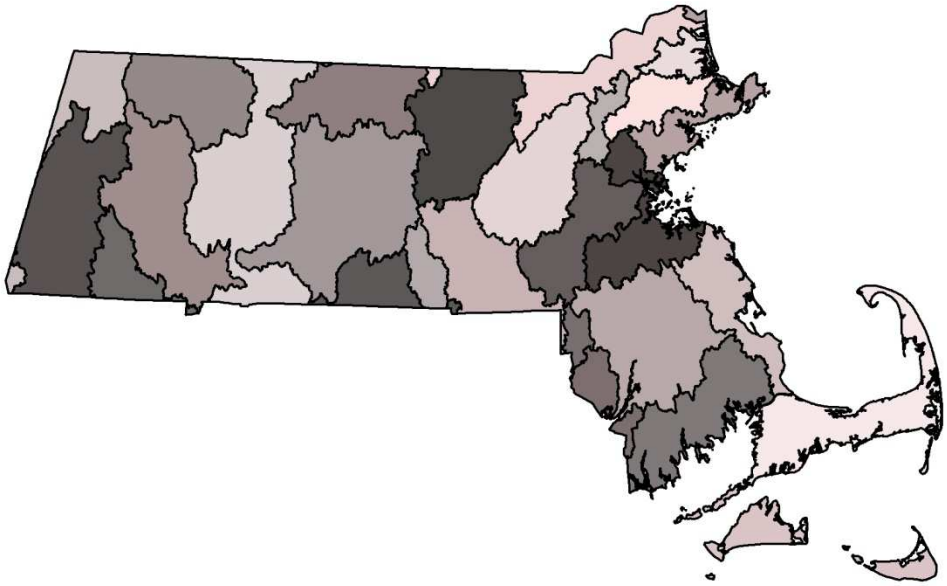
Addendum: Final Pathogen TMDL for the Cape Cod Watershed (Control Number: CN: 252.5)



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Division of Watershed Management
627 Main Street
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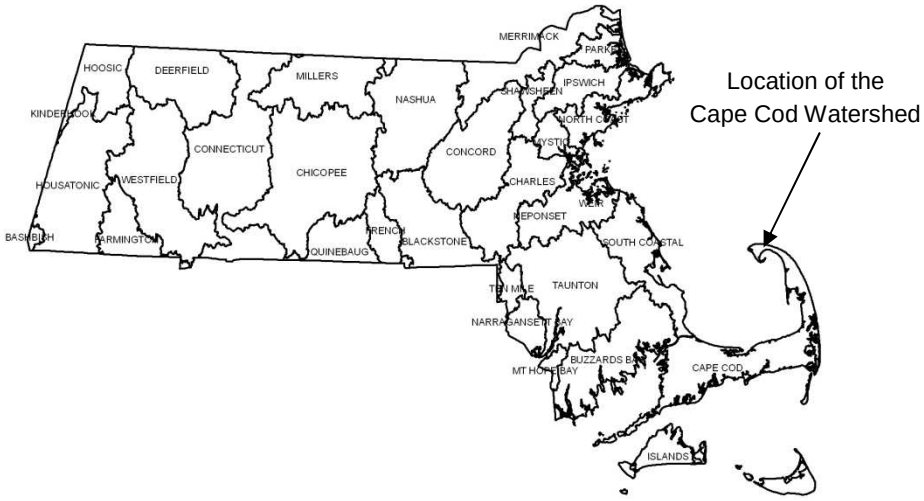
Table of Contents

List of Tables and Figures

Total Maximum Daily Loads for Pathogens within the Cape Cod Watershed



Key Features: Pathogen TMDL for the Cape Cod Watershed
Location: EPA Region 1
Land Type: New England Coastal
303(d) Listings: Pathogens
Cockle Cove Creek, MA96-79
Dock Creek, MA96-86
East Harbor (Pilgrim Lake), MA96-83
Halls Creek, MA96-93
Hyannis Inner Harbor, MA96-82
Little Pleasant Bay, MA96-78
The River, MA96-76
Santuit River, MA96-92
Snows Creek, MA96-81
Springhill Creek, MA96-87
Stewarts Creek, MA96-94
Little Pond, MA96-56
Mill Creek, MA96-80
Mill Creek, MA96-85
Old Harbor Creek, MA96-84
Paw Wah Pond, MA96-72
Pochet Neck, MA96-73

Data Sources:

- EEA "*Cape Cod Watershed Assessment and 5-Year Action Plan*"
- MassDEP "*Buzzards Bay Watershed 2000 Water Quality Assessment Report*"
- MACZM "*Atlas of Stormwater Discharges in the Buzzards Bay Watershed*"
- MassDEP "*Cape Cod Water Quality Assessment Report*"
- Cape Cod Commission "*Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project*"

- Division of Marine Fisheries (for coastal estuaries with shellfishing use) Department of Fish and Game (DFG)
- Massachusetts Department of Public Health (for public swimming areas)

Data Mechanism: Massachusetts Surface Water Quality Standards for Pathogens; The Federal BEACH Act; Massachusetts Department of Public Health (DPH) Bathing Beaches; Massachusetts Division of Marine Fisheries Shellfish Sanitation and Management; Massachusetts Coastal Zone Management (CZM)

- **Monitoring Plan:**
- Massachusetts Watershed Five-Year Cycle, MEP, Cape Cod Communities; Division of Marine Fisheries (DMF) Department of Fish and Game (DFG)
- Shellfish data; Department of Public Health Beaches data; Coastal Zone Management (CZM) data.

Control Measures: Watershed Management; Stormwater Management (e.g., illicit discharge removals, public education/behavior modification); No Discharge Areas; BMPs; By-laws; Ordinances; Septic System Maintenance/Upgrades

1.0 Introduction

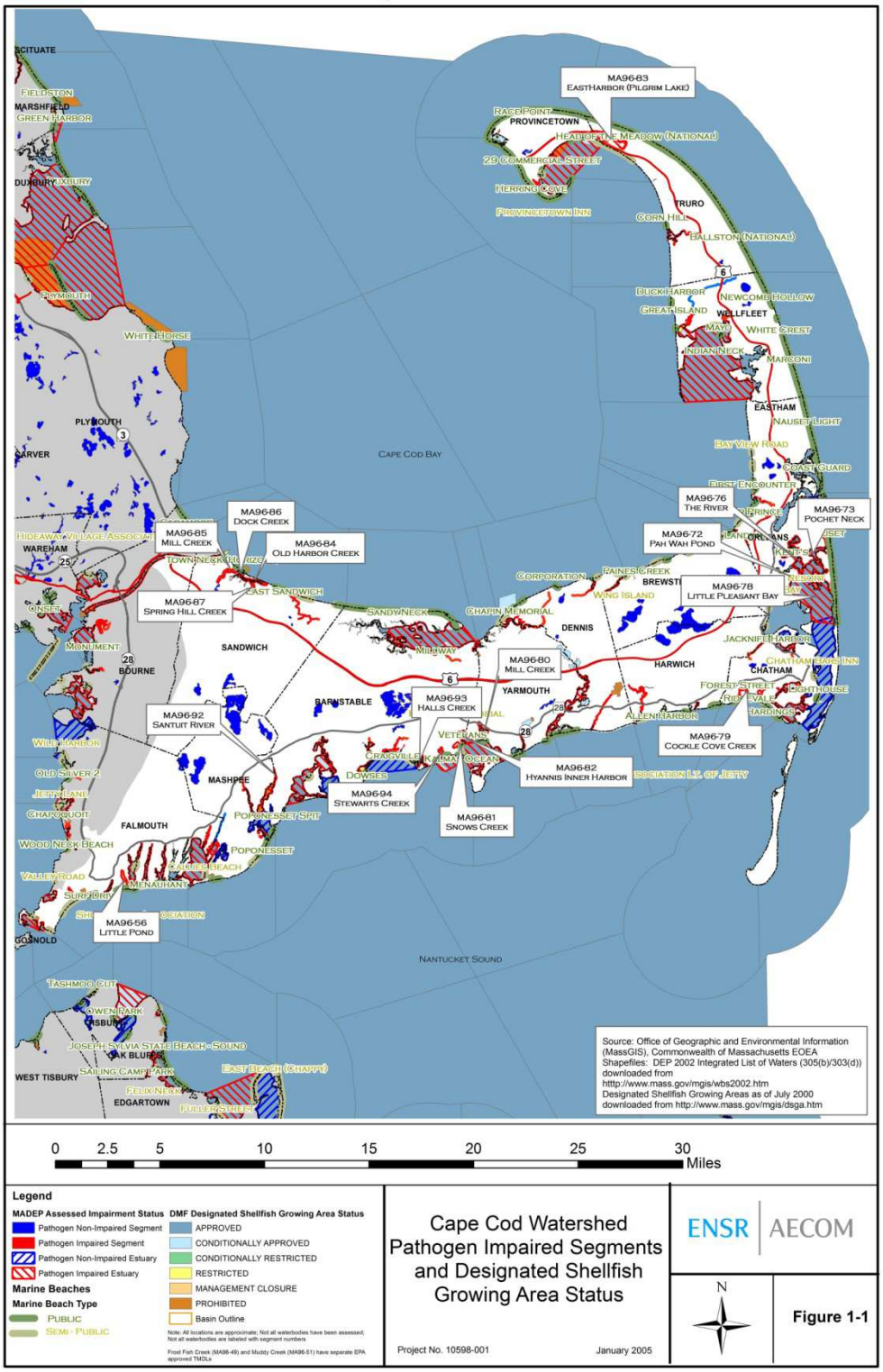
Section 303(d) of the Federal Clean Water Act (CWA) and Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to place waterbodies that do not meet established water quality standards on a list of impaired waterbodies (commonly referred to as the "303d Integrated List") and to develop Total Maximum Daily Loads (TMDLs) for listed waters and the pollutant(s) contributing to the impairment. As a result of monitoring and assessment activities, 17 new pathogen impaired segments have been identified on Cape Cod and listed in the Draft Massachusetts Year 2012 Integrated List of Waters pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. These segments require a Total Maximum Daily Load (TMDL) to be derived. A Cape Cod Pathogen TMDL (MassDEP 2009) was approved by EPA in 2009 and the 17 new pathogen impaired segments were identified and listed in the 2012 Draft Integrated List since the Cape Cod Pathogen TMDL was finalized (MassDEP 2009). This addendum was developed by MassDEP with the intention of adding these 17 segments to the "Final Pathogen TMDL for the Cape Cod Watershed", submitted to EPA in August 2009.

Section 7.4 of the Final TMDL (Application of the TMDL to Unimpaired or Currently Unassessed Segments) states "This Cape Cod Watershed TMDL may, in appropriate circumstances, also apply to segments that are listed for pathogen impairment in future Massachusetts CWA § 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, "after listing the waters for pathogen impairment and taking into account all relevant comments submitted on the future CWA § 303(d) Integrated List of waters the Commonwealth determines with USEPA approval of the CWA § 303(d) list that this TMDL should apply to newly listed pathogen impaired segments". MassDEP formally requests that the 17 segments within this Addendum be added to the Final Pathogen TMDL for the Cape Cod Watershed Report. The location of these new impairments is shown in Figure 1-1: Addendum.

Within that Final 2009 Cape Cod Pathogen TMDL submission, Massachusetts included impaired waterbodies from the "Massachusetts Year 2008 Integrated List of Waters". The 2004-2008 Surface Water Quality Assessment Report identified an additional 17 pathogen impaired segments (New Impairment cause is fecal coliform in all segments and Enteroccoci in one segment) that have been included in Category 5 of the Draft 2012 Integrated report.

Sections 1, 4, 6, and 7 of this addendum provide information that is relevant to the newly listed pathogen segments. All other Sections of the Pathogen TMDL for Cape Cod that was approved in 2009 remain relevant. This addendum summarizes the information for these segments including impairment location (Figure 1-1: Addendum), Problem Assessment (Table 4-3: Addendum), Prioritization and Known Sources (Table 6-1: Addendum) and Pathogen TMDL Calculations (Table 7-2: Addendum). Note that there have been no revisions to the water quality standards that apply to these impairments since the Cape Cod Pathogen TMDL was finalized in 2009 (Final Cape Pathogen TMDL report Table 7-1).

Figure 1-2 Addendum. Pathogen Impaired Segments.



2.0 Watershed Description – See Final Cape Cod Pathogen TMDL (CN252)

3.0 Water Quality Standards - See Final Cape Cod Pathogen TMDL (CN252)

4.0 Problem Assessment – 2012 listed segments

Pathogen impairment has been documented at numerous locations throughout the Cape Cod watershed, as shown in Figure 1-1 (Addendum). Elevated concentrations of indicator bacteria (e.g., fecal coliform, enterococci, *E. coli* etc.) can indicate the presence of sewage contamination and possible presence of pathogenic organisms. The amount of indicator bacteria and potential pathogens entering waterbodies is dependent on several factors including watershed characteristics and meteorological conditions. Indicator bacteria levels generally increase with increasing development activities, including increased impervious cover, illicit sewer connections, and failed septic systems.

Indicator bacteria levels also tend to increase with wet weather conditions as storm sewer systems overflow and/or stormwater runoff carries fecal matter that has accumulated to the river via overland flow and stormwater conduits. In some cases, dry weather bacteria concentrations can be higher when there is a constant source that becomes diluted during periods of precipitation, such as with illicit connections. The magnitude of these relationships is variable, however, and can be substantially different temporally and spatially throughout the United States or within each watershed.

Development activity generally leads to decreased water quality (e.g., pathogen impairment) in a watershed. Development-related watershed modification includes increased impervious surface area which can (USEPA 1997):

- Increase flow volume,
- Increase peak flow,
- Increase peak flow duration,
- Increase stream temperature,
- Decrease base flow, and
- Change sediment loading rates

Many of the impacts associated with increased impervious surface area also result in changes in pathogen loading (e.g., increased sediment loading can result in increased pathogen loading). In addition to increased impervious surface impacts, increased human and pet densities in developed areas increase potential fecal contamination. Furthermore, stormwater drainage systems and associated stormwater culverts and outfall pipes often result in the channelization of streams which leads to less attenuation of pathogen pollution.

A list of additional pathogen impaired segments requiring TMDLs is provided in Table 4-3 (Addendum). Information regarding each impaired segment including, discharges, use assessments and recommendations to meet use criteria are provided in the MassDEP WQA (MassDEP 2010). Massachusetts assessment and listing methodology as of the date of the WQA report is to automatically assess waters as impaired for shellfishing if Division of Marine Fisheries (DMF) Division of Fish and Game (DFG) classifies waters as prohibited of conditionally approved for shellfishing (MassDEP 2010).

Table 4-3: Addendum. Cape Cod Pathogen Impaired Segments Requiring TMDLs— (MassDEP 2012).

Segment ID	Segment Name	Segment Size (sq mi)	New Impairment Cause	Segment Description
MA96-79, SA	Cockle Cove Creek	0.007	Fecal Coliform, Enterococci	Northeast of the bend in Cockle Drive, Chatham to confluence with Bucks Creek, Chatham.
MA96-86, SA	Dock Creek	0.02	Fecal Coliform	From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich.
MA96-83, SA	East Harbor (Pilgrim Lake)	0.50	Fecal Coliform	Truro
MA96-93, SA	Halls Creek	0.07	Fecal Coliform	Estuarine portion, from Craigville Beach Road, Barnstable to mouth at Centerville Harbor, Barnstable.
MA96-82, SA	Hyannis Inner Harbor	0.13	Fecal Coliform	Waters landward of an imaginary line drawn from Harbor Bluff, Barnstable to Hyannis Park, Yarmouth.
MA96-78, SA, ORW	Little Pleasant Bay	3.3	Fecal Coliform	Waters north and east of imaginary lines drawn from the northeasterly edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham then east to a point on the inner Cape Cod National Seashore.
MA96-76 SA, ORW	The River	0.42	Fecal Coliform	The water landward of an imaginary line drawn between Old Field Point and Namequoit Point including Meetinghouse Pond, and Kescayo Gansett Pond locally known as "Lonnies Pond".
MA96-92 SA	Santuit River	0.008	Fecal Coliform	From confluence with fresh water portion south of Old Mill Road, Mashpee to mouth at Shoestring Bay, Mashpee/Barnstable.
MA96-81 SA	Snows Creek	0.02	Fecal Coliform	East of Old Colony Road, Barnstable to mouth at Lewis Bay, Barnstable.
MA96-87 SA	Springhill Creek	0.01	Fecal Coliform	From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich.
MA96-94 SA	Stewarts Creek	0.01	Fecal Coliform	Estuarine portion, west of Stetson Street, Barnstable to mouth at Hyannis Harbor, Barnstable.

Segment ID	Segment Name	Segment Size (sq mi)	New Impairment Cause	Segment Description
MA96-56 SA	Little Pond	0.07	Fecal Coliform	West of Vista Boulevard, Falmouth outlet to Vineyard Sound, Falmouth.
MA96-80 SA	Mill Creek	0.07	Fecal Coliform	Headwaters, outlet Mill Pond, Yarmouth to confluence with Lewis Bay, Yarmouth.
MA96-85 SA	Mill Creek	0.02	Fecal Coliform	Headwaters, outlet Shawme Lake Lower, Sandwich to confluence with Old Harbor Creek, Sandwich.
MA96-84 SA	Old Harbor Creek	0.06	Fecal Coliform	From Foster Road, Sandwich to Sandwich Harbor, Sandwich.
MA96-72 SA, ORW	Paw Wah Pond	0.008	Fecal Coliform	Orleans
MA96-73 SA,ORW	Pochet Neck	0.24	Fecal Coliform	To confluence with Little Pleasant Bay, Orleans.

A summary of each of the pathogen impaired segment coved by this addendum is provided below.

Cockle Cove Creek (MA96-79)

This 0.007 square mile (mi^2) Class SA segment extends northeast of the bend in Cockle Drive, Chatham to confluence with Bucks Creek, Chatham.

It should be noted that segment area is in the Sulphur Springs/Bucks Creek subwatershed. Cockle Cove Creek is the primary recipient of treated wastewater effluent from the Town of Chatham's WWTF, which discharges to the aquifer near the freshwater stream which forms the headwaters of the central salt marsh creek (Howes *et al*. 2006). The town of Chatham holds an MS4 permit (MAR041101).

Shellfish Harvesting Use

The shellfish harvesting use is assessed as impaired because all of the segment area is classified as Conditionally Approved for shellfish harvesting by the Division of Marine Fisheries (DMF) Division of fish and Game (DFG). The Town of Chatham Massachusetts, published a *Bacteria Sources Assessment for a Wetland Dominated Watershed: Guidance Document and Case Study Report,* in 2005. This study concentrated on enterococcus sampling in the Cockle Cove and estuary areas. The study sampled seven sites, four times, along an approximately 1.5 mile length of Cockle Cove Creek in 2005. Enterococci levels ranged from 15 - 7,933 CFU/100 mL, with at least twelve readings exceeding 1,000 CFU/100 mL, that were observed in the upper reaches of the creek in late August 2005 following a 1" rain event. Two other wet weather events showed relatively higher readings (range 40- 3,065 CFU/100 mL) than several other dry weather events (range 1- 1,748 CFU/100 mL).

Additionally, the Town of Chatham Board of Health monitored two sites (upper reach area) for enterococcus several times each year in Cockle Cove 2001-2004. Readings ranged between 3- 13,950 CFU/100 mL, with at least 3 readings above 7,650 CFU/100 mL. Additionally, the town of Chatham, during 2004, monitored some 20 beaches sites within the Chatham area. The data indicate particularly high levels at two sites in the lower end of Cockle Cove Creek: 1) station B4b, at the Cockle Cove Creek Parking Lot, where levels during June - August 2005 (12 samples) ranged between <2- 1,710, with a geometric mean of 248 CFU/100 mL, and June - August 2006 (21 samples) ranged between <3- 4,067,

with a geometric mean of 620 CFU/100 mL; 2) station B4c, Cockle Cove Creek at Ridgevale Bridge, where levels during June- August 2005 (12 samples) ranged between <2- 232, with a geometric mean of 11 CFU/100 mL, and June- August 2006 (26 samples) where levels ranged between <2- 2,240, with a geometric mean of 126 CFU/100 mL.

The study did not conclude that any principal human factors were the cause(s). Septic systems are strictly controlled by the town of Chatham, and stormwater runoff from roadways, etc., do not seem to be significant factors. It should be noted that there is a wastewater treatment facility (Chatham) in the northern most part of the Cockle Cove drainage area, whose discharge may affect that portion. Natural sources, including wildlife, and accumulation of vegetation and other material along shorelines, are thought to be major contributors.

Considerable evidence of wildlife presence was observed in the marshes, including foxes, foxholes, birds, feces and remnants of meals. Animal by-products getting into the marsh areas may be very significant contributors to high bacteria counts according to the study. Of course, the study recommends that the town seriously re-check all currently operating septic systems to insure their proper operation, and check out possible stormwater runoff contributor factors from roadways, to see if these, too, might be bacteria contributors. It should be pointed out that Cockle Cove Creek is adjacent to, and within a couple miles of, the two listed segments above, Mill Creek Segment MA 96-41, and Bucks Creek Segment MA 96-44. Although there is no available data within these two segments, the data in Cockle Cove indicates that bacteria contamination in this segment may affect Mill Creek and Bucks Creek, particularly at their lower ends, and in any public beach areas in between these two segments. Based on the pathogen TMDL (MassDEP, 2009) these restrictions are likely due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or unspecified urban stormwater.

Primary and Secondary Contact Recreational Uses

There is one public beach, Cockle Cove Creek Beach, which runs along the southern shoreline of Cockle Cove Creek and a small portion of another public beach, Bucks Creek Beach at the mouth of Cockle Cove Creek. Frequent testing for Enterococci bacteria during the swimming season was conducted at Cockle Cove Creek Beach from 2002 – 2007 (MA DPH 2009a). Cockle Cove Creek Beach was preemptively closed for almost all seasons by the Chatham Board of Health because of consistently elevated indicator levels and the sampling history of the beach. Bucks Creek Beach, samples taken between 2003 and 2007, was reportedly posted for two days in 2004 and 2007 but was posted for the majority (73%) of the 2006 swimming season. No postings were reported for Bucks Creek Beach in 2003 or 2005 swimming seasons.

Dock Creek (MA96-86)

This 0.02 square mile (mi^2) Class SA segment extends from railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich. NPDES discharges include:

- Division of Fisheries and Wildlife Sandwich State Fish Hatchery (MA0110027)
- Sandwich Public Schools, Henry T. Wing School (MA0101656)
- Town of Sandwich (MAR041155)

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~73% of this segment area (portion of CCB37.0) is *Conditionally Approved* for shellfish harvesting and ~27% (CCB37.2) is *Prohibited* (MA DFG 2009).

Shellfish Harvesting Use

The Shellfish Harvesting Use is assessed as impaired because the entire segment is either *Conditionally Approved* or *Prohibited*. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was approved, the same types of sources of pathogens identified in the TMDL are likely problematic for Dock Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational Uses

Bacteria source tracking efforts in the Sandwich Harbor Subwatershed area were conducted by MassDEP Southeast Regional Office staff between July and September 2007 including two sites along Dock Creek. Possible significant dry weather bacteria sources were considered likely including mammals and birds feeding on fish waste present at one site (Beasley and Sheppard 2008). Additional source tracking work in the upper watershed of Dock Creek was conducted in 2008 and 2009. The Sandwich State Fish Hatchery discharge and the Henry T. Wing School were both ruled out as contributing sources (Beasley and Sheppard 2008 and 2010). Additional source tracking work is recommended for the wetland area behind the Sandwich Shopping Mall between Main Street and Route 6A. A review of septic/cesspool sources associated with homes in this area is also recommended (Beasley and Sheppard 2010).

East Harbor (Pilgrim Lake) MA 96-83

This is a 0.50 square mile SA water body located in Truro. There are no regulated NPDES dischargers located in this vicinity.

Shellfish Harvesting Use

The DMF shellfishing area CCB:4.5 is classified as Prohibited (Moles 2007). Portnoy et al. (2007) report "*Fecal coliform, the water-quality standard for shellfish-waters, was consistently high in the northwest cove and in freshwater discharging from Salt Meadow, but very low throughout the lagoon except after heavy rain, suggesting runoff pollution from Route 6." Waterfowl are also utilizing this area"* (Portnoy et al. 2007).

The shellfish harvesting use is assessed as impaired because the segment area is classified by DMF as *Probihited* for shellfish harvesting. These restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and unspecified urban stormwater.

Halls Creek MA96-93

This is a 0.07 square mile SA waterbody that consists of an estuarine portion, from Craigville Beach Road, Barnstable to mouth at Centerville Harbor, Barnstable. NPDES discharges include the Town of Barnstable (MAR041090).

Shellfish Harvesting Use

The Shellfish Harvesting Use is assessed as impaired because the DMF shellfish classification is *prohibited* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was approved it is likely that the same types of sources of pathogens identified in the TMDL are problematic for Halls Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational and Aesthetics Uses
Halls Creek is used for water-based recreation with one semi-public beach. Frequent testing for Enterococci bacteria during the swimming season was conducted at Seaside Park Improvement Association Beach between 2002 and 2007. There were no reported posting at this beach in any year (MA DPH 2009a).

Hyannis Inner Harbor MA96-82
This is a 0.13 square mile SA waterbody that consists of waters landward of an imaginary line drawn from Harbor Bluff, Barnstable to Hyannis Park, Yarmouth. Hyannis Inner Harbor is one recipient of treated (denitrified prior to sand filter bed) wastewater effluent from the Barnstable Water Pollution Control Facility (WPCF) located in the village of Hyannis. Other NPDES discharges include the Town of Barnstable (MAR041090) and the Town of Yarmouth (MAR041176).

Shellfish Harvesting Use
The Shellfish Harvesting Use is assessed as support for 0.02 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.11 square miles because it is classified by DMF as either *Prohibited* or *Conditionally Approved* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was approved it is likely that the same types of sources of pathogens identified in the TMDL are problematic for Hyannis Inner Harbor. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases, waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational Uses
Hyannis Inner Harbor is used for water-based recreation with two public beaches. Frequent testing for Enterococci bacteria during the swimming season was conducted at Bayview Street Beach in 2002 and 2004 – 2007. There was only one reported posting at this beach in 2007 and none in any other year tested. Frequent testing for Enterococci bacteria during the swimming season was also conducted at Windmill Beach from 2003 – 2007. There were no reported postings at this beach in any year (MA DPH 2009a).

The Primary and Secondary Contact Recreational uses are assessed as support for Hyannis Inner Harbor based on the very low frequency of beach closures at Bayview Street and Windmill beaches in Yarmouth.

Little Pleasant Bay MA96-78
This is a 3.3 square mile SA/ORW waterbody that consists of waters north and east of imaginary lines drawn from the northeasterly edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham then east to a point on the inner Cape Cod National Seashore. There are no NPDES dischargers into this particular water body system. NPDES discharges include the Town of Orleans (MAR041146).

Shellfish Harvesting Use
The Shellfish Harvesting Use is assessed as support for 3.299 square miles because it is classified by DMF as *Approved* for shellfish harvesting. This use is assessed as impaired for 0.001 square miles because it is *Prohibited* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was finalized it is likely that the same types of sources of pathogens identified in the TMDL are problematic for Little Pleasant Bay. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and upstream source(s) in Paw Wah Pond.

The River MA96-76
This is a 0.42 square mile SA/ORW waterbody that consists of the water body landward of an imaginary line drawn between Old Field Point and Namequoit Point including Meetinghouse Pond, and Kescayo Gansett Pond locally known as "Lonnies Pond", Orleans (excluding the delineated segments; Namequoit River and Areys Pond). NPDES discharges include the Town of Orleans (MAR041146).

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all of this segment area (99.7% of segment area is encompassed in shellfish area SC63.0) is classified as *Approved* for shellfish harvesting (MA DFG 2009). There is a very small area (SC63.4) which is *Conditionally Approved* for shellfish harvesting (~0.3% of segment area) in the vicinity of the Nauset Marine docks.

The shellfish harvesting use is assessed as support for 0.418 square miles of the segment area which is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.002 square miles because it is classified as *Conditionally Approved* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was finalized it is likely that the same types of sources of pathogens identified in the TMDL are problematic for The River. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with illicit marina/boating pumpout releases waterfowl, pet waste, on-site (septic) systems and stormwater discharges from the municipal stormwater systems.

Santuit River (MA96-92)
This is a 0.008 square mile SA waterbody that runs from confluence with fresh water portion south of Old Mill Road, Mashpee to mouth at Shoestring Bay, Mashpee/Barnstable. NPDES discharges include the Town of Barnstable (MAR041090) and Town of Mashpee (MAR041129).

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (portion of SC20.3) is classified as *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The shellfish harvesting use is assessed as impaired because the shellfish area within the segment is *Conditionally Approved* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was finalized it is likely that the same types of sources of pathogens identified in the TMDL are problematic for the Santuit River. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Snows Creek (MA96-81)

This is a 0.02 square mile SA waterbody that runs from East of Old Colony Road, Barnstable to mouth at Lewis Bay, Barnstable. NPDES discharges include the Town of Barnstable (MAR041090). Snows Creek is in the Lewis Bay subwatershed and is one recipient of treated (denitrified prior to sand filter bed) wastewater effluent from the Barnstable Water Pollution Control Facility (WPCF) located in the village of Hyannis.

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that a portion (~10%) of this segment (encompassed by classification area SC28.9) is classified as *Prohibited* for shellfish harvesting (MA DFG 2009).

The shellfish harvesting use is assessed as impaired because the shellfish classification area (comprising an estimated 10% of the Snows Creek segment area) is *Prohibited* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was finalized it is likely that the same types of sources of pathogens identified in the TMDL are problematic for Snows Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Springhill Creek (MA96-87)

This is a 0.01 square mile SA waterbody that runs from railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich. NPDES discharges include the Town of Sandwich (MAR041155).

Bacteria source tracking efforts in the Sandwich Harbor Subwatershed area were conducted by MassDEP Southeast Regional Office staff between July and September 2007 including three sites in the upper watershed area of Springhill Creek. Significant dry weather bacteria sources were considered present in this system although no evidence of human sources were found at the site with the highest bacteria counts (Beasley and Sheppard 2008). Follow-up sampling was conducted in the summer of 2008 but bacteria counts were low at all stations in May & August and it was concluded that there were no significant dry weather human sources of bacteria (Beasley and Sheppard 2009).

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all of this segment area (CCB37.6) is classified as *Prohibited* for shellfish harvesting and a small portion (CCB37.0) is classified as *Conditionally Approved* for shellfish harvesting (MA DFG 2009).

The shellfish harvesting use is assessed as impaired because the segment is either *Conditionally Approved* or *Prohibited* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was finalized it is likely that the same types of sources of pathogens identified in the TMDL are problematic for Springhill Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Stewarts Creek (MA96-94)

This is a 0.01 square mile SA waterbody that runs from the Estuarine portion, west of Stetson Street, Barnstable to mouth at Hyannis. NPDES discharges include the Town of Barnstable (MAR041090).

Stewarts Creek is one recipient of treated (denitrified prior to sand filter bed) wastewater effluent from the Barnstable Water Pollution Control Facility (WPCF) located in the village of Hyannis.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment (classification area SC27.2) is classified as *Prohibited* for shellfish harvesting (MA DFG 2009).

The shellfish harvesting *use* is assessed as impaired because the shellfish classification area is *Prohibited* for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was finalized it is likely that the same types of sources of pathogens identified in the TMDL are problematic for Stewarts Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Little Pond (MA96-56)
This is a 0.07 square mile SA waterbody that runs from west of Vista Boulevard, Falmouth outlet to Vineyard Sound, Falmouth. NPDES discharges include the Town of Falmouth (MAR04114).

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that all of this segment area (SC10.0) is classified as *Prohibited* for shellfish harvesting (MA DFG 2009).

The shellfish harvesting use is assessed as impaired because all of the segment area is Prohibited for shellfish harvesting. Although this segment was identified as impaired after the Cape COD pathogen TMDL (MassDEP, 2009) was finalized it is likely that the same types of sources of pathogens identified in the TMDL are problematic for Little Pond. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Mill Creek (MA96-80)
This is a 0.07 square mile SA waterbody that runs from Headwaters, outlet Mill Pond, Yarmouth to confluence with Lewis Bay, Yarmouth. NPDES discharges include the Town of Yarmouth (MAR041176).

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~20% of this segment area (SC28.5) is *Conditionally Approved* and ~80% of this segment area (SC28.6) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The shellfish harvesting use is assessed as impaired for Mill Creek because this segment area is either *Conditionally Approved* or *Prohibited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Mill Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, on-site (septic) systems and/or stormwater discharges from the municipal stormwater systems.

Mill Creek (MA96-85)

This is a 0.02 square mile SA waterbody that runs from Headwaters, outlet Shawme Lake Lower, Sandwich to confluence with Old Harbor Creek, Sandwich. NPDES discharges include the Town of Sandwich (MAR041155).

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~40% of this segment area (portion of CCB37.0) is *Conditionally Approved* for shellfish harvesting and ~60% (CCB37.1) is *Prohibited* (MA DFG 2009).

The shellfish harvesting use is assessed as impaired because the entire segment is either *Conditionally Approved* or *Prohibited*. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Mill Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, pet waste, and/or stormwater discharges from the municipal stormwater systems.

Primary and Secondary Contact Recreational Uses

Bacteria source tracking efforts in the Sandwich Harbor Subwatershed area including several sites along Mill Creek were conducted by MassDEP Southeast Regional Office staff in the summers of 2007 and 2008. No significant dry weather bacteria sources were found upstream of Cranberry Highway (Route 6A) while sampling results at stations downstream from Route 6A in 2007 were inconclusive (Beasley and Sheppard 2008). A submersed stormdrain pipe was identified as a possible dry weather contributor of bacteria; however follow-up sampling in the summer of 2008 indicated low bacteria concentrations and led investigators to conclude that this stormdrain was not a significant human source of bacteria to Mill Creek (Beasley and Sheppard 2009).

Old Harbor Creek (MA96-84)

This is a 0.06 square mile SA waterbody that runs from Foster Road, Sandwich to Sandwich Harbor, Sandwich. NPDES discharges include the Town of Sandwich (MAR041155).

Shellfish Harvesting Use

The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that ~76% of this segment area (portion of CCB37.0) is *Conditionally Approved* for shellfish harvesting and ~24% (CCB37.7) is *Prohibited* (MA DFG 2009).

The shellfish harvesting use *is assessed* as impaired because the entire segment is either *Conditionally Approved* or *Prohibited*. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Old Harbor Creek. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl and/or stormwater discharges from the municipal stormwater systems.

Paw Wah Pond (MA96-72)

This is a 0.008 square mile SA/ORW waterbody that is located in Orleans. There are no NPDES permits discharging into this water body.

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that this segment area (SC64.0) is *Prohibited* for shellfish harvesting (MA DFG 2009).

The shellfish harvesting use is assessed as impaired because the segment area is Prohibited for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Paw Wah Pond. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl

Pochet Neck (MA96-73)
This is a 0.24 square mile SA/ORW waterbody that runs to confluence with Little Pleasant Bay, Orleans. NPDES discharges include the Town of Orleans (MAR041146).

Shellfish Harvesting Use
The MA Division of Marine Fisheries Shellfish Status Report of October 2009 indicates that almost all of this segment area (99% of segment area is encompassed in shellfish area SC62.2) is *Approved* for shellfish harvesting (MA DFG 2009). There is a very small area (SC62.1) which is *Prohibited* for shellfish harvesting (~1% of segment area) in the vicinity of Pochet Creek.

The shellfish harvesting use is assessed as support for 0.238 square miles because it is *Approved* for shellfish harvesting. This use is assessed as impaired for 0.002 square miles because it is *Prohibited* for shellfish harvesting. Although this segment is not specifically listed in the pathogen TMDL (MassDEP, 2009) it is BPJ that the same types of sources of pathogens identified in the TMDL are problematic for Pochet Neck. Therefore, based on BPJ, the shellfish harvesting restrictions are presumed to be due to elevated fecal coliform bacteria counts associated with waterfowl, and/or unspecified urban stormwater.

Primary and Secondary Contact Recreational and Aesthetics Uses
No testing for either of the two semi-public beaches along the shoreline of Pochet Neck (Gilmin Inn and Barley Neck beaches) has been reported to MA DPH. The Primary and Secondary Contact Recreational uses are assessed as support for Pochet Neck based on the Approved status of the shellfish area.

5.0 Potential Sources - See Final Cape Cod Pathogen TMDL (CN252)

6.0 Prioritization and Known Sources –2012 listed segments

Bacteria pollution on Cape Cod presents itself in an unusually sensitive aquatic-water environment. Rich surface and subsurface water supplies traditionally abound, but are under extreme stress with population and land-use increases in recent decades. Both year-round and summertime human populations have substantially and steadily increased throughout the entire Cape area since the 1950's at a rate in excess of 10% per decade. Construction of new housing and commercial buildings has dramatically increased as a result. Roughly 85% of the Cape Cod's watershed population (including residences and businesses) has individual septic systems for disposal of human wastes. Only four towns (Falmouth, Barnstable, Chatham, Provincetown) have municipal wastewater treatment plants, with only small percentage of the areas of these towns actually sewered (Cape Cod Commission, 2003). Septic system failures, or poorly performing systems, definitely play an important part to the bacterial

contamination throughout the Cape. Stormwater runoff from wet weather events carries this contamination into surface and ground water aquifers, particularly in and around densely populated areas.

Many parts of the Cape have sandy soils, which are usually very well suited for septic systems. However, with the high number of systems, particularly with increased summer as well as year round residents and homes, has put a strain on existing groundwater aquifer systems on the Cape. Also, a 1980 USGS study "Probable High Ground Water Levels on Cape Cod" found that quite a few areas were unsuitable for septic systems because the maximum ground water level during the year was not lower than 4 feet below the bottom of the proposed or existing leach field. These areas, particularly where there is high development, are prime candidates for sewering considerations. This means either upgrading/increasing existing WWTP capacities (including possibly forming sewer authorities involving several towns).

The Cape Cod Commission has sponsored and co-sponsored numerous studies in recent years on this subject. One major recent study (in 2003) funded by the Massachusetts Watershed Initiative, "Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project", provided methodologies and plans from a regional context for wastewater management solutions. A Watershed Implementation Committee (WIC) was set up as an advisory committee to come up with ultimate solutions to the overall wastewater treatment needs in the Cape as a whole. The WIC discussed such things as: 1) potential state legislation to generate funding for wastewater infrastructure on Cape Cod; 2) wastewater planning for future needs on the Cape; 3) County health on-site septic system technology and regulatory review; 4) linking future population growth with adequate wastewater treatment; 5) establishment of a county- wide wastewater management reserve fund. Also, the WIC prepared a regional assessment of wastewater planning and land-use analysis by using GIS maps to identify future population growth, existing water resources, sensitive or threatened water resources, existing wastewater discharges (both from WWTP's and septic systems) in each town to estuaries, and from all this information, delineate possible future WWTP sitings. The study estimated that the Cape now generates approximately 12 billion gallons of wastewater per year. Eighty percent of that goes directly, via groundwater and surface water flow, into watersheds that drain into marine estuary areas. Barnstable County provided an additional $55,000 to continue the project by using four case studies to test the tools developed in the MWI project, and to continue to support the WIC in its continued committee organization and work. There is currently (2007) another more expanded study effort by the Commission to actually formulate future project plans and locations.

From the details of Section 4.0 within each impacted segment, it would appear that beyond the septic system versus sewering/ WWTP issue, that in coastal- estuarine areas, bird populations and summertime boating activities play an extremely predominant role in generating the fairly constant, moderately high, background levels of fecal contamination that are evident in many areas. For shellfishing, these levels are critical to allowing this particular use to occur safely for humans. Over many decades, Division of Marine Fisheries Division of Fish and Game monitoring and shoreline survey notes indicate, time and again, the predominance of resident and migrating bird populations in many parts of coastal areas on the Cape. These populations have the potential of adding high enough bacteria loadings to ambient waters to significantly impact the shellfishing use classification in a negative fashion. Coupled with this, many tidal estuary areas have a lot of warmer season boating activities that can impact these same waters through discharge of boat wastes. Efforts have been underway to increase the Federal "No Discharge (for boat wastes) Zone" areas, and to provide boat waste disposal facilities in every marina or public dock area.

In an effort to provide guidance for setting bacterial implementation priorities within the Cape Cod Watershed, a summary table is provided. Table 6-1 (addendum) below provides a prioritized list of pathogen-impaired segments that will require additional bacterial source tracking work and implementation of structural and non-structural Best Management Practices (BMPs). Since limited data are available in each impaired segment, a simple scheme was used to prioritize segments based on fecal coliform concentrations. High priority was assigned to those segments where either dry or wet weather concentrations (end of pipe or ambient) were equal to or greater than 10,000 cfu /100 mL. Medium priority was assigned to segments where concentrations ranged from 1,000 to 9,999 cfu100mL. Low priority was assigned to segments where concentrations were observed less than 1,000 cfu/100 mL. MassDEP believes the higher concentrations are indicative of the potential presence or raw sewage and therefore they pose a greater risk to the public. It should be noted that in all cases, waters exceeding the water quality standards identified in Table 6-1 are considered impaired.

Also, prioritization was adjusted upward based on proximity of waters, within the segment, to sensitive areas such as Outstanding Resource Waters (ORW's), or designated uses that require higher water quality standards than Class B, such as Class A, or SA waters, public water supply intakes, public swimming areas, or shellfish areas. Best professional judgment was used in determining this upward adjustment. Generally speaking, waters that were determined to be lower priority based on the numeric range identified above were elevated up one level of priority if that segment was adjacent to or immediately upstream of a sensitive use. An asterisk * in the priority column of the specific segment would indicate this situation. In many cases the DFG sampling results that were used to develop Table ES-1 don't differentiate whether the sampling was conducted during wet or dry weather. For these data sets Table ES-1 does not distinguish priority between wet and dry weather events.

MassDEP believes that segments ranked as high priority in Table 6-1 (addendum) are indicative of the potential presence of raw sewage and therefore they pose a greater risk to the public. Elevated dry weather bacteria concentrations could be the result of illicit sewer connections or failing septic systems. As a result, the first priority should be given to bacteria source tracking activities in those segments where sampling activities show elevated levels of bacteria during dry weather. Identification and remediation of dry weather bacteria sources is usually more straightforward and successful than tracking and eliminating wet weather sources. If illicit bacteria sources are found and eliminated it should result in a dramatic reduction of bacteria concentration in the segment in both dry and wet-weather. Segments that remain impaired during wet weather should be evaluated for stormwater BMP implementation opportunities starting with less costly non-structural practices first (such as street sweeping, and/or managerial approaches using local regulatory controls. If necessary, more expensive structural measures may be required, and additional study would be needed to identify the most cost efficient and effective technology prior to implementation.

Table 6-1: Addendum. Prioritized List of Cape Cod Pathogen- Impaired Segments.

Segment ID	Segment Name	Size (Sq. mi.)	Segment Description	Priority "Dry"	Priority "Wet"
MA96-79	Cockle Cove Creek, SA	0.007	Northeast of the bend in Cockle Drive, Chatham to confluence with Bucks Creek, Chatham	Medium*, SA, Shellfishing, Public Swimming	High*, SA, Shellfishing, Public Swimming

Segment ID	Segment Name	Size (Sq. mi.)	Segment Description	Priority "Dry"	Priority "Wet"
MA96-86	Dock Creek, SA	0.02	From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich.	Medium*, SA, Shellfishing	Medium*, SA, Shellfishing
MA96-83	East Harbor (Pilgrim Lake), SA	0.50	Truro	Medium*, SA, Shellfishing	High*, SA, Shellfishing
MA96-93	Halls Creek,SA	0.07	Estuarine portion, from Craigville Beach Road, Barnstable to mouth at Centerville Harbor, Barnstable.	Insufficient Data, SA, Shellfishing	Insufficient Data, SA, Shellfishing
MA96-82	Hyannis Inner Harbor, SA	0.13	Waters landward of an imaginary line drawn from Harbor Bluff, Barnstable to Hyannis Park, Yarmouth.	Insufficient Data, Class SA, Shellfishing, Public Swimming	Insufficient Data, Class SA, Shellfishing, Public Swimming
MA96-78	Little Pleasant Bay, SA, ORW	3.3	Waters north and east of imaginary lines drawn from the northeasterly edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham then east to a point on the inner Cape Cod National Seashore.	Insufficient Data, SA/ORW, Shellfishing (note: only 0.001 out of 3.3 total sq.mi is prohibited to shellfishing)	Insufficient Data, SA/ORW, Shellfishing (note: only 0.001 out of 3.3 total sq.mi is prohibited to shellfishing)
MA96-76	The River, SA/ORW	0.42	The water landward of an imaginary line drawn between Old Field Point and Namequoit Point including Meetinghouse Pond, and Kescayo Gansett Pond locally known as "Lonnies Pond".	Insufficient Data, SA/ORW, Shellfishing (note: only 0.002 out of 0.42 total sq.mi is prohibited to shellfishing)	Insufficient Data, SA/ORW, Shellfishing (note: only 0.002 out of 0.42 total sq.mi is prohibited to shellfishing)
MA96-92	Santuit River, SA	0.008	From confluence with fresh water portion south of Old Mill Road, Mashpee to mouth at Shoestring Bay, Mashpee/Barnstable.	Insufficient Data, Class SA, Shellfishing	Insufficient Data, Class SA, Shellfishing
MA96-81	Snows Creek, SA	0.02	East of Old Colony Road, Barnstable to mouth at Lewis Bay, Barnstable.	Insufficient Data, Class SA, Shellfishing, (note: Conditionally Approved for Shellfishing)	Insufficient Data, Class SA, Shellfishing (note: Conditionally Approved for Shellfishing)
MA96-87	Springhill Creek, SA	0.01	From railroad crossing northeast of Route 6A, Sandwich to confluence	Insufficient Data, Class SA,	Insufficient Data, Class SA,

Segment ID	Segment Name	Size (Sq. mi.)	Segment Description	Priority "Dry"	Priority "Wet"
			with Old Harbor Creek, Sandwich.	Shellfishing	Shellfishing
MA96-94	Stewarts Creek, SA	0.01	Estuarine portion, west of Stetson Street, Barnstable to mouth at Hyannis Harbor, Barnstable.	Insufficient Data, Class SA, Shellfishing	Insufficient Data, Class SA, Shellfishing
MA96-56	Little Pond, SA	0.07	West of Vista Boulevard, Falmouth outlet to Vineyard Sound, Falmouth.	Insufficient Data, Class SA, Shellfishing	Insufficient Data, Class SA, Shellfishing
MA96-80	Mill Creek, SA	0.07	Headwaters, outlet Mill Pond, Yarmouth to confluence with Lewis Bay, Yarmouth.	Insufficient Data, Class SA, Shellfishing	Insufficient Data, Class SA, Shellfishing
MA96-85	Mill Creek, SA	0.02	Headwaters, outlet Shawme Lake Lower, Sandwich to confluence with Old Harbor Creek, Sandwich.	Low, Class SA, Shellfishing	Low, Class SA, Shellfishing
MA96-84	Old Harbor Creek, SA	0.06	From Foster Road, Sandwich to Sandwich Harbor, Sandwich.	Insufficient Data, Class SA, Shellfishing	Insufficient Data, Class SA, Shellfishing
MA96-72	Paw Wah Pond, SA< ORW	0.008	Orleans	Insufficient Data, Class SA, Shellfishing	Insufficient Data, Class SA, Shellfishing
MA96-73	Pochet Neck, SA, ORW	0.24	to confluence with Little Pleasant Bay, Orleans.	Insufficient Data, SA/ORW, Shellfishing (note only 0.002 out of 0.238 total sq.mi is prohibited to shellfishing)	Insufficient Data, SA/ORW, Shellfishing (note only 0.002 out of 0.238 total sq.mi is prohibited to shellfishing)

*Prioritization adjusted upward for a sensitive water, other than Class B, such as shellfishing (Class SA), or drinking water supply (Class A), or public swimming areas

7.0 Pathogen TMDL Calculations –2012 Listed Segments

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 Draft Massachusetts Year 2012 Integrated List of Waters identifies 17 estuary segments within the Cape Cod watershed for use impairment caused by excessive indicator bacteria concentrations.

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 non-point pollution sources are accounted for in a TMDL analysis. EPA regulations require that point sources of pollution (those discharges from discrete pipes or conveyances) subject to NPDES permits receive a

waste load allocation (WLA) specifying the amount of pollutant each point source can release to the waterbody. Non-point sources of pollution (and point sources not subject to NPDES permits) receive load allocations (LA) specifying the amount of a pollutant that can be released to the waterbody. In the case of stormwater, it is often difficult to identify and distinguish between point source discharges that are subject to NPDES regulation and those that are not. Therefore, EPA has stated that it is permissible to include all point source stormwater discharges in the WLA portion of the TMDL. MassDEP has taken this approach. 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 non-point source of pollution (and point sources not subject to NPDES permits).

This TMDL is explained using an alternative standards-based approach, which is based on indicator bacteria concentrations, but considers the terms of the above equation. This approach is more in line with the way bacterial pollution is regulated (i.e., according to concentration standards), however, the standard loading approach is provided as well.

General Approach: Development of TMDL Targets

For this TMDL the MassDEP developed two types of daily TMDL targets. First, MassDEP set daily concentration TMDL (WLA/LA) targets for each one of the discharge sources by category (i.e., stormwater, CSO, etc). MassDEP recommends that the concentration targets be used as the primary guide for implementation. Second, maximum daily loads were developed as a function of watershed size and runoff volume. For embayment's, maximum daily loads were calculated as a function of the observed long-term precipitation on Cape Cod, the estimated average runoff associated within 200 feet from each embayment or entire contributing watershed area for each segment and the most stringent water quality criteria based on segment classification. Each methodology is described in greater detail in the following sections however both assure loading capacities are equal to or less than the Water Quality Standards.

MassDEP believes that expressing a loading capacity for bacteria in terms of concentrations set equal to the Commonwealth's adopted criteria, as provided in Table 7-1, provides the clearest and most understandable expression of water quality goals to the public and to groups that conduct water quality

monitoring. MassDEP believes that expressing the loading capacity for bacteria in terms of loadings (e.g., numbers of organisms per day) although provided, is more difficult for the public to interpret and understand because the "allowable" loading number varies with flow over the course of the day and season and is very large (i.e. billions or trillions of organisms per day) and therefore cannot be easily understood in the context of the State Water Quality Standards or public health criteria.

To ensure attainment with water quality standards throughout the waterbody, MassDEP emphasizes the simplest and most readily understood way of meeting the TMDL is to try to meet the bacteria standard at the point of discharge. The ultimate measure of determining if the standards are achieved will be determined by monitoring and assessing instream water quality.

It is important to note that MassDEP realizes given the vast potential number of bacteria sources and the complexity of identifying and removing bacterial sources, such as stormwater, implementation will require an iterative process and will take some time to accomplish. While the stated goal in the TMDL is to meet the water quality standard at the point of discharge it also attempts to be clear that MassDEP's expectation is that for stormwater an iterative approach is needed that includes prioritization of outfalls and the application of BMPs that should be used to achieve water quality standards. MassDEP believes this approach is consistent with current EPA guidance and regulations as stated in a November 22, 22 EPA memo from Robert Wayland (US EPA 2002).

Potential Sources of Bacterial Contamination

Some insight on potential sources of bacteria is gained using dry or wet weather bacteria concentrations as a benchmark for reductions. Where a segment is identified as having high dry weather concentrations, sources such as permitted discharges, failing septic tanks, illicit sanitary sewers connected to storm drains, and/or leaking sewers may be the primary contributors. Where elevated levels are observed during wet weather, potential sources may include flooded septic systems, surcharging sewers (combined sewer overflows or sanitary sewer overflows, and/or stormwater runoff). In urban areas, sources of elevated bacteria concentrations can include runoff in areas with high populations of domestic animals or pets. In agricultural areas, sources may include runoff from farms, poorly managed manure piles or areas where wild animals or birds congregate. Other potential sources may include sanitary sewers connected to storm drains that result in flow that is retarded until the storm drain is flushed during wet weather. Sections 4, 5 and 6 of this document discuss in more detail the types of sources identified as well as their prioritization for implementation.

Waste Load Allocations (WLAs) and Load Allocations (LAs) As Daily Concentration (CFU/100 mL).

As previously noted there are many different potential sources of indicator bacteria on Cape Cod. Most of the bacteria sources are believed to be related to marinas and boating activities, wildlife (particularly birds), and failing septic systems. Some of this pollution is potentially exacerbated by stormwater. Table

7-1 presents the TMDL indicator bacteria WLAs and LAs for the various source categories as daily concentration targets for Cape Cod.

Most discharges on the Cape, involving potential pathogen pollutants, are groundwater discharges, and are not treated as point sources regulated by surface water quality standards. These discharges are regulated under Groundwater Program 314 CMR 5.00, related to groundwater discharge permits. Standards are established to coincide with Drinking Water Standards in order to promote maximum protection of groundwater as a drinking water source. For details on these requirements refer to: http://www.mass.gov/dep/water/wastewat.htm.

For point sources, Cape Cod has several wastewater treatment plants (WWTPs) and other NPDES-permit related wastewater discharges. NPDES wastewater discharge WLAs are set at the water quality standards. All 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 WQS criteria will be assigned to the portion of the stormwater that discharges to surface waters via storm drains. It should be noted that the load allocation (LA) for each segment throughout the Cape Cod watershed is zero since the runoff from pervious areas is assumed to be negligible on an annual basis. For any illicit sources, including illicit discharges to stormwater systems and sewer system overflows (SSO's) the goal is complete elimination (100% reduction). It is recommended that these concentration targets be used to guide implementation. The goal to attain WQS 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 others responsible for monitoring activities. Success of the control efforts and subsequent conformance with the TMDL will be determined by documenting that a sufficient number of bacteria samples from the receiving water meet the appropriate indicator criteria (WQS) for the water body.

Table 7-1: Addendum. Indicator Bacteria Waste Load Allocations (WLAs) and Load Allocations (LAs) for the Cape Cod Watershed.

Surface Water Classification	Pathogen Source	Waste Load Allocation Indicator Bacteria (CFU/100 mL)[1]	Load Allocation Indicator Bacteria (CFU/100 mL)[1]
A, B, SA, SB (prohibited)	Illicit discharges to storm drains	0	
	Leaking sanitary sewer lines	0	Not Applicable
	Failing septic systems	Not Applicable	0
A (Water supply **Intakes** in unfiltered public water supplies)	Any regulated discharge [7,9]- including stormwater runoff[4] subject to Phase I or II NPDES permits	Either; a) fecal coliform <=20 fecal coliform organisms per 100 mL[2] or **b)** total coliform <= 100 organisms per 100 mL[3;] where both are measured, only fecal must be met	Not Applicable

Surface Water Classification	Pathogen Source	Waste Load Allocation Indicator Bacteria (CFU/100 mL)[1]	Load Allocation Indicator Bacteria (CFU/100 mL)[1]
	Nonpoint source stormwater runoff[4]	Not Applicable	Either; a) fecal coliform <=20 fecal coliform organisms per 100 mL[2], or b) total coliform <= 100 organisms per 100 mL[3;] where both are measured, only fecal must be met
A (Includes filtered water supply) & **B**	Any regulated discharge-including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges [7,9], and combined sewer overflows[6].	Either; a) E. coli <=geometric mean[5] 126 colonies per 100 mL; single sample <=235 colonies per 100 mL; or b) Enterococci geometric mean[5] <= 33 colonies per 100 mL and single sample <= 61 colonies per 100 mL	Not Applicable
	Nonpoint source stormwater runoff[4]	Not Applicable	Either a) E. coli <=geometric mean[5] 126 colonies per 100 mL; single sample <=235 colonies per 100 mL; or b) Enterococci geometric mean[5]<= 33 colonies per 100 mL and single sample <= 61 colonies per 100 mL
SA (Designated for shellfishing)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9], and combined sewer overflows[6].	Fecal Coliform <= geometric mean, MPN, of 14 organisms per 100 mL nor shall 10% of the samples be >=28 organisms per 100 mL	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Fecal Coliform <= geometric mean, MPN, of 14 organisms per 100 mL nor shall 10% of the samples be >=28 organisms per 100 mL

Surface Water Classification	Pathogen Source	Waste Load Allocation Indicator Bacteria (CFU/100 mL)[1]	Load Allocation Indicator Bacteria (CFU/100 mL)[1]
SA & SB (Beaches[8] and non-designated shellfish areas)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9], and combined sewer overflows[6].	Enterococci - geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Enterococci -geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL
SB (Designated for shellfishing w/depuration)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9], and combined sewer overflows[6].	Fecal Coliform <= median or geometric mean, MPN, of 88 organisms per 100 mL nor shall 10% of the samples be >=260 organisms per 100 mL	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Fecal Coliform <= median or geometric mean, MPN, of 88 organisms per 100 mL nor shall 10% of the samples be >=260 organisms per 100 mL

[1] Waste Load Allocation (WLA) and Load Allocation (LA) refer to fecal coliform densities unless specified in table.
[2] In all samples taken during any 6 month period
[3] In 90% of the samples taken in any six month period;
[4] The expectation for WLAs and LAs for stormwater discharges is that they will be achieved through the implementation of BMPs and other controls.
[5] Geometric mean of the 5 most recent samples is used at bathing beaches. For all other waters and during the non-bathing season the geometric mean of all samples taken within the most recent six months, typically based on a minimum of five samples.
[6] Or other applicable water quality standards for CSO's
[7] Or shall be consistent with the Waste Water Treatment Plant (WWTP) National Pollutant Discharge Elimination System (NPDES) permit.
[8] Massachusetts Department of Public Health regulations (105 CMR Section 445)
[9] Seasonal disinfection may be allowed by the Department on a case-by-case basis.

Note: this table represents waste load and load allocations based on water quality standards current as of the publication date of these TMDLs. If the pathogen criteria change in the future, MassDEP intends to revise the TMDL by addendum to reflect the revised criteria.

Embayment's

The TMDL calculation for embayments involved an approximation of the runoff from a buffer zone. USGS hydrology data for Cape Cod were employed to develop this estimate of daily bacteria load. Walter and Whealan (2005) report precipitation results covering a time period from 1941-1995 at the Hatchville

weather station in Falmouth, MA. These data indicate that an annual average of 45 inches/year (3.75 feet/year) typically falls on Cape Cod varying from a low of about 25 inches (1965) to a high of 73 inches (1972). Rates of natural surface runoff on Cape Cod are generally very low to zero, because of the medium-to-coarse sandy soils (Walter and Whealan, 2005). Precipitation in sandy soils in Cape Cod has essentially two fates: (1) ground-water recharge, or (2) evapotranspiration. Walter and Whealan (2005) report an annual average ground water recharge rate of 27 inches/year for Cape Cod and Desimone (2003) estimates that approximately 24 inches of precipitation on Cape Cod is lost to evapotranspiration.

As a result it was assumed that no runoff occurs from the pervious areas and therefore no load allocation was provided. A buffer area of 200 feet was chosen as a reasonable estimate of the area which is likely to contribute stormwater discharges directly to each embayment. Within this 200 ft area it is assumed that all 45 inches per year of precipitation runs directly off any impervious area within this buffer zone and runoff is negligible from pervious surfaces (e.g., 0 inches/yr) because of the medium-to-coarse sandy soils on the Cape. A conservative assumption was made that all runoff from impervious surfaces is collected and piped directly to the embayment through stormdrain infrastructure. Hence, the allowable total number of bacteria per day is the water quality standard times the estimated daily runoff associated with impervious areas within the 200 foot buffer zone once conversions for the various units are applied.

The resulting TMDL for embayments on Cape Cod is reflected in the following equation:

TMDL = WLA + LA + MOS + NB
Where:
WLA = allowable load for point source categories (including piped stormwater) within 200 ft buffer zone
LA = allowable load for nonpoint source categories associated with pervious areas within 200 ft buffer zone = 0
MOS = margin of safety
NB = natural background conditions

Hence, the allowable total bacteria load on an annualized basis was calculated as the water quality standard (14 CFU/100 mL of fecal coliform for Class SA shellfishing) times the estimated annual runoff associated with impervious areas within the 200 foot buffer zone once conversions for the various units are applied. The daily load in CFU/day is then calculated by dividing the allowable annual load by the number of days, on average, that it rains. Since it rains once every three to four days, this equates to approximately 105 days per year with rainfall and runoff (based on information interpreted from http://cdo.ncdc.noaa.gov/ancsum/ACS). It should be noted that an approximate average was taken between the total number of days with >0.01inch of precipitation. The resulting equations for Class SA waters where a fecal coliform standard of 14 CFU/100 mL applies is provided below:

Class SA - Annual Waste Load Allocation for Impaired Segment (CFU/Year) =
(200 ft buffer area in acres) x (43,560 ft^2/acre) x (fraction impervious area in 200 foot buffer area) x (3.75 ft/year annual precipitation) x (14 CFU/100 mL) x (1000 mL/l) x (28.32 l/ft^3) = CFU/Year

Class SA- Daily Waste Load Allocation (WLA) for Impaired Segment (CFU/Day) =
(CFU/Year) x (year/105 precipitation days) = CFU/day

For Class SB waters the fecal coliform standard of 88 CFU/100mL is applied. It should be noted that the load allocation (LA) for each segment on Cape Cod is zero since the runoff from pervious areas is assumed to be negligible on an annual basis.

Class SB - Annual Waste Load Allocation for Impaired Segment (CFU/Year) =
(200 ft buffer area in acres) x (43,560 ft^2/acre) x (fraction impervious area in 200 foot buffer area) x (3.75 ft/year annual precipitation) x (88 CFU/100 mL) x (1000 mL/l) x (28.32 l/ft^3) = CFU/Year

Class SB- Daily Waste Load Allocation (WLA) for Impaired Segment (CFU/Day) =
(CFU/Year) x (year/105 precipitation days) = CFU/day

In conformance with the requirements that maximum daily loads be explicit, MassDEP has calculated the daily bacteria loads associated with each impaired segment. The TMDL in CFU/day for each impaired segment contributing to runoff to estuaries on the Cape is summarized in
Table 7-2 (Addendum).

Table 7-2: Addendum. Waste Load Allocation and Total Maximum Daily Load (TMDL) by Segment.

Segment[2], Waterbody, WQS Classification	Applicable WQS	Area	WLA Impervious Buffer Area		TMDL [1] (WLA + LA)
	(cfu/100mL)	200 ft buffer Area (Acres)	Percent of Impervious Area within 200 ft	Daily Load (CFU/day)	TMDL (cfu/day)
MA96-79, Cockle Cove Creek, SA	F. coliform	47.5	7.1	2.09E+07	2.09E+07
	14				
MA96-86, Dock Creek, SA	F. coliform	52.9	2.4	7.69E+06	7.69E+06
	14				
MA96-83 East Harbor(Pilgrim Lake)	F. coliform	116.4	8.0	5.77E+07	5.77E+07
SA	14				
MA96-93, Halls Creek, SA	F. coliform	92.2	1.5	8.24E+06	8.24E+06
	14				
MA96-82, Hyannis Inner Harbor, SA	F. coliform	64.6	53.1	2.12E+08	2.12E+08
	14				
MA96-78, Little Pleasant Bay, SA	F. coliform	338.0	0.6	1.31E+07	1.31E+07
	14				
MA96-76, The River, SA	F. coliform	181.9	6.4	7.17E+07	7.17E+07
	14				
MA96-92, Santuit River, SA	F. coliform	50.0	8.8	2.71E+07	2.71E+07
	14				
MA96-81, Snows Creek, SA	F. coliform	32.0	12.6	2.48E+07	2.48E+07
	14				
MA96-87 Springhill Creek, SA	F. coliform	47.4	1.7	5.05E+06	5.05E+06
	14				
MA96-94, Stewarts Creek, SA	F. coliform	35.2	8.0	1.74E+07	1.74E+07
	14				
MA96-56, Little Pond, SA	F. coliform	53.8	19.3	6.40E+07	6.40E+07
	14				
MA96-80, Mill Creek, SA	F. coliform	74.5	19.9	9.13E+07	9.13E+07
	14				
MA96-85, Mill Creek, SA	F. coliform	89.8	7.7	4.26E+07	4.26E+07
	14				
MA96-84, Old Harbor Creek, SA	F. coliform	93.9	1.9	1.10E+07	1.10E+07
	14				
MA96-72, Paw Wah Pond, SA	F. coliform	16.0	8.0	7.89E+06	7.89E+06
	14				
MA96-73, Pochet Neck, SA	F. coliform	137.1	1.7	1.41E+07	1.41E+07
	14				

[1] TMDL allocation: % surface area of segment watershed for WLA (impervious) and LA (pervious), respectively. 1 = Load Allocation (LA) equals zero since runoff from the pervious area is assumed to be negligible.

8.0 Implementation Plan - See Final Cape Cod Pathogen TMDL (CN252)

9.0 Monitoring Plan - See Final Cape Cod Pathogen TMDL (CN252)

10.0 Reasonable Assurances - See Final Cape Cod Pathogen TMDL (CN252)

11. Public Participation

During the initial TMDL process for Cape Cod two public meetings were held at 3 p.m. and 7pm. at the CCC, Barnstable on 7/23/2005 to present the Bacteria TMDL and to collect public comments. The public comment period began on July 23, 2005 and closed on August 26, 2005. The attendance list, public comments, and the MassDEP responses are attached as Appendix A to the final Cape Cod Pathogen TMDL report CN 252 (MassDEP 2009).

The public process for approval of the newly listed segments covered by this addendum is as follows:

1. A Notice of Availability for public review of the Cape Pathogen TMDL Addendum was published in the April 11, 2012 publication of the Environmental Monitor which occurred during the same timeframe for comment and review of the 2012 integrated list.
2. The public notice is appended to this document and included a web link to the Cape Pathogen TMDL (CN252), the 2012 Integrated List and Cape Pathogen TMDL Addendum (CN 252.5). All the documents are posted on MassDEPs web site.
3. The public notice allowed 30 days for public comment and closed was May 25th 2012. No public comments were received during this timeframe.
4. A separate e-mail announcing the public comment period for the TMDL addendum was made to a target list of organizations and "stakeholder" groups, as well as to key contacts at other government agencies, as is typically done for draft TMDL announcements.

12. Addendum References

Beasley, T. and J. Sheppard. 2008. *Technical Memorandum Southeast Region Bacteria Source Tracking 2007 Results.* CN291.5. Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Massachusetts Department of Environmental Protection, Division of Watershed Management, Lakeville, MA.

Beasley, T. and J. Sheppard. 2010. *Technical Memorandum Southeast Region Bacteria Source Tracking 2009 Results.* CN346.5. Commonwealth of Massachusetts, Executive Office of Environmental Affairs Massachusetts Department of Environmental Protection, Division of Watershed Management, Lakeville, MA.

Cape Cod Commission. 2003. Cape Cod Comprehensive Regional Wastewater Management Strategy Development Project. Cape Cod Commission, Water Resources Office. Barnstable County, Massachusetts.

Desimone Leslie, 2003, Simulation of Advective Flow under Steady-State and Transient Recharge Conditions, Camp Edwards, Massachusetts Military Reservation, Cape Cod, USGS Massachusetts Water-Resources Investigations Report 03-4053,U.S., Northborough, Massachusetts.

Howes, B., D. White, R. Samimy. 2006. MEP Technical Memorandum Final to Rick Dunn and Steve Halterman, MassDEP Division of Watershed Management dated 30 November 2006. *RE: Cockle Cove*

Salt Marsh NitrogenThreshold. University of Massachusetts Dartmouth, School of Marine Science and Technology (SMAST), Coastal Systems Laboratory. New Bedford, MA.

MassDEP, 2012 DRAFT Massachusetts Year 2012 Integrated List of Waters Proposed Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act, Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

MassDEP, 2009. Groundwater Program 314 CMR 5.00, related to groundwater discharge permits.. For details on these requirements refer to: http://www.mass.gov/dep/water/wastewat.htm. Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

MassDEP, 2010. Cape Cod Drainage Areas, 2004-2008 Surface Water Quality Assessment Report. Commonwealth of Massachusetts, Executive Office of Environmental Affairs, Department of Environmental Protection, Division of Watershed Management, Worcester, MA.

MassDEP, 2009, *Final Pathogen TMDL for the Cape Cod Watershed August 2009*. CN252.0. Massachusetts Department of Environmental Protection, Boston, MA, USEPA New England Region 1, Boston, MA, and ENSR International, Westford, MA.

MA DPH. 2009a. *Beaches Bill Reporting Database 2002 - 2007.* Massachusetts Department of Public Health, Environmental Toxicology Program, Boston, MA.

MA DFG. 2009. *Designated Shellfish Growing Areas Datalayer – October 2009*. Published by MassGIS (MA Office of Geographic and Environmental Information), Executive Office of Energy and Environmental Affairs , Department of Fish and Game, Division of Marine Fisheries, Boston, MA.

Portnoy, J., S. Smith, K. Lee, K. Chapman, M. Galvin, E. Gwilliam, P. Lyons, and C. Thornber. *Annual Report on Estuarine Restoration at East Harbor (Truro, MA), Cape Cod National Seashore, 2007.* Cape Cod National Seashore, Wellfleet, MA and [2] University of Rhode Island, RI.

US EPA 1997. Urbanization of Streams: Studies of Hydrologic Impacts. USEPA 841-R-97-009.

US EPA 2002. Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs, November 22, 2002 Wayland/Hanlon memorandum November 22, 2002.

Walter, D.A., and Wealan, A.T., 2005. Simulated Water Sources and Effects of Pumping on Surface and Ground Water, Sagamore and Monomoy Flow Lenses, Cape Cod, Massachusetts: U.S. Geological Survey Scientific Investigations Report 2004-5181, 85p. Available online at http://pubs.usgs.gov/sir/2004/5181.

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Commissioner

Notice of Availability: Draft Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN: 252.5)

The Massachusetts Department of Environmental Protection (MassDEP) announces the availability for public comment the Draft Addendum: Final Pathogen TMDL for the Cape Cod Watershed.

Section 303(d) of the Federal Clean Water Act (CWA) and Environmental Protection Agency (EPA) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to place waterbodies that do not meet established water quality standards on a list of impaired waterbodies (commonly referred to as the "303d List") and to develop Total Maximum Daily Loads (TMDLs) for listed waters and the pollutant(s) contributing to the impairment. A TMDL establishes a maximum amount of pollution that a water body can accept and still meet water quality standards. The TMDL serves as the technical basis for developing more detailed local implementation plans designed to find, prioritize, and address specific sources of pathogens throughout the watershed and restore the water quality.

A Cape Cod Pathogen TMDL was previously approved by EPA in 2009 (CN: 252.0). In the interim since the Cape Cod Pathogen TMDL was finalized in 2009, the 2004-2008 Cape Cod Surface Water Quality Assessment Report identified an additional 17 pathogen impaired segments (impairment cause is fecal coliform in all segments and Enteroccoci in one segment) that have been included in Category 5 of the Draft Massachusetts Year 2012 Integrated List of Waters pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. (see http://www.mass.gov/dep/water/resources/wqassess.htm for assessment reports). These segments require a Total Maximum Daily Load (TMDL) to be developed. This Draft addendum was developed by MassDEP with the intention of adding these 17 segments to the "Final Pathogen TMDL for the Cape Cod Watershed", approved by US EPA in August 2009.

Section 7.4 of the Final Cape Cod Pathogen TMDL (Application of the TMDL to Unimpaired or Currently Unassessed Segments) states "This Cape Cod Watershed TMDL may, in appropriate circumstances, also apply to segments that are listed for pathogen impairment in future Massachusetts CWA § 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, "after listing the waters for pathogen impairment and taking into account all relevant comments submitted on the future CWA § 303(d) Integrated List of waters the Commonwealth determines with USEPA approval of the CWA § 303(d) list that this TMDL should apply to newly listed pathogen impaired segments".

Electronic copies of the following documents are available on MassDEP's website at:
http://www.mass.gov/dep/water/resources/tmdls.htm#cape

- Draft Addendum: Final Pathogen TMDL for the Cape Cod Watershed (CN: 252.5)
- Final Pathogen TMDL for the Cape Cod Watershed August 2009 (Control Number: CN: 252.0), and
- Proposed Massachusetts Year 2012 Integrated List of Waters

MassDEP will consider all comments and the Draft Addendum TMDL Report will be revised as appropriate prior to submittal to EPA Region 1 for final approval. All public comments, which should refer to report number CN 252.5, must be received in writing, preferably in electronic format, by May 25, 2012 and be addressed to:

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