from 6:30 to 9:00 pm on December 18, 2001. The second meeting was held from 7:00 to 9:00 pm on February 12, 2002. A copy of the attendance list for each meeting is included on following pages.

The following is a summary of the meeting, the questions asked, and the response to the comments raised all of which have been prepared by Elaine Hartman of DWM.

Presentations:
Mark Voorhees, USEPA, presented an overview of the TMDL and the water quality studies on which the TMDL is based:
Russell Isaac, MADEP, presented the TMDL report process, and information on bacteria standards as applied to this TMDL;
Karl Pastore, EOEA watershed team leader for the Neponset was present to answer questions.

GIS displays: Large watershed maps of: (1) Neponset River Basin and Surrounding Communities; (2) Land Use Types; (3) Neponset River Basin Survey (Biological and water quality monitoring station locations); (3) 1997-99 NRWA Fecal Coliform Monitoring Stations; (4) DEP Assessment Map for Boston Harbor.

Handouts: USEPA PowerPoint presentation; MADEP PowerPoint presentation; TMDL full draft report and summary sheets; material on septic systems and Title V; funding for improvements; and various other material on related meeting topics.

Note: A second TMDL presentation meeting will be held on February 12, 2002. The TMDL report is undergoing public review. The report is available on the web.

About 10 stakeholders attended the meeting, and 7 representatives of the state and federal agencies and the watershed association, including: USEPA, MADEP-NERO, MADEP-BRP DWM; MWRA; EOEA; NRWA.

Attachments: Presentations by USEPA and MADEP; attendance sheet; TMDL 2 page summary.

Questions and Responses:

1. **What types of TMDLs have been completed in the state and how many have been done?**
TMDLs for rivers, harbors, and lakes are being developed. The lake TMDLs are grouped into watersheds, with approximately 35 lakes being drafted for the Chicopee, Blackstone and Connecticut watersheds. Public meetings have been held on these. Nineteen (19) additional lakes are being worked on in the French River watershed. The

lake TMDLs are mostly for nutrient enrichment and aquatic plants and use a runoff model developed by DEP in combination with field monitoring. For rivers, Palmer River (bacteria); Assabet (nutrients), Nashua River (nutrients); and the Blackstone River (nutrients) are under development. For coastal waters, a TMDL for Little Harbor (bacteria) has been developed. A framework upon which to base nutrient TMDLs for coastal waters is under development. All of these TMDLs use a combination of field monitoring and various types and complexities of models.

2**. What does a nutrient TMDL include?**
For marine systems the important nutrient would be nitrogen, for fresh water it would be phosphorus. The TMDL would look at the level of input from each source, and how these levels together affect the water quality instream.

3. **Are nutrients being looked at for the Neponset?**
MADEP and USEPA are concentrating on bacteria first. The effects of nutrient enrichment in the Neponset have not been seen yet. However, reducing bacteria levels will also serve to reduce nutrient levels.

4. **Why is the East Branch of the Neponset River not included on the maps? Subwatersheds 5, 6, and 7 are tributaries to the East Branch. 1994 data shows that it is not attaining standards?**
This is listed on the map as the East Branch, not as the East Branch of the Neponset River in Canton.

5. **The cost of public water supplies are increasing so people are using well water. How does this affect the system and is any one looking at this?**
Groundwater withdrawals on a municipal level are a problem. With private wells, it is a put and take situation with some loss through evaporation. Wells are more of a problem if it is a big well that has a sanitary sewer, which moves the water out of system. The Neponset River TMDL notes the lack of flow and the lower dilution capacity instream. However, since this TMDL is not tied to an NPDES permit and a particular flow, it has been more difficult from a regulatory point to change flow levels. For water supply systems with a 100,000 gallons or greater withdrawal there is a regulatory hold. Some wells are also registered and pre-date the water withdrawal law.

6**. NRWA indicated that they were nervous when a water quality initiative targets septic systems, as this pressures communities to extend sewage systems. This situation brings its own problems. NRWA has data to show that the sewer systems not the septic systems are a problem. NRWA believes that the language in the report to maintain the septic systems and sewer laterals is good. Regulatory tools are needed to make sure that laterals are maintained so that inflow and infiltration is not a problem.**
Wastewater disposal through septic and sewer systems are connected. With anti-degradation provisions it may be possible to not allow increased connections to the sewer system. Distributive systems try to keep water within a basin but require increased treatments.

7. **In terms of the State Revolving Funds is there a recharge ratio if water is to be moved out of basin?**

Although there is no recharge number for SRF, the sewering process may require the filing of an ENF (Environmental Notification Form) with MEPA (the Massachusetts Environmental Policy Agency). Review of the ENF could then trigger the writing of an EIR (Environmental Impact Report). As part of the preparation of this report, all alternatives to the out-of-basin transfer would need to be listed and evaluated for impacts. Additionally, part of writing an EIR requires the inclusion of a CMP (Comprehensive Management Plan). This plan historically evaluated just wastewater, but new procedures are being written for the development of an Integrative Water Resource Management Plan (IWRMP) to replace the CMP. The new IWRMP would include a linked water and wastewater evaluation. The Water Resources Commission, which administers the Interbasin Transfer Act, would review any new interbasin transfers of water of 1 mgd or any amount determined significant by the WRC. The WRC has required more of a return over the last few years. However, small out of basin transfers may not be covered.

8. **The EOEA team leader indicated that it was important the TMDL covered Canada Geese and requested names of publications on this issue are included in the report.**

DEP and EPA: Information on Canada Geese is important because you cannot control the wildlife but you can control the wildlife enthusiasts. The bacteria levels from geese are greater than from a cow. Geese do not like a high grass buffer zone at the waters edge. Therefore, this can be a good control measure to prevent them from staying in one area. At the Wachusett Reservoir they are kept away from the intake area so the time of travel allows the bacteria to die off. Reports will be included in the bibliography of the TMDL report.

10.**EPA: There is work on-going on this issue at Spy Pond in Arlington. They have developed a flyer to give to geese feeders. They are also trying to enforce an ordinance related to this issue and are working with a representative in the area who is a specialist on geese. The EPA will give the name of the person that to contact to the NRWA.**

11. **There is a difference in NRWA wet weather and dry weather data results, therefore individuals want to focus on dry weather illicit connections. Are there methods which volunteers can use in the field?**
Optical brightener samplers could be used. These are fairly easy to construct and operate. Also, collecting of samples from areas prior to runoff to storm drains could be included. On a more complex scale: In the Charles River they are metering for flow. DEP laboratory is working on a DNA tracking study to identify sources.

Subsequent to the public meeting, the Neponset River Watershed Association (NepRWa) submitted comments. The comments themselves are attached and a response to a brief summary of the issues raised follows.

Concern was expressed that reducing bacteria could further aggravate low flow conditions if the bacteria reductions were accomplished by more sewering or by other means that reduce stream recharge. In general, very small flows with high bacteria concentrations cause violations of water quality standards, so it is unlikely that correcting problems such as illicit connections to storm drains and surcharging of sanity sewers would have much of an impact on flow. At the same time, there is growing recognition throughout the Commonwealth that sewering and transporting wastewater out of a basin can contribute to low flow conditions. As a result of this recognition, more efforts are being made to keep wastewater disposal within its basin of origin in general and to recognize this need even for tributaries within the particular river basin.

The inclusion of at least an outline for implementing the TMDL was endorsed. DEP believes it is extremely important for local participation in correcting problems noted in the TMDL and that in some cases more detailed information will be needed so that cost effective remedies are chosen.

NepRWA observes that the TMDL implies that failing septic systems are the major source of contamination by bacteria while the Association concludes that leaking sewers and inflow/infiltration are the primary sources. DEP agrees that given the extent of urban areas in the watershed with sewers, both sanitary and storm, septic systems may not be an overriding source overall but can be so locally. Certainly elimination of illicit connections and sanitary sewer overflows need to receive the highest priority in remediation of the problems.

NepRWA notes the aggravation of extremes in flow caused by increasing impervious surfaces within the Neponset (and other) watersheds and the need to promote recharging of the groundwater and thus recharging stream flow. DEP agrees with this need and anticipates supporting such efforts to the degree that its programs can.

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APPENDIX 1: ATTENDANCE LIST