Total Maximum Daily Loads of Bacteria for Little Harbor

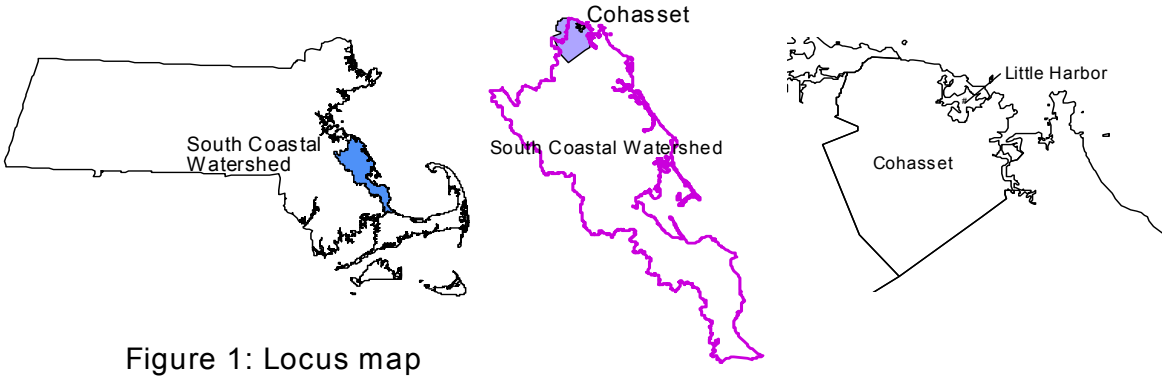

Figure 1: Locus map

COMMONWEALTH OF MASSACHUSETTS
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Limited copies of this report are available at no cost by written request to:

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Little Harbor, Cohasset, MA (MA94-20)

Total Maximum Daily Load

DEP, DWM TMDL Report MA94-20-2002-22, CN 120, FINAL FEBRUARY 4, 2002

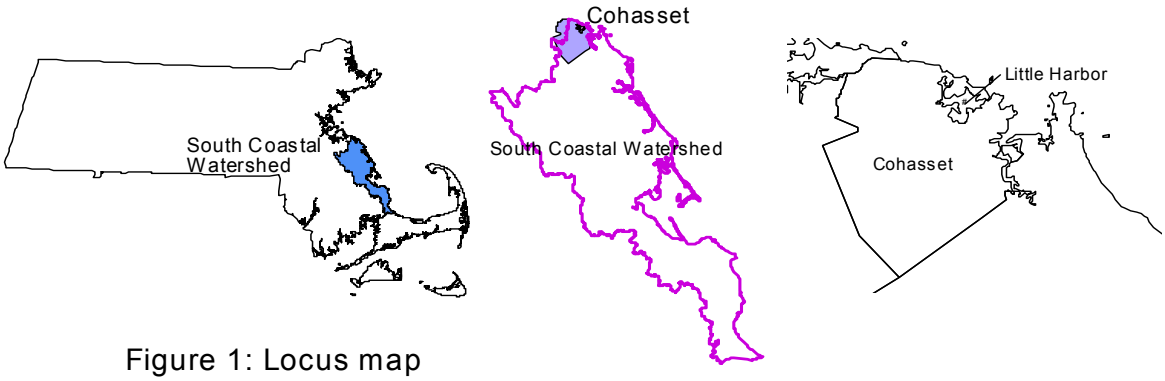

Figure 1: Locus map

Key Feature:	TMDL Assessment of a harbor with high fecal coliform
Location:	Cohasset, MA – EPA Region 1, Massachusetts South Coastal Watershed
Scope/Size:	Watershed 1.4 square miles, Surface Area 184 Acres
Land Type:	Coastal New England
Land Uses:	Residential 348 acres (48%), forest 291 acres (40%), open land 33 acres (4%), agriculture 12 acres (2%), salt wetland 40 acres (6%)
Pollutants/Stressor:	Fecal coliform
Data Sources:	Division of Marine Fisheries (1999), Camp Dresser and McKee (1999)
Monitoring Plan:	Division of Marine Fisheries
Control Measures:	Septic system upgrade/management, stormwater management

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 identified DEP, in accordance with the Federal Clean Water Act, is required to essentially develop a "pollution budget" designed to restore the health of the impaired body of water. The process 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 Little Harbor, Cohasset, in the South Coastal Watershed. The Harbor is listed on the 303d list because of bacterial contamination. The main result of this contamination is the closure of shellfish beds in various parts of Little Harbor. The analysis and recommendations presented in this document are based on the work initiated by the Town of Cohasset and co-supported by the Commonwealth through a loan from the State's Revolving Fund for wastewater infrastructure and water quality protection.

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 positive relationship between sewage pollution of shellfish growing areas and disease has been demonstrated many times. Shellfish-borne infectious diseases are generally transmitted via a fecal-oral route. The pathway can become quite circuitous. The cycle usually begins with fecal contamination of the growing waters. Feces deposited on land surfaces can release pathogens into surface waters via runoff. Most freshwater streams eventually empty into an estuary where fecal bacteria and viruses may accumulate in sediment and subsequently can be re-suspended. Shellfish pump large quantities of water through their bodies during the normal feeding process. During this process the shellfish concentrate microorganisms which may include pathogenic microorganisms.

Although there have been limited water quality studies conducted in the Little Harbor, data collected by the Division of Marine Fisheries from 1986 to 1995 document exceedences of fecal coliform standards. The shellfishing areas in Little Harbor have been closed since 1981. Based on these data, Little Harbor is listed on the Massachusetts 1998 Section 303(d) list for pathogens.

Based on the existing land uses and water-based activities, there are several possible sources contributing fecal coliform to Little Harbor: failed or substandard septic systems, stormwater and unlikely but possible limited indiscriminate discharge of boat sewage. Although wildlife can contribute fecal coliform to Little Harbor, large populations of waterfowl or other wild animals have not been observed in the watershed and therefore it is assumed that wildlife does not contribute to the water quality violations in the Little Harbor.

The three most likely sources of bacterial contamination cited above can be mitigated by:

1. Good operation and maintenance of subsurface wastewater disposal systems.
2. Correcting failing wastewater disposal systems either individually or as part of an area wide plan such as sewering or installing a community based system.

3. Controlling stormwater impacts by removal of any wastewater connections to storm drains, and instituting best management practices, such as street and frequent catch-basin cleaning, to minimize contamination of stormwater. Where possible, redirecting stormwater discharges to less sensitive resource areas or to swales for infiltration are recommended.
4. Prohibiting boat waste from being discharged to the harbor by designating Little Harbor as a "no discharge zone" and through a public education program explaining the effects of such discharges as well as noting the location of pump out facilities (one is in Cohasset Harbor). While boats with sanitary facilities in all likelihood cannot gain access to the waterbody, given the shellfish resource, these actions should be considered for their consciousness raising value and added benefits.

To meet the objective of water quality good enough for open shellfish areas, the following total maximum daily load has been calculated:

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.

Although there are no permitted discharges into the Little Harbor, a number of catch basins discharge stormwater directly into Little Harbor. These pipes are by definition point sources and therefore, for each individual piped discharge from each catch basin, the WLA = the fecal coliform standard.

The load allocation (LA) for nonpoint source pollution is split between stormwater runoff, pollution from septic systems, and pollution from boats. A properly designed, operated and maintained septic system does not allow any fecal coliform bacteria to reach the receiving waters. Thus, from septic systems the LA = 0. Similarly MSD's should be pumped by an approved dockside facility, therefore from boats the LA = 0.

Thus: WLA(pipes) = fecal coliform standard LA (Septic Systems) = 0 LA (Boats) = 0

Where:

TMDL = WLA (For each individual piped discharge from catch basins)

= LA (stormwater runoff, not including piped discharge from catch basins)

= Fecal Coliform Standard = 14 per 100 ml, and not more than 10 percent of the samples shall exceed an MPN of 28 MPN per 100 ml (12-tube single dilution test)

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, lake and 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. Funding support to aid in implementation of this TMDL is available on a competitive basis under various state programs including section 319, the State Revolving Fund Program (SRF), and the Department of Environmental Management's Lakes and Pond small grants program.

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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. The process of developing a TMDL involves the calculation of the loading capacity (the amount of pollutant loading that the water can receive without violating water quality standards) and the allocation of allowable loads to point sources, nonpoint sources and background.

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 be 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 Little Harbor, which is currently not meeting State fecal coliform standards, and to outline an implementation strategy, which abates fecal coliform sources so bacteria standards can be attained. Efforts for controlling bacteria sources in Little Harbor are ongoing already as demonstrated by the work done by ongoing wastewater management planning in this area of Cohasset (see Appendix 2). Consolidation of the fecal coliform TMDL, and the associated implementation plan, allows the public the opportunity to comment on both aspects of the Little Harbor fecal coliform control strategy simultaneously.

The overall goal of the Little Harbor TMDL is to improve water quality by reducing pollutant loading from all sources including on-site sewage disposal systems and from storm and agricultural runoff so as to restore the beneficial uses of the Harbor. Given that goal, this TMDL incorporates a watershed reduction applicable to address all known or suspected sources of fecal coliform to the Harbor.

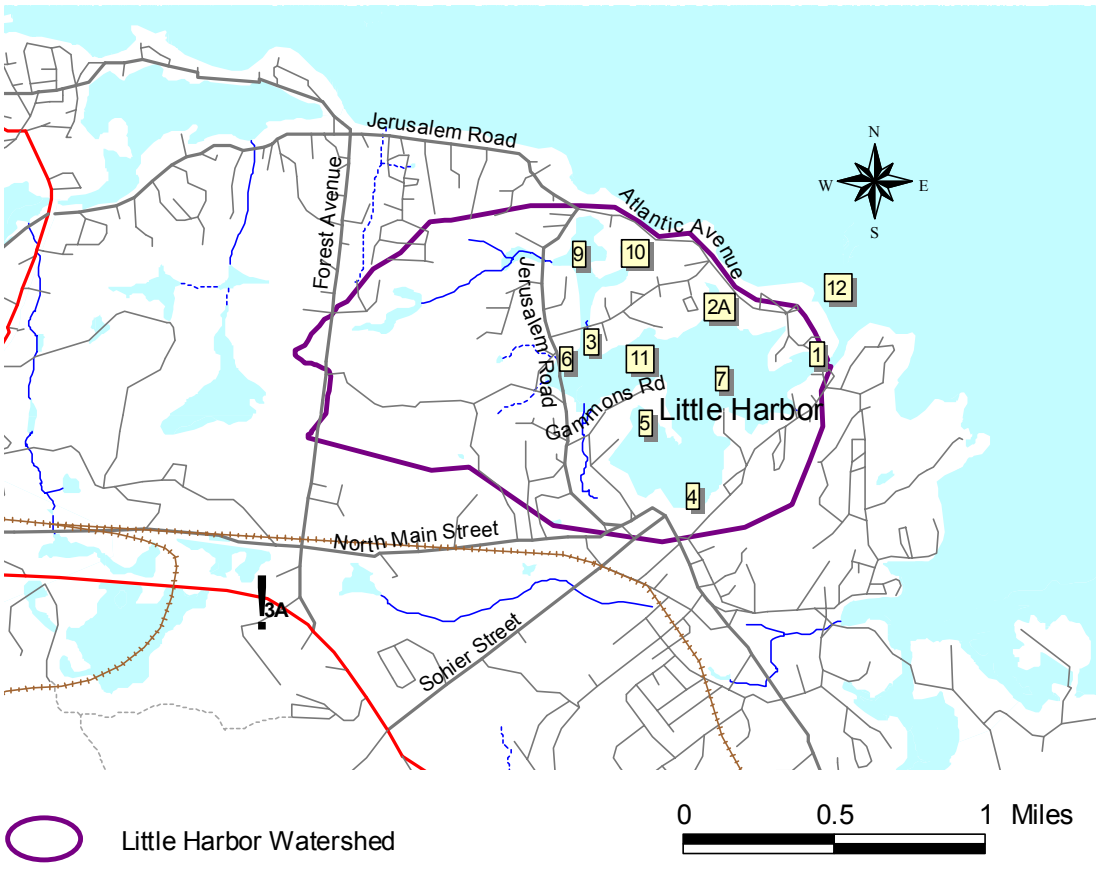
Little Harbor

The Inner Little Harbor and Little Harbor (hereafter jointly referred to as Little Harbor) have a drainage area of approximately 1.4 square miles. Little Harbor (MA94-20) is located in Cohasset at approximately 42°15′10″N, 70°47′50″W (see figure 1). Figure 2 presents a map of the area and indicates historical data collection stations.

The principal land uses in the study area are low density residential and forestry. Other uses include agriculture and recreation activities. Figure 3 presents a map of the drainage area and the land uses.

Most of the residential and commercial properties in the Little Harbor watershed are connected to Cohasset's public water service, with only a handful using private wells. All of the properties within the watershed are connected to on-site sewage disposal systems. There are a number of catch basins in the watershed discharging stormwater directly into the harbor. There are no confined animal feeding operations in the watershed, however there is some farming activity with a few horses and chickens. There are no permitted or identified direct wastewater discharges to the Little Harbor.

Figure 2: Little Harbor, Cohasset
Little Harbor Watershed and Sampling Stations



Annual precipitation in the area averages 47.7 inches and has varied from a low of 27.8 inches to a high of 67.2 inches for the period between 1961 and 1993. November through March are the wettest months with an average monthly precipitation of 4.1 – 4.8 inches, whereas June and July are the driest with an average monthly precipitation of 3.3 inches.

The Little Harbor is subject to tidal influence. At low tide, water is flowing out of the Little Harbor, while at high tide the flow is reversed. Currently the Harbor is used for recreational boating and recreational fishing. Shellfishing is not allowed because of fecal coliform concentrations exceeding criteria.

Problem Assessment Statement

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 positive relationship between sewage pollution of shellfish growing areas and disease has been demonstrated many times. Shellfish-borne infectious diseases are generally transmitted via a fecal-oral route. The pathway can become quite circuitous. The cycle usually begins with fecal contamination of the shellfish growing waters. Feces deposited on land surfaces can release pathogens into surface waters via runoff. Most freshwater streams eventually empty into an estuary where fecal bacteria and viruses may accumulate in sediment and subsequently can be re-suspended. Shellfish pump large quantities of water through their bodies during the normal feeding process. During this process the shellfish concentrate microorganisms which may include pathogenic microorganisms (Interstate Shellfish Sanitation Conference, 1997).

Although there have been limited water quality studies conducted in the Little Harbor, data collected by the Division of Marine Fisheries from 1986 to 1995 document exceedences of fecal coliform standards. Figure 2 provides the location of the sample stations for the data collected by the Division of Marine Fisheries (Neil Churchill, 1999). The shellfishing areas in Little Harbor have been closed since 1981. Based on these data, Little Harbor is listed on the Massachusetts 1998 Section 303(d) list for pathogens.

Water Quality Standards

The Surface Water Quality Standards for the Commonwealth of Massachusetts are described in 314 CMR 4.00. The Little Harbor is classified (i.e., the water quality goal) as Class SA marine water. Additionally, part of the water quality goal for Little Harbor is to have it meet the criteria for an Open Shellfish Area.

The Massachusetts DEP Surface Water Quality Standards for fecal coliform are as follows:

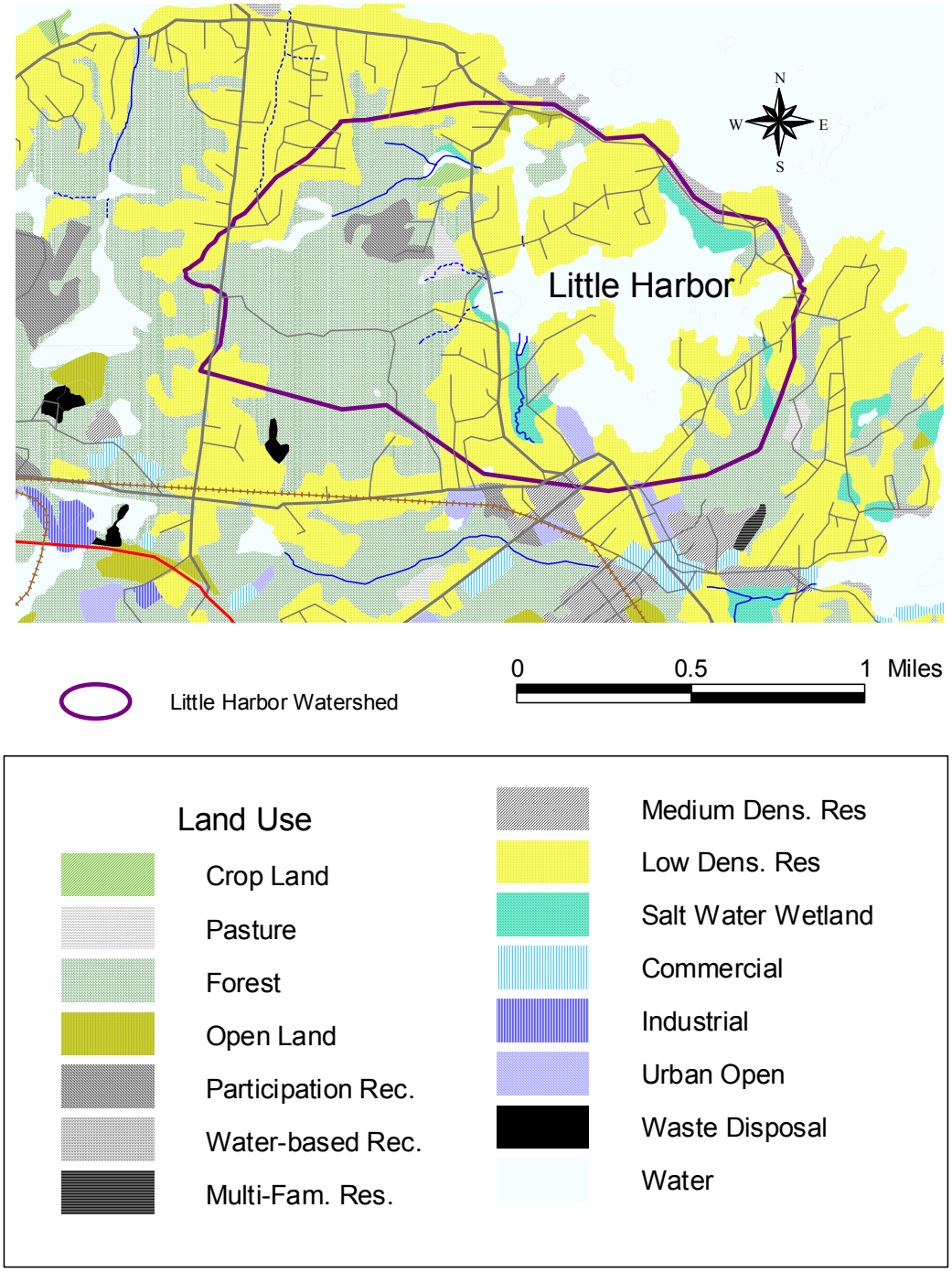
> **314 CMR 4.05(4)(a)(4):** Waters approved for open shell-fishing shall not exceed a geometric mean MPN of 14 organisms per 100 ml, nor shall more than 10% of the samples exceed a MPN of 43 per 100 ml (more stringent regulations may apply, see 314 CMR 4.06(1)(d)(4))
>
> **314 CMR 4.06(1)(d)(4):** Shellfishing - open shellfishing areas are designed as "(O)" and restricted shellfishing areas are designated as "(R)". These waters are subject to more stringent regulation in accordance with the rules and regulations of the Massachusetts Division of Marine Fisheries pursuant to M.G.L. c. 130, § 75. These include applicable criteria of the National Shellfishing Sanitation Program.

The Massachusetts Division of Marine Fisheries (DMF) uses the following standard for shellfish areas: fecal coliform median or geometric mean MPN of the water sample results shall not exceed 14 per 100 ml, and not more than 10 percent of the samples shall exceed an MPN of 28 MPN per 100 ml for a 12-tube single dilution test (Churchill, 1999).

The DMF water quality criteria consist of two parts: the measure of central tendency (median or geometric mean) and the measure of variability (the 90th percentile or upper ten percent). The variability of the data depends on the sampling variability of the test itself and other factors related to changing conditions in the water being sampled. This is addressed by using the upper two-sided 95% confidence limit for the median value of the microbiological standard and designating it as the allowed 90th percentile. For a median value of 14 MPN / 100 ml, the upper two-sided 95% confidence limits for a 5-tube multiple dilution and 12-tube single dilution tests are approximately 43 MPN/100 ml and 28 MPN/100 ml respectively. Notwithstanding the

difference in numerical value, each of these criteria represents an equal probability that the waters being sampled are of the same sanitary quality.

Figure 3: Little Harbor, Cohasset
Land Use



Fecal Contamination in Little Harbor

The following data (Table 1) collected by the Division of Marine Fisheries were provided to the Department. Clearly there are numerous violations of the Surface Water Quality Standards. For example more than 10% of the samples collected from stations 2, 2A and 5 exceed a MPN of 28 per 100 ml. These violations are not confined in one section of Little Harbor but extend to its whole perimeter. Fecal coliform appears to be consistently high in the area around Gammons Road. See Figure 2 for the location of the sampling stations. The samples are from wet and dry weather sampling events.

Table 1: Little Harbor, Cohasset
DMF Unpublished Water Quality Data

Station	Date	Fecal Coliform MPN per 100 ml 12-tube decimal dilution test	Temp. °F	Salinity Parts per Thousand	Days since last rainfall – inches of rain
1	04/12/89	3.6	40	25.2	3 – NA
1	08/09/95	18.0	66	32.0	2 – 2
2	02/19/86	65.0		2.7	NA – NA
2A	04/06/88	11.0	44	23.3	During & 6 days – NA
2A	11/28/88	65.0	50	8.8	During – NA
2A	04/12/89	0.9	42	25.2	3 – NA
2A	08/30/95	14.0	64	32.0	2 – Trace
3	03/08/88	1.7	39.2	27.2	3 – NA
3	11/28/88	30.0	46	25.2	During – NA
4	04/06/88	23.0	44	24.6	During & 6 days – NA
4	04/12/89	5.8	41	25.2	3 – NA
4	05/10/89	8.2	50	24.6	3 – NA
4	08/09/95	28.0	74	31.0	2 – 2
5	01/12/89	30.0	33	17.9	4 – NA
5	07/25/95	51.0	78	20.0	6 – 0.5
5	08/08/95	51.0	69	26.0	1 – 2
5	08/09/95	51.0	73	26.0	2 – 2
6	04/06/88	11.0	46	22.0	During & 6 days – NA
6	01/12/89	8.2	29	25.2	4 – NA
6	05/10/89	11.0	45	20.0	3 – NA

Camp, Dresser & McKee (Town of Cohasset, Little Harbor Water Quality Study, December 1999) collected dry and wet weather samples from Little Harbor as well as wet weather samples from the various catch basins and streams flowing into Little Harbor. See Table 2 for the data collected from the Little Harbor Stations and Table 3 for the data from the various flows into Little Harbor. Wet weather sampling shows clearly that fecal coliform is high in the stormwater entering Little Harbor and results in water quality violations. See Figure 2 for the location of the sampling stations. Samples collected June 29, July 22, and August 26, 1999 are dry weather (less than 0.1 inches of rain during the preceding 72 hours). Samples collected on September 30, 1999 are wet weather samples.

Table 2: Little Harbor, Cohasset CDM Water Quality Data						
Station	**Date**	**Fecal Coliform CFU/100 ml**	**Temp. °C**	**Salinity Parts per Thousand**	**Depth m**	**Tide**
1	6/29/99	100	17.2	32.7	0.15	Beg. Of Ebb
1	6/29/99	20	18.8	32.2	0.15	Beg. Of Flood
1	7/22/99	<10	26.4	31.0	0.15	Mid Ebb
1	7/22/99	10	25.5	31.2	0.15	Mid Flood
1	8/26/99	<10	18.4	31.6	0.15	Mid Ebb
1	8/26/99	<10	18.0	31.5	0.15	Mid Flood
1	9/30/99	280	-	31.3	Surface	Ebb
2A	6/29/99	10	23.9	32.1	0.15	Beg. Of Ebb
2A	6/29/99	10	27.0	32.6	0.15	Beg. Of Flood
2A	7/22/99	10	20.0	31.0	0.15	Mid Ebb
2A	7/22/99	<10	24.0	31.3	0.15	Mid Flood
2A	8/26/99	<10	19.6	31.0	0.15	Mid Ebb
2A	8/26/99	<10	18.0	31.5	0.15	Mid Flood
2A	9/30/99	300	-	29.6	Surface	Ebb
3	6/29/99	20	27.7	32.6	0.15	Beg. Of Ebb
3	6/29/99	10	27.0	32.9	0.15	Beg. Of Flood
3	7/22/99	-	29.6	29.8	0.15	Mid Ebb
3	7/22/99	<10	23.2	31.2	0.15	Mid Flood
3	8/26/99	20	22.0	31.5	0.15	Mid Ebb
3	8/26/99	<10	23.1	31.7	0.15	Mid Flood
3	9/30/99	150	-	30.3	Surface	Ebb
4	6/29/99	<10	18.8	32.0	0.5	Beg. Of Ebb
4	6/29/99	<10	21.4	32.3	0.15	Beg. Of Flood
4	7/22/99	<10	20.3	30.9	0.15	Mid Ebb
4	7/22/99	<10	24.3	31.1	0.15	Mid Flood
4	8/26/99	<10	19.4	31.6	0.15	Mid Ebb
4	8/26/99	<10	18.8	31.3	0.15	Mid Flood
4	8/26/99	40	-	31.6	0.15	Mid Flood
4	9/30/99	60	-	30.2	Surface	Ebb
5	6/29/99	<10	22.4	32.6	0.5	Beg. Of Ebb
5	6/29/99	10	23.7	32.6	0.15	Beg. Of Flood
5	7/22/99	<10	22.4	30.9	0.15	Mid Ebb
5	7/22/99	<10	22.5	31.0	0.15	Mid Flood
5	8/26/99	<10	20.7	31.8	0.15	Mid Ebb
5	8/26/99	10	19.0	31.6	0.15	Mid Flood
5	8/26/99	10	-	31.6	0.15	Mid Flood
5	9/30/99	40	-	30.6	Surface	Ebb
6	6/29/99	<10	27.9	31.8	0.15	Beg. Of Ebb
6	6/29/99	40	25.7	32.3	0.15	Beg. Of Flood
6	7/22/99	<10	27.3	30.6	0.15	Mid Ebb
6	7/22/99	<10	24.5	30.6	0.15	Mid Flood
6	8/26/99	<10	22.4	31.6	0.15	Mid Ebb

Table 2: (Continued)
Little Harbor, Cohasset
CDM Water Quality Data

Station	Date	Fecal Coliform CFU/100 ml	Temp. °C	Salinity Parts per Thousand	Depth m	Tide
6	8/26/99	10	20.9	31.6	0.15	Mid Flood
6	9/30/99	150	-	27.9	Surface	Ebb
7	6/29/99	<10	17.4	32.2	0.5	Beg. Of Ebb
7	6/29/99	<10	21.3	32.5	0.15	Beg. Of Flood
7	7/22/99	<10	18.0	30.9	0.15	Mid Ebb
7	7/22/99	<10	17.3	30.3	0.15	Mid Flood
7	8/26/99	<10	19.3	31.7	0.15	Mid Ebb
7	8/26/99	<10	18.1	31.5	0.15	Mid Flood
7	8/26/99	<10	-	31.3	0.15	Mid Flood
7	9/30/99	<10	-	30.2	Surface	Ebb
8	6/29/99	<10	19.6	31.9	0.5	Beg. Of Ebb
8	6/29/99	10	18.7	32.6	0.15	Beg. Of Flood
8	7/22/99	<10	19.7	30.5	0.15	Mid Ebb
8	7/22/99	<10	17.7	31.1	0.15	Mid Flood
8	8/26/99	<10	20.1	31.4	0.15	Mid Ebb
8	8/26/99	10	18.4	31.3	0.15	Mid Flood
8	8/26/99	10	-	31.5	0.15	Mid Flood
8	9/30/99	20	-	29.5	Surface	Ebb
9	6/29/99	10	29.4	33.9	0.15	Beg. Of Ebb
9	6/29/99	30	27.9	33.2	0.15	Beg. Of Flood
9	7/22/99	<10	27.8	30.7	0.15	Mid Ebb
9	7/22/99	<10	27.4	31.2	0.15	Mid Flood
9	8/26/99	<10	24.6	32.0	0.15	Mid Ebb
9	8/26/99	<10	23.8	31.9	0.15	Mid Flood
9	9/30/99	340	-	30.1	Surface	Ebb
10	6/29/99	<10	31.4	34.3	0.15	Beg. Of Ebb
10	6/29/99	10	28.1	32.8	0.15	Beg. Of Flood
10	7/22/99	<10	29.3	31.2	0.15	Mid Ebb
10	7/22/99	<10	26.2	32.0	0.15	Mid Flood
10	8/26/99	<10	25.3	32.3	0.15	Mid Ebb
10	8/26/99	30	24.0	32.0	0.15	Mid Flood
10	9/30/99	290	-	29.9	Surface	Ebb
11	6/29/99	<10	19.7	32.6	0.5	Beg. Of Ebb
11	6/29/99	10	25.0	31.9	0.15	Beg. Of Flood
11	7/22/99	20	21.3	30.9	0.15	Mid Ebb
11	7/22/99	<10	21.3	27.2	0.15	Mid Flood
11	8/26/99	<10	20.8	31.6	0.15	Mid Ebb
11	8/26/99	<10	19.6	31.5	0.15	Mid Flood
11	8/26/99	<10	-	31.4	0.15	Mid Flood
11	9/30/99	70	-	28.9	Surface	Ebb
12	6/29/99	<10	17.0	32.0	0.15	Beg. Of Ebb
12	6/29/99	<10	18.0	33.1	0.15	Beg. Of Flood

Table 2: (continued) Little Harbor, Cohasset CDM Water Quality Data						
Station	**Date**	**Fecal Coliform CFU/100 ml**	**Temp. °C**	**Salinity Parts per Thousand**	**Depth m**	**Tide**
12	7/22/99	<10	17.4	30.5	0.15	Mid Ebb
12	7/22/99	<10	18.4	30.9	0.15	Mid Flood
12	8/26/99	<10	18.5	31.7	0.15	Mid Ebb
12	8/26/99	<10	18.9	31.7	0.15	Mid Flood
12	8/26/99	10	-	31.3	0.15	Mid Flood
12	9/30/99	10	-	31.9	Surface	Ebb

Table 3: Little Harbor, Cohasset CDM Water Quality Data Wet Weather Sampling Event. September 30, 1999		
Location	**Flow (cfs)**	**Fecal Coliform (CFU / 100 ml)**
Northern CB in Sandy Beach parking lot	0.05	830
CB in Sandy Beach parking lot	-	660
CB on Atlantic Avenue near Sandy Beach	-	190
CB on Atlantic Avenue, Southern shore of inlet bridge	0.06	1440
CB on Beach Street, at intermittent stream	0.16	>2000
CB on Beach Street, between #30 and #44	0.16	>2000
CB on Nichols Road, near Cat Dam (west)	0.32	>2000
CB on Nichols Road, near Cat Dam (east)	0.04	>2000
CB at Jerusalem Road and Atlantic Avenue	0.03	>2000
Intermittent stream out of pond, Bow Street (south)	0.01	>2000
Intermittent stream out of pond, Bow Street (north)	0.03	>2000
Intermittent stream, eastern cove Upper Little Harbor	0.38	>2000
Richardsons Brook	0.73	>2000

CB= Catch Basin

IDENTIFICATION OF FECAL COLIFORM BACTERIA SOURCES

There are no permitted point source discharges to the Little Harbor, however, a number of potential nonpoint pollutant sources do exist. Possible sources include failing or inadequate septic systems, stormwater, and agricultural runoff.

It is difficult to provide accurate quantitative estimates of fecal coliform contributions from the various sources in the Little Harbor. Many of the sources are diffuse and intermittent and are extremely difficult to monitor or model accurately. Therefore, a general level of quantification according to source category is provided. Such an approach is suitable for this analysis, since it indicates the magnitude of sources and illustrates the need for controlling the sources.

Septic systems designed, installed and maintained in accordance with 310 CMR 15.000: Title 5, are not significant sources of fecal coliform bacteria. Studies have shown that wastewater four feet below such a septic system contains 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 Little Harbor. Failing septic systems, are illegal and must be eliminated. Failing septic systems represent a direct threat to public health because they result in discharges of partially treated or untreated human wastes to the surrounding environment. 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 washoff effect from runoff and the increased rate of groundwater recharge. Typical values of fecal coliform in untreated domestic wastewater range from 10^6 and 10^{10} MPN/100ml (Metcalf and Eddy, 1991).

Stormwater and agricultural runoff is another significant contributor of fecal coliform pollution. Fecal matter from domestic animals and wildlife are readily washed off during rain events, and transported to the Little Harbor via the stormwater drainage systems or via overland flow. The natural filtering capacity provided by vegetative cover and soils in the watershed is dramatically reduced as urbanization occurs because the imperviousness increases. Typical storm water event mean fecal coliform concentrations are provided in Tables 4 and 5. The extent of wet weather violations in Little Harbor is presently not well documented. However, a comparison of the stream data shown in Table 3 and the typical values from "pristine" forested areas in the Wachusett Reservoir watershed show that the streams that discharge into Little Harbor are clearly impacted by development and agriculture.

TMDLs must ensure attainment of standards under all weather conditions. For this reason, a progressive TMDL is being proposed to address wet weather bacteria sources. The phased TMDL requires estimating pollutant reductions necessary to meet water quality standards using the best available information. This approach allows controls to be implemented while additional data are collected.

Table 4: Stormwater Mean Event Pollutant Concentrations (Metcalf & Eddy, 1992)

Land Use Category	Fecal Coliform Bacteria [1] Organisms / 100 ml
Single Family Residential	37,000
Multifamily Residential	17,000
Commercial	16,000
Industrial	14,000

1. Derived from NURP study event mean concentration and nationwide pollutant buildup data.

Table 5: Wachusett Reservoir Storm Water Sampling MDC-CDM Wachusett Stormwater Study (June 1997)	
Land Use Category	**Fecal Coliform Bacteria 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

While boat access to Little Harbor is more or less limited to small boats without sanitary facilities, it is important that boaters be aware of the sensitive nature of the waterbody. For boats with sanitary facilities, sewage and the toxic chemicals used to disinfect and mask its odor pose a significant environmental and health threat when discharged directly into coastal waters. The United Sates Coast Guard prohibits the discharge of raw, untreated sanitary sewage anywhere within the U.S. territorial waters (3-mile limit). All vessels, new and existing, manufactured for sale, or offered for sale, or distributed for sale, or resale with an installed head must be equipped with a certified, functional marine sanitation device (MSD). The U.S. Coast Guard establishes three types of MSD's and the requirements for their use are based primarily of the class (i.e. size) of vessel. The most commonly used device on recreational vessels, like those used in Little Harbor, are Type III devices, which are simply holding tanks, either fixed or portable, which store sewage until it can be pumped to a dockside facility or discharged at sea beyond the 3 mile limit.

Total Maximum Daily Load Development

As discussed earlier, 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 such waters for the pollutant of concern. A TMDL is a process for determining how much pollutant a waterbody can safely assimilate without violating the water quality standards. Both, point and nonpoint pollution sources are taken into account in a TMDL study. Point sources of pollution (those discharges from discrete pipes or conveyances) receive a wasteload allocation (WLA) which specifies how much 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), which specifies how much pollutant can be released to the waterbody. In accordance with the CWA a TMDL must take in to account 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.

Margin of Safety = taking uncertainty into account and reserving some capacity for future growth.

FECAL COLIFORM TMDL

The pollutant 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. For fecal coliform the standard is expressed in terms of concentration of organisms per 100 ml. for which the previous equation does not directly apply (source concentrations are not directly additive). In order 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. To have a higher level of confidence that water quality standards will be attained, all bacteria sources must be controlled such that the magnitude of the source is equal to or less than the standard which is expressed in terms of concentrations. Expressing the TMDL in terms of daily loads could be confusing and difficult to interpret given the very high number and that 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 = $WLA_{(p1)}$ = $LA_{(n1)}$ = $WLA_{(p2)}$ = etc.

Where:

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

This simple and environmentally protective approach of limiting bacteria sources to be equal to, or less than, the water quality standard at the point of discharge is easily understandable by the public and those responsible for monitoring activities to identify sources and evaluate the effectiveness of controls. The goal of attaining standards at the point of discharge minimizes human health risks associated with exposure to pathogens because in ignores losses due to die-off and settling that are known to occur.

There are no permitted discharges into the Little Harbor. However, a number of catch basins discharge stormwater directly into Little Harbor. Piped discharges are by definition point sources regardless of whether they are currently subject to the requirements of NPDES permits. Therefore, WLA for each individual piped discharge from catch basins is equal to the fecal coliform standard.

The load allocation (LA) for nonpoint source pollution is split between stormwater runoff, pollution from septic systems and pollution from boats.

A properly designed, operated and maintained septic system does not allow any fecal coliform bacteria to reach the receiving waters. Thus, LA for fecal coliform from septic systems is zero. Similarly MSD's should be pumped by an approved dockside facility, therefore LA for fecal coliform from boats is zero.

Thus: **LA (Septic Systems) = 0** **LA (Boats) = 0**

TMDL = WLA (For each individual piped discharge from catch basins) = LA (stormwater runoff, not including piped discharge from catch basins) = Fecal Coliform Standard = 14 per 100 ml, and not more than 10 percent of the samples shall exceed an MPN of 28 MPN per 100 ml (12-tube single dilution test)

Margin of Safety: For this analysis, margin of safety is provided in three ways. First, the TMDL does not account for mixing in the receiving waters and assumes that zero dilution is available. In reality 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 TMDL will be set at the DMF standard of 14 per 100 ml, and not more than 10 percent of the samples shall exceed an MPN of 28 MPN per 100 ml which

is more precise than DEP's Water Quality Standard. Third, the goal of attaining standards at the point of discharge ignores losses due to die-off and settling that are known to occur.

Seasonal Variability: TMDLs must also take seasonal variability into account. This TMDL is independent of weather conditions and, therefore, protective of all seasonal conditions in the Little Harbor.

TMDL Implementation

A comprehensive control strategy is clearly needed to address the numerous and diverse sources of fecal coliform bacteria in the Little Harbor. Individual sources must be first identified in the field before they can be abated. Pinpointing sources typically requires extensive monitoring of the receiving waters, streams and storm water drainage systems during both dry and wet weather conditions. A comprehensive program to accomplish such monitoring does not exist.

As discussed earlier, based on the existing land uses, there are three sources contributing fecal coliform to Little Harbor: failed or substandard septic systems, stormwater and, unlikely but possible, limited indiscriminate discharge of boat sewage. Although wildlife can contribute fecal coliform to Little Harbor, large populations of waterfowl or other wild animals have not been observed in the watershed and therefore it is assumed that wildlife does not contribute to the water quality violations in the Little Harbor.

One potential source of fecal coliform to the Little Harbor is failed, failing or sub-standard septic systems. 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, septic systems failing to protect public health or the environment are upgraded when a property comes into the market. Furthermore, the town of Cohasset hired an engineering firm to conduct a water quality study of the Little Harbor. The study included among other things, a sanitary survey and water quality monitoring. A final report describing the Little Harbor 1999 Water Quality Study has been completed (CDM, 1999). The study evaluated the impact septic systems and stormwater have on the water quality in Little Harbor. The area around Little Harbor has limited amounts of naturally occurring soils, which are essential for the treatment of sewage in an on-site sewage disposal system. Some properties may require advanced treatment technologies to achieve the required level of environmental protection. High ledge makes the cost of a central collection system very high, therefore it is not expected that public sewers will be available in the foreseeable future. While the Town is exploring the feasibility of a sewer system for Little Harbor with its consultant, Tutela Engineering, the Town should also explore the possibility of upgrading clusters of homes with community sewage treatment and disposal systems along with all other alternatives. For homeowners faced with the upgrade of their septic system there is financial help available in the form of low interest loans if Cohasset participates in the State Revolving Fund Program and income tax credits.

The second potential source of fecal coliform to the Little Harbor is stormwater runoff. Improving stormwater runoff quality is essential for restoring water quality and opening the shellfishing beds. Based on reports of event mean storm water bacteria concentrations in Massachusetts, it is expected that bacteria levels in stormwater being discharged to Little Harbor will need to be reduced by approximately two to three orders of magnitude (i.e., greater than 99%)to achieve the goals of the TMDL. Currently Cohasset is on the list of communities affected by the Storm Water Phase II Rules. The Town of Cohasset together with the South Coastal Watershed Team will develop and implement a stormwater management plan. The plan at a minimum should include identification and implementation of stormwater best management practices (BMPs), including increased frequency of street sweeping, increased frequency of catch basin cleaning, the diversion of runoff to pervious areas for infiltration where possible, and public education. Public education will be critical to the success of the plan since the area around Little Harbor is predominantly 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 stormwater and the need for the proper cleanup and disposal of such wastes.

It is expected that water quality will be maintained through the implementation of a stormwater management plan even during wet weather when contributions of fecal coliform to Little Harbor increase. The town of Cohasset has drafted a Watershed Management Plan as part of the requirements under the new NPDES Stormwater Phase II program.

Marine Sanitation Devices are designed primarily to chemically disinfect, mask offensive odors, and reduce the size of solids but not to treat other potentially harmful constituents of the waste. The highly concentrated waste material must be periodically removed for further treatment at a wastewater or septage treatment facility designed to accept such waste. Boat pump-out facilities are available within a reasonable distance at Cohasset Harbor. Water quality will be maintained through public outreach and enforcement of the existing regulations by the Harbormaster.

The tasks and responsibilities for implementing the TMDL are shown in Table 6. 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 Executive Office of Environmental Affairs (EOEA) Watershed Basin Team. The South Coastal Watershed Team shall also make every reasonable effort to assure implementation of this TMDL.

Table 6: Tasks And Responsibilities	
Task	Responsible Group
Little Harbor Water Quality Study	Town of Cohasset
Writing TMDL	DEP
TMDL Public Meeting	DEP / EOEA Watershed Team
Response to public comments	DEP
Organization, contacts with volunteer groups	EOEA Watershed Team
Development of a stormwater plan including identification and implementation of BMPs	Town of Cohasset
Enforcement of the boat waste regulations and public outreach to boat owners	Town of Cohasset Harbormaster
Inspection and upgrade of on-site sewage disposal systems as needed	Home owners and Town of Cohasset
Organize implementation; work with stakeholders and local officials to identify remedial measures and potential funding sources	EOEA Watershed Team and Town of Cohasset
Organize and implement education and outreach program	Watershed Associations and Town of Cohasset
Write grant and loan funding proposals	Watershed Associations, Town of Cohasset, Planning Agencies, and NRCS with guidance from DEP
Basin cycle report on remedial actions and inclusion of TMDL in Basin Management Plan	EOEA Watershed Team
Monitoring	Division of Marine Fisheries, Town of Cohasset
Public outreach and enforcement of regulations for sanitary waste from boats	Cohasset Harbormaster
Provide periodic status reports on implementation of remedial activities	EOEA Watershed Team and Town of Cohasset

Water Quality Standards Attainment Statement

The proposed TMDL, if fully implemented, will result in the attainment of all applicable water quality standards, including designated uses and numeric criteria for fecal coliform.

TMDL Monitoring

Long term monitoring will be important to assess the effectiveness of BMPs and whether or not standards are attained. Fecal coliform bacteria should be monitored year-round for compliance with the Massachusetts Surface Water Quality Standards and the Massachusetts DMF shellfish standards. Monitoring that targets rainfall periods would probably be more effective for documenting the highest fecal coliform levels. Cohasset is also among the communities included in the Storm Water Phase II Rules. Therefore, the town will be required to develop a watershed management plan, and to collect stormwater runoff data to assess the effectiveness of BMPs. The Division of Marine Fisheries will collect water quality data at established sampling stations to assess standards attainment. An approved area is tested a minimum of 5 times a year by DMF. Additionally, other interested parties such as watershed groups can conduct monitoring as needed and will be encouraged to do so.

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. 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, low interest loans through the state revolving loan (SRF) program for Title 5 septic system upgrades in participating municipalities and cost sharing for agricultural BMPs under the Federal NRCS program.

Public Participation / Public Outreach

A public meeting to discuss and gain comments on the TMDL was held in conjunction with a workshop on wastewater management planning for the Little Harbor area of Cohasset. The forum was held at Cohasset Town Hall on December 12, 2001. A summary of the meeting is presented in Appendices 1 through 3, which are attached. Notice of the meeting appeared in the Massachusetts Environmental Monitor, in mailings to the Cohasset Board of Selectmen and interested agencies. In addition, the notice of the meeting appeared on DEP's web site.

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Ayres Associates (1993). Onsite Sewage Disposal System Research in Florida. The Capability of Fine Sandy Soil for Septic Tank Effluent Treatment: A Field Investigation at an In-Situ Lysimeter Facility in Florida.

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Massachusetts Department of Environmental Protection (1998). Massachusetts Section 303(d) List of Waters. DEP, Division of Watershed Management, Worcester, MA.

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Metcalf & Eddy (1991). Wastewater Engineering: Treatment, Disposal, Reuse. Third Edition.

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Natural Resources Conservation Service, Climate Analysis for Wetlands (by individual county), http://www.wcc.nrcs.usda.gov/water/wetlands.html.

Commonwealth of Massachusetts Proposed Total Maximum Daily Loads Strategy, April 1, 1998

APPENDICES

Appendix 1: Attendance List

Appendix 2: Meeting Summary by Tutela Engineering

Appendix 3: Meeting Summary and Response to Comments by MA DEP

APPENDIX 1: ATTENDANCE LIST

PUBLIC MEETING AND WORKSHOP Page 1 of 7

FOR

LITTLE HARBOR WASTEWATER MANAGEMENT PLANNING

December 12, 2001

7:00 PM

REF. #	NAME / ADDRESS	PHONE
	CHRISTOS DIMISIORIS DEP - LAKEVILLE	(508) 946-2736
	George Zoto EOEA / Watershed Init. / DEP Lakeville Office	508 946-2739
	Russell A. Isaac MA DEP 627 Main St Worcester	508 767 2876
	Elaine Hartman MA DEP 627 Main St Worcester	
	Norman & Joan Raley Preserve Our Pond 59 Tidy Ave N. Scituate	781-545-9035
	JEANNE T. GORMLEY 44 BEACH ST. COHASSET	781-383-011
	THOMAS GORMLEY, JR 44 BEACH ST. COHASSET	781-383-011
	TUCKER J. GHAVIN 107 NICHOLS ROAD. COHASSET	781 383 6334
	Jim Purinton & SHELLEY BROWN 63 MICHAS RD. COHASSET	781-383-2119
	Steve Brown 275 Jerusalem Rd	781-383-9699
	CARSTEN HABEL 49 OAK ST. COH	781 383 2840

PUBLIC MEETING AND WORKSHOP

FOR

LITTLE HARBOR WASTEWATER MANAGEMENT PLANNING

December 12, 2001

REF. #	NAME / ADDRESS	PHONE
	Nick + Anny NEWMAN 26 Little Harbor Rd.	(781) 383-6203
	AKIRA + IKAKO ISIHARA 8 Sandy Beach Ln.	(781) 383-9227
	Michael Hughes 140 Beach ST	781 383-3207
	Jerome O'Callaghan in Sheldon	383-3051
	DOUG EXMER 31 BOW STREET	383.2761
	Vivien Bobo 292 JERUSALEM	383-1420
	EDWARD LONG 31 NICHOLS RD	383-1426
	ALEXANDER C ROINES 382 ATLANTIC AVE	383-9461
	Charles Furtado 63 Highland ave	383-1600
	Kathryn Morgan 20 Bow St	383 9132
	Jean + Frank White Jerusalem Rd	383-6965

PUBLIC MEETING AND WORKSHOP

FOR

LITTLE HARBOR WASTEWATER MANAGEMENT PLANNING

December 12, 2001

7:00 PM

REF. #	NAME / ADDRESS	PHONE
	SIVADO & 292 JERUSALEM RD	383 6893
	Jason Burton / Czem 175 Edmund Foster Rd. Scituate.	781-545-8026 x209
	Donald T. Evans 72 N. Main	383-098
	Susan Turgss 96 Jerusalem Rd	
	[illegible] 50 Beach St.	383-1236
	Jack + Ginny Wieland 51 Gammons Rd	383-9089
	Kelly Stone 39 Blackhorse Lane	383-2281
	ALICE M. LYON 45 JOY PLACE	383-1557
	Jack McCarthy 278 Jerusalem Rd.	383-0128
	Eric Richter 77 Jerusalem Rd	383 [illegible]045C
	Andrew Quigley 38 Jerusalem Rd	-9795

PUBLIC MEETING AND WORKSHOP

FOR

LITTLE HARBOR WASTEWATER MANAGEMENT PLANNING

December 12, 2001

7:00 PM

REF. #	NAME / ADDRESS	PHONE
	Margaret Chapin 76 Beach Street	383-1149
	John Rousseau 44 Little Harbor Rd	—

PUBLIC MEETING AND WORKSHOP

FOR

LITTLE HARBOR WASTEWATER MANAGEMENT PLANNING

December 12, 2001

7:00 PM

REF. #	NAME / ADDRESS	PHONE
	RAY KASPERAWICZ 172 S. MAIN ST	383-9158
	David Replogle 84 GAMMONS	383/0520
	L. Jenkins 198 Jerusalem	-0024
	J.R. Power 74 Beach St	383-1893
	CARL R. HURTIG 58 GAMMONS RD.	383-0530
	Susan Ray Jones 249 Lowesdale Rd.	383-0807
	MARK BAKER 32 Nichols Rd.	383-1205
	JACK McNAMARA 150 BEACH ST.	383-6945
	Mary F White 82 Sheldon Rd	383-1838
	Judith Chute / Paul Cifrino 46 Beach St.	383-6084 383-1752
	Robert G. King 181 Atlantic Ave	383 9554

PUBLIC MEETING AND WORKSHOP

FOR

LITTLE HARBOR WASTEWATER MANAGEMENT PLANNING

December 12, 2001

7:00 PM

REF. #	NAME / ADDRESS	PHONE
	Nancy Herlin 91 Nichols Rd	383-1463
	MARK DUNNE 21 Beach St.	383-1596
	JOHN INGS TUTELA ENGINEERING ASSOC.	978-658-7493

PUBLIC MEETING AND WORKSHOP

FOR

LITTLE HARBOR WASTEWATER MANAGEMENT PLANNING

December 12, 2001

7:00 PM

REF. #	NAME / ADDRESS	PHONE
	Stacey Wonroe's Boathouse 44 Nichols Rd.	781-383-9536
	Diana & John Kinnet 67 Glenmore Rd.	383-6576

Appendix 2: Meeting Summary by Tutela Engineering

Little Harbor Wastewater Management Planning
Cohasset, MA

TUTELA ENGINEERING ASSOCIATES, INC.

MEETING MEMORANDUM

DATE:	**December 13, 2001**	cc:	**G. Vanderweil, S. Bobo, J. Beck, Dr. J. Godzik, P. Chapman, R. Lawrence, M. Haddad, N. Herlin, R. Kasperowicz, S. Cunning, DJC, DVT, TJK, JMI**
JOB #:	**T 156**		
FROM:	**Tutela Engineering Associates, Inc.**		
TO:	**File**		
SUBJECT:	**Public Meeting and Workshop For Little Harbor Wastewater Management Planning**		
MT'G DATE:	**12-12-2001**	LOCATION:	**Cohasset Town Hall Auditorium**
ATTENDEES		AFFILIATION	
See Attached Sign In Sheet		**See Attached Sign In Sheet**	
Disclaimer: These minutes are not intended as an accurate or official transcript of the meeting, but are only intended to remind the attendees of the subjects discussed.			

Gary Vanderwiel commenced the meeting by introducing the presenting parties (TEA and DEP) and describing the format of the hearing and workshop.

Dan Coughlin presented a slide show outlining the project scope including the following items:

1. Past engineering reports were reviewed which evaluated water quality and wastewater issues for the Little Harbor area and classified the Nichlos Road area as a priority on-site district. The developed Little Harbor watershed was established by the Town as the primary limit of work for the current planning project. The project involved evaluating wastewater collection and disposal options, specifically by expanding the existing Central Cohasset Wastewater Treatment Plant (WWTP) and extending sewers to the proposed project area.

2. Previous studies have shown that existing poor soils and high groundwater conditions in the Little Harbor area severely limit on-site wastewater disposal options. Municipal collection systems being considered include a conventional gravity sewer system (involving 14 pumping station which would be required due to physical limitations of the area), a Septic Tank Effluent Gravity system (which requires septage disposal as well as numerous pump stations), a Septic Tank Effluent Pumping system (also requiring septage disposal along with individual grinder pumps), a Vacuum Sewer System (believed to have limited capabilities due to existing topographic conditions), and a Low Pressure Sewer System (anticipated alternative to be recommended, similar the existing North Cohasset Sewer System). The expansion will likely tie into the existing system at North Main Street and/or Highland Avenue, where collection system capacity is already available.

3. The evaluation of the upgrade of the WWTP addresses a capacity increase from 300,000 gpd up to 450,000 gpd. No major physical alterations are anticipated to WWTP site,

only mechanical upgrades of components such as the membrane cassettes and miscellaneous pumping components. Recent upgrades already included a chemical addition system and an anoxic tank and mixer to meet expected future nitrogen discharge limits.

4. Currently the WWTP is performing exceptionally but it is not required to remove nitrogen. The future upgrade of the WWTP is expected to prompt the regulatory authorities (EPA and DEP) to revise the discharge permit to set an effluent nitrogen level of 10 mg/l. This will result in the plant's operation and maintenance costs increasing due to alternate modes of operation and increased chemical feed.

5. The existing WWTP outfall is also being analyzed to determine its capabilities in dealing with higher flow conditions. The outfall was an innovative design positioned so that it would project the treated effluent across the cove thereby maximizing dilution and dispersion. There are several sensitive receptors in Cohasset Cove, which will be examined as part of the study work based upon future flow criteria and future effluent quality.

6. Several regulatory review agencies will be reviewing the Facility Plan Supplement, which is being prepared including EPA, DEP, CZM, DMF, MEPA, MAPC, MHC, and ACE. Several issues raised by those agencies are currently being analyzed, including the potential impacts of sewers and related growth on sensitive receptors such as wetland, coastal dunes and barrier beaches.

7. The existing collection system is currently subjected to extraneous Infiltration and Inflow (I/I) conditions. Previous remediation measures had limited success so additional studies are now underway. The removal of I/I will assist in ensuring that future capacity at the WWTP will be available. System improvements will be required to realize I/I reductions. Peak flows can also limit the WWTP's ability to treat flow. Flow equalization methods, possibly including additional tankage, may be required to allow the full realization of the currently envisioned 450,000 gpd of plant capacity.

8. The first area considered to be served is the existing Little Harbor Watershed. If determined after period of time that the actual flows generated by this area has not consumed the available capacity at the WWTP, the service area could be extended. The first extension would be to the existing residents along Atlantic Avenue (east of Beach St.) to close a gap in the Central Cohasset service area. The second extension would be to existing residents along Jerusalem Road to close the service area gap between Little Harbor and the North Cohasset system. Once complete, the entire Cohasset coastline along Mass. Bay will be sewered.

9. The planning project is 50% complete. A draft document will be prepared by mid January 2002, so that findings will be available for the Spring 2002 Town Meeting. Questions were held until the end of the presentation format. DEP had been invited to attend the pubic meeting so that staffers could present recent study summaries regarding Total Maximum Daily Loadings (TMDL), which were projected for Little Harbor relative to its water quality criteria limiting pollutant, namely "fecal coliform bacteria". Since TMDL goals are more readily satisfied by the sewering of the Little Harbor area, the DEP study provides an added incentive and a demonstrated need for the project.

Russell Isaac of DEP presented a slide show relative to the State's Total Maximum Daily Load (TMDL) for watersheds and specifically for Little Harbor's bacteria TMDL. The following items were discussed.

1. Based on the progress of the planning project Cohasset is ahead of the game with respect to TMDL requirements.

2. TMDL is the quantity of pollutant loading that a water body can receive while still

meeting its water quality standards. Components of the TMDL are point sources, non-point sources and a margin of safety for consideration of future growth conditions. Non-point sources include leaking sewers, failing septic systems, storm water and wildlife.

3. Water quality standards are set for both swimming and shell fishing use. Since shellfish concentrate pollutants the shellfish standards are more stringent. For fecal coliform bacteria, this standard is 14 MPN per 100 ml.

4. Indicator parameters are used to measure bacteria levels.

5. In general the bacteria levels in Little Harbor are low to moderate in dry weather conditions, and are high in wet conditions. Storm water seems to be a major factor to the bacteria levels in Little Harbor.

6. The non-point impact from wildlife can only be removed to the extent that is practical.

7. Cohasset is subject to the Phase II storm water regulations, and will be required to implement the six minimum controls.

8. Funding opportunities are available depending on the project area and conditions. It was noted that the State Revolving Fund can give funds to the Town to set up its own local revolving loan system.

After the two presentations, the workshop phase of the meeting took place beginning with a discussion session with the approximately 80 people present breaking up in to small groups to discuss the issues presented and to develop questions, comments or suggestions. Each group had a facilitator (generally a member of the CEES group) that recorded the questions or comments. The following is a list of questions/comments and the resulting responses.

Question 1: What is the project time frame?
Response: If the design phase of the project is funded by the spring Town Meeting, the design could take place in 2002, construction funds could be voted in either the spring of 2003, SRF funding could be applied for in the summer of 2003 and construction could take place in 2004 and be completed in 2005.

Question 2: Will mandatory connections be required?
Response: The Sewer Commission will work in conjunction with the Board of Health. Generally, if a septic system passes Title V inspection, if the system is not located in the flood plain, if the system is not located within 50' of a wetland resource, and if the system meets all local Board of Health regulations, including nitrogen requirements, the owner may file for an exemption. The Board of Health will review the situation and make recommendations to the Sewer Commission as to whether the property is required to connect to the collection system. Exemptions will be the joint decision of the boards.

Question 3: Will undeveloped lots be permitted to connect to the collection system?
Response: That has not been fully determined at this time. An evaluation of actual future flow conditions with respect to WWTP capacity must be completed first. Currently the Little Harbor service area uses, on average daily basis, approximately 80,000 gpd. It is anticipated that homes in the area, once discontinuing use of their septic systems, will increase the rate of wastewater generated. That average daily flow rate could potentially double to 160,000 gpd. It is currently envisioned that, before vacant lots could be served, the Town would give priority to existing residents on both Atlantic Avenue and Jerusalem Road, adjoining Massachusetts Bay.

Question 4: Since flow is often based on the number of bedrooms, will homeowners be permitted to add additional bedrooms in the future?
Response: A limited degree of expansion will be possible, such as adding a bedroom, but will be based on the available capacity in the system. The project will not permit expansion such as the subdivision of lots, conversions of single-family homes to condo's or apartments or other multi-family conversions.

Question 5: The service area is subject to electrical power outages, what provisions will be made if a low pressure system is implemented?
Response: Each individual low-pressure sewer grinder pump is located in a tank that has storage capacity of between 24 to 45 gallons, depending on the point in the pumping cycle when the power outage occurred. Generally low volume toilets (1 to 1.5 gallon per flush) are in place and during the outage dish washers and washing machines will not be operated. This mean there would be lower wastewater generation and the pump chambers would provide about a day or two of storage. Homeowners could also purchase and install their own emergency generators and/or they could install or convert existing tankage for use as an emergency overflow chambers as further safeguards.

Question 6: Who is in charge of the project, the Selectmen or the Sewer Commission?
Response: Gary Vanderwiel indicated the Town Manager has authority to expend funds on the project based on town meeting, and the Sewer Commission provides direct project oversight.

Question 7: What documents will be brought to the Spring 2002 Town Meeting?
Response: A Facility Plan Supplement is being prepared along with other environmental and regulatory documents, including a MEPA Notice of Project Change. These planning/preliminary permitting documents are being prepared to support the Towns sewer system expansion efforts and to more fully define project feasibility. The results and recommendation of these studies will be utilized to present an article at the Spring Town Meeting for the "design" funding for the project. Funding for "construction" would be presented at a later Town Meeting after the design and a refined construction cost estimate are complete, probably at the following fall or spring town meeting.

Question 8: What is the status of the previous agreement (Amended Final Judgment) with the State?
Response: The only outstanding item relative to the Amended Final Judgment is relative to the Priority On-Site Wastewater Management Districts previously approved by Town Meeting. The Lily Pond district was addressed with the extension of low-pressure sewers system to that area. The Little Harbor district is being addressed now by this ongoing project, and if the area were sewered, the Judgment would be fully satisfied.

Question 9: After the sewers are in place, what is the expected end result relative to the water quality of Little Harbor?
Response: The installation of the sewers is anticipated to address one of the bacteria sources present in the watershed. Other bacteria sources present include storm runoff and wildlife impacts. While providing sewers could be significant, it is difficult to predict if sewers will improve the water quality of Little Harbor to the point where its water quality goals are satisfied and shell fishing beds are re-opened. There is no clear answer. Steve Bobo, of the Board of Health, indicated a past CDM report stated that 40% of the pollutants in Little Harbor are associated with septic systems. Steve Bobo indicated that the clean up of Little Harbor should be approached from many angles and the Board is currently working on addressing urban runoff issues.

Question 10: What provisions will be provide regarding vacant lots and the intensity of development?
Response: Adequate zoning and wetland regulations will be required to control growth and

development. The purpose of the proposed collection system is to serve existing homes. Gary Vanderwiel added that as part of the recent expansion of the Central Cohasset system approximately 25 vacant lots were part of the 600 lots served. Presently approximately 90% of the once vacant lots are now being developed. The Town will attempt to give priority to its existing problems without promoting development. Since the capacity is limited, the development of the approximately 60 vacant lots is not anticipated for a while.

Question 11: Why spend funds on sewers if other non-point issues are not being addressed?
Response: The State has indicated on several occasions that they believe septic systems are a significant source of non-point pollution and bacterial contamination. Other sources such as waterfowl could contribute to pollutant loadings, in the harbor, to a level that would prevent the water body from attaining its water quality goals. The elimination of septic systems in the area will certainly provide some benefit to the water body in reaching these goals.

Question 12: What are the numbers of failed septic system in the Little Harbor area?
Response: It is currently being assessed by the Board of Health, based upon existing records. In the 1997 Facility Plan, a mail questionnaire indicated a failure rate of approximately 40% in the Nichlos Road area. Some of the failed systems may have since been upgraded. This was a higher rate of failure than the town average and that is why the area was originally targeted for additional investigation via the Priority On-Site Wastewater Management District formation.

Question 13: Does that mean that 40% of the 300 homes in the Little Harbor area could be failing?
Response: Yes, if this same failure rate were applied to the entire area, 120 home could possibly be in noncompliance with meeting all of the state and local septic system regulatory criteria.

Question 14: What if the water quality problem is only related to non-sewer issues such as lawn fertilizer practices?
Response: Residential lawn fertilizers generally add nutrients (nitrogen and phosphorous) not bacteria. The waterfowl population and area mammals on the other hand could be a major part of the problem but septic systems have also been identified as a contributing factor.

Question 15: What is likelihood of obtaining 50/50 funding?
Response: Town meeting approval is required for 50/50 funding the likelihood of that passing is a point of conjecture.

Question 16: What is the cost per household to have sewers?
Response: Looking at the cost data from the North and Central Cohasset sewer construction projects, the cost generally depends on the amount of ledge encountered, the degree of site restoration and groundwater conditions for the individual sewer service lines. With ledge present, costs were about $35,000 (including pump and piping). Residential properties in the Little Harbor area would tend to require more site restoration, have higher degree of ledge excavation, have longer services and have increased groundwater problems. This project does not anticipate that the town will construct facilities on the private properties but merely bring service stubs to the property lines. Through this method, homeowners may be better able to compensate for these higher costs by private contracting.

Question 17: How will users be charged? By betterment or by taxes?
Response: Previously the Town has recovered 50% of similar sewer project costs from the tax base, and 50% from betterment charges. The betterments have been for a 20-year period, but the Town could possibly consider a 30-year period. Much of the North Cohasset system was funded by a State Revolving Fund (SRF) loan that included a high degree of 75% equivalency loans from the state. Portions of the Central Cohasset expansion used SRF loans, which were 50% equivalency loans. The Little Harbor could possibly receive a 25% to 50% equivalency loan from the state as well. Gary Vanderwiel mentioned that there was a strong chance that the Sewer Commission would recommend 50/50 funding at Town Meeting. He also indicated that a preliminary report conducted about a year ago indicated that the cost per house to

be $40,000. Gary Vanderwiel reiterated that the North Cohasset project included installing the low-pressure grinder units on private property. This approach was problematic. The Town will be installing the Little Harbor sewers to the property lines only. The change in scope could help to reduce construction costs.

Question 18: Is there any assistance available for financially burden residents?
Response: It was mentioned that the State has set up some financial assistance to certain Title V users through low interest loans at local banks. Theoretically that loan program can also be used for installing a sewer connection for those with failing systems. The town also has criteria to defer betterment charges in hardship cases.

Question 19: What is timeframe for the project?
Response: If the Spring Town Meeting approves design funds for the project, and a later Town Meeting also approves the construction funds, it is envisioned that construction would occur in 2004 and 2005, when the town will be in better shape relative to its debt service.

Question 20: Was the previous M&E Facility Plan reviewed?
Response: The review of the M&E Facility Plan was conducted as part of the 1997 Facility Plan Update. The Ward Engineering Facility Plan, which updated that previous study, was also conducted at that time.

Question 21: What can be done to address the Beachwood Street and Aaron River area?
Response: Future municipal projects could possibly include satellite treatment and disposal facilities. Coordination between the Sewer Commission and the Board of Health will be required to evaluate needs and cost effective options for the pockets of problems around the town.

Question 22: Since flow is often based on the number of bedrooms, will home owners be permitted to add additional bedrooms in the future?
Response: A limited degree of expansion will be possible, such as adding a bedroom, but such approvals will be based on the availability of capacity in the system. As previously noted the project will not permit expansion such as for the subdivision of lots or multi-unit conversions.

Question 23: How will accessibility be addressed on narrow street such as Gammons Road where ledge is present?
Response: Low-pressure sewers were constructed on the shoulder where possible in North Cohasset. Similar efforts will be made to reduce resident inconvenience. Notification of residents is important to coordinate site access. It was also noted that easements could be required if work is conducted on private roadways.

Question 24: What are the costs impacts if ledge is present?
Response: The presence of ledge will increase individual service connection costs based on site-specific conditions. Difficult ledge situations can easily add $40 to $50 per linear foot to the cost of a piping project.

Question 25: The community of Gloucester rezoned after providing sewers, is there a commitment from the Sewer Commission to work with the Planning Department and other department?
Response: The Planning Board was contacted about the project, with the main focus on environmentally sensitive areas, namely flood zones and barrier beaches. Recommendations will be made by Tutela Engineering to tighten existing regulations in the Little Harbor area either through the existing Water Resource District or by the formation of a Little Harbor District. Like Gloucester and Newburyport, specific districts for sewered areas could be developed by the Planning Department.

Question 26: If a person has knowledge of a property transferring without having a passing Title V system, specifically a condominium property, who should be contacted?

Response: It should be reported to the Board of Health. Doctor Joseph Godzik clarified that septic systems that serve a condominium complex are inspected on a three (3) year basis verses at time of transfer in accordance with Title 5.

Question 27: What is the certainty that sewers are coming Little Harbor?
Response: It solely depends on town meeting funding decisions. At this stage, the engineering evaluations all indicate that system expansion will be feasible.

Question 28: Is a Prop 2 ½ Overide required?
Response: If the 50/50 funding approach is taken, an override will most likely be required.

Question 29: Would dredging of Little Harbor be beneficial?
Response: No, dredging will not have a significant effect on the water quality. Little Harbor currently has sufficient tidal flushing capability to preserve water quality during dry weather conditions. During wet weather conditions, the high flushing action helps to improve the harbors water quality quickly over a few tide cycles. Proper operation of Cat Dam is also an important factor in the normal maintenance of Inner Little Harbor since it restricts flushing. If the dam were removed, Inner Little Harbor would also have a high degree of flushing similar to that of the main harbor.

Question 30: Sewer Commissioner, Ray Kasperowicz made a statement indicating that the questions raised were good. In his opinion, he has not been presented with any evidence that indicates the State is requiring the Town to do any more than just study the Little Harbor area. It is not clear that the Town is required to install sewers in the Little Harbor area. In his opinion, a thorough cost/benefit analysis would need to be conducted before proceeding with any sewering for the area. He noted that there are approximately 2400 homes in Cohasset, and with the Little Harbor project, approximately half the homes in town would be sewered. The remaining unsewered homes should not be forgotten.
Response: Joe Godzik indicate there is no mandate to sewer Little Harbor, but if it were sewered the last item of the Final Amended Judgment would be addressed. Dan Coughlin noted that an Onsite Wastewater Management Plan is required for the Nichlos Road area, and the Town is required to address this matter. The State has also mentioned that they have concerns regarding the total Little Harbor watershed. The recent Board of Health requirements regarding the 400' setback for removing nutrients with onsite septic systems has also placed many existing systems in non-compliance. Initial indications reveal sewer as the most cost effective approach to comply with both state mandate and local regulation. Sewers however would not address storm water as a source of pollution to Little Harbor. The cleanup of Little Harbor should be a phased and approached from several avenues.

Question 31: When were the Board of Health regulations updated to include the 400' nutrient requirement?
Response: Dr. Godzik estimated it was January 2000.

Question 32: Why was the 400' nutrient requirement instituted?
Response: Dr. Godzik indicated the general consensus of the Board of Health when it passed the regulation was to protect not only Little Harbor but also other named water bodies throughout the Town from nutrient pollution and eutrophication.

Question 33: Is the 400' nutrient requirement tougher than the State standard?
Response: Dr. Godzik indicated that it was and that local regulations are often more stringent due to local conditions. Steve Bobo added that the Board of Health is working on the storm water issue to develop an active storm water management plan that should result in water quality benefits throughout the Town.

Question 34: What percent of Little Harbor pollution is associated with storm water runoff?
Response: That has never been definitively defined, but based on the previous water quality study it was estimated that 40% was related to septic systems and 60% was from other sources.

Question 35: Since the 40% failure rate was developed prior to the implementation of the 400' nutrient requirement, how many homes would fail based on this new Board of Health criterion? Has this backed the Little Harbor resident into accepting sewers?

Response: The Board of Health has always been proactive in protecting the environment. Steve Bobo indicated that 80% to 90% of those homes in that offset might be in non-compliance. Dr. Godzik indicated that he believed that the number of homes in the Little Harbor area might not be that high since a good portion of that 400' offset is generally composed of flood prone areas with poor soils where septic system placement typically would not have occurred.

Appendix 3: Meeting Summary and

Response to Comments by MA DEP

MEMORANDUM

SUBJECT: Little Harbor TMDL and Wastewater Management Meeting
DATE: December 14, 2001
PREPARED BY: Elaine Hartman, DEP-DWM

Location and Date: Town Hall, Cohasset, 7pm December 12, 2001
Presentations by: Tutela Engineering, DEP (Russell Isaac) and an introduction of the EOEA team leader George Zoto.
Handouts: DEP presentation, and DEP TMDL report.

See attached agenda, list of attendees, and draft BOH stormwater management plan.

The consultant provided a summary of the studies reviewed, the collection system valuation, and the wastewater treatment plant evaluation, regulations, schedule and costs. Russ Isaac of DEP presented the TMDL report, process, and findings. Workshop groups of 10 participants were formed in order to develop questions and comments for the consultants and DEP. About 60 stakeholders attended the meeting.

Highlights of Consultant Presentation

This project has had a number of studies conducted over the last several years. The high water and ledge produce a high degree of failure of septic systems. Consultant is looking at a variety of types of sewer systems. The gravity system would still require about 14 pumping stations for the different gravity sections. WWTF upgrade to the membrane filtration plant would be about a 50% increase, from the present 300,000 gallons, about 150,000 gallons could be added. 4 additional cassettes would be required for the membrane bioreactors. All computer controlled processes. The system was originally designed for nitrogen control. The new permit from EPA will have a nitrogen limit to meet the 10 mg/l mark. TSS and BOD levels from the facility are good. Problems exist with I/I from leakage during wet weather and from groundwater intrusion. Dilution at outfall is 30:1. Consultant indicated that at higher flows this dilution would be maintained. A draft report on the expansion should be available by the end of December.

1. Time frame for construction will be 2004-2005. The system may be a low pressure system with main and some laterals, with the town to sell pumps to homeowners
2. All homes to hook in due to requirements of Title 5 with the board of Health to review systems to see if they met all of the requirements. Since the BOH has a new requirement with a N component homes with failed septic systems would need to hook in to meet this new requirement.
3. WWTF expansion was based upon the present number of homes and bedrooms and with expansion to current homes. Empty lots would not be eligible for connection.
4. Pumps vaults have storage capacity of about 50 gallons to offset problems when electricity is lost (happens frequently in this coastal area).
5. Next steps are notice of project change and request for a permit, followed by potential voting at next town meeting (in spring) for funds to design.
6. One element remains on the Amended Final Judgment: to address priority districts. The new sewers for the Little Harbor area would address this last element.
7. The eventual effect of the upgrade on Little Harbor would be to reduce the bacteria counts, which is the reason for listing on the 303d list.
8. The CDM report (1999) summarizes data collected for that report and data from the Division of Marine Fisheries (DMF) which includes information for several years between 1988 and 1995. CDM reported 7 of 72 samples exceeded the shellfish water standard of 14 CFU/100mL while the Marine fisheries data indicated that 40 of 90 samples exceeded 14 MPN/100 mL. The MPN test is the procedure required for shellfish waters, and the CDM data appear as the membrane filter technique, so some of the difference may

derive from the different methods. While the DMF data are older than CDM's, there have been no actions to date in the Little Harbor area that would suggest water quality would be approaching the very stringent shellfish standard. Also, it would be the DMF data that govern the assessment of the shellfish waters.

9. Concerns were stated on the potential for increased development being possible in the areas to be sewered. The limited capacity of the WWTF may keep development down although new sewers usually do bring more development.
10. As an example, the Central Sewer Project looked at the 25 vacant lots that may be developed and noted that about 90% are already scheduled for development. There are 60 vacant lots in the Little Harbor area.
11. Why the approach to sewer the area first and then to implement NPS controls after? The characteristics of this area (shallowness to groundwater, predominance of ledge and nearness of sources) have been shown through studies in other areas to have a cause and effect relationship with bacterial levels in nearby waterbodies.
12. The number of potential failing sewer systems is under determination. The 1996 evaluation of existing records showed about 40% failure.
13. Assuming that the 40% failure rate was average for the area, this would mean that up to 120 homes may not meet Title 5 criteria.
14. If the other NPS controls were implemented first, nutrients would be controlled but not the bacteria levels.
15. Residents would like to have the 50/50 local/state revolving fund match that was possible for wastewater work in other Cohasset locations.
16. Costs per home would run $30-35,000, which would include the cost of the pumps. This would be the cost prior to the 50/50 match.
17. The consultants did review the M&E 1980 facility plan as part of this project.
18. Satellite treatment plants, for the areas elsewhere in town , should be reviewed when on-site upgrading in not feasible.
19. Zoning regulations could be reviewed and possibly revised. For example, expanding the existing water resource protection district in the Planning Board regulations.
20. Dredging Little Harbor would not help control the flushing rate or the bacteria levels since flushing is already at a very high rate.
21. The requirement to sewer is a result of (1) the last item that needs to be addressed in the Agreement for Judgment as sewering would satisfy the objective, and (2) meeting the Title 5 requirements especially the new BOH addition of a 400 foot setback to moderate the N effects.
22. A cost/benefit analysis should be done.
23. Concern still over the final effect on Little Harbor once sewering was done.
24. There are 2400 households in town, and about one-half are sewered.
25. The BOH requirement for the 400-foot setback was put in during January 2000.
26. Sewers would not address stormwater problem.
27. BOH January 2000 regulation was enacted in order to protect all waterbodies within the town.
28. A Stormwater Management Plan is under development by the BOH and public works department.
29. Gloucester has a Watershed Protection Plan also.
30. A grant is in place to build vegetative swales between catch basins and water bodies to reduce pollutant levels.

Questions and Responses Regarding the TMDL for Bacteria:

The questions that arose during the public meeting are subsumed in the following questions:

Question: Why shouldn't all potential non-point sources of indicator bacteria be addressed before focusing on septic systems ? The point seeming to be if water quality standards are met after these controls are in place, then it will be clear that septic systems are not a major problem.

Response: First, even if small amounts of human sewage reach the watercourse, there is a non-zero risk of spreading disease even if concentrations of indicator bacteria are within the water quality standard. At the same time, a resource as sensitive to bacteria contamination as shellfish are can be closed simply by the threat of contamination if public health is considered to be at risk. Second, it is almost guaranteed that control of all sources will be necessary to meet the very high quality ambient water criteria for shellfishing. A relevant point is that Cohasset does fall into the category of towns, based on population, that will have to address the Phase II Storrmwater Rule. This means much of the work already underway in Cohasset to reduce the impacts of runoff will help fulfill its obligations

under the Rule.

Question: Will any wastewater project in the Little Harbor area of Cohasset receive the same matching funds from the state revolving fund (SRF) that recent projects in other parts of the Town were able to garner?

Response: Several factors determine the cost share arrangement including the competition for SRF funds by other communities in the Commonwealth.

Presentation at the Little Harbor, Cohasset Wastewater Management Plan/Bacteria TMDL Meeting

Breakout Group: Little Harbor, Cohasset Wastewater Management Plan/Bacteria TMDL Meeting

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