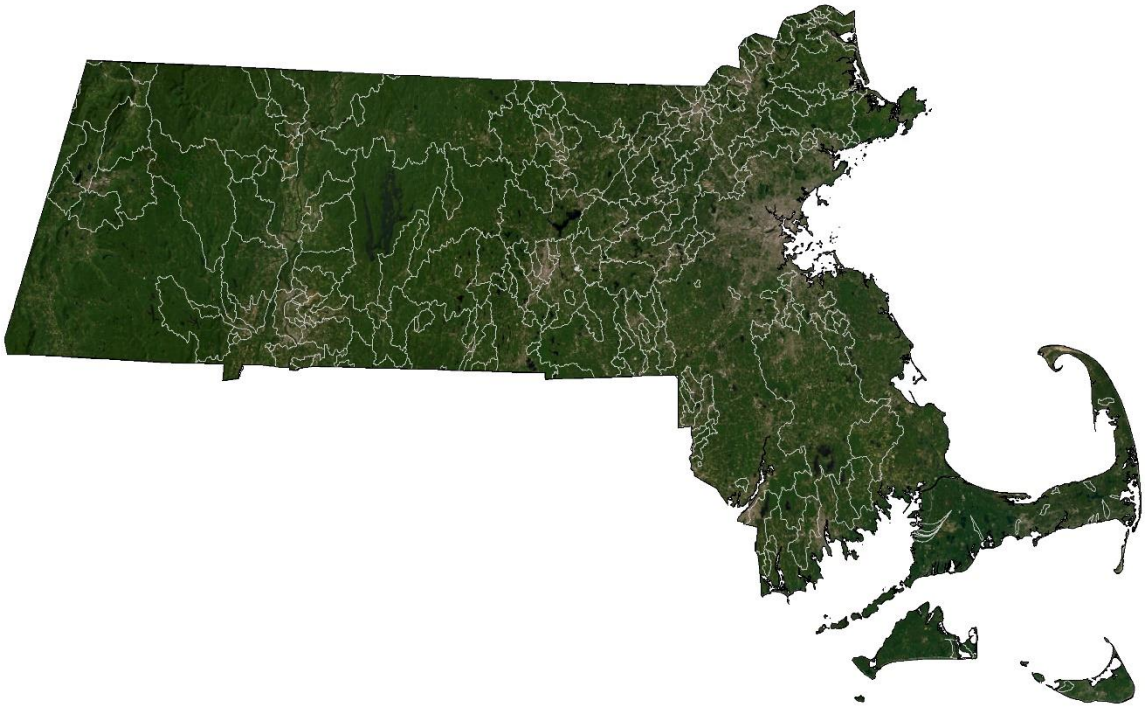
Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies



Commonwealth of Massachusetts
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December 2024

CN 515.1

Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies

Prepared by:
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Division of Watershed Management, Bureau of Water Resources
Massachusetts Department of Environmental Protection

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Available Online
https://www.mass.gov/lists/total-maximum-daily-loads-by-watershed

Massachusetts Department of Environmental Protection

The mission of the Massachusetts Department of Environmental Protection (MassDEP) is to protect and enhance the Commonwealth's natural resources – air, water, and land – to provide for the health, safety, and welfare of all people, and to ensure a clean and safe environment for future generations. In carrying out this mission MassDEP commits to address and advance environmental justice and equity for all people of the Commonwealth; provide meaningful, inclusive opportunities for people to participate in agency decisions that affect their lives; and ensure a diverse workforce that reflects the communities we serve.

Watershed Planning Program

The mission of the Watershed Planning Program (WPP) in the Massachusetts Department of Environmental Protection is to protect, enhance, and restore the quality and value of the waters of the Commonwealth. Guided by the federal Clean Water Act, WPP implements this mission statewide through five Sections that each have a different technical focus: (1) Surface Water Quality Standards; (2) Surface Water Quality Monitoring; (3) Data Management and Water Quality Assessment; (4) Total Maximum Daily Load; and (5) Nonpoint Source Management. Together with other MassDEP programs and state environmental agencies, WPP shares in the duty and responsibility to secure the environmental, recreational, and public health benefits of clean water for all people of the Commonwealth.

Acknowledgements

FB Environmental Associates, under contractual agreements with MassDEP, previously prepared two separate documents for the Watershed Planning Program: (1) *Massachusetts TMDL for Pathogen-Impaired Inland Fresh Water Rivers* and (2) *Massachusetts Statewide TMDL for Pathogen-Impaired Coastal Waterbodies*. MassDEP combined these two documents into a single statewide approach encompassing both inland fresh water and coastal impairments to prepare the *Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies*.

Disclaimer

References to trade names, commercial products, manufacturers, or distributors in this report constituted neither endorsement nor recommendations by the Massachusetts Department of Environmental Protection. The *Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies* uses information and general guidance from the USEPA-approved *Final Pathogen TMDL for the Boston Harbor, Weymouth-Weir, and Mystic Watersheds* (MassDEP, 2018b) and *Rhode Island Statewide TMDL for Bacteria Impaired Waters* (RIDEM, 2011).

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ACRONYM LIST

∑	sum
7Q10	Lowest mean flow for seven consecutive days to be expected once in ten years
ACEC	Area of Critical Environmental Concern
AEEP	Agricultural Environmental Enhancement Program
BMP	Best Management Practice
CFU	Colony Forming Units
CMR	Code of Massachusetts Regulations
CSO	Combined Sewer Overflow
CSP	Conservation Stewardship Program
CWA	Clean Water Act
CWA § 303(d)	Section 303(d) of the federal CWA
CZM	Massachusetts Office of Coastal Zone Management
DWM	Division of Watershed Management
E. coli	Escherichia coli
EEA	Executive Office of Energy and Environmental Affairs
EMC	Event Mean Concentration
USEPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
GIS	Geographic Information System
HFRP	Healthy Forests Reserve Program
IDDE	Illicit Discharge Detection and Elimination System
LA	Load Allocation
LID	Low Impact Development
LTCP	Long-Term Control Plan
DPH	(Massachusetts) Department of Public Health
MassDEP	Massachusetts Department of Environmental Protection
DMF	(Massachusetts) Division of Marine Fisheries
MassWWP	Massachusetts Water Watch Partnership
MDAR	Massachusetts Department of Agricultural Resources
MEP	Maximum Extent Practicable
MOS	Margin of Safety
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer Systems
NOAA NCEI	National Oceanic & Atmospheric Administration National Centers for Environmental Information
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
ORW	Outstanding Resource Water
POTW	Publicly Owned Treatment Works
RCPP	Regional Conservation Partnership Program
RFR	Request for Responses
SRF	State Revolving Fund
SSO	Sanitary Sewer Overflows
SWMP	Stormwater Management Plan
STV	Statistical Threshold Value
SWQS	(Massachusetts) Surface Water Quality Standards (314 CMR 4.00)
TMDL	Total Maximum Daily Load
TOX	(Massachusetts DPH) Environmental Toxicology Program
USGS	United States Geological Survey
WLA	Waste Load Allocation
WPP	(MassDEP) Watershed Planning Program
WQC	Water Quality Criteria
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant

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1. Introduction

1.1. Background

Section (§) 303(d) of the federal Clean Water Act (CWA) requires states to identify waters within their boundaries that are not meeting state water quality standards. For these impaired waterbodies, CWA §303(d) further requires the U.S. Environmental Protection Agency (USEPA) and states to develop a Total Maximum Daily Load (TMDL) for the pollutant(s) violating or causing violation of water quality standards. In Massachusetts, impaired waterbodies requiring a TMDL are listed in Category 5 of the Integrated List of Waters, such as the *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle* (MassDEP, 2022).

A TMDL defines the maximum amount of a pollutant that a waterbody can assimilate while continuing to meet applicable water quality standards and allocates that maximum allowable pollutant load between point and nonpoint pollutant sources. A TMDL also provides a framework for USEPA, states, and partner organizations to establish and implement pollution control and management plans, with the ultimate management goal described in CWA §101(a)(2): to achieve "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water, wherever attainable."

This report presents the *Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies* and provides a framework to address bacterial and other pathogenic pollutants in 210 fresh water river segments and 18 marine segments within twenty-eight watersheds in Massachusetts. **This TMDL report includes 212 TMDLs for *Escherichia coli (E. coli)*, 18 TMDLs for fecal coliform, and 228 TMDLs for enterococcus.** *E. coli* and/or enterococci are indicator organisms identified in the Massachusetts Surface Water Quality Standards (SWQS; 314 CMR 4.00) as the basis for water quality criteria established to protect the Primary Contact Recreation designated use in fresh water and coastal and marine waters, while fecal coliform criteria are the basis for assessing the Shellfishing use in coastal and marine waters. This TMDL was developed using a watershed framework. Under a watershed framework, TMDLs are provided for multiple waterbodies in a watershed. Each of the 228 pathogen-impaired river or marine segments included in this TMDL are listed are listed in Category 5 of the *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle* (MassDEP, 2022), which includes the CWA §303(d) list (MassDEP, 2022). Figure 1 provides an overview map of the watersheds and the impaired waterbody segments. Table 1 summarizes the number of segments in each of the 28 watersheds. Table 2 lists each impaired waterbody name, segment ID, and impairment type.

The main body of the report includes information common to all the impaired segments, while the appendices include information specific to each impaired segment. **Appendices A through AB contain summaries of each impaired segment by watershed**, as well as GIS-based maps showing sampling locations and surrounding watershed areas, the TMDL calculations and percent reductions needed, and recommendations for management activities to achieve the necessary pollutant reduction. This report also includes

Table 1. Summary of Major Watersheds and Number of Pathogen-Impaired Segments

Basin ID & Watershed	No. of Segs.
11 Hoosic	3
21 Housatonic	4
32 Westfield	10
33 Deerfield	7
34 Connecticut	15
35 Millers	1
36 Chicopee	17
41 Quinebaug	7
42 French	4
51 Blackstone	19
52 Ten Mile	7
81 Nashua	19
82 Concord	17
53 Narragansett Bay	3
61 Mount Hope Bay	2
62 Taunton	1
71 Mystic	3
72 Charles	7
73 Neponset	2
74 Weymouth & Weir	6
83 Shawsheen	1
84 Merrimack	34
92 Ipswich	9
93 North Coastal	4
94 South Coastal	3
95 Buzzards Bay	11
96 Cape Cod	10
97 Islands	2
TOTAL	**228**

recommendations for tools to help municipalities, watershed groups, and other stakeholders to implement the TMDL in a phased approach.

In addition to the recommendations provided in this report, a companion document entitled *Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Manual for Massachusetts* (ENSR, 2005) provides additional guidance for the implementation of this TMDL. The Massachusetts Clean Water Toolkit (MassDEP, 2019a) also provides illustrated, interactive scenarios and fact sheets on best management practices (BMPs) for protecting water quality in a wide range of settings, such as agricultural, residential, commercial, and construction.

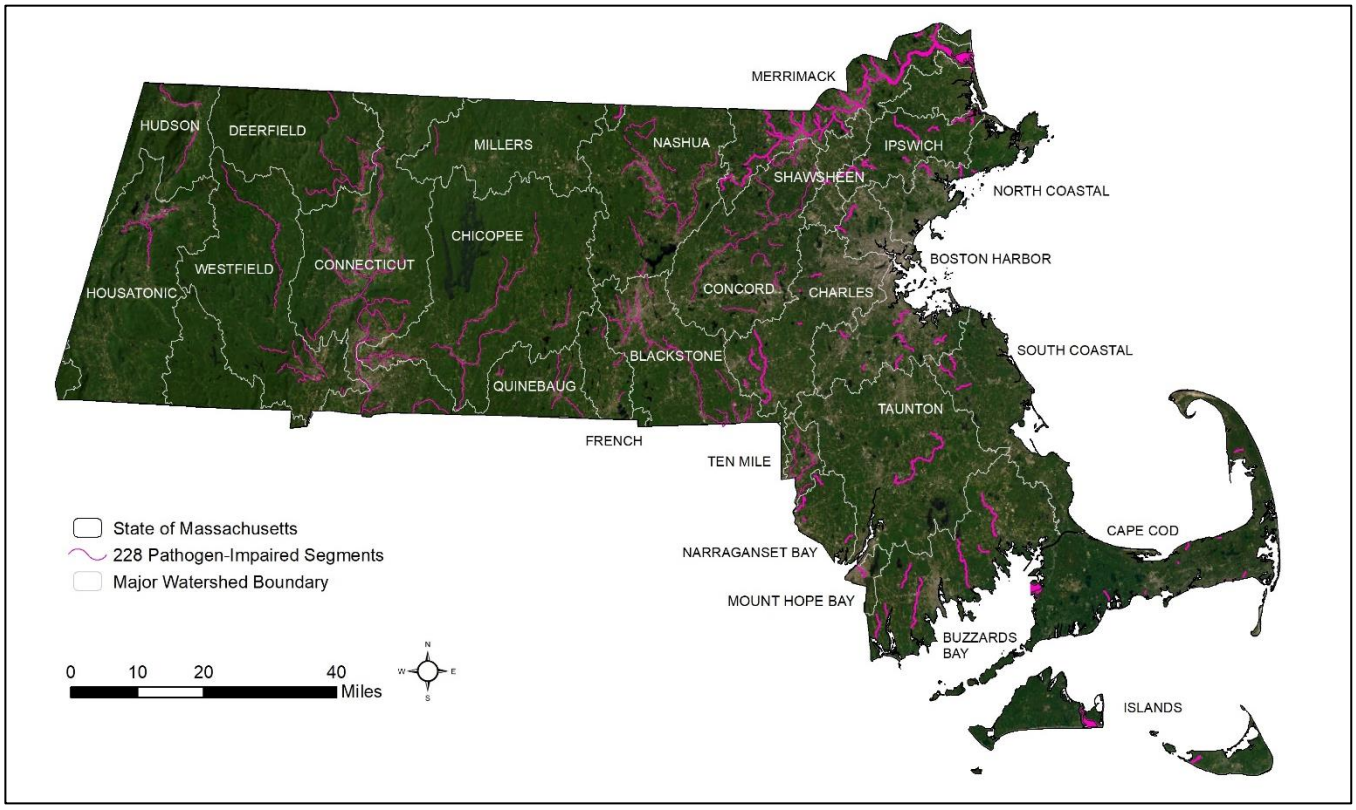

Figure 1. Map of Major Watersheds in Massachusetts and Pathogen-Impaired Segments

Table 2. Pathogen-Impaired Segments by Major Watershed addressed by this TMDL Report

Segment-specific information is detailed in each appendix by major watershed identified in the major watershed headings below. EC = *E. coli*. ENT = enterococci. FC = fecal coliform. AQL = Aquatic Life. CSO = Combined Sewer Overflow. CW = Cold Water Fishery. HQW = High Quality Water. ORW = Outstanding Resource Water. PWS = Public Water Supply (tributary). SF = Shellfishing. TWS = Treated Water Supply. WW = Warm Water Fishery.

Segment ID	Waterbody	Class (Qualifier)[1]	*E. coli* Impaired Use[2]	Enterococci Impaired Use[2]	Fecal coliform Impaired Use[2]
Hoosic River Basin [Appendix A]					
MA11-02	North Branch Hoosic River	B (CW, HQW)	Primary		Primary
MA11-03	Hoosic River	B (CW, HQW)	Primary		Primary
MA11-05	Hoosic River	B (WW)	Primary		Primary
Housatonic River Basin [Appendix B]					
MA21-02	East Branch Housatonic River	B (WW)	Primary		Primary
MA21-04	Housatonic River	B (WW)	Primary		Primary
MA21-17	Southwest Branch Housatonic River	B (CW, HQW)	Primary		Primary
MA21-18	West Branch Housatonic River	B (CW, HQW)	Primary		Primary
Westfield River Basin [Appendix C]					

Segment ID	Waterbody	Class (Qualifier)[1]	*E. coli* Impaired Use[2]	Enterococci Impaired Use[2]	Fecal coliform Impaired Use[2]
MA32-04	Westfield River	B (CW, HQW)		Primary	
MA32-08	Little River	B (CW)	Primary		Primary
MA32-09	Powdermill Brook	B	Primary		
MA32-22	Potash Brook	B (CW)	Primary		
MA32-27	Miller Brook	B (CW)	Primary		
MA32-28	White Brook	B (CW)	Primary		
MA32-36	Little River	B (CW)	Primary		
MA32-37	Ashley Brook	B (CW)	Primary		
MA32-39	Jacks Brook	B	Primary		
MA32-41	Moose Meadow Brook	B	Primary		Primary
Deerfield River Basin [Appendix D]					
MA33-03	Deerfield River	B (WW)	Primary		
MA33-04	Deerfield River	B (WW)	Primary		
MA33-19	East Branch North River	B (CW, HQW)	Primary		
MA33-21	Hinsdale Brook	B (CW)	Primary		
MA33-30	Green River	B (CW, HQW*)	Primary		Primary
MA33-101	South River	B (CW)	Primary		Primary
MA33-102	South River	B	Primary		Primary
Connecticut River Basin [Appendix E]					
MA34-03	Connecticut River	B (WW, CSO)	Primary		
MA34-04	Connecticut River	B (WW, CSO)	Primary		
MA34-05	Connecticut River	B (WW, CSO)	Primary		
MA34-07	Bachelor Brook	B (WW)	Primary		
MA34-11	Manhan River	B	Primary		
MA34-19	Stony Brook	B	Primary		
MA34-21	Longmeadow Brook	B	Primary		
MA34-25	Mill River	B	Primary		
MA34-27	Fort River	B	Primary		
MA34-28	Mill River	B	Primary		
MA34-29	Mill River	B (CSO)	Primary		
MA34-30	Scantic River	B	Primary		
MA34-36	Bloody Brook	B	Primary		
MA34-42	Buttery Brook	B	Primary		
MA34-60	Unnamed Tributary	B	Primary		
Millers River Basin [Appendix F]					
MA35-16	Keyup Brook	B (CW)	Primary		
Chicopee River Basin [Appendix G]					
MA36-05	Ware River	B (WW)	Primary		
MA36-06	Ware River	B (WW)	Primary		Primary
MA36-08	Prince River	B (CW, HQW)	Primary		
MA36-11	Sevenmile River	B (WW, HQW)	Primary		
MA36-12	Sevenmile River	B (WW)	Primary		
MA36-15	Quaboag River	B (WW)	Primary		
MA36-16	Quaboag River	B (WW)	Primary		Primary
MA36-17	Quaboag River	B (WW)	Primary		
MA36-18	Forget-Me-Not Brook	B (CW, HQW)	Primary		
MA36-21	Chicopee Brook	B (CW)	Primary		
MA36-22	Chicopee River	B (WW, CSO)	Primary		
MA36-24	Chicopee River	B (WW, CSO)	Primary		Primary
MA36-25	Chicopee River	B (WW, CSO)	Primary		
MA36-39	Unnamed Tributary	B	Primary		
MA36-40	Abbey Brook	B	Primary		
MA36-41	Fuller Brook	B	Primary		
MA36-50	Danforth Brook	B	Primary		
Quinebaug River Basin [Appendix H]					
MA41-03	Quinebaug River	B (WW)	Primary		Primary
MA41-04	Quinebaug River	B (WW)			Primary
MA41-06	Cady Brook	B (WW)	Primary		
MA41-12	Cohasse Brook	B	Primary		
MA41-13	Mckinstry Brook	B	Primary		
MA41-16	Unnamed Tributary	B	Primary		
MA41-17	West Brook	B	Primary		

Segment ID	Waterbody	Class (Qualifier)[1]	*E. coli* Impaired Use[2]	Enterococci Impaired Use[2]	Fecal coliform Impaired Use[2]
French River Basin [Appendix I]					
MA42-07	Burncoat Brook	B	Primary		
MA42-11	Wellington Brook	B	Primary		
MA42-15	Sucker Brook	B	Primary		
MA42-18	Grindstone Brook	B	Primary		
Blackstone River Basin [Appendix J]					
MA51-01	Kettle Brook	B (WW)	Primary		Primary
MA51-02	Middle River	B (WW)	Primary		
MA51-03	Blackstone River	B (WW, CSO)	Primary		
MA51-04	Blackstone River	B (WW)	Primary		
MA51-05	Blackstone River	B (WW)	Primary		
MA51-06	Blackstone River	B (WW)	Primary		
MA51-07	Beaver Brook	B (WW, HQW)	Primary		
MA51-08	Unnamed Tributary	B (WW, CSO)	Primary		Primary
MA51-15	Tatnuck Brook	B	Primary		
MA51-16	Dark Brook	B	Primary		
MA51-17	Poor Farm Brook	B	Primary		
MA51-18	Peters River	B	Primary		
MA51-27	Coal Mine Brook	B (CW)	Primary		
MA51-31	Singletary Brook	B	Primary		
MA51-32	Arnolds Brook	B	Primary		
MA51-36	Mill River	B (TWS, WW)	Primary		
MA51-39	Fox Brook	B	Primary		
MA51-40	Muddy Brook	B	Primary		
MA51-45	Cronin Brook	B	Primary		
Ten Mile River Basin [Appendix K]					
MA52-02	Ten Mile River	B (WW, HQW*)	Primary		Primary
MA52-03	Ten Mile River	B (WW)	Primary		Primary
MA52-05	Speedway Brook	B (WW)	Primary		Primary
MA52-07	Sevenmile River	A (PWS, ORW)	Primary		
MA52-08	Sevenmile River	B	Primary		Primary
MA52-09	Scotts Brook	B	Primary		
MA52-11	Coles Brook	B	Primary		
Narragansett Bay (Shore) Coastal Drainage Area [Appendix L]					
MA53-19	Bliss Brook	B	Primary		
MA53-20	Runnins River	B	Primary		
MA53-21	Unnamed Tributary	B	Primary		
Mount Hope Bay (Shore) Coastal Drainage Area [Appendix M]					
MA61-05	Quequechan River	B (WW, CSO)	Primary		
MA61-09	Lewin Brook	B	Primary		
Taunton River Basin [Appendix N]					
MA62-01	Taunton River	B (WW)	Primary		
Mystic River Basin and Coastal Drainage Area [Appendix O]					
MA71-10	Cummings Brook	B	Primary		
MA71-11	Shaker Glen Brook	B	Primary		
MA71-15	Munroe Brook	B	Primary		
Charles River Basin and Coastal Drainage Area [Appendix P]					
MA72-12	Beaver Brook	B	Primary		
MA72-14	Mine Brook	B (WW, HQW*)	Primary		
MA72-34	Chicken Brook	B	Primary		
MA72-35	Hopping Brook	B	Primary		
MA72-41	Unnamed Tributary	B	Primary		
MA72-43	Unnamed Tributary	B	Primary		
MA72-44	Seaverns Brook	B	Primary		
Neponset River Basin and Coastal Drainage Area [Appendix Q]					
MA73-18	Steep Hill Brook	B	Primary		
MA73-23	Plantingfield Brook	B	Primary		
Weymouth & Weir River Basin and Coastal Drainage Area [Appendix R]					
MA74-10	Furnace Brook	B	Primary		
MA74-20	Plymouth River	B	Primary		
MA74-22	Cranberry Brook	B (ORW)	Primary		

Segment ID	Waterbody	Class (Qualifier)[1]	*E. coli* Impaired Use[2]	Enterococci Impaired Use[2]	Fecal coliform Impaired Use[2]
MA74-23	Mary Lee Brook	B	Primary		
MA74-27	Farm River	A (PWS, ORW)	Primary		
MA74-28	Farm River	B	Primary		
Nashua River Basin [Appendix S]					
MA81-01	North Nashua River	B (WW, CSO)	Primary		
MA81-02	North Nashua River	B (WW, CSO)	Primary		
MA81-03	North Nashua River	B (WW, CSO)	Primary		
MA81-04	North Nashua River	B (WW)	Primary		
MA81-05	Nashua River	B (WW)	Primary		
MA81-09	Nashua River	B (WW)	Primary		
MA81-13	Monoosnoc Brook	B	Primary		
MA81-20	James Brook	B	Primary		
MA81-24	Gates Brook	A (PWS, ORW)	Primary		Primary
MA81-31	Stillwater River	A (PWS, ORW)	Primary		
MA81-39	Fall Brook	B	Primary		
MA81-60	Still River	B (CW)	Primary		
MA81-62	Baker Brook	B (CSO)	Primary		
MA81-72	Wekepeke Brook	B	Primary		
MA81-74	Catacoonamug Brook	B	Primary		
MA81-79	Willard Brook	B (ORW)		Primary	
MA81-80	Pearl Hill Brook	B (ORW)		Primary	
MA81-99	Falulah Brook	A (PWS, ORW)	Primary		
MA81-100	Falulah Brook	B	Primary		
Concord (SuAsCo) River Basin [Appendix T]					
MA82A-03	Sudbury River	B (AQL, HQW)	Primary		
MA82A-05	Hop Brook	B (WW)	Primary		
MA82A-07	Concord River	B (TWS, WW)	Primary		Primary
MA82A-09	Concord River	B (WW, CSO)	Primary		Primary
MA82A-10	River Meadow Brook	B	Primary		Primary
MA82A-19	Pantry Brook	B			Primary
MA82A-22	Unnamed Tributary	B	Primary		
MA82A-25	Sudbury River	B (WW, HQW)	Primary		
MA82A-34	Beaver Brook	B	Primary		
MA82B-02	Assabet River	B (WW)	Primary		Primary
MA82B-03	Assabet River	B (WW)	Primary		Primary
MA82B-04	Assabet River	B (WW)	Primary		Primary
MA82B-05	Assabet River	B (WW)	Primary		Primary
MA82B-07	Assabet River	B (WW)	Primary		Primary
MA82B-12	Elizabeth Brook	B	Primary		
MA82B-14	Nashoba Brook	B	Primary		
MA82B-22	Coles Brook	B	Primary		
Shawsheen River Basin [Appendix U]					
MA83-22	Webb Brook	B	Primary		
Merrimack River Basin and Coastal Drainage Area [Appendix V]					
MA84A-01	Merrimack River	B (TWS, WW, CSO)	Primary		Primary
MA84A-02	Merrimack River	B (TWS, WW, CSO)	Primary		
MA84A-03	Merrimack River	B (TWS, WW, CSO)	Primary		
MA84A-04	Merrimack River	B (WW, CSO)	Primary		
MA84A-05	Merrimack River	SB (SF, CSO)		Primary	
MA84A-06	Merrimack River	SB (SF, CSO)		Primary	Shellfish
MA84A-08	Powwow River	SB (SF)	Primary		
MA84A-09	Little River	B (WW)	Primary		
MA84A-10	Spicket River	B (WW, CSO)	Primary		
MA84A-11	Beaver Brook	B (CW)	Primary		
MA84A-12	Richardson Brook	B	Primary		
MA84A-13	Trout Brook	B	Primary		
MA84A-14	Trull Brook	B	Primary		
MA84A-16	Back River	B	Primary		
MA84A-17	Black Brook	B	Primary		
MA84A-18	Bare Meadow Brook	B	Primary		
MA84A-21	Deep Brook	B	Primary		
MA84A-25	Powwow River	B (WW)	Primary		

Segment ID	Waterbody	Class (Qualifier)[1]	*E. coli* Impaired Use[2]	Enterococci Impaired Use[2]	Fecal coliform Impaired Use[2]
MA84A-26	Merrimack River	SA (SF)			Shellfish
MA84A-27	Plum Island River	SA (ORW, SF)			Shellfish
MA84A-28	Powwow River	A (PWS, ORW)			Primary
MA84A-30	Unnamed Tributary	SA (SF)	Primary		
MA84A-31	South Branch Souhegan River	B	Primary		
MA84A-35	Peppermint Brook	B	Primary		
MA84A-36	Bartlett Brook	B	Primary		
MA84A-37	Creek Brook	B	Primary		
MA84A-39	East Meadow River	A (PWS, ORW)	Primary		
MA84A-40	Fish Brook	A (PWS, ORW)	Primary		
MA84B-01	Unnamed Tributary	B			Primary
MA84B-02	Beaver Brook	B			Primary
MA84B-03	Stony Brook	B (WW)			Primary
MA84B-04	Stony Brook	B (WW)	Primary		
MA84B-06	Bennetts Brook	B	Primary		
MA84B-07	Tadmuck Brook	B	Primary		
Ipswich River Basin and Coastal Drainage Area [Appendix W]					
MA92-02	Ipswich River	SA (SF)			Shellfish
MA92-05	Lubbers Brook	B	Primary		
MA92-08	Martins Brook	B	Primary		Primary
MA92-12	Unnamed Tributary	B	Primary		Primary
MA92-14	Fish Brook	B	Primary		
MA92-17	Howlett Brook	B	Primary		Primary
MA92-21	Kimball Brook	B	Primary		Primary
MA92-22	Labor in Vain Creek	SA (SF)			Shellfish
MA92-23	Unnamed Tributary	SA (SF)			Shellfish
North Shore Coastal Drainage Area [Appendix X]					
MA93-37	Beaver Brook	B	Primary		
MA93-38	Crane River	B	Primary		
MA93-58	Unnamed Tributary	B	Primary		
MA93-59	Unnamed Tributary	B	Primary		
South Shore Coastal Drainage Area [Appendix Y]					
MA94-04	Indian Head River	B (WW)	Primary		
MA94-39	Longwater Brook	B	Primary		
MA94-40	Cushing Brook	B	Primary		
Buzzards Bay Coastal Drainage Area [Appendix Z]					
MA95-04	Weweantic River	B (WW, HQW)		Primary	
MA95-06	Sippican River	B (WW, HQW)		Primary	
MA95-11	Paskamanset River	B	Primary	Primary	
MA95-12	Shingle Island River	A (PWS, ORW)		Primary	
MA95-19	Megansett Harbor	SA (SF)			Shellfish
MA95-36	Mattapoisett River	B	Primary	Primary	
MA95-68	Wild Harbor River	SA (SF)			Shellfish
MA95-78	Rands Harbor	SA (SF)			Shellfish
MA95-79	Fiddlers Cove	SA (SF)			Shellfish
MA95-82	Kirby Brook	B		Primary	
MA95-83	Angeline Brook	B		Primary	
Cape Cod Coastal Drainage Area [Appendix AA]					
MA96-75	Round Cove	SA (ORW, SF)			Shellfish
MA96-95	Allens Harbor	SA (SF)			Shellfish
MA96-96	Wychmere Harbor	SA (SF)			Shellfish
MA96-99	Little River	B	Primary		
MA96-100	Unnamed Tributary	B	Primary		
MA96-102	Whites Brook	B	Primary		
MA96-103	Chase Garden Creek	B	Primary		
MA96-104	Unnamed Tributary	B	Primary		
MA96-107	Red River	B	Primary		
MA96-108	Unnamed Tributary	B (ORW)	Primary		
Islands Coastal Drainage Area [Appendix AB]					
MA97-16	Katama Bay	SA (SF)			Shellfish
MA97-29	Long Pond	SA (SF)			Primary

1 Qualifiers are provided for informational purposes only, see the SWQS (MassDEP, 2021a). The descriptions of the current SWQS regulation included in this document are for informational purposes, only. The actual SWQS regulation shall control in the event of any discrepancy with the description provided. As a result, no person in any administrative or judicial proceeding shall rely upon the content of this document to create any rights, duties, obligations, or defenses, implied or otherwise, enforceable at law or in equity.
2 Although some of the segments impaired for the Primary Contact Recreation Use are also impaired for Secondary Contact Recreation, the criteria to protect the Primary Contact Recreation Use are more stringent, therefore these criteria form the basis for the TMDL. While Long Pond (MA97-29) is impaired for Primary Contact Recreation Use due to fecal coliform, the Shellfish criteria are more appropriate and conservative and form the basis of the TMDL

1.2. Pathogens and Indicator Bacteria

Pathogens, or disease-causing organisms, are easily carried by stormwater runoff, as well as other discharges, into surface waterbodies. Once in a surface water, these pathogens can infect humans through consumption of contaminated fish and shellfish, skin contact, or ingestion of water. Infections due to pathogen-contaminated recreational waters include gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases (USEPA, 1986). Of the designated uses listed in § 303(d) of the federal CWA, protection from pathogenic contamination is important for waters designated for recreation (primary and secondary contact), public water supplies, aquifer protection, and the protection and propagation of fish, shellfish, and wildlife (USEPA, 2001).

The most common source of pathogens in surface waters is from the fecal wastes of warm-blooded animals. Wastes from warm-blooded animals contain many types of bacteria, including the coliform group and *Streptococcus*, *Lactobacillus*, *Staphylococcus*, and *Clostridia*. Each gram of human or animal feces contains approximately 12 billion bacteria that may include pathogenic bacteria, such as *Salmonella*, associated with gastroenteritis. Feces may contain other pathogens besides bacteria, including viruses, protozoa, and parasites (MassDEP, 2007).

Pathogens can also negatively affect waters used as sources of drinking water, even though such waters undergo effective treatment. The amount of treatment required to produce potable water increases as pathogen levels increase, and high levels of treatment may result in disinfection by-products that are also harmful to humans. Information on pathogens and water quality are available at these USEPA webpages:

- Water Quality Criteria: Microbial (Pathogen) (USEPA, 2019c)
- Advisories and Technical Resources for Fish and Shellfish Consumption (USEPA, 2019a)
- Swimming Advisories (USEPA, n.d.)

The wide variety of pathogenic organisms that might be present in waters makes it expensive and sometimes difficult to identify and measure the risk of each specific disease. Therefore, scientists and public health officials usually monitor non-pathogenic bacteria that are typically associated with harmful pathogens in fecal waste but are more easily identified and measured. These associated bacteria are called indicator organisms. Indicator bacteria themselves are not necessarily a health risk but are used to indicate the likely presence of pathogenic organisms. High densities of indicator bacteria increase the likelihood of the presence of pathogenic organisms (USEPA, 2001).

Two commonly used indicators are coliform bacteria and fecal streptococci. The relationship among indicator organisms is illustrated in Figure 2, with those used in Massachusetts highlighted. Indicator criteria specific to Massachusetts are discussed in detail in Section 2. Coliform bacteria include total coliform, fecal coliform, and *E. coli*.

Fecal coliform (a subset of total coliform) and *E. coli* (a subset of fecal coliform) are present in the intestinal tracts of warm-blooded animals. The presence of coliform bacteria in water indicates fecal contamination and the possible presence of pathogens. Fecal streptococci bacteria, specifically the subgroup enterococci, are also used as indicator bacteria. All these bacteria live in the intestinal tract of animals, but because enterococci have a lower die-off rate, their presence is a better predictor of human gastrointestinal illness than fecal coliform (USEPA, 2001), particularly in brackish waters.

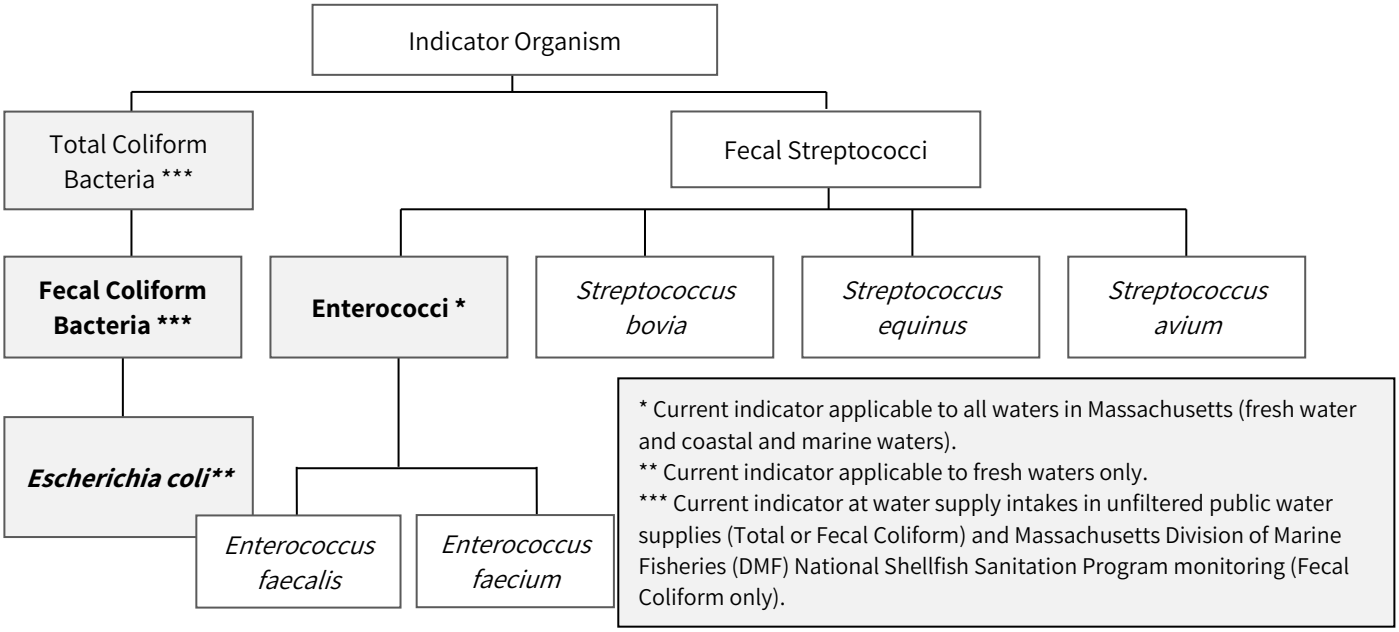

Figure 2. Relationship among indicator organisms (USEPA, 2001)

1.3. Comprehensive Watershed-Based Approach to TMDL Development

Historically, water and sediment quality studies have focused on the control of point sources of pollutants (i.e., discharges from pipes and other structural conveyances) that discharge directly into well-defined hydrologic resources, such as estuaries, lakes, ponds, or rivers. This approach has been successful in identifying and reducing a large amount of water pollutants; however, it does not fully characterize the more diffuse and chronic sources of pollutants that are widely scattered throughout a broad geographic region such as a watershed (e.g., roadway runoff, failing septic systems in high groundwater, areas of concentrated waterfowl use, fertilizers, pesticides, pet waste, and certain agricultural sources). These sources are referred to as nonpoint sources of pollutants and often contribute significantly to the decline of water quality through their cumulative impacts. A watershed-based approach that uses the surface drainage area as the basic study unit enables managers to gain a more complete understanding of the potential pollutant sources impacting a waterbody and increases the precision of identifying local problem areas or “hot spots” that may detrimentally affect water and sediment quality.

Addressing many waterbodies across multiple watersheds through a watershed-based TMDL is more efficient than developing separate TMDLs for each impaired waterbody. This approach also provides a useful format for guiding both remediation and protection efforts at the municipal and regional levels by providing a coordinating framework for environmental management that supports efforts to systematically identify, evaluate, and prioritize point and nonpoint sources of pollutants using natural hydrologic boundaries to define the problem areas. Once identified, sources are required to meet applicable water quality standards for indicator bacteria or be eliminated. Water quality restoration then becomes an iterative process, where data are reviewed as they become available, especially after targeted activities, such as public education campaigns, improved infrastructure, and refined stormwater management, are implemented. Participation by local governments, watershed groups, citizens, and other stakeholders in the TMDL process is crucial to achieve intended objectives because it ensures that individuals most likely to be knowledgeable of watershed conditions will help identify problems and develop solutions. Fresh water river or coastal waterbody segments that are assessed as impaired by MassDEP after approval of this TMDL report will be added as an addendum in revised versions of the report. Future submittals will provide detailed information on the impaired waterbodies as provided in the watershed appendices. MassDEP will provide public notice for comment, then submit to the USEPA for review and approval.

2. Applicable Surface Water Quality Standards

The purpose of a TMDL is to define the maximum amount of a pollutant that a waterbody can assimilate while allowing a waterbody to meet its applicable water quality standards. This section summarizes the Massachusetts Surface Water Quality Standards (SWQS; 314 CMR 4.00) that are applicable to TMDLs presented in this report (MassDEP, 2021a).

The SWQS determine the minimum water quality criteria that all surface waters of the Commonwealth must meet to protect their designated uses. The SWQS implement provisions of the Federal Water Pollution Control Act, 33 USC §1251, et seq. (known as the CWA) and associated federal Water Quality Standards regulation, 40 CFR Part 131, as well as the Massachusetts Clean Waters Act (M.G.L. c. 21, §§ 26 through 53) (MassDEP, 2021a).

The SWQS are composed of several parts, including classification of waters by designated use and application of criteria based on designated use. Each part is described below.

2.1. Classification by Designated Uses

Under the Massachusetts SWQS at 314 CMR 4.05(3), fresh water lakes, ponds, rivers, and streams are designated as either Class A, B, or C, with corresponding designated uses. Similarly, coastal and marine waters are designated at 314 CMR 4.05(4) as either Class SA, SB, or SC, each with a set of sensitive uses. No surface waters in Massachusetts are designated Class C or SC.

All fresh waters covered by this TMDL are Class A or B and all coastal and marine waters are Class SA or SB. Based on the SWQS, these waters should be suitable for the following uses: (1) habitat for fish, other aquatic life, and wildlife, with Class A waters being excellent habitat, (2) primary and secondary contact recreation (e.g., swimming, or boating and fishing, respectively), and (3) consistently good aesthetic value, with Class A waters being of excellent aesthetic value.

In addition, Class A includes public water supplies and their tributaries, which are among the most sensitive uses and therefore receive the most stringent protections. Class B waters designated with a “Treated Water Supply” qualifier are used as a source of public water supply with appropriate treatment. Other uses assigned to Class B waters are irrigation and other agricultural uses and compatible industrial cooling and processing.

Class SA waters that are designated for shellfishing are suitable for shellfish harvesting without depuration (within Approved and Conditionally Approved Shellfish Areas). Class SB shellfishing waters are designated as suitable for shellfish harvesting with depuration (within Restricted and Conditionally Restricted Shellfish Areas). Class SA and SB waters may also serve as water intakes for desalination facilities, conditional upon compliance with the SWQS.

In addition to classification, individual waterbody segments may be assigned qualifiers, which reflect additional uses or special considerations of that waterbody that may affect the application of criteria or antidegradation provisions (see 314 CMR 4.06(1)(d)). Qualifiers are assigned to segments by category at 314 CMR 4.06(2) through (5) and to specific segments at (6)(b): *Figure A; Figures and Tables 1 through 27.* Those that relate to this TMDL are:

- **Public Water Supply (PWS):** Class A waters that may be used as a source of public drinking water for a public water system as defined in 310 CMR 22.00: *Drinking Water,* may be subject to more stringent criteria in accordance with 310 CMR 22.00, and may have restricted use; these waters are designated for protection as Outstanding Resource Waters under 314 CMR 4.04(3).
- **Outstanding Resource Water (ORW):** Waters designated for protection as ORWs under 314 CMR 4.04(3).
- **High Quality Water (HQW):** Waters designated for protection under 314 CMR 4.04(2); other waters as described in 314 CMR 4.04(2) also are high quality, although they are not necessarily denoted as high quality in the classification tables.

- **Treated Water Supply (TWS):** Class B waters used as a source of public water supply after appropriate treatment and that may be subject to more stringent site-specific criteria.
- **Cold Water (CW)**: Waters subject to the dissolved oxygen and temperature criteria needed to support cold water fisheries. Where a cold water fish population has been identified by the Division of Fisheries and Wildlife as meeting their protocol, but the water has not been documented to meet the cold water criteria in 314 CMR 4.00, the Department will protect the existing cold water fish population and its habitat as an existing use.
- **Warm Water (WW)**: Waters subject to the dissolved oxygen and temperature criteria needed to support warm water fisheries.
- **Aquatic Life (AQL):** Waters where natural background conditions prevent the attainment of a "higher use" designation, thus Class C dissolved oxygen and temperature criteria apply.
- **Combined Sewer Overflow (CSO):** Waters identified as impacted by the discharge of CSOs without a long-term control plan (LTCP) approved or fully implemented.
- **Shellfishing (SF):** Waters subject to more stringent regulation by the Massachusetts Division of Marine Fisheries (DMF) pursuant to M.G.L. c. 130, § 75, including applicable criteria of the National Shellfishing Sanitation Program. DMF issues approval for use of areas designated for shellfishing.

Except for CSO, shellfishing, and the intakes of certain PWS, these qualifiers generally do not change the fecal indicator bacteria *(E. coli* or enterococci) water quality criteria (WQC) but more often focus on other types of water quality protection measures, such as restricting discharges to the waters. For more information on the surface water classes, designated uses, and qualifiers mentioned above, see the Massachusetts SWQS (MassDEP, 2021a).

To evaluate surface water quality, surface waters in Massachusetts are divided into assessment units. Smaller streams are often a single assessment unit, while large rivers may be divided into multiple units. Each unit is potentially assessed under the full range of designated uses, including swimming, fishing, drinking, irrigation, fish and wildlife habitat, as well as any existing uses (equally or more sensitive than the designated uses, attained by the waterbody on or after November 28, 1975). Sensitive uses require more stringent water quality protection; thus, meeting the requirements of these uses will tend to protect all other uses.

2.2. Surface Water Quality Criteria for Pathogens

In 2007, fecal coliform was replaced in the SWQS with *E. coli* and enterococci as indicator bacteria, as recommended by the USEPA in the *Ambient Water Quality Criteria for Bacteria – 1986* (USEPA, 1986). (Fecal coliform and total coliform data are used to determine compliance with Massachusetts' drinking water regulations for surface water and groundwater sources.) In marine waters designated for shellfishing, fecal coliform remains in use by the DMF in accordance with the National Shellfishing Sanitation Program. Data may be presented in this TMDL that were collected prior to 2007 and therefore use the fecal coliform indicator for impairment determination; these data will be presented with no applicable WQC.

A **geometric mean** is a way to average a set of values and is commonly used with bacterial water quality assessments which often show a great deal of variability. Unlike an arithmetic mean, a geometric mean reduces the effect of an occasional high or low value on the average.

The 2021 amendments to the SWQS adopted the USEPA's 2012 human health bacteria criteria recommendations for waters designated for Primary Contact Recreational uses such as bathing (MassDEP, 2018c; MassDEP, 2021a). The SWQS include a geometric means, or geomeans, for *E. coli* and enterococci bacteria for fresh water samples or enterococci only for coastal and marine samples collected within a 90-day period year-round. A shorter evaluation period of 30-days is used for segments containing public or semi-public beaches (during the bathing season) or have discharges from CSOs or

publicly-owned treatment works (POTW) (year-round). In addition to the geometric means, the statistical threshold values (STVs) for *E. coli* and/or enterococci shall not be exceeded by more than 10% of samples in the same period. Under the SWQS, the bathing season at beaches is determined by beach operators; but for the purposes of assessment or TMDLs, is defined as April 1 to October 15 of each year. A summary of WQC for indicator bacteria is presented in Table 3.

2.3. Numeric Water Quality Targets

In a TMDL, the water quality target is a numeric endpoint that represents the level of acceptable water quality to be achieved by implementing the TMDL. For indicator bacteria, the numeric targets for the TMDLs presented in this report are equal to numeric WQC defined in the SWQS (314 CMR 4.00) and listed in Table 3.

For this TMDL report, we focus only on Class A and B fresh water river segments for the designated use of Primary Contact Recreation, and Class SA and SB coastal and marine waters for the designated uses of Shellfishing and Primary Contact Recreation. Most of the segments are listed as impaired for *E. coli*, with some segments listed as impaired for enterococci from Massachusetts Department of Public Health (DPH) data at a designated public beach along the segment, and one segment listed only for fecal coliform as a carry-over from a previous assessment (no *E. coli* data available).

For the segments with a designated beach (listed for enterococci), we apply a 30-day rolling geomean during the bathing season and a 90-day rolling geomean during the non-bathing season. For segments without a designated beach and with *E. coli* data, we identify those segments with a CSO qualifier and/or a POTW and apply a year-round, 30-day rolling geomean. For the remaining segments without a designated beach and with *E. coli* data, we apply a year-round, 90-day rolling geomean. For water quality stations and years with more than 10 samples, we also calculate the rolling 90th percentile in the relevant periods for the applicable segments, as noted for the geomean calculations. If there are no stations within a segment with more than 10 samples in a year, then the STV criteria apply to single sample results.

Table 3. Summary of water quality criteria by waterbody class, designated use, and indicator bacteria from 314 CMR 4.05(3)(a)4., (3)(b)4., (4)(a)4., (4)(b)4., and (5)(f).

CFU = Colony Forming Units. MPN = Most Probable Number

Waterbody Class, Designated Use	Indicator Bacteria	Geometric Mean Applied to Rolling 30-day or 90-day period[1]	Statistical Threshold Value (STV) Applied to Rolling 30-day or 90-day period[2]
Class A & B, Primary Contact Recreation	fecal coliform[3]	NA	NA
	E. coli	≤ 126 CFU per 100mL[2]	≤ 410 CFU per 100mL
	Enterococci	≤ 35 CFU per 100mL[2]	≤ 130 CFU per 100mL
Class SA & SB, Primary Contact Recreation	Enterococci	≤ 35 CFU per 100mL[2]	≤ 130 CFU per 100mL
Class SA, Shellfishing	fecal coliform	≤ 14 MPN per 100mL	≤ 28 MPN per 100mL
Class SB, Shellfishing	fecal coliform	≤ 88 MPN per 100mL[4]	≤ 260 MPN per 100mL

[1] No minimum number of samples, see the Massachusetts SWQS (314 CMR 4.00) for applicable duration period
[2] Applicable for stations and years with more than 10 samples; otherwise, STV applied to single sample results.
[3] Fecal coliform criteria were replaced with E. coli *and enterococci criteria beginning in 2007*
[4] Median or geometric mean ≤ 88 MPN per 100mL

3. Source Assessment

The number of potential pathogens entering waterbodies is dependent on several factors, including watershed land use characteristics and meteorological conditions. As development density and land uses that affect water quality increase (e.g., including commercial, residential, and industrial land uses), the number of pathogens (as estimated by indicator bacteria) generally increases. Increased development density and corresponding high levels of impervious cover, such as rooftops, roads, and parking lots, affect streams as follows (USEPA, 1997):

- Increased flow volume
- Increased peak flow
- Increased peak flow duration
- Increased stream temperature
- Decreased base flow
- Altered sediment loading rates

Sources of pathogen pollutants may include illicit sewer connections, failed septic systems, poorly managed pet or livestock waste, congregating waterfowl, among other factors. Many of these 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. Two studies in Massachusetts, summarized in Table 4 and Table 5, provide data to illustrate the relationship between land use, development intensity, and pathogen pollutants.

To reduce the amount of pathogen pollutants that impairs waterbodies, Section 402 of the CWA requires that all point sources be regulated under the National Pollutant Discharge Elimination System (NPDES) permit program to control the type and quantity of pollutants discharged. Massachusetts' discharge permits are issued under 314 CMR 3.00: *Surface Water Discharge Permit Program*. Nonpoint sources are much more difficult to identify and control as they are more diffuse. Nonpoint source pollution is typically driven by watershed runoff, or the movement of water over the land surface and through the unsaturated zone and groundwater into waterbodies. Nonpoint sources of pathogenic pollutants include failing septic systems, illicit discharges or leaky sewers, wild animal and pet waste, manure spreading, and others mentioned above and described in more detail below. The *Massachusetts Nonpoint Source Management Program Plan 2020-2024* (MassDEP, 2019c) represents Massachusetts' strategy for preventing, controlling, and reducing nonpoint source pollutants. For more information on nonpoint source pollution, see MassDEP and USEPA's webpages (MassDEP, 2019d; USEPA, 2018a).

3.1. Point Sources

The Massachusetts SWQS defines "point source" at 314 CMR 4.02:

> *Point Source. Any discernible, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, from which pollutants are or may be discharged. Point Source does not include return flows from irrigated agriculture.*

Under Section 402 of the CWA, all point sources must be regulated under the NPDES permit program to control the type and quantity of pollutants discharged. These include large facilities like wastewater treatment plants or facilities (WWTP, WWTF, POTW), CSOs, industrial plants, confined animal feeding operations (CAFOs), and separate storm sewer systems in municipalities.

Pathogen-related point source pollution can occur during both wet and dry weather. Usually, pathogen levels (as estimated by indicator bacteria) are higher in wet weather conditions, as CSOs, sanitary sewer overflows (SSOs), and/or stormwater runoff carry fecal matter to rivers and estuaries.

In some cases, dry weather pathogen and associated indicator bacteria concentrations can be higher than those in wet weather. The constant flow of pollutants (such as illicit wastewater connections into storm drains) becomes diluted during periods of precipitation. Although the magnitude of these relationships (indicator bacteria concentration versus precipitation) is variable in time and location, the data may provide indications of the sources of pathogen pollutants.

Examples of wet weather sources include:

- wildlife and domesticated animals (including pets),
- stormwater runoff including point sources from municipal separate storm sewer systems (MS4s),
- CSOs and SSOs.

Examples of dry weather sources include:

- leaking sewer pipes,
- stormwater drainage systems (illicit connections of sanitary sewers to storm drains),
- failing septic systems,
- recreational activities, and
- wildlife, including birds.

It is difficult to provide accurate quantitative estimates of pathogen contributions from various sources because many sources are diffuse, intermittent, and difficult to monitor. Therefore, this TMDL uses a method of providing a general level of priority according to each source category for each segment in each watershed. This approach is suitable because it identifies the severity of the sources and illustrates the need for controlling them. Precisely quantifying many sources (failing septic systems, leaking sewer pipes, SSOs, illicit wastewater connections to stormwater pipes) is difficult and unnecessary, because they are prohibited and therefore must be eliminated.

To reduce pathogen pollution from municipal sewer systems, 260 out of 351 towns in Massachusetts are regulated under the MS4 program as “urbanized areas” as defined by the US Census Bureau in 2010. The MS4 program has expanded stormwater pollution awareness through six minimum control measures: Public Education and Outreach, Public Participation, Illicit Discharge Detection and Elimination (IDDE), Management of Construction Site Runoff, Management of Post Construction Site Runoff, and Good Housekeeping in Municipal Operations. Approaches to reduce pathogen pollution in the MS4 permit include distributing fliers about pet waste, mapping outfalls and catchment areas, prioritizing repairs and improvements, and revising municipal regulatory controls. USEPA and MassDEP jointly issued the revised Phase II MS4 General Permit which became effective on July 1, 2018. Communities with approved TMDLs are required to implement enhanced BMPs for public education and designate the outfalls that discharge to pathogen-impaired waterbodies as Problem Catchments or as a high priority for investigation and improvements under the IDDE program, in addition to the requirement to reduce pollutants to the Maximum Extent Practicable or MEP, as noted in *General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts* (USEPA, 2020); refer to Appendix F.

3.1.1. Illicit Discharges in Storm Sewers

An illicit discharge refers to flows to MS4-regulated storm drains during dry weather, that contain pollutants and/or pathogens typically not found in stormwater (USEPA, 2020). Illicit sanitary sewer connections to storm drains are an on-going problem in many urban drainage systems, particularly older systems that may have once combined stormwater with sanitary sewer flows (NEIWPCC, 2003). The IDDE program is a requirement of the Massachusetts General Permits for stormwater discharges from MS4s (USEPA, 2020). Permittees are required to systematically find and eliminate sources of non-stormwater discharges to MS4s. Examples of illicit discharges commonly seen in urban communities in Massachusetts include direct discharges such as sanitary wastewater pipes connected from a home to a storm drain and indirect illicit discharges such as a damaged sanitary sewer line that is leaking wastewater into a cracked storm sewer line through inflow and infiltration (NEIWPCC, 2003).

3.1.2. Sanitary Sewers and Wastewater Treatment Plants

WWTPs receive and treat wastewater from a variety of sources including institutions, hospitals, commercial, industrial, and residential users. This wastewater, which contains a variety of organic and inorganic pollutants, is transported to WWTPs via sanitary sewer networks, where it is treated to remove harmful wastes, then disinfected to inactivate, or kill, pathogens and meet effluent limitations as specified in NPDES permits. Untreated or partially treated wastewater has the potential to enter the State's surface waters due to malfunctioning WWTPs. Through municipal grants and low interest loans obtained from the State Revolving Fund (SRF), hundreds of millions of dollars have been spent over the past four decades on upgrading WWTPs to secondary and more advanced treatment processes to control pathogens and other pollutants.

3.1.3. Combined Sewer Overflows

A combined sewer system (CSS) collects rainwater runoff, domestic sewage, and industrial wastewater in one pipe. In dry conditions, the pipe transports all collected wastewater to a sewage plant for treatment; from there, effluent is discharged to a waterbody. During a heavy rainfall or snowmelt event, the volume of combined stormwater and wastewater can exceed the capacity of the CSS and/or treatment plant. When this occurs, stormwater and wastewater may be discharged, untreated, directly to streams, rivers, and other waterbodies. These events, called CSOs, contain untreated or partially treated human and industrial waste, toxic materials, and debris, as well as stormwater. CSSs are a legacy in urbanized areas and have, in many cases, been replaced or are being replaced by separate storm sewer systems and sanitary sewer systems.

According to the USEPA, CSOs are a priority water pollutant concern for the nearly 860 municipalities across the U.S. that have CSSs. Massachusetts has 19 CSO communities or sewer districts, regulated through NPDES permits. Each CSO permittee must implement system controls known as the Nine Minimum Controls to maximize efficiency of the existing facilities to limit the duration and impact of CSO discharges. Facilities must also develop and implement a Long-Term Control Plan or LTCP (MassDEP, n.d. (c)). For more information, see (USEPA, 2018b). For more information including an interactive map of CSO locations in Massachusetts see MassDEP webpage: Sanitary Sewer Systems & Combined Overflows (MassDEP, 2019b).

3.1.4. Sanitary Sewer Overflows

Sanitary Sewer Overflows (SSO) are discharges of untreated wastewater from sanitary sewer systems. These overflows can be caused by clogged or cracked sewer pipes, by excess infiltration and inflow, by undersized sewer systems (piping and/or pumps), by pumping station equipment failure, or electrical power failure. Such untreated wastewater can find its way to surface waters and cause water quality violations.

3.1.5. Illicit Discharges from Boats

Since 2014, all Massachusetts waters are designated as a No-Discharge Zone (NDZ) in which the discharge of boat sewage is prohibited. There has been extensive work by the Massachusetts Office of Coastal Zone Management (CZM), coastal communities, and other organizations to ensure that boat pump-out services are available where boating occurs (CZM, 2022). Many free boat pump-out services are available at various sites along the coast, funded by the Clean Vessel Act. The Massachusetts CZM webpage maintains online maps of these boat pump-out facilities, and the Clean Vessel Act Program offers a *Boaters Pocket Guide to Pumpout Facilities*. Any sewage discharge from boats in the waters covered by this TMDL are therefore illicit discharges.

3.2. Nonpoint Sources

3.2.1. Non-Regulated Stormwater Runoff

Stormwater runoff is the water from rain or snowmelt that flows over the land surface or through the ground (sometimes referred to as throughflow) into surface waters. Stormwater runoff may also seep through soil to infiltrate to groundwater, eventually discharging to surface waters. As the runoff moves, it transports natural and anthropogenic pollutants, such as soil, trash, and fecal waste, and eventually deposits them into surface waters. In developed areas, stormwater is typically channelized in storm drains, discharging via outfalls to wetlands and surface waters. Stormwater runoff is one of the leading sources of impairment of our nation's waters and often contains high concentrations of various pollutants, including pathogens. Urbanization and associated impervious surfaces alter the natural drainage features of a watershed, thereby significantly impacting local hydrology with increased peak discharge rates and volumes, reduced recharge to wetlands and streams, and increased discharge of pollutants to wetlands and receiving surface waters.

Extensive stormwater data have been collected and compiled in Massachusetts and on a national level to characterize the quality of stormwater. Pathogens and associated indicator bacteria are the most variable of stormwater pollutants, with concentrations often varying by factors of 10 to 100, or more, during a single storm. Considering this variability, stormwater indicator bacteria concentrations are difficult to predict accurately. Caution must be exercised when using values from single wet weather grab samples to estimate the magnitude of pathogen loading, because it is often unknown whether the sample is representative of the "true" mean of that wet weather event.

To gain an understanding of the magnitude of pathogen loading from stormwater and avoid over- or underestimating pathogen loading, event mean concentrations (EMC) are often used. An EMC is the concentration of a flow-proportioned sample collected throughout the course of a storm event. These samples are commonly collected using an automated sampler which can proportion sample aliquots based on flow. Typical stormwater event mean concentrations for various indicator bacteria (fecal coliform) in Massachusetts' watersheds (and across the nation) are provided in Table 4 and Table 5. These EMCs illustrate that stormwater indicator bacteria concentrations from certain land uses (i.e., residential) are typically at levels that cause water quality problems. For additional information on EMC for pathogens including *E. coli* and enterococci see (USEPA, 2019d).

Table 4. Lower Charles River Basin Stormwater Event Mean Indicator Bacteria Concentrations*

FC EMC = Fecal Coliform Event Mean Concentration. SWQS = Massachusetts Surface Water Quality Standards. CFU = Colony Forming Units.

Land Use Category	FC EMC (CFU/100 mL)	No. Events	Pre-2007 [1] Class B SWQS	Reduction to Meet Pre-2007 SWQS (CFU/100mL, %)
Single Family Residential	2,800 – 94,000	8	10% of the samples shall not exceed 400 organisms/ 100 mL	2,400 – 93,600 (85.7 – 99.6)
Multifamily Residential	2,200 – 31,000	8		1,800 – 30,600 (81.8 – 98.8)
Commercial	680 – 28,000	8		280 – 27,600 (41.2 - 98.6)

[1] This table was developed under the previous Class B Standard (revised in 2006 and approved by USEPA in 2007): Shall not exceed a geometric mean of 200 organisms in any set of representative samples, nor shall more than 10% of the samples exceed 400 organisms. The number 400 was used to illustrate required reductions in the "Reduction to Meet SWQS (%)" Column.
*Note: data summarized from (USGS, Measured and Simulated Runoff to the Lower Charles River, Massachusetts, October 1999 - September 2000, 2002).

Table 5. Stormwater Event Mean Fecal Coliform Concentrations, as reported in (MassDEP, 2002); original data provided in (Metcalf and Eddy, 1991)

FC EMC = Fecal Coliform Event Mean Concentration. SWQS = Surface Water Quality Standards. CFU = Colony Forming Units.

Land Use Category	FC EMC[1] (CFU/100 mL)	Pre-2007 Class B SWQS[2]	Reduction to Meet Pre-2007 SWQS (CFU/100mL, %)
Single Family Residential	37,000	10% of the samples shall not exceed 400 organisms/ 100 mL	36,600 (98.9)
Multifamily Residential	17,000		16,600 (97.6)
Commercial	16,000		15,600 (97.5)
Industrial	14,000		13,600 (97.1)

[1] Derived from Nationwide Urban Runoff Program (NURP) study event mean concentrations and nationwide pollutant buildup data (USEPA, 1983).
[2] This table was developed under the previous Class B Standard (revised in 2006 and approved by USEPA in 2007): Shall not exceed a geometric mean of 200 organisms in any set of representative samples, nor shall more than 10% of the samples exceed 400 organisms. Used 400 to illustrate required reductions in the "Reduction to Meet SWQS (%)" Column.

3.2.2. Septic Systems

Septic systems designed, installed, operated, and maintained in accordance with Massachusetts 310 CMR 15.000 (Title 5) are not significant sources of pathogens. Studies demonstrate that wastewater located four feet below properly functioning septic systems contain, on average, less than one fecal coliform indicator bacteria organism per 100 mL due to effective filtration and adsorption through the leach field and underlying natural soils (Ayres Associates, 1993). However, failed or non-conforming septic systems, such as cesspools, can be a major contributor of pathogens to Massachusetts' waterbodies. Wastes from failing septic systems enter surface waters either as direct overland flow or via groundwater. Wet weather events typically increase the rate of transport of pollutant loadings from failing septic systems to surface waters because of the wash-off effect from runoff and the increased rate of groundwater recharge.

3.2.3. Pet Waste

In residential areas, household pets such as cats and dogs can be a significant source of pathogens. Depending on the size of the dog, research has found that daily fecal production was between 7.6 and 52 grams per day and from 3 million to 8.8 billion enterococci colony-forming units (CFU) per fecal event (Wright, Solo-Gabriele, Elmir, & Fleming, 2009). Based on loading estimates to a Florida beach, one dog fecal event was equivalent to fecal shedding from 7,000 adult swimmers or bird fecal events and was the largest source of enterococci to recreational waters (Wright, Solo-Gabriele, Elmir, & Fleming, 2009). If pet waste is not properly discarded, then pathogens from the waste can wash off the land under wet weather conditions and transported to surface waters. Pet waste can also enter surface waters by direct deposition of fecal matter from pets standing or swimming in surface waters (USEPA, 2001).

3.2.4. Wildlife Waste

Fecal matter from wildlife may be a significant source of pathogens in some watersheds. This is particularly true when human activities, including the feeding of wildlife and habitat modification, result in the congregation of wildlife. Geese, gulls, and ducks represent a major pathogen source, particularly at lakes and stormwater ponds where large resident populations have become established and their waste is deposited directly into surface waters (CWP, 1999). Birds were found to produce 100 million *E. coli* and enterococci colonies per day per bird in the Great Lakes area and to be one of the dominant sources of fecal indicator bacteria to those waters (Haack, Fogarty, & Wright, 2003).

Wildlife waste deposited on land can also be washed off and transported to surface waters by stormwater runoff. Roads and drainage structures that expedite the transport of natural sources of pathogens to

surface waters may exacerbate the impact of these sources on water quality. Municipalities regulated under the MS4 permit are now required to establish procedures that address waterfowl congregation in problem areas by year 2 of the effective date of the permit.

Certain types of infrastructure may also attract large numbers of wildlife and result in higher pathogen loading to surface waters. For example, in Bellingham, MA, large numbers of pigeons were found congregating under a bridge over the pathogen-impaired Peters River (MA51-18). Fecal indicator bacteria concentrations upstream of the bridge were consistently lower than those downstream, suggesting that the birds may have been a significant source of indicator bacteria to this segment (MassDEP, 2010).

3.2.5. Agriculture

Agricultural activities include dairy farming, raising livestock and poultry, growing crops, and keeping horses and other animals for pleasure or profit. Activities and facilities associated with agricultural land use can be sources of pathogens to surface waters. Communities, farmers, horse owners, and others who confine animals are largely responsible for mitigating fecal pollutants. Direct deposition of fecal matter from farm animals standing or swimming in surface waters and the runoff of farm animal waste from land surfaces are considered the primary mechanisms for agricultural pollutants in surface waters. CAFOs are large agricultural facilities that are regulated as point source dischargers under the NPDES General Permit.

3.2.6. Recreation

The recreational use of waterbodies can be a source of pathogen contamination. Swimmers themselves may contribute to fecal contamination at swimming areas. When swimmers enter the water, residual fecal matter may be washed from the body and contaminate the water with pathogens. In addition, small children in diapers may contribute to contamination of the recreational waters. These sources are likely to be particularly important when the number of swimmers is high, and the flushing action of water currents is low.

4. Determination of Load Capacity

4.1. Definition of a TMDL

The Total Maximum Daily Load (TMDL) is the amount of a pollutant that a waterbody can assimilate without violating SWQS. Both point and nonpoint source pollutants are accounted for in a TMDL. USEPA regulations require that point source pollutants (i.e., discharges from discrete pipes or conveyances) subject to NPDES permits (including MassDEP's Surface Water Discharge permits) receive a waste load allocation (WLA) specifying the amount of a pollutant that can be released to the waterbody. Nonpoint source pollutants (i.e., all other diffuse sources of pollutants) 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 nonpoint source pollution and point source discharges that are subject to NPDES regulation.

Stormwater runoff within urbanized areas regulated by the General Stormwater Permit for MS4s is considered a point source. Stormwater is diverted, collected, and conveyed through a stormwater collection system to an outfall that discharges to a receiving water. Stormwater runoff outside of MS4 areas, or that flows directly to surface water, is considered a nonpoint source of pollutants. Permitted stormwater runoff is accounted for in the WLA of the TMDL, while non-permitted runoff is accounted for in the LA of the TMDL.

In accordance with the federal CWA, a TMDL must also account for seasonal variations and include a margin of safety (MOS) to account for uncertainty in loading capacity.

In equation form, a TMDL is expressed as follows:

$$\mathbf{TMDL = \sum WLA + \sum LA + MOS}$$

where:

$\sum$ ***WLA*** *= sum of Waste Load Allocations, or point sources including NPDES-regulated stormwater.*

$\sum$ ***LA*** *= sum of Load Allocations, or natural background, nonpoint sources, and stormwater not regulated by NPDES.*

MOS *= Margin of Safety.*

TMDLs can be expressed in terms of mass per unit of time (i.e., daily load), concentration, or other appropriate measures (40 CFR Part 103.2(i)). The WLA and LA both need to account for existing and future loads. This TMDL consists of two types of targets for allowable levels of indicator bacteria:

- Concentrations of indicator bacteria (expressed as bacteria counts/100mL of water), and
- Loads of indicator bacteria (expressed as numbers of bacteria/day).

The stated goal of the TMDL is to meet SWQS at the point of discharge for all the river segments in this report. Both targets are designed to meet the designated Primary Contact Recreation and Shellfishing uses by ensuring that indicator bacteria criteria in the Massachusetts SWQS will be attained. Both targets in this TMDL are considered by MassDEP to be daily targets.

4.2. Pollutant Load Allocations

This TMDL includes two types of pathogen TMDL targets: concentration and numerical load. Expressing a TMDL in terms of indicator bacteria concentrations based on criteria in the SWQS, as provided in Table 6, provides a clear and understandable expression of water quality goals. Concentration targets for indicator bacteria are also the primary guide for implementation (see Section 5). The concentration-based TMDL is a useful format for guiding both remediation and protection efforts in the watersheds. A concentration target allows interested stakeholders to readily determine (through monitoring) whether a source is exceeding its allocation.

As required under the federal CWA, the TMDL is also expressed in terms of indicator bacteria daily load or the number of organisms per day (CFU/day). The load varies with flow over the course of the day and season and can be very large (billions or trillions of indicator bacteria per day) and thus more difficult to understand and interpret and not directly comparable to WQC (expressed as concentrations). Section 4.2.2 contains the table, figure, and equations that express the TMDLs as daily loads in terms of numbers of organisms per day.

4.2.1. Concentration-Based Waste Load Allocations and Load Allocations

Table 6 presents the TMDL indicator bacteria WLAs and LAs as daily concentration targets for the various pathogen source categories applicable to surface waters in this TMDL report.

Runoff from impervious cover is likely to flow to receiving waters through a stormwater collection system. For prohibited point sources, including illicit discharges to stormwater systems and SSOs, the WLA is zero, which corresponds to complete elimination, or 100% reduction. The goal for controlling CSOs is meeting the WQC through implementation of approved LTCPs. LAs apply to all nonpoint sources of pathogens (including stormwater runoff from pervious land cover types or runoff from non-regulated impervious areas) and are equal to the WQC applicable to each segment.

These concentration targets can be used to guide implementation. The goal to attain applicable criteria established in the Massachusetts SWQS at the point of discharge is protective of designated uses 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 can be determined by documenting that samples collected from the receiving waters meet the appropriate WQC for the waterbody.

Table 6. Concentration-Based Waste Load Allocations (WLAs) and Load Allocations (LAs)

<table>
<tr><th>Class</th><th>Indicator Bacteria Concentration-Based Load</th><th>Waste Load Allocation Pathogen Sources</th><th>Load Allocation Pathogen Sources</th></tr>
<tr><td rowspan="3">A, B, SA, & SB (prohibited)</td><td rowspan="3">0 (No load allocation)</td><td>Illicit discharges to storm drains</td><td>Not Applicable</td></tr>
<tr><td>Leaking sanitary sewer lines, SSOs</td><td>Not Applicable</td></tr>
<tr><td>Not Applicable</td><td>Failing septic systems</td></tr>
<tr><td rowspan="2">A & B for Primary Contact Recreation designated use</td><td>E. coli geomean[5]
≤ 126 CFU/100 mL; and
no more than 10% of samples
≥ 410 CFU/100 mL (STV) [6];</td><td rowspan="4">Any regulated discharge, including stormwater runoff[1] subject to MS4 NPDES permits, NPDES wastewater treatment plant discharges[2,3], and combined storm sewer overflows[4].</td><td rowspan="4">Nonpoint source stormwater runoff[1]</td></tr>
<tr><td>Enterococci geomean[5]
≤ 35 CFU/100 mL;
no more than 10% of samples
≥ 130 CFU/100 mL (STV) [6]</td></tr>
<tr><td>SA & SB for Primary Contact Recreation designated use</td><td>Enterococci geomean[5]
≤ 35 CFU/100 mL;
no more than 10% of samples
≥ 130 CFU/100 mL (STV) [6]</td></tr>
<tr><td>SA for Shellfishing designated use</td><td>Fecal coliform geomean[5]
≤ 14 MPN/100 mL;
Statistical Threshold Value;
no more than 10% of samples
≥ 28 MPN/100 mL</td></tr>
<tr><td>SB for Shellfishing designated use</td><td>Fecal coliform median or geomean[5]
≤ 88 MPN/100 mL; and
no more than 10% of samples
≥ 260 MPN/100 mL (STV) [6]</td><td colspan="2"></td></tr>
</table>

[1] WLAs and LAs for stormwater discharges will be achieved through the implementation of structural and non-structural BMPs, source reduction, and other controls to the Maximum Extent Practicable.

[2] Or shall be consistent with the Wastewater Treatment Plant (WWTP) National Pollutant Discharge Elimination System (NPDES) permit.

[3] Seasonal disinfection may be allowed by the MassDEP on a case-by-case basis.

[4] Or other applicable SWQS for CSOs.

[5] Geometric mean is calculated using sample results within a rolling 30-day period at bathing beaches during bathing season (April 1 to October 15). The 30-day rolling period applies year-round to CSO-discharge and POTW-impacted waters. For all other waters and at beaches during the non-bathing season, the geometric mean is calculated using samples collected within a rolling 90-day period.

[6] Statistical Threshold Value, STV. If <10 samples collected, no samples shall exceed 410 CFU/100 mL for *E.coli*, 130 CFU/100 mL for enterococci, and 260 MPN/100 mL for Fecal coliform.

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

4.2.2. Load-Based Waste Load Allocations and Load Allocations

Although water quality criteria for pathogens are expressed as concentrations in the SWQS (and the target for restoration of the waterbody is the criterion), it is possible to evaluate pollutant loading in terms of the total number of indicator bacteria per day in a waterbody. For rivers, this means multiplying the volume of water that flows through the river per day by the concentration of observed indicator bacteria. For coastal and marine waterbodies, the numerical loading is calculated by multiplying the daily runoff volume to the waterbody by the concentration of indicator bacteria in that runoff.

Flow is highly variable depending on precipitation, season, snowmelt, and other factors. The U.S. Geological Survey (USGS) maintains a system of stream gages to measure flow, though not every river segment has a stream gage and estimates are often required. To estimate the flow for an ungaged location or segment, flows at a gage in the watershed or nearby watershed can be weighted based on drainage area. The USGS StreamStats web-based application can also be used to estimate flow statistics at ungaged sites (USGS, n.d.).

Similar to the most severe hydrologic condition at which the WQC must be applied as outlined in the Massachusetts SWQS (314 CMR 4.03(3) *Hydrologic Conditions*), the pathogen TMDL is expressed in terms of the criteria for the indicator bacteria proportional to flow for days in which flow exceeds 7Q10 conditions.

Example calculations for determining pathogen TMDLs for rivers using the load-based approach. The TMDL associated with each 1.0 cubic foot per second (cfs) of flow to meet WQC of 126 CFU/100 mL (*E. coli*, Class A or B) or 35 CFU/100 mL (enterococci, Class A or B) is derived as follows:

$$TMDL\left(\frac{10^9\text{CFU}}{\text{day}}\right) = Flow\left(\frac{ft^3}{\text{sec}}\right) \times \text{WQC}\left(\frac{\text{CFU}}{100\text{mL}}\right) \times 86{,}400\left(\frac{\text{sec}}{\text{day}}\right) \times 10\left(\frac{100\text{mL}}{\text{L}}\right) \times 28.3168\left(\frac{\text{L}}{\text{ft}^3}\right) \div 10^9$$

Figure 3 and Table 7 illustrate the allowable indicator bacteria daily load in CFU/day at various flows in cubic feet per second (cfs) for two WQC concentrations: the geometric mean for *E. coli* (126 CFU/100 mL) and the geometric mean for enterococci (35 CFU/100 mL). For river segments, the WLA is the daily load from allowable regulated sources and the LA is the daily load from allowable nonpoint sources. The TMDL is proportioned between the WLA and LA by multiplying the daily load by the percent impervious of the contributing watershed for the WLA, and the remaining load is assigned to the LA. The TMDLs for each pathogen impaired segment are provided in the appendices.

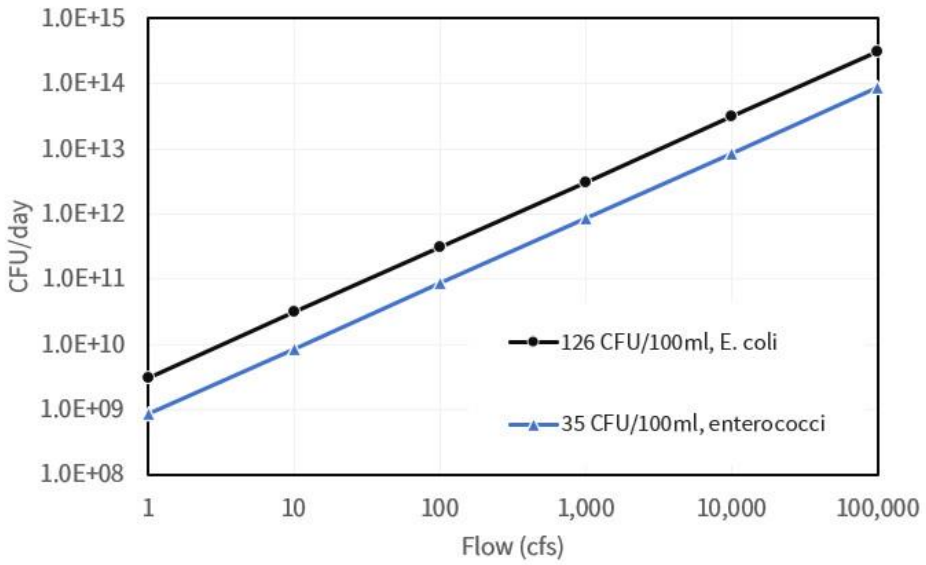

Figure 3. Total Maximum Daily Load (TMDL) by river flow for indicator bacteria

Table 7. Total Maximum Daily Load (TMDL) by river flow for *E. coli* and enterococci.

The surface water quality standard is the geometric mean of 126 CFU/100mL for E. coli and 35 CFU/100mL for enterococci. TMDL = Load Allocation (LA) + Waste Load Allocation (WLA) + Margin of Safety (MOS). MOS is implicit or zero.

Flow (cfs)	*E. coli* TMDL (10^9 CFU/100mL)	Enterococci TMDL (10^9 CFU/100mL)
1	3	1
10	31	9
100	308	86
1,000	3,083	856
10,000	30,827	8,563
100,000	308,269	85,630

mL: milliliter; cfs: cubic feet per second; CFU: colony-forming unit

Example calculations for determining pathogen TMDLs for estuaries/embayments using the load-based approach. For marine waterbodies, total maximum daily pathogen loads are typically calculated based on long-term average runoff volumes. The numerical TMDL is calculated by multiplying the average daily runoff volume to the waterbody by the concentration of indicator bacteria in that runoff. The approach differs from rivers in how the runoff volume is calculated and includes two methods depending on the location of the impaired coastal waterbody. **For segments located on Cape Cod and the Islands basins, groundwatersheds are used, and for all other segments, surface water drainage areas (i.e., watersheds) are used**. Note that some segments located on Cape Cod's western side drain to Buzzards Bay and are included in that appendix, using the groundwatershed as the basis for TMDL development.

An average daily runoff volume from the Cape Cod and Islands watersheds (including eastern Buzzards Bay) was determined according to the methodology used most recently in the *Final Pathogen TMDL for the Islands Watershed* (MassDEP, 2020a). The waterbodies in these basins are in areas of coarse and highly transmissive soils, where rain and runoff from impervious areas (IA) rapidly infiltrate into the ground,

and overland surface runoff is negligible. In these waterbodies, groundwatersheds (or groundwater-controlled watersheds) determine flow to the assessment unit waterbody and have been mapped by MassDEP or USGS.

For the purposes of this TMDL, in the Cape Cod and Islands watersheds, all rainfall to impervious areas within a 200-foot buffer around the waterbody is assumed to directly enter the waterbody as runoff. In areas outside the 200-foot buffer, all precipitation is assumed to infiltrate into the ground, including precipitation to impervious areas which rapidly infiltrate into adjacent soils. Pervious areas within the 200-foot buffer are also assumed to generate zero runoff to the waterbody. Average annual rainfall to this region is 45 inches per year based on precipitation recorded from 1941 to 1995 (Walter & Whealan, 2005), and average daily rainfall is 45 inches/365 days per year (or 0.123 inches/day). Due to the assumption that there is no nonpoint source pathogen pollution, the LA is set as zero for both fresh water streams and coastal and marine waterbodies located in Cape Cod or the Islands watersheds. The margin of safety is implicit, due to conservative assumptions (see Section 4.3). **Thus, the total maximum annual load of pathogens to the Cape Cod/Island coastal and marine waterbodies is represented by the following equation:**

$$TMAL\left(\frac{10^9\text{CFU}}{\text{year}}\right) = IA\ in\ 200\ ft\ Buffer\ (ft^2)\ \times 144\left(\frac{in^2}{ft^2}\right) \times 45\ \left(\frac{in}{year}\right) \times \text{WQC}\left(\frac{\text{CFU}}{100\text{mL}}\right) \times 10\left(\frac{100\text{mL}}{\text{L}}\right) \times 0.0164\left(\frac{\text{L}}{in^3}\right)\ \div 10^9$$

Dividing the total maximum annual load by the number of days per year, the numerical TMDL for the Cape Cod and Islands waterbodies is therefore:

$$TMDL\left(\frac{10^9\text{CFU}}{\text{day}}\right) = TMAL\left(\frac{10^9\text{CFU}}{\text{year}}\right) \div 365$$

Flows to the waterbody from each groundwatershed are multiplied by the SWQS indicator bacteria concentration to determine the waterbody's TMDL in numeric format. For TMDL waterbodies not located on Cape Cod and not in the Islands basin, surface watersheds are used.

For all other coastal and marine impaired segments, average annual flow to the impaired segment is determined by the methodology used in the pathogen TMDLs for Buzzards Bay, South Coast, and North Coast watersheds (MassDEP, 2009; MassDEP, 2012; MassDEP, 2014) and described in detail most recently in the *Pathogen TMDL for Boston Harbor, Weymouth-Weir, and Mystic Watersheds* (MassDEP, 2018b).

Average annual precipitation in coastal watersheds in this TMDL is determined to be 45.7 inches per year. All precipitation to impervious areas (45.7 inches per year of runoff) is assumed to enter waterways and ultimately the impaired segment. In pervious areas, 24.0 inches per year of runoff is assumed to enter the impaired waterbody, based on a long term (1905-2007) 50th percentile value from USGS gages in New England. The impervious and pervious land area in each watershed is thus multiplied by 45.7 and 24.0 inches of runoff, respectively, to get the total volume of runoff to each impaired segment. The runoff volume is then multiplied by the most stringent indicator bacteria concentration to get the maximum allowable number of indicator bacteria per year for that waterbody. Daily load is determined by dividing by 365 days in a year (updated from 105 days used in the pathogen TMDLs cited above).

The margin of safety is implicit, due to conservative assumptions (see Section 4.3). Runoff from impervious areas make up the WLA, and runoff from pervious areas are the LA. **Thus, the total maximum annual load of pathogens to coastal and marine waterbodies (excluding Cape Cod/Islands) is represented by the following equation:**

$$TMAL\left(\frac{10^9\text{CFU}}{\text{year}}\right) = Annual\ WLA\ [IA\ (ft^2)\ \times 144\left(\frac{in^2}{ft^2}\right) \times 45.7\ \left(\frac{in}{year}\right) \times\ \text{WQC}\left(\frac{\text{CFU}}{100\text{mL}}\right) \times 10\left(\frac{100\text{mL}}{\text{L}}\right) \times 0.0164\left(\frac{\text{L}}{in^3}\right)\ \div 10^9] + \ Annual\ LA\ [PA\ (ft^2)\ \times 144\left(\frac{in^2}{ft^2}\right) \times 24\ \left(\frac{in}{year}\right) \times\ \text{WQC}\left(\frac{\text{CFU}}{100\text{mL}}\right) \times 10\left(\frac{100\text{mL}}{\text{L}}\right) \times 0.0164\left(\frac{\text{L}}{in^3}\right)\ \div 10^9]$$

Dividing the annual load by the total number of days in the year (365), the numerical TMDL for marine segments, excluding those in the Cape Cod and Islands basins, is therefore:

$$TMDL\left(\frac{10^9\text{CFU}}{\text{day}}\right) = TMAL\left(\frac{10^9\text{CFU}}{\text{year}}\right) \div 365$$

4.2.3. Application of the TMDL to Unimpaired or Currently Unassessed Segments

This TMDL report includes 212 TMDLs for *E. coli*, 18 TMDLs for fecal coliform, and 228 TMDLs for enterococcus for 228 pathogen-impaired segments on the 2018/2020 CWA § 303(d) list of impaired waters in the Commonwealth of Massachusetts. MassDEP recommends that the information contained in this TMDL report be used to guide management activities and maintain and protect existing water quality for all other waters in the Commonwealth, even if not included on the CWA § 303(d) list. The analyses conducted for the pathogen-impaired segments in this TMDL report also apply to the non-impaired segments since the potential sources and their characteristics are equivalent.

The concentration-based WLAs and/or LAs for each source and designated use are the same as specified herein. Therefore, the pollutant prevention TMDLs have identical WLAs and LAs based on the sources present and the designated uses of the waterbody segment (see Table 6). All discharges will need to be compliant with the applicable WLAs, as well as the antidegradation provisions of the SWQS (314 CMR 4.04). Any new construction that complies with State stormwater standards and permits is presumed to comply with the antidegradation requirements.

This TMDL may, in appropriate circumstances, also apply to segments that are listed for pathogen impairment in subsequent Massachusetts CWA § 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, after listing the waters for pathogen impairment and considering all relevant comments submitted on the CWA § 303(d) list, the Commonwealth determines, with USEPA approval, that this TMDL report should apply to future pathogen-impaired segments. This process will require the same type of information on the additional impaired waterbodies and their TMDLs as is contained in the appendices to this report. Newly-impaired segments will be provided to the public for review and comment and included as an addendum to the TMDL core report and appropriate appendix.

4.3. Margin of Safety

The MOS accounts for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality. The MOS can be implicit (i.e., incorporated into the TMDL analysis through conservative assumptions) or explicit (i.e., expressed in the TMDL as a portion of the loadings). The concentration-based TMDLs contain an implicit MOS by using the following conservative assumptions during the analysis: The TMDLs are set equal to the appropriate criterion for each waterbody segment and include the goal of meeting indicator bacteria criteria at the point of discharge for all sources. This means the TMDLs do not rely on dilution in the waterbody to meet the criterion. In addition, the TMDLs do not rely on in-stream processes such as bacteria die-off and settling, which are known to reduce in-stream indicator bacteria concentrations. Consequently, the concentration-based TMDLs represent conservative TMDL target-setting, so there is a high level of confidence that the TMDLs established are consistent with the criteria in the SWQS, and the entire loading capacity can be allocated among sources. For these reasons, the MOS is implicit, and the explicit MOS shown in the general TMDL formula above is equal to zero. For compliance with this TMDL, ambient water quality will be considered at the point of discharge.

Margin of Safety with regard to Climate Change: While the general vulnerabilities of inland and coastal areas to climate change can be identified, specific impacts and effects of changing conditions are not well known at this time, as described in the *Massachusetts Climate Change Adaptation Report* (EEA, 2011). Because the science is not yet available, MassDEP is unable to analyze climate change impacts on streamflow, precipitation, and pathogen loading with any degree of certainty for TMDL development. These uncertainties and informational gaps further support an implicit MOS. MassDEP does not believe that an explicit MOS approach is appropriate under the circumstances or will provide a more protective or accurate MOS than the implicit MOS approach, as the available data simply do not lend themselves to characterizing and estimating loadings to derive numeric allocations within confidence limits. Although the implicit MOS approach does not expressly set aside a specific portion of the load to account for potential impacts of climate change, MassDEP has no basis to conclude that the conservative assumptions that were used to develop the numeric model applications are insufficient to account for the lack of knowledge regarding climate change.

4.4. Estimating Indicator Bacteria Reductions to Meet SWQS

Required TMDL reductions were calculated using available indicator bacteria data (2005-2019). Methods were consistent with the Massachusetts SWQS and USEPA guidelines for statistical analysis of indicator bacteria data (USEPA, 2012b; MassDEP, 2021a). Massachusetts uses the geometric mean of enterococci and *E. coli* indicator bacteria data to assess the Primary Contact Recreation designated use, and the geometric mean of fecal coliform indicator bacteria for the Shellfishing designated use, and comparison to the applicable STV to determine compliance with SWQS (as described in Section 2).

Geometric means of indicator bacteria data from 2005-2019 were calculated using the appropriate rolling 30- or 90-day period for all sampling stations in the impaired segments, which would include the Primary Contact Recreation designated use and, where applicable, the Shellfishing designated use. For impaired segments with multiple sampling stations, the sampling station with the highest geometric mean relative to the applicable criterion was used to calculate a percent reduction needed for that segment to attain applicable criteria established in the Massachusetts SWQS. These TMDL reductions provide a rough estimation of the pollutant abatement action needed for each segment to meet SWQS. For example, if the highest geometric mean from a Class A segment impaired for *E. coli* is 500 CFU/100 mL and the geometric mean water quality criterion is 126 CFU/100 mL, the percent reduction needed to meet the geometric mean criterion is calculated as follows:

Example: Initial percent reduction = [(500 – 126) / 500] x 100 = 75% reduction

The result of this analysis for each impaired segment is provided in the appendices. The reductions necessary to achieve the TMDLs are based on estimates of current indicator bacteria concentrations. Future development activities and land use changes have the potential to increase levels of indicator

bacteria or stormwater runoff associated with pollutants. These future activities will need to meet the TMDLs and be addressed in applicable watershed management plans and by state or local requirements.

4.5. Seasonal Variability

TMDLs must also account for seasonal variability. Pathogen inputs to Massachusetts' surface waters include a mix of dry- and wet-weather sources, and there may be no single critical seasonal or climatic condition that is protective for all other conditions. This TMDL has set WLAs and LAs for all known and suspected source categories equal to the Massachusetts SWQS independent of seasonal and climatic conditions. This will ensure the attainment of applicable criteria established in the Massachusetts SWQS regardless of seasonal and climatic conditions.

5. Implementation

Implementing measures to meet TMDLs require an iterative process, with realistic goals over a reasonable timeframe, and adjusted as warranted based on ongoing monitoring. A comprehensive control strategy is needed to address the numerous and diverse sources of pathogens in the impaired segments of this TMDL.

Controls on several types of pathogen sources are required as part of a comprehensive management strategy. Sources like sewer connections to drainage systems, leaking sewer pipes, SSOs, and failing septic systems are prohibited and must be eliminated. Individual sources must be first identified in the field before they can be abated. Pinpointing sources typically requires extensive monitoring of the receiving waters and upstream stormwater systems under both dry and wet weather conditions. A comprehensive program is needed to ensure illicit sources are identified and that appropriate actions will be taken to eliminate them. MassDEP, USEPA, municipalities, watershed associations, and other stakeholder groups have been successful in carrying out such monitoring, identifying sources, and, in some cases, mobilizing the responsible municipality and other entities to take corrective actions, largely through the MS4 General Permit program, which requires minimal control measures to identify and eliminate illicit discharges. Progress toward finding and eliminating illicit discharges can be followed in the annual municipal MS4 reports.

CSOs and stormwater runoff represent major sources of pathogens to the Commonwealth's rivers, and the current level of control is inadequate for applicable criteria established in the Massachusetts SWQS to be attained. Improving stormwater runoff quality is essential for restoring water quality and recreational uses. At a minimum and as required under the MS4 General Permit for applicable Phase I and Phase II communities, intensive application of non-structural BMPs is needed throughout Massachusetts to reduce pathogen loadings as well as loadings of other stormwater pollutants (e.g., nutrients and sediment) contributing to use impairment in Massachusetts' waterbodies. Depending on the degree of success of the non-structural stormwater BMP program, structural controls may become necessary.

The "*Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Manual for Massachusetts*" (ENSR, 2005) was developed to support implementation of pathogen TMDLs. TMDL implementation-related tasks are shown in Table 8. MassDEP, working with USEPA and other team partners, shall make every reasonable effort to assure implementation of this TMDL. These stakeholders can provide valuable assistance in defining hotspots and sources of pathogen contamination, as well as the implementation of mitigative or preventative measures.

5.1. Segment Prioritization for Implementation Activities

In this TMDL report, each pathogen-impaired segment was assigned a priority level of High, Medium, or Low for pollutant reduction activities (Table 8). Activities to reduce pathogen sources include source tracking to identify the location of pollutants (CWP, 2004), as well as stepwise implementation of structural and non-structural BMPs that reduce or eliminate pollutant sources.

Prioritization was based on indicator bacteria concentrations, suspected illicit discharges due to dry weather exceedances (refer to Section 5.1.1) or to the presence of CSOs or POTWs, proximity to sensitive environmental areas or public bathing beaches, and high risk for concentrated stormwater runoff from MS4-regulated areas. Regardless of priority, river segments included in this TMDL are listed as impaired for indicator bacteria on the 2018/2020 Integrated List of Waters and will all require remediation.

Since limited pollutant source information and data were available for each impaired segment, a simple scheme was used to prioritize segments based on the highest indicator bacteria concentrations observed. Data for each segment are summarized in the appendices. High priority was assigned to those segments where dry or wet weather concentrations (regardless of the specific indicator bacteria, refer to Section 5.1.1) were equal to or greater than 10,000 CFU/100 mL, as such high levels generally indicate a direct sanitary source. Medium priority was assigned to segments where concentrations ranged from 1,000 to 9,999 CFU/100mL since this range of concentrations generally indicates a direct sewage source that may

get diluted in the conveyance system. Low priority was assigned to segments where observed concentrations were less than 1,000 CFU/100 mL.

For segments with maximum indicator bacteria concentrations during dry weather, sources such as permitted discharges, failing septic systems, illicit sanitary sewers connected to storm drains, and/or leaking sewers may be the primary contributors. Bacteria source tracking during dry weather is usually more straightforward and successful than tracking wet weather sources, and when successful, can dramatically reduce pathogen levels in surface waters. Due to the public health risk that raw sewage in surface waters poses, plus the greater likelihood of success in tracking and eliminating these illicit connections, maximum indicator bacteria concentrations that occurred during dry weather were assigned higher priority.

When maximum indicator bacteria concentrations occurred during wet weather, potential sources may include inundated septic systems, surcharging sewers (e.g., CSOs or SSOs), and/or stormwater runoff. In urban areas, sources of elevated indicator bacteria concentrations can include runoff in areas with high populations of domestic animals or pets. Other potential sources include sanitary sewers connected to storm drains that result in flow that is delayed until the storm drain is flushed during wet weather. Segments with elevated indicator bacteria concentrations during wet weather should be evaluated for stormwater BMP implementation opportunities starting with less costly non-structural practices first (such as street sweeping, catch basin cleaning, and/or managerial approaches using local regulatory controls) and more expensive structural measures second. Additional study to identify the most cost efficient and effective technology would be required. All waterbody segments located in urbanized areas and therefore subject to the MS4 General Stormwater Permit are considered High Priority for the IDDE program and were adjusted higher in priority where the MS4 coverage area is greater than 10% in the segment watershed.

Segments were also assigned a high priority if there was a public swimming area present, regardless of the availability of indicator bacteria data. Prioritization was adjusted one level upward based on the presence of suspected illicit discharges (dry weather exceedances), and/or CSO or POTW discharge(s). Prioritization was also adjusted upward based on proximity to sensitive environmental areas (e.g., Areas of Critical Environmental Concern, Cold Water habitats, Outstanding Resource Waters, public water supplies, and shellfishing) and areas at high risk for concentrated stormwater runoff from MS4-regulated areas (i.e., the MS4 area represents 10% or greater of the contributing watershed). Segments that satisfy more than one of these criteria were adjusted upward one priority level.

In some cases, the impairment was not based on indicator bacteria data, but on administrative decisions (e.g., shellfish bed closures, beach closures, receiving water for NPDES discharges, etc.). As stated above, in segments with a public swimming area, high priority was assigned. In segments with one or more sensitive areas (as described above) located within the proximal segment watershed, the presence of POTW/CSO discharges, the suspected presence of illicit discharges, or an MS4-regulated area greater than 10% of the contributing watershed, medium priority was assigned. In segments where no sensitive environmental areas are present, then low priority was assigned. Regardless of priority, river and estuary segments included in this TMDL are listed as impaired for indicator bacteria on the 2018/2020 Integrated List of Waters and will all require remediation.

Table 8. Priority ranking for and potential pathogen sources to the pathogen impaired segments addressed in this TMDL.

The maximum single sample results for fecal indicator bacteria (*E. coli*, Enterococcus, or fecal coliform) were used to assign the priority for each segment (High ≥10,000 CFU/100mL, Medium = 1,000 to 9,999 CFU/100mL, Low <1,000 CFU/100mL). ND = no data available. Priority increased if dry weather condition on the day of maximum single sample occurrence (DRY/WET indicates a tie result under both conditions), proximal to sensitive areas such as Public Water Supplies (PWSs), Outstanding Resource Waters (ORWs), an Area of Critical Environmental Concern (ACEC) (whether the sensitive areas intersect the segment or the segment flows into a downstream watershed with more than 20% sensitive area coverage), if the waterbody has a Cold Water (CW) qualifier, and contains >10% MS4-regulated area in the segment watershed. High priority for presence of a bathing beach along the segment. These factors were used to determine the priority rank (High, Medium, or Low priority) for each segment. Potential pathogen sources include Publicly Owned Treatment Works (POTWs), Combined Sewer Overflows (CSOs), illicit discharges, urban stormwater runoff, septic systems, agriculture, pet waste, and wildlife waste.

Segment ID	Waterbody	Watershed Area (acres)	Percent MS4 Area in Watershed	Maximum Sample Parameter	Maximum Single Sample Result (CFU/100mL)	Wet/Dry	Cold Water	Proximal to Sensitive Area	Bathing Beach	Rank (H/M/L)	POTWs	CSOs	Illicit Discharges	Urban Stormwater	Septic Systems	Agriculture	Pet Waste	Wildlife Waste
Hoosic River Basin [Appendix A]																		
MA11-02	North Branch Hoosic River	27,928	5.40%	EC	380	DRY	X			M			X	X	X	X	X	X
MA11-03	Hoosic River	40,915	9.80%	EC	660	DRY	X			M			X	X	X	X	X	X
MA11-05	Hoosic River	131,152	8.00%	EC	2,200	DRY				H	X		X	X	X	X	X	X
Housatonic River Basin [Appendix B]																		
MA21-02	E. Branch Housatonic River	45,344	17.90%	EC	480	DRY		X		M			X	X	X	X	X	X
MA21-04	Housatonic River	109,022	17.50%	EC	536	WET		X		M	X		X	X	X	X	X	X
MA21-17	Southwest Branch Housatonic River	15,069	19.50%	EC	111,990	DRY	X	X		H			X	X	X	X	X	X
MA21-18	W. Branch Housatonic River	23,481	18.80%	EC	448	WET	X	X		M			X	X	X	X	X	X
Westfield River Basin [Appendix C]																		
MA32-04	Westfield River	108,159	0.00%	EC; FC	866; 120	WET; DRY	X	X	X	H			X	X	X	X	X	X
MA32-08	Little River	54,702	9.10%	EC; FC	2,420; 880	WET; WET	X			H			X	X	X	X	X	X
MA32-09	Powdermill Brook	12,542	64.50%	EC; FC	576; 290	WET; WET				M			X	X	X	X	X	X
MA32-22	Potash Brook	4,214	0.00%	EC; FC	2,420; 170	WET; WET	X			H			X	X	X	X	X	X
MA32-27	Miller Brook	320	90.90%	EC; FC	1,000; 1,340	DRY; DRY	X			H			X	X	X	X	X	X
MA32-28	White Brook	434	93.60%	EC; FC	576; 580	WET; WET	X			M			X	X	X	X	X	X
MA32-36	Little River	50,257	3.50%	EC; FC	2,420; 210	WET; WET	X	X		H			X	X	X	X	X	X
MA32-37	Ashley Brook	688	57.90%	EC	2,420	WET				H			X	X	X	X	X	X
MA32-39	Jacks Brook	1,853	32.30%	EC	2,420	WET		X		H			X	X	X	X	X	X
MA32-41	Moose Meadow Brook	5,207	0.10%	EC; FC	2,760; 6,040	WET; WET				M			X	X	X	X	X	X

Segment ID	Waterbody	Watershed Area (acres)	Percent MS4 Area in Watershed	Maximum Sample Parameter	Maximum Single Sample Result (CFU/100mL)	Wet/Dry	Cold Water	Proximal to Sensitive Area	Bathing Beach	Rank (H/M/L)	POTWs	CSOs	Illicit Discharges	Urban Stormwater	Septic Systems	Agriculture	Pet Waste	Wildlife Waste
Deerfield River Basin [Appendix D]																		
MA33-03	Deerfield River	365,497	0.10%	EC; FC	2,050; 2,800	DRY; DRY				H	X		X	X	X	X	X	X
MA33-04	Deerfield River	424,623	1.40%	EC; FC	2,910; 3,600	DRY; DRY				H	X		X	X	X	X	X	X
MA33-19	East Branch North River	34,691	0.00%	EC; FC	2,420; 630	DRY; DRY	X			H			X	X	X	X	X	X
MA33-21	Hinsdale Brook	3,426	1.60%	EC; FC	921; 1,100	DRY; DRY	X	X		M			X	X	X	X	X	X
MA33-30	Green River	57,144	8.80%	EC; FC	2,760; 3,300	DRY; DRY	X			H			X	X	X	X	X	X
MA33-101	South River	11,525	0.00%	EC; FC	921; 800	DRY; DRY	X			M			X	X	X	X	X	X
MA33-102	South River	16,832	0.00%	EC; FC	2,420; 1,600	DRY; DRY				H			X	X	X	X	X	X
Connecticut River Basin [Appendix E]																		
MA34-03	Connecticut River	4,609,991	1.40%	ND	ND	ND				M	X	X	X	X	X	X	X	X
MA34-04	Connecticut River	5,317,766	2.30%	EC	180	WET				M	X	X	X	X	X	X	X	X
MA34-05	Connecticut River	6,170,533	4.20%	EC	260	WET				M	X	X	X	X	X	X	X	X
MA34-07	Bachelor Brook	20,178	20.30%	EC	300	WET				M	X		X	X	X	X	X	X
MA34-11	Manhan River	91,611	18.10%	EC	1,200	WET		X		H	X		X	X	X	X	X	X
MA34-19	Stony Brook	14,635	54.70%	EC	970	DRY				M			X	X	X	X	X	X
MA34-21	Longmeadow Brook	3,372	100.00%	EC	4,000	WET				H			X	X	X	X	X	X
MA34-25	Mill River	19,225	19.50%	EC	440	WET				H			X	X	X	X	X	X
MA34-27	Fort River	35,055	21.70%	EC	1,500	WET				H			X	X	X	X	X	X
MA34-28	Mill River	34,814	9.10%	EC	2,900	WET				M			X	X	X	X	X	X
MA34-29	Mill River	21,581	90.00%	EC	4,000	WET				H		X	X	X	X	X	X	X
MA34-30	Scantic River	15,967	5.90%	EC	3,600	WET				M			X	X	X	X	X	X
MA34-36	Bloody Brook	3,618	33.90%	EC	960	WET				M			X	X	X	X	X	X
MA34-42	Buttery Brook	2,024	100.00%	EC	4,200	DRY				H			X	X	X	X	X	X
MA34-60	Unnamed Tributary	1,866	100.00%	EC	20,000	WET				H			X	X	X	X	X	X
Millers River Basin [Appendix F]																		
MA35-16	Keyup Brook	4,518	0.00%	EC; FC	270; 360	DRY; DRY				M			X	X	X	X	X	X
Chicopee River Basin [Appendix G]																		
MA36-05	Ware River	106,111	1.80%	EC	900	DRY		X		M	X		X	X	X	X	X	X
MA36-06	Ware River	137,373	4.10%	EC	1,050	DRY		X		H	X		X	X	X	X	X	X
MA36-08	Prince River	8,970	0.00%	EC	800	DRY	X	X		M			X	X	X	X	X	X
MA36-11	Sevenmile River	20,184	15.10%	EC	1,360	WET				H			X	X	X	X	X	X
MA36-12	Sevenmile River	26,378	15.00%	EC	1,440	WET				H	X		X	X	X	X	X	X
MA36-15	Quaboag River	93,842	11.10%	EC	2,420	DRY				H	X		X	X	X	X	X	X

Segment ID	Waterbody	Watershed Area (acres)	Percent MS4 Area in Watershed	Maximum Sample Parameter	Maximum Single Sample Result (CFU/100mL)	Wet/Dry	Cold Water	Proximal to Sensitive Area	Bathing Beach	Rank (H/M/L)	POTWs	CSOs	Illicit Discharges	Urban Stormwater	Septic Systems	Agriculture	Pet Waste	Wildlife Waste
MA36-16	Quaboag River	115,178	9.80%	EC	800	DRY				M	X		X	X	X	X	X	X
MA36-17	Quaboag River	135,813	11.80%	EC	830	WET		X		M	X		X	X	X	X	X	X
MA36-18	Forget-Me-Not Brook	798	48.80%	EC	620	DRY	X			M			X	X	X	X	X	X
MA36-21	Chicopee Brook	15,375	6.60%	EC	800	WET	X			M			X	X	X	X	X	X
MA36-22	Chicopee River	424,521	6.60%	EC	900	DRY		X		M	X	X	X	X	X	X	X	X
MA36-24	Chicopee River	457,169	10.50%	EC	510	WET		X		M	X	X	X	X	X	X	X	X
MA36-25	Chicopee River	462,582	11.50%	EC	890	WET				M	X	X	X	X	X	X	X	X
MA36-39	Unnamed Tributary	1,074	100.00%	EC	200	DRY		X		M			X	X	X	X	X	X
MA36-40	Abbey Brook	843	100.00%	-	ND	-		X		H			X	X	X		X	X
MA36-41	Fuller Brook	7,124	49.10%	-	ND	-		X		M			X	X	X	X	X	X
MA36-50	Danforth Brook	3,490	0.00%	EC	800	WET		X		L			X	X	X	X	X	X
Quinebaug River Basin [Appendix H]																		
MA41-03	Quinebaug River	93,943	11.30%	EC	980	DRY				M	X		X	X	X	X	X	X
MA41-04	Quinebaug River	96,297	11.30%	EC	2,420	WET				H	X		X	X	X	X	X	X
MA41-06	Cady Brook	7,846	28.00%	EC	1,990	WET				H	X		X	X	X	X	X	X
MA41-12	Cohasse Brook	2,609	18.00%	-	ND	-		X		L			X	X	X	X	X	X
MA41-13	Mckinstry Brook	5,129	13.60%	-	ND	-				L			X	X	X	X	X	X
MA41-16	Unnamed Tributary	3,915	0.00%	-	ND	-				L			X	X	X	X	X	X
MA41-17	West Brook	907	0.00%	EC	816	WET				L			X	X	X	X	X	X
French River Basin [Appendix I]																		
MA42-07	Burncoat Brook	2,868	96.70%	-	ND	-				M			X	X	X	X	X	X
MA42-11	Wellington Brook	2,303	49.10%	EC	866	DRY				M			X	X	X	X	X	X
MA42-15	Sucker Brook	1,644	8.50%	-	ND	-				L			X	X	X	X	X	X
MA42-18	Grindstone Brook	1,905	33.10%	-	ND	-				L			X	X	X	X	X	X
Blackstone River Basin [Appendix J]																		
MA51-01	Kettle Brook	19,433	50.50%	EC	2,420	WET		X		H			X	X	X	X	X	X
MA51-02	Middle River	32,143	59.70%	EC	1,410	DRY				H			X	X	X	X	X	X
MA51-03	Blackstone River	86,589	76.30%	EC	4,400	WET				H	X	X	X	X	X	X	X	X
MA51-04	Blackstone River	94,167	76.40%	EC	10,000	WET				H	X		X	X	X	X	X	X
MA51-05	Blackstone River	167,753	57.60%	EC	12,000	WET				H	X		X	X	X	X	X	X
MA51-06	Blackstone River	232,043	47.50%	EC	5,400	WET				H	X		X	X	X	X	X	X
MA51-07	Beaver Brook	2,799	100.00%	EC	9,800	DRY				H			X	X	X	X	X	X
MA51-08	Unnamed Tributary	8,216	100.00%	EC	10,110	DRY				H		X	X	X	X	X	X	X

Segment ID	Waterbody	Watershed Area (acres)	Percent MS4 Area in Watershed	Maximum Sample Parameter	Maximum Single Sample Result (CFU/100mL)	Wet/Dry	Cold Water	Proximal to Sensitive Area	Bathing Beach	Rank (H/M/L)	POTWs	CSOs	Illicit Discharges	Urban Stormwater	Septic Systems	Agriculture	Pet Waste	Wildlife Waste
MA51-15	Tatnuck Brook	6,881	51.70%	EC	2,300	WET		X		H			X	X	X	X	X	X
MA51-16	Dark Brook	7,275	53.80%	EC	2,100	WET		X		H			X	X	X	X	X	X
MA51-17	Poor Farm Brook	2,478	92.90%	EC	2,100	WET				H			X	X	X	X	X	X
MA51-18	Peters River	7,815	80.50%	EC	1,200	WET				H			X	X	X	X	X	X
MA51-27	Coal Mine Brook	801	100.00%	EC	2,000	WET	X			H			X	X	X	X	X	X
MA51-31	Singletary Brook	3,701	42.70%	EC	500	WET				M			X	X	X	X	X	X
MA51-32	Arnolds Brook	795	100.00%	EC	490	WET				M			X	X	X	X	X	X
MA51-36	Mill River	21,193	57.20%	EC	760	DRY				M	X		X	X	X	X	X	X
MA51-39	Fox Brook	2,874	40.60%	EC	18,000	DRY				H			X	X	X	X	X	X
MA51-40	Muddy Brook	3,983	46.20%	EC	2,400	DRY				H			X	X	X	X	X	X
MA51-45	Cronin Brook	1,838	100.00%	EC	2,100	WET				H			X	X	X	X	X	X
Ten Mile River Basin [Appendix K]																		
MA52-02	Ten Mile River	7,040	85.30%	EC; ENT	3,700; 250	DRY; DRY				H			X	X	X	X	X	X
MA52-03	Ten Mile River	27,123	94.40%	EC	2,900	DRY				H	X		X	X	X	X	X	X
MA52-05	Speedway Brook	2,174	100.00%	EC; ENT; FC	24,200; 1,600; 14,000	DRY; DRY; DRY				H			X	X	X	X	X	X
MA52-07	Sevenmile River	3,192	89.10%	EC	3,500	DRY		X		H			X	X	X	X	X	X
MA52-08	Sevenmile River	8,087	95.70%	EC; ENT	1,730; 130	DRY; DRY		X		H			X	X	X	X	X	X
MA52-09	Scotts Brook	791	55.90%	EC	5,700	DRY				H			X	X	X	X	X	X
MA52-11	Coles Brook	2,092	15.00%	EC	6,300	DRY				H			X	X	X	X	X	X
Narragansett Bay (Shore) Coastal Drainage Area [Appendix L]																		
MA53-19	Bliss Brook	1,394	25.30%	EC	1,190	WET				H			X	X	X	X	X	X
MA53-20	Runnins River	2,630	55.30%	EC; ENT	7,270; 1,800	DRY; DRY				H			X	X	X	X	X	X
MA53-21	Unnamed Tributary	208	100.00%	EC	2,420	DRY				H			X	X	X		X	X
Mount Hope Bay (Shore) Coastal Drainage Area [Appendix M]																		
MA61-05	Quequechan River	19,312	55.70%	EC	90	WET				M		X	X	X	X	X	X	X
MA61-09	Lewin Brook	1,707	15.90%	EC	570	WET				M			X	X	X	X	X	X
Taunton River Basin [Appendix N]																		
MA62-01	Taunton River	193,632	56.20%	EC; FC	1,600; 1,600	DRY; DRY				M	X		X	X	X	X	X	X
Mystic River Basin and Coastal Drainage Area [Appendix O]																		
MA71-10	Cummings Brook	2,548	100.00%	EC	500	DRY				M			X	X	X	X	X	X
MA71-11	Shaker Glen Brook	1,775	100.00%	EC	1,300	DRY				H			X	X	X	X	X	X
MA71-15	Munroe Brook	952	100.00%	EC	660	WET				M			X	X	X	X	X	X

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Charles River Basin and Coastal Drainage Area [Appendix P]																		
MA72-12	Beaver Brook	1,825	56.50%	EC	510	DRY				M			X	X	X		X	X
MA72-14	Mine Brook	10,064	93.10%	EC	340	DRY		X		M			X	X	X	X	X	X
MA72-34	Chicken Brook	4,600	100.00%	EC	730	DRY				M			X	X	X	X	X	X
MA72-35	Hopping Brook	7,045	72.10%	EC	730	DRY				M			X	X	X	X	X	X
MA72-41	Unnamed Tributary	429	0.00%	EC	2,600	DRY				H			X	X	X	X	X	X
MA72-43	Unnamed Tributary	4,582	100.00%	EC	430	DRY				M			X	X	X	X	X	X
MA72-44	Seaverns Brook	1,592	100.00%	EC	9,500	DRY				H			X	X	X	X	X	X
Neponset River Basin and Coastal Drainage Area [Appendix Q]																		
MA73-18	Steep Hill Brook	3,811	100.00%	EC	1,100	DRY				H			X	X	X	X	X	X
MA73-23	Plantingfield Brook	959	100.00%	EC	8,000	WET				H			X	X	X	X	X	X
Weymouth & Weir River Basin and Coastal Drainage Area [Appendix R]																		
MA74-10	Furnace Brook	2,526	100.00%	EC	510	DRY				M			X	X	X		X	X
MA74-20	Plymouth River	2,711	100.00%	EC	980	DRY				M			X	X	X		X	X
MA74-22	Cranberry Brook	1,165	100.00%	EC	3,700	WET		X		H			X	X	X		X	X
MA74-23	Mary Lee Brook	898	100.00%	EC	3,700	WET				H			X	X	X		X	X
MA74-27	Farm River	8,139	100.00%	EC	1,500	WET		X		H			X	X	X	X	X	X
MA74-28	Farm River	8,267	100.00%	EC	43	DRY				M			X	X	X	X	X	X
Nashua River Basin [Appendix S]																		
MA81-01	North Nashua River	37,669	17.40%	EC	11,000	DRY				H		X	X	X	X	X	X	X
MA81-02	North Nashua River	55,453	27.10%	EC	3,600	DRY				H	X	X	X	X	X	X	X	X
MA81-03	North Nashua River	64,031	29.00%	EC	2,420	DRY				H	X	X	X	X	X	X	X	X
MA81-04	North Nashua River	85,951	30.00%	EC	2,420	WET		X		H	X		X	X	X	X	X	X
MA81-05	Nashua River	219,874	28.00%	EC	2,420	WET		X		H	X		X	X	X	X	X	X
MA81-09	Nashua River	83,894	22.60%	EC	2,420	WET		X		H	X		X	X	X	X	X	X
MA81-13	Monoosnoc Brook	7,148	29.90%	EC	2,420	DRY		X		H			X	X	X	X	X	X
MA81-20	James Brook	2,808	36.90%	EC	2,420	WET		X		H			X	X	X	X	X	X
MA81-24	Gates Brook	2,003	78.70%	EC	1,200	WET		X		H			X	X	X	X	X	X
MA81-31	Stillwater River	18,849	0.30%	EC	3,300	WET		X		M			X	X	X	X	X	X
MA81-39	Fall Brook	4,605	68.80%	EC	320	DRY		X		M			X	X	X	X	X	X
MA81-60	Still River	1,524	6.10%	EC	400	DRY		X		M			X	X	X	X	X	X
MA81-62	Baker Brook	11,685	29.40%	EC	470	WET				M		X	X	X	X	X	X	X
MA81-72	Wekepeke Brook	7,500	16.40%	EC	2,420	WET		X		H			X	X	X	X	X	X

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MA81-74	Catacoonamug Brook	5,470	46.30%	EC	4,400	WET		X		H			X	X	X	X	X	X
MA81-79	Willard Brook	10,984	4.30%	EC	330	DRY		X	X	H			X	X	X	X	X	X
MA81-80	Pearl Hill Brook	4,643	3.80%	EC	26	DRY		X	X	H			X	X	X	X	X	X
MA81-99	Falulah Brook	2,645	0.00%	-	ND	-				L			X	X	X	X	X	X
MA81-100	Falulah Brook	8,080	13.90%	-	ND	-		X		M			X	X	X	X	X	X
Concord (SuAsCo) River Basin [Appendix T]																		
MA82A-03	Sudbury River	74,671	81.20%	EC; FC	1,730; 650	WET; WET				H			X	X	X	X	X	X
MA82A-05	Hop Brook	9,980	95.10%	EC	430	DRY				M	X		X	X	X	X	X	X
MA82A-07	Concord River	234,601	68.40%	EC; FC	500; 590	WET; WET				M	X		X	X	X	X	X	X
MA82A-09	Concord River	256,077	69.80%	EC; FC	980; 440	DRY; WET				M	X	X	X	X	X	X	X	X
MA82A-10	River Meadow Brook	17,195	81.30%	EC; FC	8,400; 12,000	DRY; DRY				H			X	X	X	X	X	X
MA82A-19	Pantry Brook	3,853	57.30%	-	ND	-				M			X	X	X	X	X	X
MA82A-22	Unnamed Tributary	13,036	83.90%	EC	410	WET		X		M			X	X	X	X	X	X
MA82A-25	Sudbury River	27,748	61.90%	EC; FC	540; 610	WET; WET		X		M			X	X	X	X	X	X
MA82A-34	Beaver Brook	3,575	100.00%	EC	510	DRY				M			X	X	X	X	X	X
MA82B-02	Assabet River	12,771	97.20%	EC; FC	2,800; 17,000	WET; DRY				H	X		X	X	X	X	X	X
MA82B-03	Assabet River	22,608	84.70%	EC; FC	2,000; 1,600	DRY; DRY				H	X		X	X	X	X	X	X
MA82B-04	Assabet River	47,365	61.50%	EC; FC	8,000; 12,000	DRY; DRY				H	X		X	X	X	X	X	X
MA82B-05	Assabet River	61,211	61.10%	EC; FC	1,990; 340	WET; WET				H	X		X	X	X	X	X	X
MA82B-07	Assabet River	113,674	60.60%	EC; FC	1,400; 2,400	DRY; DRY				H	X		X	X	X	X	X	X
MA82B-12	Elizabeth Brook	11,314	12.30%	EC	620	WET				M			X	X	X	X	X	X
MA82B-14	Nashoba Brook	13,512	77.30%	EC	2,420	WET				H			X	X	X	X	X	X
MA82B-22	Coles Brook	1,277	100.00%	EC	3,000	WET				H			X	X	X	X	X	X
Shawsheen River Basin [Appendix U]																		
MA83-22	Webb Brook	762	100.00%	EC	6,700	DRY				H			X	X	X	X	X	X
Merrimack River Basin and Coastal Drainage Area [Appendix V]																		
MA84A-01	Merrimack River	2,643,112	11.10%	-	ND	-		X		M		X	X	X	X	X	X	X
MA84A-02	Merrimack River	2,962,287	17.60%	-	ND	-		X		M		X	X	X	X	X	X	X
MA84A-03	Merrimack River	2,984,894	18.10%	-	ND	-		X		M	X	X	X	X	X	X	X	X
MA84A-04	Merrimack River	3,105,500	20.90%	-	ND	-				M	X	X	X	X	X	X	X	X
MA84A-05	Merrimack River	3,153,135	21.70%	EC	580	WET		X		M	X	X	X	X	X	X	X	X
MA84A-06	Merrimack River	3,204,333	22.20%	-	ND	-		X	X	H	X	X	X	X	X	X	X	X
MA84A-08	Powwow River	37,876	49.00%	-	ND	-		X		M			X	X	X	X	X	X

Segment ID	Waterbody	Watershed Area (acres)	Percent MS4 Area in Watershed	Maximum Sample Parameter	Maximum Single Sample Result (CFU/100mL)	Wet/Dry	Cold Water	Proximal to Sensitive Area	Bathing Beach	Rank (H/M/L)	POTWs	CSOs	Illicit Discharges	Urban Stormwater	Septic Systems	Agriculture	Pet Waste	Wildlife Waste
MA84A-09	Little River	18,634	100.00%	EC	380	DRY				M		X	X	X	X	X	X	X
MA84A-10	Spicket River	35,199	90.80%	-	ND	-				M		X	X	X	X	X	X	X
MA84A-11	Beaver Brook	13,688	79.60%	EC	6,000	DRY	X			H		X	X	X	X	X	X	X
MA84A-12	Richardson Brook	2,733	62.10%	-	ND	-				M			X	X	X	X	X	X
MA84A-13	Trout Brook	1,545	32.90%	-	ND	-				M			X	X	X	X	X	X
MA84A-14	Trull Brook	3,113	100.00%	-	ND	-				M			X	X	X		X	X
MA84A-16	Back River	3,929	54.30%	-	ND	-				M			X	X	X	X	X	X
MA84A-17	Black Brook	2,099	100.00%	-	ND	-				M			X	X	X		X	X
MA84A-18	Bare Meadow Brook	4,969	100.00%	-	ND	-				M			X	X	X	X	X	X
MA84A-21	Deep Brook	1,678	100.00%	EC	6,800	WET				H			X	X	X	X	X	X
MA84A-25	Powwow River	32,174	45.60%	-	ND	-				M			X	X	X	X	X	X
MA84A-26	Merrimack River	276	85.80%	-	ND	-		X		M			X	X	X		X	X
MA84A-27	Plum Island River	1,821	10.90%	-	ND	-		X		M			X	X	X	X	X	X
MA84A-28	Powwow River	31,278	44.80%	EC	230	WET		X		M			X	X	X	X	X	X
MA84A-30	Unnamed Tributary	4,590	60.80%	-	ND	-				M			X	X	X	X	X	X
MA84A-31	S. Branch Souhegan River	5,530	0.00%	EC	550	WET				L			X	X	X	X	X	X
MA84A-35	Peppermint Brook	1,155	100.00%	-	ND	-				M			X	X	X	X	X	X
MA84A-36	Bartlett Brook	4,346	72.00%	-	ND	-				M			X	X	X	X	X	X
MA84A-37	Creek Brook	3,527	100.00%	-	ND	-				M			X	X	X	X	X	X
MA84A-39	East Meadow River	4,540	57.90%	-	ND	-		X		M			X	X	X	X	X	X
MA84A-40	Fish Brook	3,882	100.00%	-	ND	-		X		M			X	X	X	X	X	X
MA84B-01	Unnamed Tributary	836	65.80%	-	ND	-				M			X	X	X	X	X	X
MA84B-02	Beaver Brook	8,527	71.70%	-	ND	-				M			X	X	X	X	X	X
MA84B-03	Stony Brook	24,325	77.40%	EC	150	DRY				M			X	X	X	X	X	X
MA84B-04	Stony Brook	29,130	81.20%	EC	790	DRY				M			X	X	X	X	X	X
MA84B-06	Bennetts Brook	2,978	37.70%	-	ND	-				M			X	X	X	X	X	X
MA84B-07	Tadmuck Brook	1,271	100.00%	-	ND	-				M			X	X	X	X	X	X
Ipswich River Basin and Coastal Drainage Area [Appendix W]																		
MA92-02	Ipswich River	99,827	67.70%	-	ND	-		X		M			X	X	X	X	X	X
MA92-05	Lubbers Brook	3,772	100.00%	EC; FC	340; 210	DRY; WET				M			X	X	X		X	X
MA92-08	Martins Brook	8,460	100.00%	EC; FC	2,000; 1,200	DRY; DRY				H			X	X	X	X	X	X
MA92-12	Unnamed Tributary	2,184	100.00%	EC; FC	1,200; 3,000	WET; WET				H			X	X	X	X	X	X
MA92-14	Fish Brook	11,602	38.60%	EC; FC	960; 630	WET; DRY				M			X	X	X	X	X	X

Segment ID	Waterbody	Watershed Area (acres)	Percent MS4 Area in Watershed	Maximum Sample Parameter	Maximum Single Sample Result (CFU/100mL)	Wet/Dry	Cold Water	Proximal to Sensitive Area	Bathing Beach	Rank (H/M/L)	POTWs	CSOs	Illicit Discharges	Urban Stormwater	Septic Systems	Agriculture	Pet Waste	Wildlife Waste
MA92-17	Howlett Brook	6,686	45.20%	EC; FC	410; 1000	DRY; WET				H			X	X	X	X	X	X
MA92-21	Kimball Brook	661	87.80%	EC; FC	990; 4,000	WET; WET				H			X	X	X	X	X	X
MA92-22	Labor in Vain Creek	1,334	21.30%	-	ND	-				M			X	X	X	X	X	X
MA92-23	Unnamed Tributary	349	3.00%	-	ND	-		X		M	X		X	X	X	X	X	X
North Shore Coastal Drainage Area [Appendix X]																		
MA93-37	Beaver Brook	1,458	100.00%	EC	3,800	WET				H			X	X	X	X	X	X
MA93-38	Crane River	3,375	100.00%	EC	3,400	WET				H			X	X	X	X	X	X
MA93-58	Unnamed Tributary	990	100.00%	EC; ENT	1,600; 14,000	WET; WET				H			X	X	X		X	X
MA93-59	Unnamed Tributary	1,133	70.40%	EC; ENT	3,000; 4,600	DRY; WET				H			X	X	X	X	X	X
South Shore Coastal Drainage Area [Appendix Y]																		
MA94-04	Indian Head River	19,488	99.90%	EC; FC	250; 340	DRY; DRY				M			X	X	X	X	X	X
MA94-39	Longwater Brook	1,905	100.00%	EC	488	DRY				M			X	X	X	X	X	X
MA94-40	Cushing Brook	2,612	100.00%	EC	2,420	DRY				H			X	X	X		X	X
Buzzards Bay Coastal Drainage Area [Appendix Z]																		
MA95-04	Weweantic River	36,368	35.20%	EC; ENT; FC	1,600; 1,600; 1,600	WET; WET; WET		X		H			X	X	X	X	X	X
MA95-06	Sippican River	17,987	2.90%	EC; ENT; FC	1,600; 1,600; 1,600	WET; WET; WET		X		H			X	X	X	X	X	X
MA95-11	Paskamanset River	18,333	46.30%	EC; ENT; FC	17,330; 1,600; 1,600	WET; WET; WET				H			X	X	X	X	X	X
MA95-12	Shingle Island River	13,503	7.50%	EC; ENT; FC	440; 180; 500	DRY; DRY; DRY		X		M			X	X	X	X	X	X
MA95-19	Megansett Harbor	5,464	45.30%	ND	ND	ND		X	X	H			X	X	X	X	X	X
MA95-36	Mattapoisett River	15,568	1.50%	EC; ENT; FC	1,600; 1,600; 1,600	WET; WET; WET				M			X	X	X	X	X	X
MA95-68	Wild Harbor River	1,583	74.80%	-	ND	-				M			X	X	X	X	X	X
MA95-78	Rands Harbor	1,255	62.20%	-	ND	-				M			X	X	X		X	X
MA95-79	Fiddlers Cove	282	80.10%	-	ND	-				M			X	X	X		X	X
MA95-82	Kirby Brook	2,447	12.80%	EC; ENT; FC	1,500; 1,600; 2,600	DRY; DRY; WET				H			X	X	X	X	X	X
MA95-83	Angeline Brook	2,216	0.00%	EC; ENT; FC	1,600; 1,600; 1,600	DRY; DRY; DRY				H			X	X	X	X	X	X
Cape Cod Coastal Drainage Area [Appendix AA]																		
MA96-75	Round Cove	332	73.50%	-	ND	-		X		M			X	X	X		X	X
MA96-95	Allens Harbor	229	99.70%	-	ND	-				M			X	X	X	X	X	X
MA96-96	Wychmere Harbor	281	100.00%	-	ND	-		X	X	H			X	X	X		X	X

Segment ID	Waterbody	Watershed Area (acres)	Percent MS4 Area in Watershed	Maximum Sample Parameter	Maximum Single Sample Result (CFU/100mL)	Wet/Dry	Cold Water	Proximal to Sensitive Area	Bathing Beach	Rank (H/M/L)	POTWs	CSOs	Illicit Discharges	Urban Stormwater	Septic Systems	Agriculture	Pet Waste	Wildlife Waste
MA96-99	Little River	940	92.70%	EC	900	DRY				M			X	X	X	X	X	X
MA96-100	Unnamed Tributary	638	100.00%	EC	1,900	DRY				H			X	X	X		X	X
MA96-102	Whites Brook	734	54.10%	EC	2,200	WET				H			X	X	X	X	X	X
MA96-103	Chase Garden Creek	392	67.30%	EC	1,500	DRY				H			X	X	X	X	X	X
MA96-104	Unnamed Tributary	976	74.80%	EC	1,000	DRY				H			X	X	X	X	X	X
MA96-107	Red River	1,169	100.00%	EC	6,100	WET				H			X	X	X		X	X
MA96-108	Unnamed Tributary	1,256	0.00%	EC	800	DRY				M			X	X	X		X	X
Islands Coastal Drainage Area [Appendix AB]																		
MA97-16	Katama Bay	4,774	6.40%	-	ND	-		X	X	H			X	X	X	X	X	X
MA97-29	Long Pond	1,573	0.00%	-	ND	-		X		M			X	X	X		X	X

5.1.1. Wet-Dry Weather Analysis

The determination of weather conditions during sampling events (i.e., wet or dry weather) assists investigators in identifying likely sources of pollutants, thus supporting the prioritization of remediation efforts. To determine wet or dry weather status, daily precipitation totals were matched to each sampling data point based on the methods described below (note: hourly precipitation data were not available at sufficient spatial and temporal scales).

Rainfall data were obtained from 31 weather stations with near-complete data (>89%). Weather data were obtained from the National Oceanic & Atmospheric Administration National Centers for Environmental Information (NOAA NCEI) directly or indirectly from MassDEP. Weather conditions were defined as “wet” when precipitation was >0.50” in the prior 72 hours (including the day of sample collection) and “dry” when “wet” thresholds were not met. Since wet or dry weather status is used to target implementation measures, an assumption was made that any rainfall that fell on the sampling day occurred before collecting the sample. Therefore, if the rain that fell on that date occurred after sample collection, the sample may be misclassified as wet weather. For stations with missing information, data gaps were filled with data from the nearest weather station, provided one was within 20 miles of the watershed border or 30 miles of the segment centroid. A map and corresponding table of the sampling sites, as well as the rainfall stations, are shown in Figure 4 and Table 9.

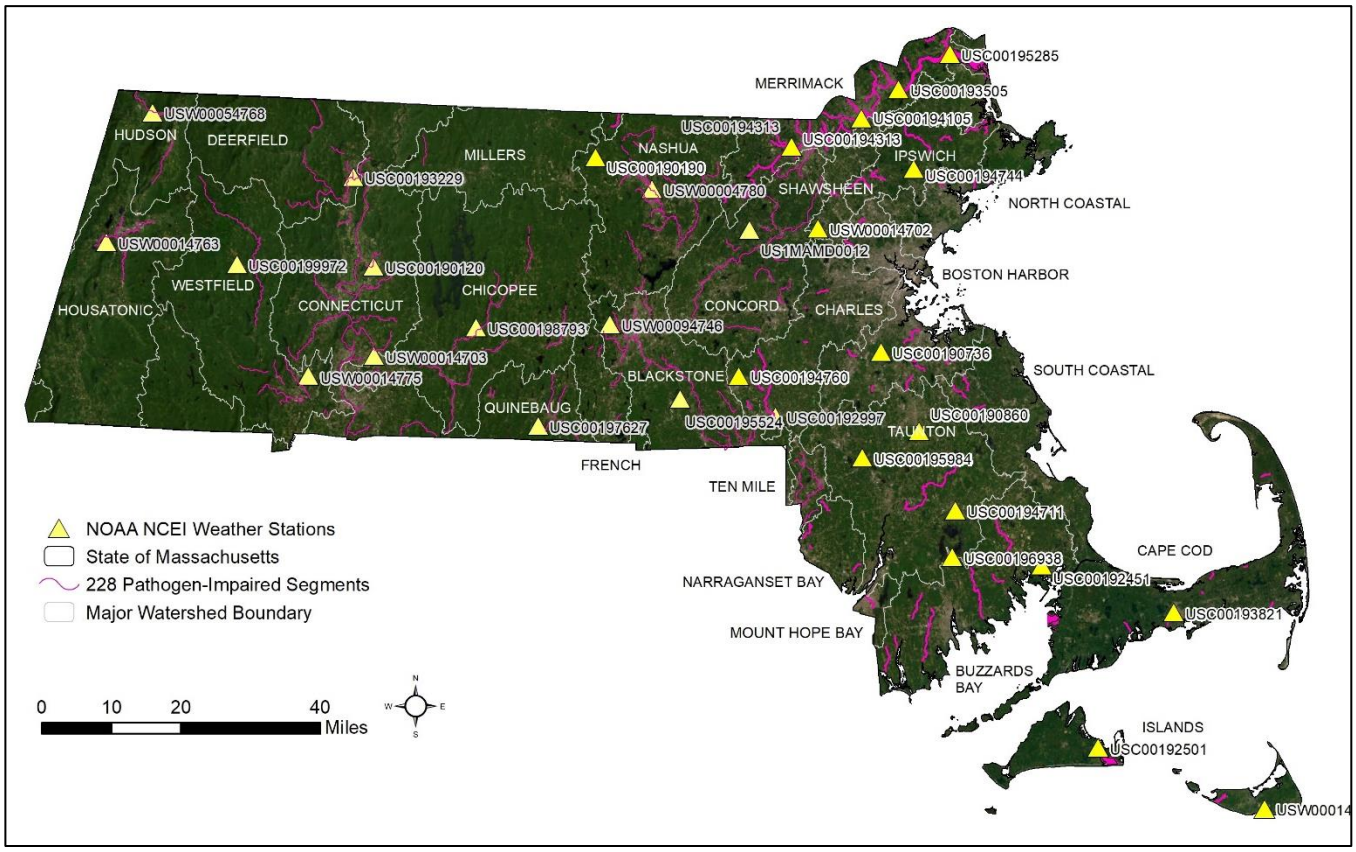

Figure 4. Weather Station Locations for Dry-Wet Weather Analysis

Table 9. List of Weather Stations Matched with Segments

Major Watershed	Weather Station	Rainfall Date Range	Segment ID
Hoosic River Basin [Appendix A]	NORTH ADAMS HARRIMAN AIRPORT MA US	2005-2015	MA11-02, MA11-03, MA11-05
Housatonic River Basin [Appendix B]	PITTSFIELD MUNICIPAL AIRPORT MA US	2005-2015	MA21-02, MA21-04, MA21-17, MA21-18
Westfield River Basin [Appendix C]	WESTFIELD BARNES MUNICIPAL AIRPORT MA US	2005-2015	MA32-08, MA32-09, MA32-22, MA32-27, MA32-28, MA32-36, MA32-37, MA32-39, MA32-41
	WORTHINGTON MA US	2005-2015	MA32-04
Deerfield River Basin [Appendix D]	GREENFIELD NUMBER 3 MA US	2005-2015	MA33-03, MA33-04, MA33-101, MA33-102, MA33-19, MA33-21, MA33-30
Connecticut River Basin [Appendix E]	AMHERST MA US	2005-2019	MA34-04, MA34-25, MA34-27, MA34-28
	CHICOPEE FALLS WESTOVER FIELD MA US	2005-2015	MA34-05, MA34-07, MA34-19, MA34-21, MA34-29, MA34-42, MA34-60
	GREENFIELD NUMBER 3 MA US	2005-2015	MA34-03, MA34-36
	WARE MA US	2005-2015	MA34-30
	WESTFIELD BARNES MUNICIPAL AIRPORT MA US	2005-2015	MA34-11
Millers River Basin [Appendix F]	GREENFIELD NUMBER 3 MA US	2005-2015	MA35-16
Chicopee River Basin [Appendix G]	CHICOPEE FALLS WESTOVER FIELD MA US	2005-2015	MA36-24, MA36-25, MA36-39, MA36-40, MA36-41
	WARE MA US	2005-2015	MA36-05, MA36-06, MA36-15, MA36-16, MA36-17, MA36-21, MA36-22, MA36-50
	WORCESTER MA US	2005-2015	MA36-08, MA36-11, MA36-12, MA36-18
Quinebaug River Basin [Appendix H]	SOUTHBRIDGE 3 SW MA US	2005-2015	MA41-03, MA41-04, MA41-06, MA41-12, MA41-13
	WARE MA US	2005-2015	MA41-16, MA41-17
French River Basin [Appendix I]	SOUTHBRIDGE 3 SW MA US	2005-2015	MA42-11, MA42-15
	WORCESTER MA US	2005-2015	MA42-07, MA42-18
Blackstone River Basin [Appendix J]	FRANKLIN MA US	2005-2015	MA51-18, MA51-32, MA51-36
	NORTHBRIDGE 2 MA US	2005-2015	MA51-04, MA51-05, MA51-06, MA51-39, MA51-40
	WORCESTER MA US	2005-2015	MA51-01, MA51-02, MA51-03, MA51-07, MA51-08, MA51-15, MA51-16, MA51-17, MA51-27, MA51-31, MA51-45
Ten Mile River Basin [Appendix K]	FRANKLIN MA US	2005-2015	MA52-02, MA52-03, MA52-05, MA52-07, MA52-08, MA52-09, MA52-11
Narragansett Bay (Shore) Coastal Drainage Area [Appendix L]	NORTON WEST, MA US	2005-2019	MA53-19, MA53-20, MA53-21
Mount Hope Bay (Shore) Coastal Drainage Area [Appendix M]	ROCHESTER, MA US	2005-2019	MA61-05, MA61-09, MA95-11, MA95-12, MA95-36, MA95-82, MA95-83

Major Watershed	Weather Station	Rainfall Date Range	Segment ID
Taunton River Basin [Appendix N]	MIDDLEBORO, MA US	2005-2019	MA62-01
Mystic River Basin and Coastal Drainage Area [Appendix O]	BEDFORD HANSCOM FIELD, MA US	2005-2019	MA71-11, MA71-10, MA71-15
Charles River Basin and Coastal Drainage Area [Appendix P]	BEDFORD HANSCOM FIELD, MA US	2005-2019	MA72-43, MA72-44
	MILFORD, MA US	2005-2019	MA72-12, MA72-14, MA72-34, MA72-35, MA72-41
Neponset River Basin and Coastal Drainage Area [Appendix Q]	BLUE HILL COOP, MA US	2005-2019	MA73-18, MA73-23, MA74-27, MA74-10, MA74-20, MA74-23, MA74-22, MA74-28
Weymouth & Weir River Basin and Coastal Drainage Area [Appendix R]	BLUE HILL COOP, MA US	2005-2019	MA74-27, MA74-10, MA74-20, MA74-23, MA74-22, MA74-28
Nashua River Basin [Appendix S]	FITCHBURG MUNICIPAL AIRPORT MA US	2005-2019	MA81-01, MA81-02, MA81-03, MA81-04, MA81-05, MA81-09, MA81-13, MA81-20, MA81-31, MA81-39, MA81-60, MA81-62, , MA81-72, MA81-74, MA81-79, MA81-80, MA81-99, MA81-100
	WORCESTER MA US	2005-2015	MA81-24
Concord (SuAsCo) River Basin [Appendix T]	ACTON 1.3 SW MA US	2005-2015	MA82A-03, MA82A-05, MA82A-07, MA82A-19, MA82A-22, MA82A-25, MA82B-02, MA82B-03, MA82B-04, MA82B-05, MA82B-07, MA82B-12, MA82B-14, MA82B-22
	LOWELL MA US	2005-2015	MA82A-09, MA82A-10, MA82A-34
Shawsheen River Basin [Appendix U]	BEDFORD HANSCOM FIELD, MA US	2005-2019	MA83-22
Merrimack River Basin and Coastal Drainage Area [Appendix V]	ASHBURNHAM, MA US	2005-2019	MA84A-31
	HAVERHILL, MA US	2005-2019	MA84A-37, MA84A-39, MA84A-04, MA84A-09, MA84A-05
	LAWRENCE, MA US	2005-2019	MA84A-36, MA84A-40, MA84A-03, MA84A-10, MA84A-18
	LOWELL, MA US	2005-2019	MA84B-06, MA84A-35, MA84B-07, MA84A-11, MA84A-12, MA84A-13, MA84A-14, MA84A-17, MA84A-21, MA84B-01, MA84B-03, MA84B-04, MA84B-02, MA84A-01, MA84A-02
	NEWBURYPORT, MA US	2005-2019	MA84A-16, MA84A-25, MA84A-28, MA84A-08, MA84A-06, MA84A-26, MA84A-27, MA84A-30

Major Watershed	Weather Station	Rainfall Date Range	Segment ID
Ipswich River Basin and Coastal Drainage Area [Appendix W]	MIDDLETON, MA US	2005-2019	MA92-05, MA92-08, MA92-12, MA92-14, MA92-17, MA92-21
	NEWBURYPORT, MA US	2005-2019	MA92-22, MA92-02, MA92-23
North Shore Coastal Drainage Area [Appendix X]	MIDDLETON, MA US	2005-2019	MA93-37, MA93-38, MA93-58, MA93-59
South Shore Coastal Drainage Area [Appendix Y]	BROCKTON, MA US	2005-2019	MA94-39, MA94-40, MA94-04
Buzzards Bay Coastal Drainage Area [Appendix Z]	EAST WAREHAM, MA US	2005-2019	MA95-06, MA95-04, MA95-19, MA95-68, MA95-79, MA95-78
Cape Cod Coastal Drainage Area [Appendix AA]	HYANNIS, MA US	2005-2019	MA96-99, MA96-100, MA96-104, MA96-108, MA96-102, MA96-103, MA96-107, MA96-75, MA96-96, MA96-95
Islands Coastal Drainage Area [Appendix AB]	EDGARTOWN, MA US	2005-2019	MA97-16
	NANTUCKET MEMORIAL AIRPORT, MA US	2005-2019	MA97-29

5.2. Stormwater Discharges

5.2.1. Regulated Stormwater Discharges

Stormwater runoff is composed of both point and nonpoint sources as discussed in Section 3. Stormwater discharges covered under the federal NPDES MS4 General Permit program are defined as point sources. The Federal Water Quality Act of 1987 recognized that runoff from urban areas and industrial sites pollutes surface waters and required the USEPA to address stormwater discharges with NPDES permits using a two-phased approach. Phase I and Phase II regulations were published in 1990 and 1999, respectively.

In Phase I, USEPA required operators of medium and large MS4 systems to obtain permit coverage which, in Massachusetts, applies to the cities of Boston and Worcester. Dischargers of "stormwater associated with industrial activity" were also required to apply for permits. The Phase I industrial sources generally include heavy and light manufacturing facilities, hazardous/solid waste processing, recycling facilities (including junkyards), mining (including sand and gravel), timber processing, power plants, vehicle maintenance, sewage/sludge treatment plants, and construction activities that disturb more than five acres.

Phase II regulates communities that fall under the definition of small MS4-designated areas. Discharges in these urbanized areas include stormwater discharges associated with small construction activity and the municipally owned industrial activities that were exempted from regulation during Phase I. In Massachusetts, this applies to 260 communities and 30 non-traditional State and federal organizations that also qualified as permittees under the designation criteria. Figure 5 shows urbanized areas (within Massachusetts) in the study area to which Phase II NPDES stormwater permit requirements apply. Of the 260 municipalities in Massachusetts regulated under the small MS4 permit, 235 are situated within the study area (Table 10; USEPA, 2016). There are 15 towns in the study area that have US Census-designated urbanized areas, but the towns requested and were granted waivers from the MS4 program by USEPA due to the small size of those areas. In addition, the City of Worcester was included in Phase I Large and Medium MS4 Permits

Many point source stormwater discharges in the TMDL study area are regulated under the NPDES Phase I and Phase II permitting programs, and the most critical stormwater point sources are described above in Section 3. The NPDES permit does not, however, establish numeric effluent limitations for stormwater discharges. Maximum Extent Practicable is the statutory standard that establishes the level of pollutant reductions that regulated municipalities must achieve; it is a narrative effluent limitation that is satisfied through implementation of Stormwater Management Plans (SWMPs) and achievement of measurable goals.

Nonpoint source discharges are generally characterized as sheet flow runoff and are not categorically regulated under the NPDES program, and therefore can be difficult to manage. However, some of the same principles for mitigating point source impacts may be applicable. Individual municipalities not regulated under a NPDES Stormwater Permit should implement the same six minimum control measures to minimize stormwater contamination.

Stormwater Phase II Annual Reports are submitted by regulated communities each May. Recent annual reports indicate that substantial progress is being made, particularly with certain communities, on those aspects of the six-point plan requirements that would address pathogen pollutant sources. Community-specific progress with stormwater management is presented in the appendices.

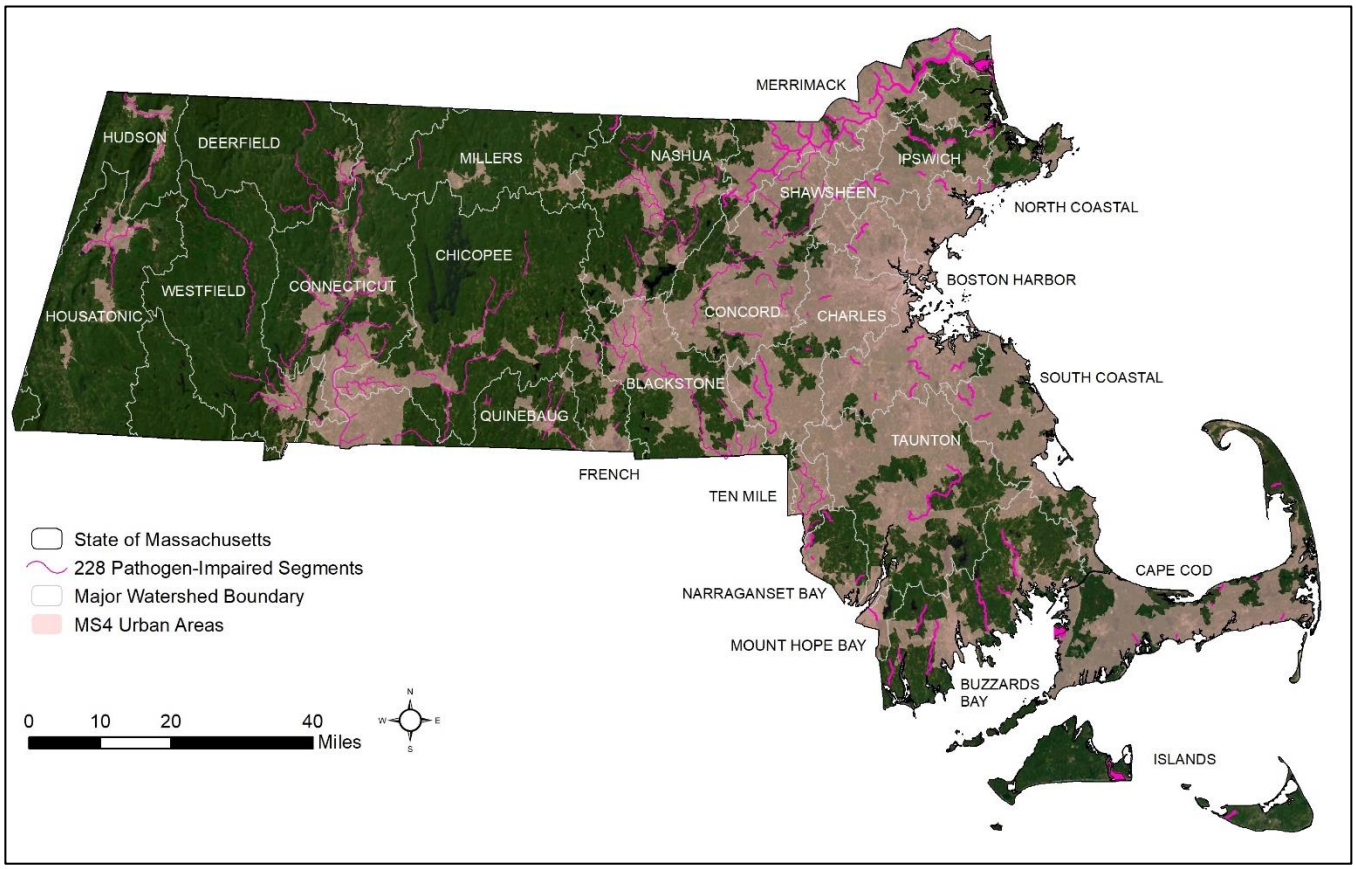

Figure 5. Massachusetts' urbanized areas within the TMDL study area subject to the MS4 General Permit

Table 10. List of Massachusetts' municipalities in the study area with portions subject to the NPDES General MS4 Stormwater Permit.

ABINGTON
ACTON
ACUSHNET
ADAMS
AGAWAM
AMESBURY
AMHERST
ANDOVER
ASHBURNHAM *
ASHBY *
ASHLAND
ATHOL
ATTLEBORO
AUBURN
AVON
AYER
BARNSTABLE
BEDFORD
BELCHERTOWN
BELLINGHAM
BERKLEY
BERLIN
BEVERLY
BILLERICA
BLACKSTONE
BOLTON *
BOURNE
BOXBOROUGH
BOXFORD
BOYLSTON
BRAINTREE
BREWSTER
BRIDGEWATER
BROCKTON
BROOKFIELD
BURLINGTON
CANTON
CARLISLE *
CARVER
CHARLTON
CHATHAM
CHELMSFRD
CHESHIRE
CHICOPEE
CLARKSBURG
CLINTON
CONCORD
DALTON
DANVERS
DARTMOUTH
DEERFIELD
DENNIS
DOUGLAS
DRACUT
DUDLEY
DUNSTABLE
EAST BRIDGEWATER
EAST BROOKFIELD
EAST LONGMEADOW
EASTHAMPTON
EASTON
ERVING
ESSEX
FALL RIVER
FALMOUTH
FITCHBURG
FOXBOROUGH
FRAMINGHAM
FRANKLIN
FREETOWN
GARDNER
GEORGETOWN
GILL
GRAFTON
GRANBY
GREENFIELD
GROTON
GROVELAND
HADLEY
HALIFAX
HAMILTON
HAMPDEN
HANOVER
HANSON
HARDWICK
HARVARD *
HARWICH
HAVERHILL
HINGHAM
HINSDALE *
HOLBROOK
HOLDEN
HOLLISTON
HOLYOKE
HOPEDALE
HOPKINTON
HUDSON
HUNTINGTON
IPSWICH
KINGSTON
LAKEVILLE
LANCASTER
LANESBOROUGH
LAWRENCE
LEICESTER
LENOX *
LEOMINSTER
LEXINGTON
LINCOLN
LITTLETON
LONGMEADOW
LOWELL
LUDLOW
LUNENBURG
LYNNFIELD
MANSFIELD
MARION
MARLBOROUGH
MASHPEE
MATTAPOISETT
MAYNARD
MEDWAY
MENDON
MERRIMAC
METHUEN
MIDDLEBOROUGH
MIDDLETON
MILFORD
MILLBURY
MILLVILLE
MILTON
MONSON
MONTAGUE
MONTGOMERY
NATICK
NEW BEDFORD
NEW BRAINTREE
NEWBURY
NEWBURYPORT
NORTH ADAMS *
NORTH ANDOVER
NORTH ATTLEBOROUGH
NORTH BROOKFIELD
NORTH READING
NORTHAMPTON
NORTHBOROUGH
NORTHBRIDGE
NORTON
NORWELL
NORWOOD
ORANGE
OXFORD
PALMER
PAXTON
PEABODY
PELHAM *
PEMBROKE
PEPPERELL
PITTSFIELD
PLAINVILLE
PLYMOUTH
PLYMPTON *
QUINCY
RANDOLPH
RAYNHAM
READING
REHOBOTH
RICHMOND
ROCHESTER *
ROCKLAND
ROWLEY
RUSSELL *
RUTLAND
SALISBURY
SANDWICH
SEEKONK
SHARON
SHERBORN
SHIRLEY
SHREWSBURY
SOUTH HADLEY
SOUTHAMPTON
SOUTHBOROUGH
SOUTHBRIDGE
SOUTHWICK
SPENCER
SPRINGFIELD
STERLING
STOUGHTON
STOW
STURBRIDGE
SUDBURY
SUNDERLAND
SUTTON
SWANSEA
TAUNTON
TEMPLETON
TEWKSBURY
TOPSFIELD
TOWNSEND
TYNGSBOROUGH
UPTON
UXBRIDGE
WARE *
WAREHAM
WARREN
WAYLAND
WEBSTER
WELLESLEY
WENHAM
WEST BOYLSTON
WEST BRIDGEWATER
WEST BROOKFIELD
WEST NEWBURY
WEST SPRINGFIELD
WESTBOROUGH
WESTFIELD
WESTFORD
WESTHAMPTON *
WESTMINSTER
WESTON
WESTPORT
WESTWOOD
WEYMOUTH
WHATELY
WHITMAN
WILBRAHAM
WILLIAMSBURG *
WILLIAMSTOWN
WILMINGTON
WINCHESTER
WOBURN
WORCESTER
WRENTHAM
YARMOUTH

** Municipalities within the TMDL area with waivers from the MS4 program at the time this TMDL was completed.*

5.2.2. Non-Regulated Stormwater Discharges

Of the 288 towns in Massachusetts in the study area, 53 are not identified as urbanized areas and are not regulated under the MassDEP General Stormwater Permit. Fifteen more contained small urbanized areas; these towns requested and were granted waivers from regulation under the MS4 permit program. These non-MS4 municipalities are encouraged to implement both structural and non-structural BMPs as those required by the MS4 communities to address sources of pathogens.

5.2.3. Construction Stormwater Discharges

MassDEP has promulgated "Stormwater Management Regulations" that establish a statewide general permit program aimed at controlling the discharge of stormwater runoff from certain privately-owned sites containing large impervious surfaces. The regulations require private owners of land containing five or more acres of impervious surfaces to: apply for and obtain coverage under a general permit, implement nonstructural BMPs for managing stormwater, install low impact development (LID) techniques and structural BMPs at sites undergoing development or redevelopment, and submit annual compliance certifications to MassDEP. Where MassDEP has determined that stormwater runoff is causing or contributing to violations of the SWQS, the proposed regulations would allow MassDEP to impose the same requirements on certain private owners of land with less than five acres of impervious surfaces and require the owners of such land to design and implement the LID techniques and stormwater BMPs needed to address these violations.

The Massachusetts Statewide Municipal Stormwater Coalition (MSMSC), composed of about 10 stormwater-focused groups around the State, further coordinates with and assists municipalities on pathogen pollutant concerns (Think Blue Massachusetts, n.d.).

Some non-structural BMPs that manage urban stormwater runoff include street sweeping, catch basin maintenance, road salt management, spill prevention and control plans, integrated pest management, snow disposal, pollution prevention at the Departments of Public Works, and natural vegetation preservation. Public outreach and homeowner education, including landscaping education and car washing practices, are also a vital component of reducing the impact of stormwater runoff. LID techniques, such as bioretention areas and rain gardens, porous pavement, and vegetated filter strips, can also greatly reduce the impact stormwater has on local waterbodies. Communities can also consider structural stormwater controls such as sand and organic filters and constructed stormwater wetlands, among others. Find more information on the MassDEP website (MassDEP, 2019c).

5.3. CSOs, Illicit Sewer Connections, and Failing Infrastructure

Among the highest priority pathogen sources are CSOs, illicit connections of sewer pipes to storm drains, and failing wastewater infrastructure. They represent direct discharges of untreated wastewater to the environment, and thus pose serious public health risks. An integrated approach to remediating these sources is necessary to attain the goals of this TMDL. A study of the Merrimack River suggests that CSO abatement on its own would not eliminate violations of the SWQS in the river's mainstem (CDM, 2006). Most of the river from Manchester, NH to downstream of Haverhill, MA would still exceed applicable criteria established in the SWQS more than 10% of the time. Furthermore, CSO control plans with full separation of sewers in each city would only yield slight additional improvements (e.g., downstream of continuing CSO discharges following storm events). Implementing CSO discharge controls (Phase I and certain high priority Phase II), as well as non-CSO stormwater conveyance controls, fixing illicit connections and failing infrastructure, and developing septic system maintenance programs would be necessary to significantly reduce the total number of indicator bacteria violation days (CDM, 2004; CDM Smith, 2017; CDM, 2006).

USEPA's Phase II rule specifies that an MS4 community must develop, implement, and enforce a stormwater management program designed to reduce the discharge of pollutants to the MEP, protect water quality, and satisfy the applicable water quality requirements of the CWA and the Massachusetts SWQS. Portions of many towns in the watersheds covered by this TMDL are classified as Urbanized Areas by the U.S. Census Bureau and are therefore subject to the regulatory authority of the Massachusetts Small MS4

General Permit (effective date July 1, 2018). Municipalities that operate regulated MS4s must develop and implement an SWMP to meet Six Minimum Control Measures within five years of the effective date of July 1, 2018, for the MS4 permit issued in 2016:

- Public education and outreach on stormwater impacts,
- Public involvement and participation,
- Illicit discharge detection and elimination (IDDE),
- Construction site stormwater runoff control,
- Post-construction stormwater management in new development and redevelopment, and
- Pollution prevention and good housekeeping for municipal operations.

Written submittal of the SWMP to USEPA was required by June 30, 2019, including the IDDE program description and procedures. This is one of the most important control measures, since it corrects prohibited sources that represent a severe health and water quality risk. In general, a comprehensive IDDE Program must contain the following four elements:

1. Develop (if not already completed) a storm sewer system map showing the location of all outfalls, and the names and locations of all waters of the United States that receive discharges from those outfalls.
2. Develop and promulgate municipal regulations/bylaws that require the municipality to comply with Phase II regulations including prohibition of illicit discharges and appropriate enforcement mechanisms.
3. Develop and implement a plan to detect and address illicit discharges, including illegal dumping, to the system. USEPA recommends that the plan include the following four components: locating priority areas; tracing the source of an illicit discharge; removing the source of an illicit discharge; and program evaluation and assessment.
4. Inform public employees, businesses, and the public of hazards associated with illegal discharges and improper disposal of waste. IDDE outreach can be integrated into the broader stormwater outreach program for the community. Fulfilling the outreach requirement for IDDE helps the MS4 community to comply with this mandatory element of the stormwater program.

The SWMP must also include municipal bylaws or ordinances that address post-construction project sediment and erosion control and pollutant removal.

Communities that are not covered under the Phase II rule (i.e., not designated as MS4 communities) are encouraged to implement a program for detecting and eliminating sewage discharges to storm sewer systems, including illicit sewer connections. Implementation of the Phase II rule, whether voluntarily or mandated, will help communities achieve TMDLs.

5.4. Wastewater Treatment Plants

WWTP discharges to surface waters are regulated under the federal NPDES and the Commonwealth's Surface Water Discharge program. Each WWTP has an effluent limit included in its NPDES or groundwater permit. Some NPDES permits are listed on the USEPA website (USEPA, 2019b) and the Commonwealth's wastewater permits are available on MassDEP's website (MassDEP, n.d. (a)). Details on the Massachusetts groundwater permit program are also available on MassDEP's website (MassDEP, n.d. (b)).

5.5. Failing Septic Systems

Pathogen pollutant inputs to surface waters in Massachusetts can be reduced through septic system inspection, maintenance, and when necessary, replacement. These activities are regulated under Massachusetts Title 5 regulation (310 CMR 15.00), which defines requirements for new construction, inspection of private sewage disposal systems before property ownership transfer, building expansions, or changes in use of properties, and aids in the discovery of poorly operating or failing systems. Additional targeted inspection programs may be warranted in watersheds where streams show high indicator bacteria levels or other evidence to suspect individual septic system failure. Regulatory and educational materials

for septic system installation, maintenance, and alternative technologies are provided by MassDEP (MassDEP, n.d. (d)).

Additional information on how to prevent surface water pollution from failing septic systems is available through the Massachusetts Clean Water Toolkit (MassDEP, 2019a).

5.6. Pet Waste

Most surface water pollutants come from minor sources, especially at the household level. Pet waste is one of those small sources of pollutants, carrying untreated waste to storm sewers or directly overland into lakes, streams, and estuaries. Pet waste damages aquatic ecosystems and wildlife because it contains highly concentrated nutrients and pathogens such as parasites (e.g., campylobacteriosis, giardiasis, salmonellosis, and toxocariasis) and increases the biological oxygen demand of a waterway, depleting oxygen levels for sensitive aquatic species. Beaches may be closed if certain disease-causing bacteria and viruses are found in the water.

Stormwater Phase II requirements include an educational program to inform the public about the impact of stormwater that may carry pet waste to surface waters. To prevent pet waste from getting in the water, many towns have “pooper scooper” ordinances, with fines for violations, that require pet owners to remove fecal matter from public property. Pet waste should be disposed of away from any waterway or stormwater system. Towns should work with volunteers to map locations where waste from pets is a significant and chronic problem. This work should be incorporated into the municipalities’ Phase II plans and should result in an evaluation of strategies to reduce the impact of waste on water quality. This may include installing signage, providing pet waste receptacles or pet waste digester systems in high-use areas, enacting ordinances requiring clean-up of pet waste, and targeting educational and outreach programs in problem areas. Additional information about stormwater runoff, including preventing pathogen pollutants from abandoned pet waste, is available in the Massachusetts Clean Water Toolkit on the MassDEP website (MassDEP, 2019a).

5.7. Agriculture

Agriculture can have dramatic impacts on a range of water quality factors, including pathogens, nutrients, pesticides, salt, irrigation effects, and erosion and sedimentation. Aquatic impacts are more significant where the water table and/or infiltration rates are high.

Massachusetts has several programs to monitor and reduce agricultural impacts on water quality. For example, the Agricultural Environmental Enhancement Program (AEEP) is a voluntary statewide program that provides financial support to agricultural operators to help them implement conservation practices intended to protect natural resources by preventing pollutants that may arise from agricultural practices. Projects focus on their potential to impact the most sensitive resources, including drinking water supplies, wetlands, and MassDEP priority waterbodies. The Pesticide Program of the Massachusetts Department of Agricultural Resources (MDAR) also carries out pesticide-related activities, such as education and water monitoring.

Nutrient regulations are primarily aimed at preventing phosphorus and nitrogen water pollution, but they can also reduce pathogen pollution. In 2012, the Massachusetts Legislature passed Chapter 262, An Act Relative to the Regulation of Plant Nutrients. The Act requires MDAR to promulgate statewide regulations to ensure that plant nutrients, including manure, are applied in an effective manner to provide sufficient nutrients for plant growth while minimizing impacts on water resources to protect human health and the environment. MDAR developed regulations entitled “330 CMR 31.00: Plant Nutrient Application Requirements for Agricultural Land and Land Not Used for Agricultural Purposes.” The regulation gives MDAR authority to regulate and enforce the registration and application of plant nutrients to lawns and non-agricultural turf to prevent nonpoint source pollution to surface and groundwater. It also specifies implementation of the University of Massachusetts Amherst Extension Service’s Guidelines (UMass Guidelines), if available for the commodity grown, as the compliance standard. The regulations were first adopted in 2015 and amended on January 12, 2018.

Act regarding plant nutrients: (Commonwealth of Massachusetts, 2012)
Plant nutrient regulations: (MDAR, 2018b)
Information about UMass Extension's education and outreach materials relative to nutrient management and fertilizer: (UMass Amherst, 2020)

For more information on Nutrient Management Plan guidelines, see section 31.04 of "330 CMR 31": (MDAR, 2018a).

The USDA Natural Resource Conservation Service (NRCS) offers technical and financial assistance to farm businesses for conservation practices and other improvements to their land. This assistance offers many benefits to farmers, while also protecting rivers from pathogen pollutants. Programs most relevant to pathogens and water quality include:

- The Environmental Quality Incentives Program (EQIP) provides financial and technical assistance to agricultural producers to deliver environmental benefits such as improved water and air quality, conserved ground and surface water, increased soil health and reduced soil erosion and sedimentation, and improved or created wildlife habitat. Funds are prioritized based on the most recently available MassDEP list of impaired waters.
- The Conservation Stewardship Program (CSP) helps agricultural producers maintain and improve their existing conservation systems and adopt additional conservation activities to address priority resources concerns. Participants earn CSP payments for conservation performance—the higher the performance, the higher the payment.
- The Agricultural Conservation Easement Program helps landowners, land trusts, and other entities protect, restore, and enhance wetlands, grasslands, and working farms and ranches through conservation easements.
- The Healthy Forests Reserve Program (HFRP) helps landowners restore, enhance, and protect forestland resources on private and tribal lands through easements and financial assistance. Through HRFP, landowners promote the recovery of endangered or threatened species, improve plant and animal biodiversity, and enhance carbon sequestration.
- The Regional Conservation Partnership Program (RCPP) promotes coordination between NRCS and its partners to deliver conservation assistance to producers and landowners. NRCS aids producers through partnership agreements and RCPP conservation program contracts.

To assist farmers with environmentally sustainable and profitable farming, the NRCS and other stakeholders have developed an integrated farm management approach known as the CORE4 approach. The approach focuses on four fundamental components – conservation tillage, crop nutrient management, integrated pest management, and conservation buffers. Additional information on the CORE4 approach can be found in the CORE4 Conservation Practices Training Guide (NRCS, 1999).

Additional information on agricultural BMPs to protect water quality from a range of nonpoint sources of pollution, including pathogens, is available through the Massachusetts Clean Water Toolkit (MassDEP, 2019a).

5.8. Wildlife Waste

Past TMDL studies have shown that waterfowl and wildlife contribute significantly to elevated indicator bacteria concentrations in surface waters. Waste left to decay on land may be washed into storm sewers or directly into surface waters by rain or melting snow and cause water quality impairments (USEPA, 2001).

Towns and residents can take several measures to minimize waterfowl-related impacts. Shoreline homeowners can allow tall, coarse vegetation to grow in areas along the edges of impacted waterbodies frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to the water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage their migration. Daily cleanup of waterfowl waste on public beaches would likely reduce the number of beach closures due to bacteria exceedances of water quality standards. Educational programs should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water

quality impairments and can harm human health and the environment. Towns should ensure this regulation is cited in their SWMPs.

5.9. Recreational Waters Use Management

Recreational waters receive pathogen inputs from swimmers. To reduce swimmers' contributions to pathogen impairment, bathroom and shower facilities can be made available, and bathers should be encouraged to shower prior to swimming. In addition, parents should change young children's diapers as soon as they are soiled, and properly dispose of used diapers.

All Massachusetts waters are designated as a No-Discharge Zone (NDZ) in which the discharge of boat sewage is prohibited. Massachusetts Office of Coastal Zone Management (CZM), coastal communities, and other organizations continue to ensure that these boat pump-out services, including many which are free, are available and well publicized where boating occurs (CZM, 2022).

5.10. Climate Change

MassDEP recognizes that long-term (25+ years) climate change impacts to the Massachusetts environment, including in the study area covered by this TMDL, are occurring, based on the consensus in the scientific community. The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) *2011 Climate Change Adaptation Report* predicts that by 2100 the sea level could be 1 to 6 feet higher than the current position, and precipitation rates in the northeast could increase by as much as 20%. However, the details of how climate change will affect sea level rise, precipitation, streamflow, and sediment-nutrient loading in specific locations are generally unknown. The ongoing debate is not about whether climate change will occur, but the rate and extent to which it will occur, as well as the adjustments needed to address its impacts. USEPA's 2012 *Climate Change Strategy* states: "Despite increasing understanding of climate change, there still remain questions about the scope and timing of climate change impacts, especially at the local scale where most water-related decisions are made" (USEPA, 2012a). This is particularly true in Massachusetts, where water quality management decisions and implementation actions generally occur at the municipal level, on a sub-watershed scale.

USEPA's *Climate Change Strategy* identifies the types of research needed to support the goals and strategic actions to respond to climate change. USEPA acknowledges that data are missing or not available for making water resource management decisions under changing climate conditions. In addition, USEPA recognizes the limitation of current modeling in predicting the pace and magnitude of localized climate change impacts and recommends further exploration of the use of tools, such as atmospheric, precipitation, and climate change models, to help states evaluate pollutant load impacts under a range of projected climatic shifts.

USEPA released *Watershed modeling to assess the sensitivity of streamflow, nutrient, and sediment loads to potential climate change and urban development in 20 U.S. watersheds* (USEPA, 2013), which studied 20 watersheds around the nation. The watershed most relevant to Massachusetts examined in the study is a New England coastal basin ranging between southern Maine and central coastal Massachusetts. This includes many watersheds in the current TMDL, covering northeast Massachusetts and the greater Boston area. The initial "first order" conclusion of this study was that in many locations, future conditions, including water quality, are likely to be different from the past. However, most significantly, this study did not demonstrate that changes to TMDLs (the water quality restoration targets) would be necessary for the region. USEPA's 2012 *Climate Change Strategy* also acknowledges that the northeast, including New England, needs to develop standardized regional assumptions regarding future climate change impacts.

MassDEP believes that impacts of climate change should be addressed through TMDL implementation with an adaptive management approach in mind. Adjustments can be made as environmental conditions, pollutant sources, or other factors change over time.

6. Monitoring Plan

The long-term plan for statewide monitoring of indicator bacteria includes the following actions:

1. Identify and prioritize Massachusetts' waterbodies for which data are lacking or absent to determine if the waterbody meets the use criteria.
2. Monitor areas where BMPs and other control strategies have been implemented or discharges have been removed to assess the effectiveness of the modification or elimination.
3. Assemble available data to formulate a concise report such as a Watershed-Based Plan (MassDEP, n.d. (f)) to assess the basin as a whole for evaluation and selection of BMPs.
4. Continue to monitor for indicator bacteria during routine monitoring via random (probabilistic) sampling or by rotating basin.

At a minimum, monitoring should be conducted with a focus on:

- Capturing water quality conditions under varied weather conditions;
- Establishing sampling locations to pinpoint sources;
- Researching new and proven technologies for distinguishing human from animal pathogen sources in water samples; and
- Assessing efficacy of BMPs.

Additional information on water quality monitoring plans in Massachusetts is found in *A Strategy for Monitoring and Assessing the Quality of Massachusetts' Waters to Support Multiple Water Resource Management Objectives 2016-2025* (MassDEP, 2018a).

The Massachusetts Department of Public Health (DPH) regulations contain fecal indicator bacteria criteria and sampling protocols to protect the health and safety of bathers. DPH regulations apply to public and semi-public marine or fresh water bathing beaches in 105 CMR 445.000, *Minimum Standards for Bathing Beaches (State Sanitary Code, Chapter VII)* (DPH, 2014).

Agencies and organizations involved in water quality monitoring include the following:

- **The Massachusetts Department of Public Health (DPH)** publishes annual reports on the testing of public and semi-public beaches for both marine and fresh waters and notes where exceedances of water quality criteria result in beach closures. These reports are available for download from the DPH website (Environmental Toxicology Program, n.d.).
    - **DPH Environmental Toxicology Program (TOX)** conducts beach monitoring and assessments of human exposure to chemical, microbial, and radiological contaminants identified in environmental and biological media. TOX provides quantitative evaluations of the human health risk of exposure to these contaminants. TOX also provides qualitative evaluations of those risks through consultations and technical assistance provided to internal and external stakeholders, including the public, as well as local, state, and federal agencies.
- **The Massachusetts Department of Marine Fisheries (DMF)** conducts monitoring of shellfishing areas in accordance with the National Shellfishing Sanitation Program. These data, along with sanitary surveys, are used to make decisions regarding classification and closure of areas for shellfish harvest. Classification and restriction information is published on the DMF website (DMF, n.d.).
- **The Strategic Monitoring and Assessment for River basin Teams (SMART)** program assessed response and exposure indicators to determine threats to waterbodies. The SMART program was specifically designed for the Massachusetts Watershed Initiative, and the monitoring program was implemented in Central Massachusetts watersheds from 1998 to 2013. The SMART program included a focus on outreach, collaboration, and technical assistance to watershed groups, as well as a long-term monitoring program to identify trends in water quality in key rivers in central Massachusetts. The SMART program was implemented in six basins in MassDEP's Central Region through the cooperative efforts of the Division of Watershed Management (DWM), the Wall

Experiment Station, the Nashua River Watershed Association, and MassDEP's Central Regional Office. Find more information and water quality technical memorandum associated with this project see the MassDEP website (MassDEP, 2013).

- **The Water Resources Research Center** supports research, education, and outreach on water resources issues of state, regional, and national importance as part of the national system of institutes authorized under the Water Resources Research Act of 1964. Established in 1965, the Center is now part of the Center for Agriculture, Food, and the Environment at the University of Massachusetts Amherst. The Center encourages an interdisciplinary approach to resolving state and regional water problems and has involved the University system and many other Massachusetts colleges and universities in Center research. The Center supports faculty research and training of graduate students and is a national leader in the use of volunteers for high quality monitoring of surface waters. Since 1990, the Massachusetts Water Watch Partnership (MassWWP) of the Center provides training and other technical assistance to citizen scientists who conduct water quality monitoring programs on the lakes, rivers, and estuaries of Massachusetts.
- **Surface water monitoring by volunteers** (such as watershed associations, stream teams, school groups, and individuals) contributes to MassDEP's watershed management approach. MassDEP is supporting volunteer data collection in streams and lakes in the Commonwealth through its water quality monitoring grants. MassDEP has provided funding to volunteer and educational groups to initiate, or expand, bacteria monitoring in their local watersheds and to submit the data for MassDEP assessment purposes. High quality data from volunteer programs support efforts to assess surface waters, manage nonpoint sources of pollutants, and calculate TMDLs.

7. Reasonable Assurances

USEPA guidance for developing pathogen TMDLs requires that in waters "impaired by both point and nonpoint sources, where a point source is given a less stringent WLA based on an assumption that nonpoint source load reductions will occur, reasonable assurance must be provided for the TMDL to be approvable" (USEPA, 2001). This TMDL does not include less stringent WLAs for point sources based on anticipation of LA reductions from nonpoint sources, and therefore, a reasonable assurance demonstration is not required. Nonetheless, reasonable assurances that LAs will be achieved are discussed below. Successful reduction in nonpoint sources depends on the willingness and motivation of stakeholders to get involved and the availability of federal, state, and local funds.

Reasonable assurances that the TMDL will be implemented include both application and enforcement of current regulations, availability of financial incentives including low interest loans to communities through the SRF, and the various local, state, and federal programs for pollution control. Stormwater NPDES permit coverage is designed to address discharges from municipal owned stormwater drainage systems. Enforcement of regulations controlling nonpoint source discharges includes local enforcement of the state Wetlands Protection Act and Rivers Protection Act, Title 5 regulations for septic systems, and various local regulations including zoning regulations. Financial incentives may include federal funds available under CWA § 319, 604(b), and 104(b) grant programs, which are provided as part of the Performance Partnership Agreement between MassDEP and USEPA. However, CWA § 319 funds to address nonpoint source pollution cannot be used for point source remediation or to address the requirements of NPDES stormwater permits. Additional financial incentives include state income tax credits and low interest loans for Title 5 upgrades through municipalities participating in this portion of the SRF program.

A summary of many of MassDEP's tools and regulatory programs to address common pathogen sources is presented below.

7.1. Overarching Tools

Watershed-Based Plans: It is recommended that implementation be conducted on a watershed basis and that more specific watershed plans, including watershed-based plans, be developed, where appropriate, to focus and prioritize appropriate restoration measures. For a general overview of watershed-based plans, see section 2 of the *Massachusetts Nonpoint Source Pollution 319 Grant Guidebook* (MassDEP, 2021b).

Massachusetts Clean Waters Act (M.G.L. Chapter 21, sections 26-53): The Massachusetts Clean Waters Act provides MassDEP with specific and broad authority to develop regulations that address both point and nonpoint sources of pollutants. There are numerous regulatory and financial programs, including those identified in the preceding paragraph, that have been established to directly and indirectly address pathogen impairments throughout the state. Several of these programs are briefly described below.

Massachusetts' Surface Water Discharge Permit Program (314 CMR 3.00): The NPDES permit program was administered jointly by the USEPA and MassDEP until June 2020. Massachusetts and USEPA now issue separate permits. Any pollutant discharge to surface waters of the Commonwealth requires a valid permit in accordance with 314 CMR 3.03(1). This includes general permits for Phase II stormwater discharges from small MS4s.

Massachusetts SWQS (314 CMR 4.00): The SWQS assign waterbody classifications (Class A, B, and C for fresh water; SA, SB, and SC for coastal and marine waters), each with specific designated uses, and establish water quality criteria to protect those uses. Bacteria criteria are established for each classification.

Ground Water Discharge Permit Program (314 CMR 5.00): This program regulates the discharge of pollutants to the groundwaters of the Commonwealth to ensure groundwaters are protected for their actual and potential use as a source of potable water and that surface waters are protected for their existing and designated uses to ensure attainment of applicable criteria established in the Massachusetts SWQS.

Rivers Protection Act (M.G.L. Chapter 258 Acts of 1996) and the Wetlands Protection regulation (310 CMR 10.00): In 1996, Massachusetts passed the Rivers Protection Act. The purposes of the Act are to protect the private or public water supply, to protect groundwater, to provide flood control, to prevent storm damage, to prevent pollution, to protect land containing shellfish, to protect wildlife habitat, and to protect fisheries. The provisions of the Act are implemented through Massachusetts' Wetlands Protection regulation, which establish up to a 200-foot setback from rivers in the Commonwealth to control construction activity and protect the items listed above. Although this Act does not directly address pathogen discharges, it indirectly reduces many sources of pathogens close to waterbodies. More information on the Rivers Protection Act and the Wetlands Protection regulation can be found on the MassDEP website (MassDEP, n.d. (e)).

Regulation of Plant Nutrients: In 2012, MDAR developed regulations (330 CMR 31.00) to ensure that plant nutrients are applied in an effective manner to provide sufficient nutrients for maintaining healthy agricultural lands, as well as turf and lawns, while minimizing the impacts of nutrients on surface and groundwater resources to protect human health and the environment. The regulations include setbacks from surface waters, public drinking water, and wetlands and seasonal application restrictions. While not directly focused on pathogen pollutants, the setback requirements can reduce pathogen loading in cases where manure is applied.

Regulation of Shellfishing: In Massachusetts, DMF oversees both commercial and recreational shellfishing, including designating the minimum shell size for scallops, oysters, and clams; these rules are published in 322 CMR, and recreational shellfishing limits are summarized on their website, *Recreational saltwater fishing regulations* (DMF, 2023). However, shellfishing for recreation is regulated at the municipal level. Shellfishing regulations specific to a municipality can be obtained from the town clerk, as well as the required permit and the locations of open and closed beds.

No Discharge Zone: In 2014, the USEPA and the MA Office of Coastal Zone Management (CZM) designated waters adjacent to the entire Massachusetts coastline as a No Discharge Zone (NDZ), in which the discharge of sewage from vessels, whether treated or untreated, is strictly prohibited (CZM, 2021). This action was taken to ensure that the public and water quality were protected from the threats associated with such discharges, including exposure to pathogens, nutrients, and other chemicals.

7.2. Addressing CSOs

CSOs discharge stormwater with untreated or partially treated human and industrial waste, toxic materials, and debris, and as a result are a significant source of pathogen contamination. Control or reduction of CSOs will result in improvements to water quality in the receiving waters.

Massachusetts, in concert with USEPA Region 1, has established a detailed CSO abatement program and policy. CSO discharges are regulated by the Commonwealth in several ways. Like any discharge of pollutants, CSOs must have a NPDES Permit and Massachusetts' Surface Water Discharge Permit under federal and State regulations.

All permits for a CSO discharge must comply with the Massachusetts SWQS (314 CMR 4.00), which additionally provide the basis for water quality-based effluent limitations in discharge permits. Any discharge, including CSOs, is allowed only if it meets water quality criteria for the receiving segment and the antidegradation provisions. USEPA's 1994 CSO Control Policy revised some features of its 1989 version to provide greater flexibility by allowing a minimal number of overflows, which are compatible with the water quality goals of the CWA. MassDEP's 1995 regulatory revisions correspondingly decreased reliance on partial use designation as the sole regulatory vehicle to support CSO abatement plans (MassDEP, 1997).

NPDES/MA permits require the nine minimum controls necessary to meet technology-based limitations as specified in the 1994 USEPA Policy. The nine minimum controls may be summarized as: operate and maintain properly, maximize storage, minimize overflows, maximize flows to POTWs, prohibit dry weather CSOs, control solids and floatables, institute pollution prevention programs, notify the public on impacts, and observe monitoring and reporting requirements. The nine minimum controls may be supplemented

with additional treatment requirements, such as screening and disinfection, on a case-by-case basis. The MassDEP's goal is to eliminate adverse CSO impacts and attain the highest water quality achievable. Separation or relocation of CSOs is required wherever it can be achieved based on an economic and technical evaluation.

As untreated CSOs cause violations of SWQS, and thus are in violation of NPDES permits, all the Commonwealth's CSO permittees are under enforcement orders to either eliminate the CSO, or plan, design, and construct CSO abatement facilities. Each LTCP must identify and achieve the highest feasible level of control. The process also requires the permittee to comply with any approved TMDL. There are 19 CSO communities in the Commonwealth (MassDEP, 2019b).

7.3. Addressing Failed Septic Systems

Septic System Regulations (Title 5) (310 CMR 15.00): MassDEP has regulations in place that require minimum standards for the design of individual septic systems. Those regulations ensure, in part, protection for nearby surface and ground waters from pathogen contamination. The regulations require minimum setbacks from surface waters and drinking water wells, standards for replacing failed and inadequate systems and include a requirement that all septic systems must be inspected and upgraded to meet Title 5 requirements at the time of sale or transfer of each property.

7.4. Addressing Stormwater

Stormwater is regulated through both federal and state programs. Those programs include, but are not limited to, the federal and state Phase I and Phase II NPDES stormwater program, and, at the state level, the Wetlands Protection Act (M.G.L. Chapter 130, Section 40), the Massachusetts SWQS (314 CMR 4.00), and the various permitting programs previously identified in Section 5.

Operators of regulated MS4s are required to design stormwater management programs to 1) reduce the discharge of pollutants to the MEP, 2) protect water quality, and 3) satisfy the appropriate water quality requirements of the CWA. Implementation of the MEP standard typically requires the development and implementation of BMPs and the achievement of measurable goals to satisfy each of the six minimum control measures mentioned in Sections 3 and 5. In addition, each permittee must determine if a TMDL has been developed and approved for any waterbody into which an MS4 discharges. If a TMDL has been approved, then the permittee must comply with the TMDL including the application of BMPs or other performance requirements. The permittee must report annually on all control measures planned or currently being implemented to control pollutants of concern identified in TMDLs. Although USEPA's Phase II MS4 regulations only require MS4 implementation in urbanized areas subject to permitting, USEPA and MassDEP nonetheless encourage permittees to update and implement their respective SWMPs jurisdiction-wide to further water quality improvements. Finally, MassDEP has the authority to issue an individual permit to achieve water quality objectives. Links to the Massachusetts Phase II permit and other stormwater control guidance can be found on the MassDEP website (MassDEP, 2020c).

The MassDEP wetlands regulations (310 CMR 10.0) direct issuing authorities to enforce the MassDEP Stormwater Management Policy, place conditions on the quantity and quality of point source discharges, and to control erosion and sedimentation. The Stormwater Management Policy was issued under the authority of 310 CMR 10.0. The policy and its accompanying Stormwater Performance Standards apply to new and redevelopment projects where there may be an alteration to a wetland resource area or within 100 feet of a wetland resource (buffer zone). The policy requires the application of structural and/or non-structural BMPs to control suspended solids, which have associated co-benefits for pathogen removal. The Massachusetts Stormwater Handbook was developed to promote consistent interpretation of the Stormwater Management Policy and Performance Standards: Volumes 1 through 3. It provides guidance on increased stormwater recharge, treatment of runoff from polluting land use, LID techniques, pollution prevention, removal of illicit discharges, and improved operation and maintenance of stormwater BMPs (MassDEP, 2008).

7.5. Financial Tools

MassDEP has developed a Nonpoint Source Management Plan that sets forth an integrated strategy and identifies important programs to prevent, control, and reduce pollutants from nonpoint sources and to protect and restore the quality of waters in the Commonwealth. Section (§) 319 of the federal CWA specifies the contents of the management plan. The plan is an implementation strategy to address nonpoint source pollution management in the Commonwealth, with attention given to funding sources and schedules. Statewide implementation of the plan is being accomplished through a wide variety of federal, state, local, and non-profit programs and partnerships.

In addition, the State is partnering with NRCS to provide implementation incentives through the national Farm Bill. As a result of this effort, NRCS now prioritizes its EQIP funds based on MassDEP's list of impaired waters. The program also provides high priority points to those projects designed to address TMDL recommendations. Over the past several years, EQIP funds have been used throughout the Commonwealth to address water quality goals through the application of structural and non-structural BMPs.

Section 604(b) of the federal CWA authorizes the awarding of funds through the USEPA to states for water quality assessment and management planning grants. The Nonpoint Source Management Section in MassDEP's Watershed Planning Program administers the 604(b) grant program in Massachusetts. Eligible applicants for 604(b) grants include municipalities, regional planning agencies, conservation districts, counties, and interstate agencies. Each year MassDEP's priority topics and basins are listed in the Request for Proposals (RFP). The 604(b) RFP is usually released in late January with proposals due approximately 8 weeks later. Recent priority topics for 604(b) grant applications have included the following:

- Development of watershed-based plans
- Identification of the nature, extent, and causes of water quality problems
- Determination of pollutant load reductions necessary to meet SWQS
- Development of municipal and regional approaches to stormwater issues including coordination of technical information sharing among communities and creation of stormwater utilities in regulated and non-regulated communities
- Development of green infrastructure projects that manage wet weather to maintain or restore natural hydrology
- Development of implementation plans that will address water quality impairments in impaired watersheds

The Nonpoint Source Management Section in MassDEP's Watershed Planning Program also administers the CWA § 319 grant program in Massachusetts to implement nonpoint source BMPs that address water quality goals. CWA § 319 funding is used to apply needed implementation measures and provide high priority points for projects that are designed to address CWA § 303(d) listed waters and to implement TMDLs. MassDEP has funded numerous projects through the § 319 grant program that were designed to address stormwater and pathogen-related impairments. Approximately 75% of all projects funded since 2002 were designed to address pathogen-related impairments. Under USEPA guidance issued in 2003, § 319 funds cannot be used to address the requirements of NPDES permits, including MS4, Residual Designation, and Phase I and Phase II permits (USEPA, 2020). Stormwater and urban implementation projects may be eligible for funding if not required as part of the stormwater permit and the communities desire credit under the permit. Applicants are advised to contact MassDEP's Watershed Planning Program regarding eligibility. For a general overview of the Section 319 grant program, see the *Massachusetts Nonpoint Source Pollution 319 Grant Guidebook* (MassDEP, 2021b). The § 319 program also provides additional assistance in the form of guidance. The Massachusetts Clean Water Toolkit (MassDEP, 2019a) provides detailed guidance in the form of BMPs by land use type to address various water quality impairments and associated pollutants.

The SRF Loan Program provides low interest loans to eligible applicants for the abatement of water pollution problems across the Commonwealth. MassDEP has issued millions of dollars in loans for the

planning and construction of CSO facilities and to address stormwater pollutants. Loans have also been distributed to municipal governments statewide to upgrade and replace failed Title 5 systems. These programs all demonstrate the State's commitment to assist local governments in implementing the TMDL recommendations. More information is available on the MassDEP website (MassDEP, 2020b).

Grants also exist specifically for stormwater. The Massachusetts Stormwater MS4 Municipal Assistance Grant Program, introduced in 2017, enables groups of Massachusetts municipalities to expand their efforts to meet requirements for the 2016 Small Municipal Separate Storm Sewer System (MS4) General Permits, and to reduce stormwater pollution through coordinated partnerships that emphasize resource sharing.

MassDEP's Watershed Planning Program provided water quality monitoring grant opportunities in State Fiscal Years 2019 to 2023 for tribal nations and/or nonprofit organizations to monitor water quality including collections of indicator bacteria data for use in water quality assessments.

- SFY2019: Bacteria monitoring of surface waters ($200,000) to 17 recipients ($3,303 to $15,000)
- SFY2020: Bacteria monitoring of surface waters ($200,000) to 14 recipients ($3,222 to $15,000)
- SFY2021: Equipment and supplies grants ($100,000) to two coalitions representing 14 entities ($45,474 and $54,526)
- SFY2022: Direct monitoring of surface waters through field and laboratory work of numerous priority analytes including bacteria ($150,000) to three coalitions representing 13 entities ($51,960 to $38,306) and partial funding to one coalition representing three entities ($16,109)
- SFY2023: Direct monitoring of surface waters through field and laboratory work of numerous priority analytes including bacteria ($500,000) to six individual Eligible Entities and coalitions representing 24 entities ($26,007-$95,588), and partial funding to three individual Eligible Entities ($13,378 -$114,789).

MassDEP's goal in offering these grants is to support ongoing or new monitoring and data collection efforts to increase the amount of external data MassDEP uses for water quality assessments. MassDEP supplements its own surface water quality dataset ("internal dataset") with data collected by entities outside of the agency ("external dataset"). Internal and certain external data meeting MassDEP's acceptance criteria for data quality are used as the basis for assessing surface water quality in accordance with requirements set forth in § 305(b) and § 303(d) of the federal CWA. This includes external data for assessment of pathogen impairment. Future grant opportunities will be dependent on the availability of State funding.

The CZM Coastal Pollution Remediation grant program provides funding to municipalities located within the Massachusetts coastal watershed to address stormwater runoff pollution and boat waste from commercial vessels. Eligible projects include stormwater pollutant identification and assessment; BMP selection, design, permitting and construction; and commercial boat-waste pumpout projects. Projects must focus on waters that directly connect to the coast (i.e., inland ponds/lakes with no flow connection to coastal waters through day-lighted or culverted streams, or impacts to groundwater, are not eligible project areas). Additional funding through grant programs is also available to restore waterbodies through the Buzzards Bay National Estuary Partnership and Massachusetts Bay National Estuary Partnership.

A complete list of funding sources for implementation of nonpoint source pollutants is provided in the report, *2020-2024 Massachusetts Nonpoint Source Management Program Plan* (MassDEP, 2019c), *Nonpoint Source Pollution* (MassDEP, 2019d) and appendix A of the *Massachusetts Nonpoint Source Pollution 319 Grant Guidebook* (MassDEP, 2021b). These lists include specific programs available for nonpoint source management and resources available for communities to manage local growth and development. The SRF provides low interest loans to communities for certain capital costs associated with building or improving WWTFs. In addition, many communities in Massachusetts sponsor low-cost loans through the SRF for homeowners to repair or upgrade failing septic systems.

MassDEP's approach and existing programs provide a wide variety of tools that both MassDEP and communities can use to address pathogens based on land use and common pathogen sources (e.g., CSOs, failing septic systems, stormwater and illicit connections, pet waste, etc.). The necessary remedial actions to address pathogen sources are well established. MassDEP's authority combined with the

programs identified above provide reasonable assurance that implementation of remedial actions will occur.

8. Public Participation

Public meetings to present the results of this TMDL report and answer questions were held in 2024 on May 8th, May 9th, and June 13th. The May 8th meeting was held in-person at the MassDEP Central Regional Office (CERO) in Worcester from 1 p.m. to 3 p.m. and marked the beginning of the public comment period. The May 9th meeting was held virtually via Zoom from 6 p.m. to 8 p.m. and presented the same information as the May 8th meeting. Each meeting was open to anyone throughout the Commonwealth to attend.

A notice of the public meetings was issued through a press release, a notice was placed in the Massachusetts Environmental Policy Act (MEPA) Monitor, and an email was sent to interested parties, including Environmental Justice (EJ) and Tribal communities. A copy of the draft TMDL was published on the MassDEP website.

To supplement the MEPA public notice and MassDEP press release, the Watershed Planning Program sent a notification for the Draft TMDL and information sessions on April 2, 2024, via an email distribution list to 600+ contacts. The notification was also sent to all MassDEP Environmental Justice (EJ) and Tribal contacts. This list included a contact for the Massachusetts Environmental Health Association and the Massachusetts Association of Conservation Commissions. Notice was also posted on the MassDEP Public Hearings & Comment Opportunities webpage.

An additional hybrid public information session held on June 13, 2024, at the MassDEP Southeastern Regional Office (SERO) in Lakeville from 1 p.m. to 3 p.m., was open to anyone throughout the state who wanted to attend in person or remotely via Zoom. The Watershed Planning Program sent a notification for the Draft TMDL and information sessions (and extended public comment period) on June 5th via an email distribution list previously mentioned.

MassDEP presented the same information at each public meeting. Timothy Fox and Holly Brown, TMDL Analysts in the Watershed Planning Program (WPP) at MassDEP, summarized the Statewide Pathogen TMDL Report findings. Additional MassDEP staff were present to respond to questions including Matthew Reardon (TMDL Section Chief, WPP), Richard Carey (Director, WPP) and Lealdon Langley (Director, Division of Watershed Management).

The public comment period was extended to 5 p.m., June 21, 2024. Public comments received during the public meetings and comments received in writing within an extended comment period following the public meetings were considered by the Department. This final version of the TMDL report includes a summary of the public comments, the Department's response to the comments, and attendance records from the virtual meeting and physical meeting (Appendix AC).

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10. Appendices

Appendices A through AB contain summaries of each impaired segment, GIS-based maps showing sampling locations and surrounding watershed areas, the TMDL calculations and percent reductions needed, and recommendations for management activities to achieve the necessary pollutant reduction. Each appendix represents a major watershed as follows:

Appendix A: Hoosic River Basin [3 impaired segments]
Appendix B: Housatonic River Basin [4 impaired segments]
Appendix C: Westfield River Basin [10 impaired segments]
Appendix D: Deerfield River Basin [7 impaired segments]
Appendix E: Connecticut River Basin [15 impaired segments]
Appendix F: Millers River Basin [1 impaired segments]
Appendix G: Chicopee River Basin [17 impaired segments]
Appendix H: Quinebaug River Basin [7 impaired segments]
Appendix I: French River Basin [4 impaired segments]
Appendix J: Blackstone River Basin [19 impaired segments]
Appendix K: Ten Mile River Basin [7 impaired segments]
Appendix L: Narragansett Bay (Shore) Coastal Drainage Area [3 impaired segments]
Appendix M: Mount Hope Bay (Shore) Coastal Drainage Area [2 impaired segments]
Appendix N: Taunton River Basin [1 impaired segments]
Appendix O: Mystic River Basin and Coastal Drainage Area [3 impaired segments]
Appendix P: Charles River Basin and Coastal Drainage Area [7 impaired segments]
Appendix Q: Neponset River Basin and Coastal Drainage Area [2 impaired segments]
Appendix R: Weymouth & Weir River Basin and Coastal Drainage Area [6 impaired segments]
Appendix S: Nashua River Basin [19 impaired segments]
Appendix T: Concord (SuAsCo) River Basin [17 impaired segments]
Appendix U: Shawsheen River Basin [1 impaired segments]
Appendix V: Merrimack River Basin and Coastal Drainage Area [34 impaired segments]
Appendix W: Ipswich River Basin and Coastal Drainage Area [9 impaired segments]
Appendix X: North Shore Coastal Drainage Area [4 impaired segments]
Appendix Y: South Shore Coastal Drainage Area [3 impaired segments]
Appendix Z: Buzzards Bay Coastal Drainage Area [11 impaired segments]
Appendix AA: Cape Cod Coastal Drainage Area [10 impaired segments]
Appendix AB: Islands Coastal Drainage Area [2 impaired segments]

Several segment watersheds extend outside of Massachusetts and into neighboring states and even Canada in the case of the Connecticut River watershed. Some statistics, mapping products, and/or segment descriptions cover all or a portion of the segment watersheds, depending on available data and the intended use of the data. Generally, pollutant sources and sensitive environmental areas were identified for Massachusetts only. A list of these data, including their coverage and source(s), are provided in Table 11 to better guide interpretation of information presented in the appendices.

Table 11. List of GIS layer files, including their coverage and source(s), used for mapping and segment descriptions in the appendices.

LAYER	COVERAGE	SOURCE
Watersheds	Complete watersheds	MassDEP with FBE review
Land Cover	Complete watersheds	MassGIS, VCGI, NHGRANIT, RIGIS, UCONNCLEAR, NRCAN
Impervious Cover	Complete watersheds, except the portion of the Connecticut River watershed (MA34-03, MA34-04, and MA34-05) which extends into Canada, a portion of the Connecticut River watershed in New Hampshire. Additionally, coverage is only available for Strafford and Rockingham counties and portions of Carroll and Belknap counties in NH.	MassGIS, VCGI, RIGIS, UCONNCLEAR
Directly Connected Impervious Area	Complete watersheds. Note for Connecticut River watershed segments (MA34-03, MA34-04, and MA34-05): impervious cover was not included for Canada and a portion of New Hampshire, therefore those areas were considered completely pervious.	MassDEP from available Land Cover and Impervious layers
MS4 Urban Area	Complete Watersheds (except Canada)	Data.gov
Sewer Service Area	Used as a general guide in each watershed discussion. Not represented on any map.	MassGIS, VCGI, RIGIS, UCONNCLEAR
Areas of Critical Environmental Concern	Massachusetts Only	MassGIS
NHESP Priority Habitats of Rare Species	Massachusetts Only	MassGIS
NHESP Natural Communities	Massachusetts Only	MassGIS
Public Water Supply Reservoir Watershed (Zone A)	Massachusetts Only	MassGIS
Outstanding Resource Waters	Massachusetts Only	MassGIS
Conserved Land Protected in Perpetuity	Complete watersheds, except the portion of the Connecticut River watershed in Canada.	MassGIS, VCGI, NHGRANIT, RIGIS, UCONNCLEAR
Protected and Recreational Open Space	Massachusetts Only, with other states (except Canada) representing only conserved lands protected in perpetuity and not recreational open spaces or similar.	MassGIS, VCGI, NHGRANIT, RIGIS, UCONNCLEAR
NPDES Major, Minor, Industrial Permitted Wastewater Discharge to Surface Waters	Massachusetts Only	MassDEP
DEP Ground Water Discharge Permits	Massachusetts Only	MassDEP
Combined Sewer Overflow	Massachusetts Only	MassGIS
Unpermitted Land Disposal Dumping Grounds	Massachusetts Only	MassGIS
Landfills	Complete Watersheds (except Canada)	MassGIS, VCGI, NHDES, NHGRANIT, RIGIS, UCONNCLEAR

All layers outside of MA were projected into NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001
***MassGIS**- Massachusetts Geographic Information System*
***MassDEP**- Massachusetts Department of Environmental Protection*
***VCGI**- Vermont Center for Geographic Information*
***NHGRANIT**- New Hampshire Geographically Referenced Analysis and Information Transfer System*
***NHDES**- New Hampshire Department of Environmental Services*
***RIGIS**- Rhode Island Geographic Information System*
***UCONNCLEAR**- University of Connecticut Center for Land Use Educational and Research*
***NRCAN**- Natural Resources of Canada*

Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies

Appendix AC: Response to Comments

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
Rebecca L. Tepper, Secretary
Massachusetts Department of Environmental Protection
Bonnie Heiple, Commissioner
Bureau of Water Resources
Kathleen M. Baskin, Assistant Commissioner

December 2024

CN 515.1.29

Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies

Appendix AC: Response to Comments

Prepared by:
TMDL Section, Watershed Planning Program
Division of Watershed Management, Bureau of Water Resources
Massachusetts Department of Environmental Protection

December 2024

CN 515.1.29

Suggested Citation
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Available Online
https://www.mass.gov/lists/total-maximum-daily-loads-by-watershed

Massachusetts Department of Environmental Protection
The mission of the Massachusetts Department of Environmental Protection (MassDEP) is to protect and enhance the Commonwealth's natural resources – air, water, and land – to provide for the health, safety, and welfare of all people, and to ensure a clean and safe environment for future generations. In carrying out this mission MassDEP commits to address and advance environmental justice and equity for all people of the Commonwealth; provide meaningful, inclusive opportunities for people to participate in agency decisions that affect their lives; and ensure a diverse workforce that reflects the communities we serve.

Watershed Planning Program
The mission of the Watershed Planning Program (WPP) in the Massachusetts Department of Environmental Protection is to protect, enhance, and restore the quality and value of the waters of the Commonwealth. Guided by the federal Clean Water Act, WPP implements this mission statewide through five Sections that each have a different technical focus: (1) Surface Water Quality Standards; (2) Surface Water Quality Monitoring; (3) Data Management and Water Quality Assessment; (4) Total Maximum Daily Load; and (5) Nonpoint Source Management. Together with other MassDEP programs and state environmental agencies, WPP shares in the duty and responsibility to secure the environmental, recreational, and public health benefits of clean water for all people of the Commonwealth.

Acknowledgements
FB Environmental Associates, under contractual agreements with MassDEP, previously prepared two separate documents for the Watershed Planning Program: (1) *Massachusetts TMDL for Pathogen-Impaired Inland Fresh Water Rivers* and (2) *Massachusetts Statewide TMDL for Pathogen-Impaired Coastal Waterbodies*. MassDEP combined these two documents into a single statewide approach encompassing both inland fresh water and coastal impairments to prepare the *Final Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies*.

Disclaimer

References to trade names, commercial products, manufacturers, or distributors in this report constituted neither endorsement nor recommendations by the Massachusetts Department of Environmental Protection.

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DRAFT MASSACHUSETTS STATEWIDE TOTAL MAXIMUM DAILY LOAD (TMDL) FOR PATHOGEN-IMPAIRED WATERBODIES (CN 515.0) DATED MARCH 2024

IN-PERSON PUBLIC MEETING ON MAY 8, 2024

VIRTUAL PUBLIC MEETING ON MAY 9, 2024

HYBRID PUBLIC MEETING ON JUNE 13, 2024

The Massachusetts Department of Environmental Protection (MassDEP), through the Watershed Planning Program (WPP) in the Bureau of Water Resources, held three public information sessions on the Draft Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies. The three public information sessions were open to everyone throughout the state and sought stakeholder input on the draft plan to reduce pathogens in Massachusetts rivers, streams, and estuaries. The first information session was held in-person from 1-3 p.m. on May 8, 2024, at MassDEP's Central Regional Office located in Worcester. The second information session was held virtually via Zoom from 6-8 p.m. on May 9, 2024. The third information session on June 13, 2024, from 1-3 p.m. was held using a hybrid format: in-person at MassDEP's Southeast Regional Office located in Lakeville and virtually via Zoom for remote attendees. Attendance records for all three information sessions, whether in-person or virtual, are included at the end of the appendix.

MassDEP received several comments on the Draft TMDL. Many comments shared similar questions and concerns regarding MassDEP's stakeholder engagement, age of data, use of external data, and TMDL implementation and enforcement. MassDEP's overall responses to these general comments are presented first, followed by MassDEP responses to comments received (1) during each information session and (2) via formal comment letters and e-mails.

General Comments and Responses:

General Approach

The Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies addresses impairments listed in Category 5 of the *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle* (2018/2020 Integrated Report; MassDEP, 2022b) for select waterbodies that did not already have a final TMDL approved by the U.S. Environmental Protection Agency (USEPA). TMDL development is based on the latest Integrated Report at the time, but the TMDL development process can span multiple years. For example, this TMDL used the 2018/2020 Integrated Report, and not the *Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle* (2022 Integrated Report; MassDEP, 2023), because the TMDL was already at an advanced stage of development when the 2022 Integrated Report was finalized in 2023. However, the goal of the statewide TMDL approach is to more easily facilitate updates to the TMDL as future Integrated Reports are finalized, allowing for a more coordinated approach. The statewide pathogen TMDL approach is well established within New England and with the completion and USEPA approval of this TMDL, all states in the region will have statewide pathogen TMDLs.

There are several previous USEPA-approved pathogen TMDLs in Massachusetts that are part of the public record. It is not possible to merge existing pathogen TMDLs into this TMDL document. Subsequent to USEPA-approval of this TMDL, the publicly available MassDEP TMDL Viewer (https://www.mass.gov/info-details/total-maximum-daily-load-tmdl-viewer) will be updated to easily identify all watersheds associated with an approved pathogen TMDL. The TMDL Viewer, developed by WPP, depicts all final USEPA-approved TMDLs. This TMDL does not replace or supersede any previously USEPA-approved pathogen TMDLs.

Stakeholder Engagement

Public participation is a required element of TMDL development. MassDEP provides a timeline of actions below that were taken to provide public notice that the draft Statewide Pathogen TMDL was available for public review and comment.

- **April 2, 2024**: WPP sent notifications for the Draft Statewide TMDL and public information sessions via an e-mail distribution list containing over 600 contacts. The notification was also sent to a MassDEP-compiled and maintained statewide Environmental Justice email distribution list, including the Massachusetts Environmental Health Association and the Massachusetts Association of Conservation Commissions. The e-mail notification contained the date and time of the first two public information sessions and instructions on how to participate in the virtual session (hosted on May 9, 2024). A copy of the draft TMDL and appendices were published on the MassDEP website.
- **April 10, 2024**: The Massachusetts Environmental Policy Act (MEPA) public notice for the draft TMDL was published in the Environmental Monitor. *Please note: All official MassDEP requests for public comment on TMDLs are published in the Public Notices section of the Environmental Monitor, the bi-weekly publication from the Massachusetts Environmental Policy Act (MEPA) Office. Information on how to register for e-mail notices can be found on the Mass.gov website here: https://www.mass.gov/info-details/the-environmental-monitor .*
- **April 26, 2024**: A MassDEP press release provided information on the draft TMDL and the first two public information sessions.
- **May 1, 2024**: The Massachusetts Office of Coastal Zone Management included notice of the TMDL in their monthly newsletter, CZ-Mail, that includes 3,420 subscribers.
- **May 2, 2024**: The Public Information Meeting Notice was posted on all MassDEP social media accounts (Instagram, X and LinkedIn).
- **May 8, 2024**: An in-person public information session was held at MassDEP's Central Regional Office from 1 p.m. to 3 p.m.
- **May 9, 2024**: A virtual public information session was held via Zoom from 6 p.m. to 8 p.m.
- **May 31, 2024**: The Massachusetts Office of Coastal Zone Management sent the June 2024 edition of CZ-Mail to its subscribers. The CZ-Mail newsletter contained notice that the public comment period for the draft Statewide Pathogen TMDL was still open.
- During the public comment period, MassDEP received requests from Town of Dartmouth officials and residents for more stakeholder outreach.
- **June 6, 2024**: WPP sent notification via an email distribution list of an additional hybrid public meeting that included the option of either in-person attendance at MassDEP's Southeast Regional Office or remote attendance via Zoom. In addition to the more than 600 contacts on the e-mail distribution list, which was also used for the April 2nd notification, Town of Dartmouth officials were sent the notification. The public comment period was also extended to June 21, 2024. This information was also posted on MassDEP social media accounts.
- **June 13, 2024**: A hybrid public information session was held at MassDEP's Southeast Regional Office.

Please note the following: when draft TMDLs are made available on the MassDEP website for public comment, the Public Participation section of the TMDL document is intentionally left blank. When the final TMDL is submitted to USEPA for approval, the Public Participation section contains a narrative description of all outreach activities that were conducted to support the TMDL process. Examples of this can be found in USEPA-approved TMDLs on the MassDEP website.

Clean Water Act Program- Overall and Communication

MassDEP would like to reiterate that the development of the Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies was one of several steps in an iterative process guided by the federal Clean Water Act (CWA) that aims to protect and restore surface waters of the Commonwealth. Every step in this iterative process has and will continue to integrate public participation.

The targets established in the TMDL are based on the Massachusetts Surface Water Quality Standards (SWQS) (MassDEP, 2021). The Massachusetts SWQS establish designated uses for surface waters and associated water quality criteria intended to protect those designated uses. The formal adoption of water quality criteria in the Massachusetts SWQS is subject to the federal CWA (33 U.S.C. §1251 et seq. [1972]) and federal Water Quality Standards Regulation (40 CFR 131). Requirements include public hearings and state and federal review. Bacteria criteria that were used to identify pathogen-impaired waterbodies in this TMDL were adopted into the Massachusetts SWQS in 2021 and were approved by USEPA in 2022. The TMDL report is not proposing any regulatory changes.

Bacteria criteria established in the Massachusetts SWQS were used to identify waterbodies impaired by pathogens. The assessment methodology for using bacteria data to identify pathogen impairments is described in the most recent Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual for the 2022 Integrated Report (MassDEP, 2022a). This listing process involved a bi-annual data solicitation whereby stakeholders can submit quality-assured data to WPP for use in assessments. For more information on external data submittals see: https://www.mass.gov/guides/external-data-submittals-to-the-watershed-planning-program.

Only data that were used to make assessment decisions and have gone through an extensive quality assurance and quality control (QA/QC) process were used in the TMDL. This approach was implemented to ensure that the TMDL indicator bacteria reduction calculation methodology was applied consistently throughout the state. Furthermore, the surface waters included in this statewide TMDL document were listed as impaired using a public process that included opportunities for stakeholder input. Specifically, during the 2016 reporting cycle, MassDEP made a concerted effort to:

> "*Validate and report on its back-logged monitoring data, and to streamline the assessment and listing process. This culminated in the completion, for the 2016 integrated reporting cycle, of a statewide assessment (i.e., all watersheds) of the shellfish harvesting, primary and secondary contact recreation and aesthetic uses, as well as the assessments of the aquatic life use-attainment status of 15 watersheds and/or coastal drainage systems.*" (MassDEP, 2019) (https://www.mass.gov/doc/final-massachusetts-year-2016-integrated-list-of-waters/download)

The federal CWA requires states to submit reports on the status of their waterbodies every two years. These reports are called "Integrated Lists of Waters" (Integrated Reports). Section 303(d) of the CWA requires states to identify those waterbodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and to prioritize and schedule them for the development of a TMDL. The development of the 303(d) list (Category 5 of the Integrated Report) includes a public review and comment process. USEPA reviews and approves the 303(d) list. According to the CWA, each state must develop TMDLs for all waters identified on their Section 303(d) list of impaired waters. A TMDL establishes the maximum amount of a pollutant that a waterbody can receive and still attain water quality standards. Under the CWA, USEPA reviews and either approves or disapproves the TMDL.

When USEPA approves the Integrated Report, the next step in the process is developing TMDLs. For example, the Massachusetts Draft Statewide TMDL for Pathogen-Impaired Waterbodies required multiple years of

development to address pathogen impairments on the 303(d) list. After finalizing the TMDL report, MassDEP will submit the TMDL to USEPA for review and approval.

In summary, the development of the Draft Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies and the required processes under the federal CWA that preceded it, involved significant MassDEP stakeholder interaction and public involvement. TMDLs are not developed in isolation or without consideration for federal and state water resource management procedures and objectives. However, MassDEP will continue to refine the outreach process based on public feedback.

Age of Data Used in the TMDL

For consistency, the same data used to identify pathogen-impaired surface waters in the *Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle* (MassDEP, 2022b) were summarized in the TMDL. MassDEP's rationale for the inclusion of older data in assessments (and not necessarily the most recent data) is provided in the Response to Comments (RTC) document for the 2018/2020 Integrated Report (MassDEP, 2022c). While MassDEP strives to use the most recent data available for both assessments and Integrated Reports, data greater than five years old are sometimes used, especially given WPP's rotating basin monitoring schedule. For the data years used in assessments, the more recent data are given priority in decision-making. MassDEP is actively working on system improvements to maximize data currency in assessment decision-making (i.e., minimize the time lag between data collection and reporting).

More recent data collected by federal and state agencies, local municipalities, and environmental organizations were not used in the development of the TMDL because they were either collected after USEPA approval of the 2018/20 Integrated Report or not included as part of the assessments within the 2018/20 Integrated Report. As described above, the TMDL was developed based on the latest Integrated Report at the time (i.e., the 2018/20 Integrated Report) because the 2022 Integrated Report was finalized when the TMDL was at an advanced stage. Many of the waterbodies included in this TMDL have been listed as impaired for many years across multiple Integrated Reports, and TMDL development is required. However, MassDEP and USEPA recognize that municipalities have done, and are continuing to do, a significant amount of work to monitor and control bacterial contamination of surface waters.

Use of External Data

Dedicated environmental organizations have been submitting high quality bacteria data to MassDEP for decades, and many have expressed concerns that their data were not used in the TMDL. This TMDL presented the data that were used in prior water quality assessments used to identify the waterbodies as impaired for pathogens, specifically, the 2018/2020 Integrated Report. In some cases, data from external organizations were used to identify pathogen-impaired waterbodies as part of the assessment process and were thus used in the TMDL report. As previously noted, the targets and loading calculations established in the TMDL are based on the Massachusetts SWQS. The water quality data and the estimated indicator bacteria reductions in the TMDL provide an estimation of the pollutant reductions needed for each segment to meet applicable water quality criteria established in the Massachusetts SWQS.

It is important to highlight that the finalization and approval of this TMDL is not the end of the process. External data have and will be used in future re-assessments. The Data Management and Water Quality Assessment Section in MassDEP's Watershed Planning Program provides guidance that describes how to submit data that can be used to support water quality assessments as required by CWA Sections 305(b), 314, and 303(d). Organizations and individuals that collect quality-assured surface water quality data are encouraged to submit these data to MassDEP's Watershed Planning Program. The guidance for submitting data is available on this website:

https://www.mass.gov/guides/external-data-submittals-to-the-watershed-planning-program

Implementation and Future Enforcement of the TMDL

In general, MassDEP is pursuing a cooperative approach in addressing nonpoint sources of contamination by bacteria. A total of 260 cities and towns in Massachusetts do have legal requirements to implement best management practices (BMPs) under their National Pollution Discharge Elimination System (NPDES) stormwater permits. Many towns with sewer systems have requirements under NPDES permits related to operation and maintenance of their sewer system. Given challenges related to climate change, aging infrastructure, natural hazards, and other critical priorities, a number of NPDES permits require development of an Adaptation Plan for the Wastewater Treatment System (WWTS) and/or sewer system that permitees own and operate (USEPA, 2024). In addition, failing septic systems are required to be corrected once the local Board of Health becomes aware of these systems and at the time of property transfer should the required inspections reveal a problem. Other activities, such as farming involving livestock, are the subject of cooperative control efforts through such organizations as the Natural Resources Conservation Service (NRCS), which has a long history of providing both technical advice and matching funds for instituting BMPs on farms. While MassDEP has enforcement tools available, the Department intends to fully pursue cooperative efforts that offer the most promise for improving water quality.

Since conditions may change from when the assessment data were collected, data collection and analysis are critical steps in the TMDL implementation process after the TMDL is approved. A local municipality or interested party may want to establish specific goals to reflect local concerns as part of a nine-element watershed-based plan. For more information see: https://www.mass.gov/info-details/nine-element-watershed-based-plans-information. Please also see Sections 5 and 7 of the TMDL for information on implementation, financial resources and other tools to restore water quality.

Questions & comments received on May 8th from in-person meeting attendees:

1) How are legacy contaminated sites dealt with in terms of impairment classification? By legacy I mean conceivably, over 100 years of contamination that was never properly remediated that's still out there and being reflected in the pathogens that you're talking about. How is that dealt with in the methodology? What about PFAS? Where is the TMDL for that right now?

- **Howard Erlichman**

MassDEP Response: *TMDLs are typically prepared to address a specific type of pollutant. This TMDL report applies statewide for waterbodies identified as impaired for pathogens in the Final Massachusetts Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle (2018/2020 Integrated Report). MassDEP has developed a TMDL Strategy that prioritizes impaired waterbodies: Massachusetts Vision 2.0 Clean Water Act Section 303(d) and Total Maximum Daily Load Development (https://www.mass.gov/doc/massachusetts-vision-20-clean-water-act-section-303d-and-total-maximum-daily-load-development/download). MassDEP's priority concerns for 2024-2032 planning period are impairments caused by nutrients (nitrogen and phosphorus) and pathogens that affect public health.*

This TMDL report does not address legacy pollutants, per- and polyfluoroalkyl substances (PFAS), or other pollutants. However, the Commonwealth has identified PFAS contamination as an important emerging issue, and in 2020 the Massachusetts legislature appointed the PFAS Interagency Task Force to investigate water and ground contamination of PFAS across the Commonwealth. MassDEP's

Watershed Planning Program has completed multiple projects to investigate PFAS concentrations in surface water and fish tissue (https://www.mass.gov/info-details/pfas-in-surface-water-and-fish-tissue). For example, MassDEP jointly funded a water quality study with the United States Geological Survey (USGS) in 2020 to evaluate the presence of PFAS in Massachusetts' rivers and streams. An additional study was initiated in 2022 to collect surface water and fish tissue samples from 52 waterbodies throughout Massachusetts. Instead of developing TMDLs, actions to mitigate PFAS contamination will likely occur through relevant regulatory processes (i.e., waste site cleanup, legacy firefighting foam take-back program, NPDES permitting, residuals and biosolids, etc.). More information on Massachusetts actions to address PFAS can be found here: https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas and specifically in relation to residuals see https://www.mass.gov/info-details/pfas-in-residuals.

2) Is this the first pathogen TMDL that the state has had? Is this a big departure from the previous versions? Has it changed in any way?

- **Katharine Lange, Mass Rivers**

MassDEP Response: *MassDEP has developed several previous USEPA-approved pathogen TMDLs, which are all included in an online TMDL Viewer, developed by MassDEP's Watershed Planning Program (https://www.mass.gov/info-details/total-maximum-daily-load-tmdl-viewer). This TMDL follows the same approach as previously approved TMDLs. All targets are based on applicable water quality criteria established in the Massachusetts Surface Water Quality Standards (314 CMR 4.00). The most significant change associated with this Statewide TMDL is that MassDEP is now implementing a more efficient TMDL development process. The TMDL is structured to include a core document and watershed-specific appendices. The core document contains common information that is applicable to all pathogen-impaired surface waters and the appendices include waterbody specific information. It is anticipated that the core document will not require future revisions, and appendices will be added to address future 303(d)-listed surface waters with pathogen impairments. It is expected that this approach will reduce the time between the listing of a waterbody and TMDL development.*

Questions & comments received on May 9th from virtual meeting attendees:

3) Perhaps I just have not done enough reading of the TMDL, but the Appendix refers to the percent reductions that will be required for each of the impaired branches. Does this refer to the geometric mean? It sounds like the TMDL is going to require a certain percent reduction for each of these branches and I'm trying to understand what the percentage refers to. Is it the maximum geometric mean listed in the table? I'm referring to Appendix B Table 1-1.

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

The percent reductions enumerated in the watershed-specific appendices describe the load reductions necessary to meet applicable requirements established in the Massachusetts Surface Water Quality Standards (see Section 4.4 of the TMDL core document). An example calculation that illustrates how these load reductions are derived can be found on page 21 of the TMDL core document.

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4) Our organization has done plenty of monitoring since 2007, but it seems that none of those data were useful. I've never seen 1586 in the Southwest Branch for a 90-day geometric mean. I'm a little puzzled over how that came to be for the Southwest Branch.

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

Data that were used in the Draft Statewide TMDL for Pathogen-Impaired Waterbodies were based on data from the 2018/2020 Integrated Report. Specifically, the maximum geomean statistic that was used to calculate the required load reductions is based on data that were used to identify the impairment. For sampling station W1644, there was one sample on August 2, 2006, that had a very elevated count associated with an infrastructure issue that was promptly remediated. It is important to reiterate that these identified reductions are meant for planning purposes, and the objective of this TMDL is to ensure that pathogen-impaired waterbodies are restored to meet applicable requirements established in the Massachusetts Surface Water Quality Standards (314 CMR 4.00; see Section 4.4 of the TMDL core document). Please refer to the General Comments and Responses section for more information on the use of external data.

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5) So the goal is to have all sampling efforts once we implement [Best Management Practices] to have *E. coli* 126 CFU/100mL or less. We haven't been able to find any significant *E. coli* input. We think it's wildlife, and it's hard to meet, but we will work on it.

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

Pathogens are associated with several sources and enter surface waters through several pathways. There is extensive existing guidance that describes implementation strategies that mitigate wildlife pathogen sources. It is also important to recognize that even if the source of the pathogen is non-human, any concentrations exceeding the relevant indicator bacteria criteria in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) associated with a given designated use (Primary Contact, etc.) will result in a waterbody being designated as impaired.

6) I understand the reason for the TMDL, it gets us to focus and try and get these levels down. But it doesn't seem clear what the process for delisting is. And should this be included in the TMDL, or is it included elsewhere? How do stakeholders understand the process for delisting?

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

MassDEP's Watershed Planning Program (WPP) and other state agencies collect surface water quality data. Individuals and organizations can also submit quality-controlled surface water quality data to WPP (see response to comment 4). These data are analyzed according to the Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual (MassDEP, 2022a). If data show that a waterbody, or Assessment Unit (AU), is not attaining water quality standards, the waterbody is placed on Category 5 of the Integrated Report (or 303(d) list) and prioritized for TMDL development. When a TMDL is approved for an impaired waterbody, that waterbody is delisted for that specific pollutant, but may remain on Category 5 if it is still impaired by other pollutants. Specifically, the 2022 CALM Guidance Manual states:

> *"Impairment removals take one of two forms: 1) delisting of a pollutant (removal from Category 5/the 303(d) list) or 2) restoration of a pollutant (removal from Category 4a) or a non-pollutant (removal from Category 4c). Since MA reports on the overall AU status in the [Integrated Report], removal of an impairment by delisting or restoration may not necessarily result in a change of the category of the AU in the [Integrated Report] if there are additional causes of impairment (i.e., the AU can appear in only one category). Both delistings and restorations follow the same procedure, but pollutant delistings require approval by USEPA (MassDEP, 2022a, page 72)."*

Acceptable reasons for delisting are also presented in the 2022 CALM Guidance Manual (MassDEP 2022a, page 75). Continued monitoring during and after TMDL implementation is essential for tracking water quality improvement. If, based on the CALM Guidance Manual, new data show that water quality standards are being attained, the listing status may be updated. However, it is important to note that water quality improvement may not occur for several years.

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7) Can 604(b) funds be used for monitoring projects that assess the current use attainment of surface waters impaired for pathogens?

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

The Nonpoint Source Management Section in MassDEP's Watershed Planning Program administers two grant programs to address nonpoint source pollution: the Clean Water Act (CWA) Section 604(b) Water Quality Management Planning Grant and the CWA Section 319 Nonpoint Source Implementation Grant. Groups interested in water quality monitoring and TMDL implementation efforts may consider applying for the CWA Section 604(b) grant, which includes, but is not limited to, the following project categories: determination of the nature, extent, and causes of water quality problems; determination of pollutant load reductions necessary to meet established requirements in the Massachusetts Surface Water Quality Standards (314 CMR 4.00); and development of nine-element Watershed-Based Plans (WBPs) to restore impaired waters and protect healthy waters. Continued monitoring following the

approval and implementation of TMDLs is a critical stage in restoring impaired surface waters. This monitoring enables state and local officials to measure the success of implementation. CWA Section 604(b) grants can and have been used to fund these types of efforts. Summaries of past CWA Section 604(b) and Section 319 projects are available on this website:

https://www.mass.gov/info-details/grants-financial-assistance-watersheds-water-quality#sections-604(b)-and-319-and-project-summaries-

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8) For water sampling data to be used to remove an impaired segment from the 303(d) list, is it required that the water samples be taken at the same locations as the water samples that were used to originally to list the waterbody?

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

No. New data collected within a listed segment are reviewed for quality (e.g., representativeness, accuracy, and precision) and usability for assessment. Data considered usable and sufficient can be employed to justify removal of an impairment cause. The data do not need to be based on the same sampling design or from the same locations within the assessment unit. Stakeholders should consult the Data Management & Water Quality Assessment Section in MassDEP's Watershed Planning Program when designing sampling efforts to meet quality assurance objectives.

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9) We are dealing with some problems explaining to the public regarding what the numbers mean. We have many exceedances above 126 CFU/100mL but explaining the rolling geomean is difficult when maybe the next sample is below 126 CFU/100mL, but then you had one that was hundreds or thousands. So that is going to stay impaired for the probably the whole summer. Any thoughts on that?

-Barbara Kickham, Lake Quinsigamond Watershed Association

MassDEP Response:

MassDEP's Watershed Planning Program, through the Surface Water Quality Standards Section, developed a technical guidance document to support calculation of the rolling geometric mean associated with the Primary Contact Recreation designated use established in the Massachusetts Surface Water Quality Standards (314 CMR 4.00). The technical guidance document is entitled, "Surface Water Quality Criteria for Bacteria: Implementation Guidance for the Protection of Human Health in Waters Designated for Primary Contact Recreation," which can be accessed on the Massachusetts Surface Water Quality Standards webpage: https://www.mass.gov/regulations/314-CMR-4-the-massachusetts-surface-water-quality-standards.

When a waterbody is listed as impaired for pathogens, the waterbody stays on the 303(d) list until either future data show that the waterbody is no longer impaired or until a TMDL is approved (or other "good cause" for removal is documented and approved).

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10) I have been wondering if the TMDL allocation should be summed in the appendices, should the WLA [waste load allocation; point sources] and LA [load allocation; nonpoint sources] be added up?

-Barbara Kickham, Lake Quinsigamond Watershed Association

MassDEP Response:

We appreciate that suggestion, and we will consider adding the total WLA and LA to future TMDL documentation. We are able to provide the sum of the WLA and LA of specific watersheds in an electronic format upon request.

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11) Should streams that enter a swimming waterbody where there's public beaches be considered for a 30-day rolling average? So, I'm looking at Coal Mine Brook and Poor Farm Brook, which enter Lake Quinsigamond, and they're both 90-day, but they contribute a lot of stormwater to the lake, which is heavily used recreational activities on it as you know most of the year because of the rowing. We have high bacteria levels coming out of these places going into the lake.

-Barbara Kickham, Lake Quinsigamond Watershed Association

MassDEP Response:

In terms of assessing water quality, the appropriate duration interval to apply (i.e., 30 or 90 days) is based on the waterbody classification and qualifiers as designated in Massachusetts Surface Water Quality Standards (314 CMR 4.00). See also the technical guidance reference in response to comment 9, especially Section 3.2. The targets and loading calculations established in the TMDL are based on the Massachusetts SWQS. A local municipality or interested party may want to establish tailored specific goals to reflect local concerns as part of a nine-element watershed-based plan. For more information see: https://www.mass.gov/info-details/nine-element-watershed-based-plans-information

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12) This TMDL does not include lakes, it only includes streams, rivers, estuaries, and bays. I think it should be clarified that this TMDL does not include lakes.

-Barbara Kickham, Lake Quinsigamond Watershed Association

MassDEP Response:

Thank you for your clarifying comment. It is correct that this TMDL does not include lakes. This is detailed in Section 1.1 of the TMDL core document, pg.1: "This report presents the Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies and provides a framework to address bacterial and other pathogenic pollutants in 210 fresh water river segments and 18 marine segments within twenty-eight watersheds in Massachusetts.".

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13) Also, there should be an emphasis on determining the kind of bacteria that's getting into the waterbody. We have a lot of problems with geese, and we have beaver dams on one of our brooks that enters the lake and is occasionally high in bacteria. We are planning on conducting some DNA marker testing and try to figure out it it's human, and that way we'll be able to do some source tracking.

-Barbara Kickham, Lake Quinsigamond Watershed Association

MassDEP Response:

We appreciate your source tracking efforts. DNA testing is promising, but it is not yet a fully reliable tool to distinguish between human and other sources of fecal bacteria. When perfected, this tool will be extremely valuable in helping target remedial actions. It is also important to recognize that even if the source of the pathogen is non-human, any concentrations exceeding the relevant indicator bacteria criteria in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) associated with a given designated use (Primary Contact Recreation use, etc.) will result in a waterbody being designated as impaired. See also the response to comment 7.

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14) Will the video be available?

-Kerry Snyder

MassDEP Response:

A pdf copy of the presentation is available on the MassDEP TMDL website, and a recording of the presentation can be provided upon request. For more information see: https://www.mass.gov/lists/total-maximum-daily-loads-by-watershed#statewide-pathogen-tmdl-

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15) We have known about the concentration targets for a while now. What is new with the TMDL? Does the TMDL come with any legal requirements or enforcement?

-Ben Wetherill, OARS for the Sudbury, Assabet, and Concord Rivers

MassDEP Response:

The targets (i.e., the numeric water quality criteria for bacterial pathogen indicators) were developed by USEPA and adopted by MassDEP into the Massachusetts Surface Water Quality Standards (314 CMR 4.00). Using these water quality criteria and surface water data, MassDEP identifies waterbodies that are not meeting the Primary Contact Recreation designated use established in the Massachusetts SWQS. The aspect that is new with this TMDL is that MassDEP has used these targets to calculate load and waste load allocations that would be required to restore these impaired waterbodies.

Regarding enforcement, please refer to the General Comments and Responses at the beginning of this section.

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16) What do you mean by the pathogen TMDL being reevaluated every two years?

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

MassDEP is required to submit an Integrated Report describing the status of all surface waters in the Commonwealth to USEPA every two years. This Integrated Report includes all impaired waterbodies that are not meeting established requirements in the Massachusetts Surface Water Quality Standards (314 CMR 4.00). As stated in Section 1.3 of the TMDL core document, fresh water river or coastal waterbody segments that are assessed as impaired by MassDEP after approval of this TMDL report will be added as an addendum in revised versions of the report. Future submittals will provide detailed information on the impaired waterbodies as provided in the watershed appendices. MassDEP does not

anticipate that the core document will be modified in the future. MassDEP will provide public notice of the opportunity to provide comments on draft revisions, and then submit the final version to USEPA for review and approval.

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17) On the east branch we've tested above the impaired segment and found some pretty high levels that we're not quite sure where the source is. So that could be amended, perhaps down the road?

-Alison Dixon, Berkshire Regional Planning Commission

MassDEP Response:

We encourage the submission of quality assured data for potential water quality assessment updates. Please see section Use of External Data above. See also the response to comments 6 and 7 above.

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18) Your presentation indicated that that point sources would be handled through permitting, but nonpoint sources, you used the term voluntary actions in order to bring the waterbody into compliance which makes sense if there are not laws for people that are contributing bacteria to the environment. Single-family residential land use contributes significantly more bacteria than industrial properties or land use. It seems like there's no way to deal with or implement remediation for nonpoint sources. Is that what we're dealing with here?

-Peter Severance, River Merrimack

MassDEP Response:

Regarding enforcement, please refer to the General Comments and Responses at the beginning of this section.

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19) The big problem is stormwater. Does this speak to municipal separate storm sewer systems (MS4) permit requirements? Can you talk about MS4 permits and if there are any opportunities to control MS4 stormwater?

-Peter Severance, River Merrimack

MassDEP Response:

Yes, there are requirements built into MS4 permitting. The National Pollutant Discharge Elimination System (NPDES) Phase I and Phase II stormwater permitting programs require the regulated entities to develop, implement, and enforce a stormwater management program (SWMP) that effectively reduces or prevents the discharge of pollutants into receiving waters to the maximum extent practicable. Stormwater discharges must also comply with applicable requirements established in the Massachusetts Surface Water Quality Standards (314 CMR 4.00). The Phase II permit uses a best management practice (BMP) framework and measurable goals to meet the maximum extent practicable and water quality standards. Individual municipalities not regulated under an NPDES Stormwater Permit should implement the same six minimum control measures to minimize stormwater contamination. If a TMDL has been approved for any waterbody into which the MS4 discharges, as a requirement of the permit, the permittee must determine whether the approved TMDL is for a pollutant likely to be found in stormwater discharges from the MS4. If the TMDL includes a pollutant waste load

allocation, BMPs, or other performance standards for stormwater discharges, the permittee must incorporate into their SWMP the recommendations in the TMDL for limiting the pollutant contamination. The permittee must assess whether the pollutant reduction required by the TMDL is being met by existing stormwater management control measures in their SWMP or if additional control measures are necessary. As TMDLs are developed and approved, stormwater management programs and annual reports from permittees must include a description of the BMPs that will be used to control the pollutant(s) of concern, to the maximum extent practicable. Annual reports filed by the permittee should highlight the status or progress of control measures currently being implemented or plans for implementation in the future. Records should be kept concerning assessments or inspections of the appropriate control measures and how the pollutant reductions will be met.

Questions & comments received on June 13th from in-person and virtual meeting attendees:

20) Good afternoon. My name is Robert Almy. I am the chair of the Dartmouth Public Works Board. It is an appointed position; I am trying to retire. As I tell people, I'm retired and working full time and not getting paid for any of it. And I'd like to thank you folks for part of my workload. It keeps me interested and meeting new people and re-engaging with some issues. I have 47 years working with and for public agencies in resource management, mostly water resources. As a second job, for 18 years I taught environmental studies at the University of California in Santa Barbara. I am a big fan of science applied. There are two parts to this: there's the science, and how it's applied and I'm going to address both of those today. First, and I want to focus on the Paskamansett and another watershed in the Shingle River Watershed in Dartmouth. That's what I've focused on, so I don't make any comments on other watersheds as to the science. The science behind the designation of the Paskamansett River cannot be supported. Five grab samples from a river ten miles long, taken 19 and 12 years ago, respectively, doesn't reflect current conditions, no matter how much work you do on these statistics. I will remind you of the famous line from Mark Twain. There are lies, there are damn lies, and there's statistics. Okay? So we challenge the designation proposed. We also request all of the metadata having to do with the sampling to do with the sampling including: the identification and qualification of the samplers, the sampling technique used, chain of custody forms, and laboratory used to analyze the samples. We'd like to look at the background. If you use old data, we want to know what it looks like, in detail. In addition, the description of the watershed, the characterization of the appendix, is at least six years out of date with respect to local and regional planning documents, current land uses, and land use restrictions. We just, as a community and with our partners, spent almost a million dollars to tie up a very large undeveloped property in our watershed to protect water quality in surface water and our water sources. That's pretty significant. We've updated what in some areas is called the General Plan or the Comprehensive Plan. We've updated a number of other open space plans. None of this is reflected in the appendix. This is not good science. You're probably aware that science is under attack in this country, unfortunately. I would be really disappointed if this were an example of bad science, and we had to go into some kind of formal process and discuss it further in public. Not with something as important as water quality. Now, to the science applied part. How science is applied is essential for whatever proposed action, its credibility, and its implementation. I want to point out the following, I read these documents reasonably closely, I don't see anywhere in the public facing materials information on what specific agency will approve or recommend the TMDL to EPA, and how that approval process works. This is an important action. We also need to know how to challenge any proposed actions. Okay, we'd rather do this in a conference room talking about a specific watershed rather than go to it the way of some of the legal consulting firms do. I don't have to name them. Some of us in this room have dealt with the ramifications on Cape Cod. Which, and I guess I can say, from the perspective of looking across the bay at Cape Cod, maybe that's motivated to for some communities to make progress that they wouldn't have otherwise made. But I've been aware of the Sole Source Aquifer Problem in Cape Cod for decades, and somehow that hasn't been addressed by the people who drink the water. That's unfortunate, that's on them. Without a last-minute objection, the process here would have included a single public hearing in Worcester. As far as I can tell, in conversations with throughout the town of Dartmouth, we didn't receive any notice. So clearly, that's not acceptable. And I suspect there are still towns and cities in the Commonwealth who have no idea this is going on. That's what I suspect. That's not a good thing this is too important, and you do need those towns and cities as partners in this. And finally, public participation. Your draft TMDL has "Chapter 8: Public Participation". This is what's in your document Alright? It says "Placeholder". Now, I've had a fair amount of years doing really difficult problems in public, where some segments of the public or an element of the community, like agriculture, like oil and gas companies, don't want to do things. The 26 years ago I started implementation of a regional MS4 program. It was for a large unincorporated area in California about two thirds the size of the State of Connecticut and 6 small communities, and we developed their plans for them. We put together sampling and all the stuff and we

sold the communities. Public participation and involvement is the most important element of a nonpoint source pollution control program for three reasons: change in behavior is the only effective control, period. Citizens' support is essential for the adoption of local regulations, whatever they are. Without the support, you go to town meeting, nothing happens. And, most importantly, public support is essential for the allocation of limited tax dollars. I can tell you in Dartmouth that we don't spend a million dollars a year on roads that need it because it goes to school. That kind of competition is happening everywhere in the Commonwealth. And even in those towns that are lucky enough to be able to pay pass the tax override. So, in conclusion, I support your programs to improve water quality, but DEP can't do this alone. I observed that public health and safety is one of the most important roles for local government. That's us. So I urge you to consider the best scope and basis for an effective TMDL process; which I think is smaller areas, watersheds groups into smaller areas, and that DEP engage affected cities and towns in each of these smaller areas directly and develop a collaborative process in each area. I think it's important that this program be successful, and I want it to be successful. And I think, as it's setup, there's too broad a scope in what you're trying to accomplish. That's my opinion. Thank you for the opportunity to give you comments, and I'll be happy to answer any questions. If not, I yield my time to others. Thank you.

-Robert Almy, Chair of the Dartmouth Public Works Board

MassDEP Response:

Thank you for your comment and your decades of public service.

As stated in the "General Comments and Responses" at the beginning of this section, the several steps that proceeded the development of this draft TMDL involved significant opportunities for public participation and input. For example, the bacteria criteria used to identify pathogen-impaired surface waters were based on USEPA's nationally recommended criteria. MassDEP adopts water quality criteria into the Massachusetts Surface Water Quality Standards (314 CMR 4.00) to protect designated uses (e.g., Primary Contact Recreation). Adoption of any new or revised criteria into the Massachusetts SWQS first requires a formal regulatory process that involves public hearings and opportunities for public comment. USEPA subsequently reviews and approves any revisions to the Massachusetts SWQS, which is required for new or revised criteria to be used for Clean Water Act purposes, such as water quality assessments.

The surface waters included in this statewide TMDL document were listed as impaired using a public process that included opportunities for stakeholder input. Specifically, the Paskamansett River was listed as impaired for pathogens during the 2016 reporting cycle, Massachusetts Year 2016 Integrated List of Waters (MassDEP, 2019). This impairment was based on data collected in 2005 and 2013. The Draft Massachusetts 2016 Integrated List of Waters (Integrated Report) was published on the MassDEP website. Notice of its availability for public review and comment appeared in the August 23, 2017, edition of the Massachusetts Environmental Monitor and was provided directly to over one hundred different watershed associations and other interested parties. The public comment period ended on October 23, 2017. Adjustments were made to the 2016 Integrated Report as a result of public comments received and discussions with USEPA during the final review and approval process. The Integrated Report listed the Paskamansett River in Category 5 as impaired by pathogens and requiring a TMDL. Therefore, this river is included in this statewide TMDL.

In the TMDL, as shown on Table 5-3 in "Appendix Z: Buzzards Bay Coastal Drainage Area," in 2005 two stations were sampled monthly over a five-month period. Data for E. coli, enterococci, and fecal coliform were collected during each sampling event. These data show that both the statistical threshold value (STV) and the rolling geomean of the criteria were exceeded in both stations. An additional station was sampled in 2013 over a five-month period, and again the data showed that both the STV

and the rolling geomean were exceeded. Based on the assessment guidelines described in the Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual, this waterbody was listed as impaired.

Since surface water conditions may change from when data were collected and used for assessments, data collection and analysis are critical steps in the TMDL implementation process after the TMDL is approved. MassDEP and USEPA recognize that municipalities have done, and are continuing to do, a tremendous amount of work to control bacterial contamination of surface waters. The statewide TMDL provides some examples of that overall effort, but it is not an exhaustive listing of all the work required to finalize this effort and provide a status of that work. However, some programs, such as current Massachusetts MS4 permits, require these status reports, and those will be very valuable in assessing priorities and future work.

In terms of the TMDL approval process, when the draft TMDL is updated with public comments and finalized, MassDEP will submit the final TMDL to USEPA, which has 30 days to review the document and respond with either an approval, partial-approval, or rejection. It is important to recognize that the TMDL development and approval process is not associated with a regulatory change. TMDLs are planning documents that provide estimated pollutant loads from point and nonpoint pollutant sources and describe the estimated load reductions needed for the waterbody to meet applicable requirements in the Massachusetts SWQS. In terms of both public outreach and the Public Participation section in the TMDL document, please refer to the General Comments and Responses section.

MassDEP recognizes that water quality improvement cannot be accomplished without the support of local communities. The NPS implementation that is needed to accomplish load reductions is voluntary. MassDEP encourages local municipalities, environmental groups, and other stakeholders to utilize available funding sources.

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21) I'm sorry I don't have my camera on. Okay, so it was really just a question, not a comment. At the start of the presentation, I heard that TMDLs are administered through the NPDES program, and I just wondered whether you know the activities associated with TMDLs would then be eligible for Section 319 Grants.

-Patty Gambarini

MassDEP Response:

Thank you for your comment. The TMDL waste load allocations, which are associated with regulated point sources of pollution, are administered through the NPDES program and other permitting efforts. The TMDL load allocations, associated with NPS pollution, are implemented through voluntary efforts. MassDEP's NPS Management Section in the Watershed Planning Program administers two NPS grant funding programs under the Clean Water Act (CWA) that address NPS pollution: (1) the CWA Section 604(b) Water Quality Management Planning Grant and (2) the CWA Section 319 NPS Implementation Grant. The Clean Water State Revolving Fund (CWSRF) is another funding option for larger projects.

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22) I'm, for the record, Christopher Michaud, Director of Public Health for the Town of Darthmouth, Massachusetts. Thank you for this opportunity to talk today about the Draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies. This is an important plan, however, I feel the fast track nature that MassDEP has undertaken, that only beginning in late April, advising of the intent through

a press release of this plan, and then quickly holding a public hearing in the central part of the state at 1:00 to 3:00PM, and only after our pleading did they offer this opportunity today, again between one and three in the southeast. While we applaud MassDEP for providing this opportunity, in the southeast region of MassDEP, the one to three PM does not provide for adequate participation by the public to provide oral testimony. Many people are working at this time and cannot take the time from work, others are on vacation or with school obligations with children graduating. This is an important process for the entirety of the Commonwealth with the overwhelming singular landscape of Massachusetts being color coded pink because of impaired waterbodies as part of this plan. I plead for MassDEP to open up more opportunity and not abruptly close this on June 21st. If we are to be successful in this plan, we must engage the stakeholders, businesses, nonprofits, government agencies on all levels, municipal, planning, health, conservation, executive bodies; this is going to require the entirety of the team. Rushing ahead and cutting out this important part of the process is merely going to result in another TMDL plan being stuffed on the shelf, which is a should and not a shall. We'll leave it there until we have another problem that arises to catastrophic levels and possibly being forced by external interest to force the State into making the correction. I plead for MassDEP to exercise some restraint in closing this to broaden the outreach across the regions, to do outreach with the cities and towns, and not close the public hearing. I'll be providing written comment with some of my concerns about some of the technical aspects of this. But this is an important process that we all to be part of. Please do not close this on the 21st. Thank you.

-Christopher Michaud, Director of Public Health for the Town of Dartmouth, Massachusetts

MassDEP Response:

Thank you for your comment. Please refer to the General Comments and Responses at the beginning of this section for a clarification of MassDEP's outreach efforts.

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23) Hey everybody. Thank you. Korrin Petersen, Vice President of Clean Water Advocacy at the Buzzards Bay Coalition. Just a clarifying question; back in 2009 MassDEP submitted a pathogen TMDL for Buzzards Bay at EPA, which EPA approved. I think there were like 52 segments included in that 2009 Pathogen TMDL. I was wondering are these, the segments that are included on Appendix Z for this statewide pathogen TMDL, additions to, and what happens to the 2009 TMDL. So, if you could clarify how those 2 different TMDLs are married together that would be, that would be great. Thank you.

- Korrin Petersen, Vice President of Clean Water Advocacy at the Buzzards Bay Coalition

MassDEP Response:

Thank you for your comment. Current USEPA-approved TMDLs are still in place. The Statewide TMDL for Pathogen-Impaired Waterbodies was written for waterbodies that do not have a USEPA-approved TMDL. Please also refer to the General Comments and Responses at the beginning of this section.

Questions & comments received via e-mail:

24) Comments Received from Charles River Watershed Association

Charles River Watershed Association

June 21, 2024

Via Email

MassDEP
Watershed Planning Program
Attention: Timothy Fox
8 New Bond Street
Worcester, MA 01606

Re: Draft Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies and Appendix P: Charles River Basin and Coastal Drainage Area

Dear Mr. Fox:

Charles River Watershed Association ("CRWA") appreciates the opportunity to comment on the draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies (the "Draft Statewide Pathogen TMDL"), and Appendix P, relating to the Charles River Basin and Coastal Drainage Area.

As one of the country's oldest watershed organizations, CRWA protects, restores, and enhances the Charles River and its watershed through science, advocacy, and the law. Over the last five decades, our initiatives have dramatically improved water quality in the watershed, fundamentally changed approaches to water resource management, and protected the Charles River as a public resource for current and future generations. In 2005, CRWA was instrumental in the development of the phosphorus and nitrogen total maximum daily load ("TMDL") for the Charles River, and in 2017, we were involved in the Vision 1.0 process. More recently, we submitted comments on the Draft Massachusetts Vision 2.0: Clean Water Act Section 303(d) and Total Maximum Daily Load Development.

CRWA is grateful to the Massachusetts Department of Environmental Protection's ("MassDEP") Watershed Planning Program for their continued efforts to establish TMDLs for impaired waterbodies throughout the state. However, we have concerns about the collection and analysis of the data presented in the Charles-specific appendix, as well as a few more generalized concerns. These are primarily that:

- almost all the data in Appendix P appears significantly outdated;
- Appendix P covers only a handful of waterbodies in the Charles River watershed;
- the TMDLs and samples in Appendix P do not provide a complete picture of seasonal and weather-based variation; and,
- the TMDLs are not presented in a format that is conducive to aiding remediation efforts.

Charles River Watershed Association
41 West Street, Floor 8 Boston, MA 02111 t 617 540 5650 www.crwa.org

CRWA also has more generalized concerns related to the Draft Statewide Pathogen TMDL's failure to meaningfully acknowledge the effects of climate change. To help ensure the most robust protection for waterbodies in the Charles River watershed and throughout the state, CRWA respectfully submits the following comments.

Timeliness of the Data and Sampling

While we understand the difficulties associated with collecting appropriate samples, CRWA is concerned that within the Charles River watershed, no sample cited in the report is more recent than 2010, and most are from 2007 or earlier. This means that all of the data concerning the Charles River watershed are at least 14 years old. The watershed area has seen considerable development in that timeframe; data collected from over a decade ago may provide a helpful starting point to discover changes over time in pathogenic pollution in the Charles, but should not be considered a current picture of the watershed's health. To respond to these concerns and to clarify how pathogen TMDLs have been developed in the Charles River watershed, we hope MassDEP will address the following questions:

- What, if any, data on the Charles River watershed collected since 2010 was used in developing this TMDL?
- If no data collected since 2010 was used in developing the TMDL for the Charles River Basin and Coastal Drainage Area, what challenges led to the lack of more data being used?

CRWA is aware that other watershed and non-profit organizations have similarly noted the use of outdated data for the development of pathogen TMDLs in their areas. With that in mind, CRWA hopes that the final TMDL will - if it does not include more recent data on the Charles River watershed - include an explanation of the issues posed by the use of outdated data, and a plan to proactively address those issues.

Clarification of the Selection Methodology

The data for the Charles River watershed only addresses 7 tributaries identified in the report as impaired, only one of which is in the Lower Basin. Neither the report nor the section addressing the Charles River watershed specifically explains how those tributaries were identified. While the TMDL cites the Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle[1] as the source of these designations, even that citation raises the following issues: (1) that list is not the most recent such list[2],

[1]https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-20182020-reporting-cycle/download
[2]See Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle, https://www.mass.gov/lists/integrated-lists-of-waters-related-reports

and (2) that list is opaque as to when, where, and how much data was collected in order to identify pathogen impaired waterbodies. Further, specific segments that are identified in the 2022 and 2018/2020 reports as requiring a TMDL due to impairment from *E. Coli*, including the Charles (e.g. segments MA72-03, and MA72-04[3]) are not included in this TMDL.

While it is reasonable for sampling data to be limited by resources, this data does not cover a broad geographic area or an effective sampling of the more developed areas of the watershed that are likely contributing disproportionately to pathogen presence in the Charles. There are several concerns specifically related to which waterbodies are included in the TMDL and Appendix P which should be addressed in the final report, either through changes that include more complete data, or from a review of the gaps in the report including explanations for those gaps and a proactive approach towards filling them. To address these issues, CRWA requests that MassDEP respond to the following questions:

- How and why were the seven waterbodies included in the TMDL selected?
- Why were others, such as the two portions of the Charles above identified, omitted?

The 2007 Charles River pathogen TMDL does address some of the impaired waterbodies not addressed in this report, but considering the significant growth of urban development in the region, change in weather patterns due to climate change, and the upcoming RDA permitting process, CRWA believes that addressing all impaired waterbodies in the watershed with the most up-to-date data available is necessary for a complete, comprehensive report. The next draft should, if it does not include a more comprehensive accounting of waterbodies in the Charles River watershed, include an explanation of the issues resulting in so few waterbodies being addressed within the watershed, and a plan to address those issues proactively. If this was simply because TMDLs were previously developed for similarly impaired waterbodies or sections of waterbodies, the Appendix should include a note to that effect. To the degree that the limited number of TMDLs was due to a lack of capacity, CRWA welcomes any opportunities to collaborate with MassDEP.

Lack of Wet Weather Sampling and Absence of Seasonal Variation

Another issue with the data is that all of the data points presented in Appendix P are classified by MassDEP as being from dry weather. The TMDL itself identifies CSOs and especially stormwater runoff as major sources of pathogenic pollution, both of which occur primarily in wet weather. To address this issue, CRWA requests that MassDEP respond to the following questions:

- Why were no wet weather data presented? If none were collected, why not?

[3] Integrated List of Waters for the Clean Water Act 2018/2020 Reporting Cycle, p. 150

- CRWA defines "wet weather" in our watershed as 0.25+ inches of rainfall over 48 hours. MassDEP defined wet weather as .50+ inches over 72 hours for this report. Given the strong connection between pathogenic pollution and stormwater, CRWA would appreciate further clarification of the rationale underpinning MassDEP's definition of wet weather.

Additionally, the only samples used in Appendix P are from May to October. While we understand that this is MassDEP's sampling season, CRWA would like to see consideration of samples from early spring when rainfall tends to be higher, as that might again have some relevance on the level of bacterial pollution within the Charles River watershed. Though these months are outside of the traditional sampling season, community partners may have access to or have collected this valuable data, as discussed below.

Inclusion of Community Partner Data

CRWA and other organizations collect and submit bacterial pollution data to MassDEP. However, no CRWA data has been used to develop Appendix P. The same is true of sampling data that other environmental organizations have submitted to MassDEP. This is the case even where the data would be less outdated than whatever data was ultimately used. To address this issue, CRWA hopes that MassDEP can clarify:

- Why data from some environmental organizations was omitted by the report, especially where those organizations provided the most recent or fullest picture of the health of the relevant watershed.
- Whether data from environmental organizations was somehow flawed, and if so why organizations were not informed of deficiencies prior to the development of this TMDL so that better data might be collected and included.
- How data might be clarified - or the TMDL modified - to include all available quality data for watersheds.

Given that this appears to be a widespread issue that has been experienced by other watershed or non-profit organizations, CRWA would appreciate it if further explanation of volunteer data submission and selection procedures were included in the final Statewide Pathogen TMDL document.

As an additional note to ensure the most accurate reporting of local bylaws and stormwater policies within Appendix P, CRWA notes that:

- as of October 2023, Holliston has a wetlands protection bylaw[4];

[4] Town Of Holliston General By-Laws October 2023. pg. 42.

- Wellesley has no stormwater bylaw but does give their board of public works authority to regulate stormwater; the Town has instituted a stormwater utility fee[5];
- Dover is actively reviewing their stormwater management, including possibly implementing a stormwater utility fee[6]; and
- Weston now has a pet waste bylaw.[7]

Lack of Actionable Goals for Municipalities

The way in which the findings in the report are presented, especially the actual TMDLs, does not adequately support remediation actions. The report does not break down waste load allocations ("WLAs") and load allocations ("LAs") by political boundary. Although the report does explain the use of a watershed-based approach in part by saying that it will provide a "useful format for guiding both remediation and protection efforts at the municipal and regional levels by providing a coordinating framework for environmental management…"[8] it is not clear how the approach actually provides a comprehensive framework for coordination or individual action. In general, given our mission, CRWA supports watershed-wide planning. However, like many of our sister organizations, CRWA also regularly works with municipalities to clarify regulatory obligations. If MassDEP were able to provide a watershed-scale approach that also contained some level of municipal WLA planning - an approach that would work well with municipal separate storm sewer system ("MS4") permitting - it could ease compliance and remediation efforts. Without clearly identifying what the target load reductions for each municipality are, there is no clear way for anyone other than the state government to directly act on this TMDL.

While Appendix P does address the current regulatory status of municipalities surrounding each tributary, it does not give comprehensive geographic or WLA/LA breakdowns of the tributary. Instead, it acknowledges the general presence of MS4 permits, outfalls, and bylaws.[9] It also narratively identifies possible sources, in some cases with specific reference to certain neighborhoods, and in most cases using information reported by the towns themselves in their permitting document submissions.[10] Where it identifies urban stormwater runoff as a major source of pathogens, it does not provide any specific proportions. There is no specific breakdown of whether nonpoint or point sources should be the primary

[5] https://www.wellesleyma.gov/2240/Stormwater-Utility-Enterprise-Fund
[6] https://www.doverma.gov/DocumentCenter/View/3017/Dover-Stormwater-Management-Program att. T, p. 7
[7] Gen. Town By-laws, Art. XX § 8.
[8] Draft Massachusetts Statewide TMDL for Pathogen-impaired Waterbodies, p. 8
[9] Draft Massachusetts Statewide TMDL for Pathogen-impaired Waterbodies Appendix P: Charles River Basin and Coastal Drainage Area,
[10] Id.

targets for remediation, or how much action is needed. Where outfalls are linked to an impaired water body, they are not accompanied by a WLA assigned to the municipal sewer system to which those outfalls belong, let alone a WLA for the specific outfall.

Specific figures for WLA and LA, rather than percentages of the TMDL, should be presented in a clear format. Wherever possible, WLA for specific sources, and LA for specific land uses should be given. Where such findings are not feasible, methods of improving data collection in order to make such findings should be identified as an action item for remediation efforts. Ideally, Appendix P would provide sufficient meaningful action items or new actionable findings for municipalities that aim to improve their local water quality and that of the entire watershed.

The 2007 Lower Charles Phosphorus TMDL provides a framework for presenting this data in an actionable manner. In that report, a breakdown of both current and maximum daily loads was presented for each municipality as a whole, and for each type of land use within the municipality.[11] Alongside this was a total target load reduction percentage for each municipality. This created clear, actionable recommendations for municipalities by identifying which land uses were contributing to the current load, and how much that municipality needs to reduce its current load. Where specific outfalls were contributing to phosphorus loading in the watershed, Tables 3-17 provided specific WLAs for each one.[12] The current draft TMDL does not directly present this information. If that information is identifiable in the report, it would require a detailed analysis of the data and the geography of the identified impaired tributaries to determine the current and allocated loads from a given municipality. If the purpose of this TMDL is to guide remediation and protection, the lack of clear action plans or even identified target areas for municipalities renders the report inadequate for its goals.

The lack of distinction between WLA and LA is also a significant problem in light of the ongoing Residual Designation Authority ("RDA") permitting process. The RDA provides a valuable new tool for addressing nonpoint sources of pollution, and TMDL reports are a vital tool used by the EPA in identifying those sources. In presentations relating to RDA implementation, EPA has specifically identified TMDLs as a tool in the planned implementation of RDA permitting. This TMDL does not sufficiently identify the types of land use and specific geographic areas that would be addressed by the RDA permitting process.

[11] See Table 6-4, Final Phosphorus TMDL for the Lower Charles Basin, June 2007, pp. 106-07
[12] Final Phosphorus TMDL for the Lower Charles Basin, June 2007, p. 56

To address concerns related to the utility of the report in assisting towns, cities, and other actors in remediation, where feasible CRWA would like to see the following additions to Appendix P:

- Clear figures for current point and nonpoint source pathogen pollution, LAs and WLAs, and percent reductions required to meet those allocations are presented in a single table organized by municipality.
- Clear identification of land uses that contribute significantly to nonpoint source pollution organized by the municipality.
- Discussion of planned use of the TMDL in the RDA process.

Climate Change-Induced Weather Extremes as a Key Factor in Pathogen Pollution

More generally, CRWA recommends that the final Statewide Pathogen TMDL contain more consideration of climate change and the effects of extreme weather on pathogenic pollution. As MassDEP is aware, the Northeast has experienced the most significant increase in extreme storms in the United States.[13] References to climate change in the Draft Statewide Pathogen TMDL are minimal; while Section 5.10 addresses it, it does not discuss whether climate change and severe weather are expected to have effects on bacterial pollution levels.

Conclusion

The future of clean water in Massachusetts will rely on strong, enforceable bacterial TMDLs. To help create the strongest regulatory framework for pathogen pollution and address some of the concerns above, CRWA suggests that the final Statewide Pathogen TMDL:

- encourage data collection by non-profit or volunteer groups by directly including information in the document on data standards, submission procedures, and selection considerations;
- summarize past regulatory efforts and data selection considerations leading to the creation of the Statewide Pathogen TMDL to proactively address procedural questions about TMDL development[14]; and
- enable clearer paths toward pathogen pollution reduction in nearby impaired waterbodies for municipalities by suggesting WLAs or other means of allowing more targeted reduction efforts.

[13] https://nca2023.globalchange.gov/chapter/21/

[14] This would be particularly useful in cases like this one, where TMDLs are not being developed due to internal regulatory decisions to focus instead on developing TMDLs for new waterbodies rather than updating existing TMDLs.

CRWA is excited to continue to collaborate with MassDEP to develop protective standards for waterbodies in the Charles River watershed and throughout the state. We welcome any questions and look forward to reviewing the final Statewide Pathogen TMDL.

Respectfully,

Zeus Smith, Esq.
Associate Attorney, CRWA

Charles River Watershed Association
41 West Street, Floor 8 Boston, MA 02111 t 617 540 5650 www.crwa.org

8

MassDEP Response:

Timeliness of the Data and Sampling

Regarding the data in Appendix P, please refer to General Comments and Responses at the beginning of this section.

Clarification of the Selection Methodology

Please see General Approach in the General Comments and Responses above. The MA72-03 and MA72-04 assessment units are included in the Final Pathogen TMDL for the Charles River Watershed (MassDEP, 2007). These two segments were originally listed for fecal coliform. In the referenced Category 5 table on page 150 of the 2018/2020 Integrated Report (MassDEP, 2022b), MA72-03 and MA73-04 have "ATTAINS Action IDs" for Escherichia Coli (E. coli). When the pathogen criteria were updated, it was determined that the pathogen TMDL was protective of the E. coli criteria. Specifically, the Final Pathogen TMDL for the Charles River Watershed states:

> *"The Charles River Watershed pathogen TMDLs have been developed using fecal coliform as an indicator bacterium for fresh waters. Any changes in the Massachusetts pathogen water quality standard will apply to this TMDL at the time of the standard change. Massachusetts believes that the magnitude of indicator bacteria loading reductions outlined in this TMDL will be both necessary and sufficient to attain present WQS and any future modifications to the WQS for pathogens (MassDEP, 2007, page 4)."*

Since these segments are included in a USEPA-approved pathogen TMDL, these segments were not included in this statewide TMDL. These segments are listed as Category 5 because they remain impaired for other pollutants that do not yet have a TMDL.

To reiterate, assessment units that are already associated with a USEPA-approved pathogen TMDL are not included in this statewide TMDL. These TMDLs are still in effect. Assessment units that were listed as impaired for pathogens in the 2022 Integrated Report will be addressed in subsequent revisions to the statewide appendices.

Lack of Wet Weather Sampling and Absence of Seasonal Variation

MassDEP sampling is dependent on multiple factors, including logistics and staffing. Given the multiple competing sampling efforts in any given year, sampling is generally not scheduled based on expected weather (but sampling can be cancelled for extreme weather events). For more information, annual monitoring summaries since 2005 are available on the MassDEP webpage: https://www.mass.gov/lists/annual-monitoring-summaries. Water quality assessments for pathogens are dependent only on pathogen indicator bacteria counts and are independent of both flow and any weather characterizations. Pathogen impairments are identified using the statistical threshold value (STV) and rolling geomean criteria magnitudes for revised bacteria criteria in the Massachusetts Surface Water Quality Standards (314 CMR 4.00).

Inclusion of Community Partner Data

Please refer to the General Comments and Responses at the beginning of this section.

Thank you for your comment related to the bylaws in Appendix P. The appendix has been updated.

Lack of Actionable Goals for Municipalities

MassDEP recognizes that the waste load allocations and load allocations are described at the watershed level, which is an appropriate level. TMDLs can assign specific allocations to point and nonpoint sources where there is sufficient data. In the absence of data for detailed allocations, the

allocations can be aggregated. However, providing a comprehensive framework for coordinating individual actions is beyond the scope of this statewide TMDL. For each waterbody, estimates of the indicator bacteria reductions necessary to meet applicable requirements in the Massachusetts SWQS are provided. The targets established in the TMDL are based on the Massachusetts SWQS.

The eventual implementation of the TMDL will be made at the local level. MassDEP looks forward to working with municipalities and stakeholder organizations during the implementation process. A useful tool to promote TMDL implementation and to ensure eligibility for Clean Water Act section 319 grants, administered by MassDEP's NPS Management Section in the Watershed Planning Program, is a nine-element watershed-based plan. For more information see: https://www.mass.gov/info-details/nine-element-watershed-based-plans-information.

To aid local planning, MassDEP's TMDL Viewer will be updated to reflect areas covered by the Statewide Pathogen TMDL after the TMDL is finalized and USEPA-approved. The TMDL Viewer, which can be used as a tool for local decision makers when developing implementation strategies, can be found at this link:
https://www.mass.gov/info-details/total-maximum-daily-load-tmdl-viewer

Climate Change-Induced Weather Extremes as a Key Factor in Pathogen Pollution

Adaptive management is an appropriate strategy to address the impact and uncertainty associated with climate change. This approach recognizes that restoring polluted waters is a long-term process. For this reason, MassDEP supports an adaptive management approach to implementing a TMDL: taking the most cost-effective measures first, measuring their impact, and adjusting where necessary. Giving priority to projects with more immediate impacts on water quality will help communities adjust implementation steps if needed. Please also refer to General Comments and Responses: Implementation and Future Enforcement of the TMDL at the beginning of this section.

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25) Comments Received from Connecticut River Conservancy

15 Bank Row, Greenfield MA 01301 - (413) 772-2020 - ctriver.org
Connecticut River Conservancy

June 21, 2024

MassDEP
Watershed Planning Program
Attention: Timothy Fox
8 New Bond Street
Worcester, MA 01606

Re: Statewide Pathogen TMDL (CN 515.0) Comments

Dear Mr. Fox,

Thank you for the opportunity to comment on the draft Massachusetts Statewide Pathogen TMDL. Connecticut River Conservancy (CRC) is the watershed organization for the entire Connecticut River watershed which comprises portions of Massachusetts, Vermont, New Hampshire, and Connecticut. We restore and advocate for clean water, healthy habitats, and resilient communities to support a diverse and thriving watershed. One part of our work is conducting water quality monitoring every summer from June to September during the recreational season. Our water quality monitoring specifically focuses on *E. coli* bacteria to provide weekly health and safety information, publicly accessible online (ctriver.org/isitclean), to recreational users of the Connecticut River and its tributaries. CRC was fortunate to be the recipient of MassDEP Water Quality Monitoring Grant for several years including FY19, FY20, FY23, and FY24 which has supported our ability to keep an up-to-date, approved Quality Assurance Project Plan (QAPP) on file with MassDEP and submit the data we have collected from the Connecticut River, Deerfield River, and Chicopee River basins to MassDEP through the Environmental Protection Agency's Water Quality Exchange (WQX) Database.

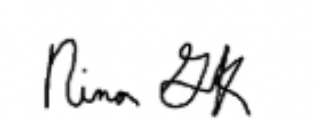
We have reviewed the Pathogen TMDL and we appreciate the tremendous effort and analysis the agency has done to produce this extensive document, including the GIS data and local information included in each watershed appendix.

Our primary concern with this draft TMDL is that it relies primarily on old data. For most of the segments included in the appendices (C-G) that fall within our watershed and within the areas for which we collect pathogen data and submit it to MassDEP via WQX, no data newer than 2014 and no data collected and submitted by CRC was included in the report. One segment, the Mill River in Northampton (MA34-28) included the data collected and submitted by CRC from 2012-2019, although data after 2019 has also been submitted to DEP for that river segment. We do not understand why this latest draft TMDL does not include new data. MassDEP did already use our newer data in the 2022 Integrated List of Waters. In fact, our data was used in the 2022 Integrated List of Waters to delist segment MA33-03 of the Deerfield River as impaired for *E. coli* bacteria and yet that segment is still considered impaired and included in this draft TMDL. It feels unacceptable to us that new data has not been used for this draft TMDL without any explanation. If there is a specific reason why new data was not used, then we recommend that DEP communicate that to us and to the public, directly naming why new data sets are not used to support the new TMDLs. We are readily available and want to help collaborate in this process in any way that we can be helpful.

Another concern we have is around enforcement. It is not clear to us how the maximum allowable loads will be implemented or enforced, nor what will happen if TMDLs are not met. What will be done if pollution sources are identified that exceed the allowable load? Are there immediate actions that need to be taken or financial consequences for exceedance? We recommend that DEP include an enforcement and management plan and guidelines for mitigating a TMDL exceedance.

We appreciate your focus on moving this TMDL forward and thank you for considering these comments. Please contact Ryan O'Donnell, Water Quality Monitoring Coordinator at rodonnell@ctriver.org or Nina Gordon-Kirsch, Massachusetts River Steward at ngordonkirsch@ctriver.org with any questions.

Sincerely,



Nina Gordon-Kirsch
Massachusetts River Steward
Connecticut River Conservancy

Ryan O'Donnell
Water Quality Monitoring Coordinator
Connecticut River Conservancy

MassDEP Response:

Thank you for your comments. Please refer to General Comments and Responses at the beginning of this section. Current data may show that a waterbody is meeting applicable requirements in the Massachusetts Surface Water Quality Standards (314 CMR 4.00). Due to the timing of the TMDL development and the 2022 Integrated Report, the Deerfield River segment MA33-03 effectively becomes a protective TMDL and will remain as such. This will prevent the waterbody from being listed as impaired at a future date. No remediation is needed for this segment at this time; however, measures should remain in place to maintain the quality of the water. Please also see Sections 5 and 7 of the TMDL for information on implementation, financial resources, and other tools to restore water quality.

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26) Comments Received From the Massachusetts River Alliance

MASSACHUSETTS
Rivers Alliance
11 Curtis Avenue, Somerville, MA 02144
617-714-4272 • massriversalliance.org

June 21, 2024

Timothy Fox
Massachusetts Department of Environmental Protection
Watershed Planning Program
8 New Bond Street
Worcester, MA 01606

Dear Mr. Fox,

Thank you for the opportunity to comment on the draft statewide pathogen TMDL. The Massachusetts Rivers Alliance is a statewide organization with 86 member groups dedicated to protecting and restoring the rivers and streams of the Commonwealth.

We are glad to see MassDEP update this TMDL, and we appreciate the extensive analysis the agency has done to produce it, particularly the GIS data and other local information in each watershed appendix.

Our primary concern with this draft TMDL is its use of very old data. For a document that is meant to be an "update," many watershed assessments are relying on data that is over a decade old. There is likewise little mention of climate change in this draft TMDL, a driving force behind changes in local weather patterns that impact how pathogens are carried into waterways. We hope that MassDEP will use more recent watershed data in tandem with modern precipitation data.

The reliance on old data highlights an ongoing concern among watershed associations about how MassDEP is using external partner data. Many of our member organizations have submitted more recent data to MassDEP, some using funding from MassDEP's water quality monitoring grants, and do not see that data reflected in this document. Some have not received confirmation from MassDEP that their data has been approved, or any reason why their data is insufficient, and if they do, it is years later in some cases. Several of these organizations will be submitting their own comments to MassDEP this week. These organizations spend significant time and resources in collecting this data, and want to support accurate scientific assessments of their rivers. If MassDEP's criteria

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for external data has changed, or if your staff have concerns with the external data that's being submitted, please communicate that to partner organizations so that they can contribute their local expertise to the TMDL process. These groups are eager to collaborate with agency staff to ensure a smooth and high-quality data process for both parties. Discussion of this process would fit well in the "Public Participation" section of the draft TMDL, which is currently empty.

Finally, this update would be most helpful in context with past pathogen TMDLs. We request that MassDEP put this draft TMDL in the same document as existing pathogen TMDLs for other watershed segments so that reviewers may better understand the full picture of each watershed. Reviewers would also benefit from a clickable Table of Contents for each watershed appendix.

Thank you for your time and consideration of these comments.

Sincerely,

Katharine Lange
Policy Director
Massachusetts Rivers Alliance
katharinelange@massriversalliance.org

MassDEP Response:

Thank you for your comments. Regarding the age of the data, use of external data, and general approach, please refer to General Comments and Responses at the beginning of this section. A clickable table of contents has been added to each appendix.

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27) Comments Received From the Neponset River Watershed Association

neponset river
WATERSHED ASSOCIATION

Bonnie Heiple, Commissioner
Massachusetts Department of Environmental Protection
100 Cambridge Street, Suite 900
Boston, MA 02114

RE: Statewide Pathogen TMDL (CN 515.0)

Dear Commissioner Heiple:

The Neponset River Watershed Association is a member-supported nonprofit organization dedicated to the improvement and protection of the Neponset River and its watershed. Included in that mission is a commitment to supporting resilience efforts throughout the region. It is with this mission in mind that we submit these comments on MassDEP's proposed *Massachusetts Statewide Total Maximum Daily Load (TMDL) for Pathogen-Impaired Waterbodies*.

Overall, NepRWA is pleased to see that MassDEP has prioritized the creation of a statewide pathogen TMDL and has plans to provide regular updates along with the biannual Integrated List of Waters. The shared language on the development and calculations for the TMDL is useful to avoid a fragmented approach to what is truly a regional and systemic issue. Additionally, the watershed specific appendices make it easy to drill down into specific waterbody issues, including subwatershed analyses and reviews of potential issues of concern. We also appreciate seeing that the other appendices take advantage of external data to extend the reach of DEP's Watershed Planning Program's internal sampling.

NepRWA is concerned about some of the data used and omitted from the proposal, undercutting the effectiveness of the TMDL. Specifically, we urge MassDEP to consider the following:

Timeliness of Data

The first significant issue is the timeliness of data included in the development of the TMDL. It appears that no data after 2018 was used in the creation of watershed specific TMDLs. In the case of the Neponset, the relevant cited data is limited to a single year's collection in 2009. This leads to a meaningful disconnect between the most accurate data from the biannual Integrated List of Waters, creating unnecessary confusion and inaccuracies.

2173 Washington Street, Canton, MA 02021
781.575.0354 | staff@neponset.org | www.neponset.org

In particular, the Neponset River Watershed Association has submitted data on Steep Hill Brook (MA73-18) for decades, with *E. coli* data deemed "assessment quality" in the years 2008-2014 per a 2016 review, and biannually since then. It is unclear therefore why these data were not included in the assessment of Steep Hill Brook for the TMDL. Given that these data were deemed assessment grade, MassDEP should explain the reasons for their omission. Similarly, NepRWA has provided data on the Plantingfield Brook (MA73-23) between 2019 and 2022, demonstrating E. coli impairment.

Additional Information and Enforcement

While significant and detailed geographic analysis has been done for each listed waterbody, we urge MassDEP not to miss the opportunity to include more detailed information from USGS's StreamStats application. Additional information includes total miles of roadway within the subwatershed, number of road crossings per reach segment, and estimated base and peak flows for contextualizing load calculations.

While the proposed TMDL provides some clear resources, including explanations of TMDL development and waterbody-specific target goals, there is no clear mechanism by which the TMDL will promote better enforcement or attainment of the stated load goals. Given the calculation of each waterbody by MS4 permit area and individual municipality, it seems that it would be within the scope of this document to create municipal specific load targets, which could then be more easily tracked for improvement and implementation. This would bring the document closer in line to MS4 permit requirements for municipalities and make clearer what responsibilities fall under which local government purview.

Missing Information and Utility

The "Public Engagement" section of the TMDL is blank and it is unclear what is meant to be captured in this section. We would encourage the use of this space as a repository of questions and comments received and answered, to both act as an FAQ and provide some transparency to the process. Additionally, some best practices or examples that municipalities could follow for effective outreach around pollutants would be especially helpful.

Finally, there are additional ease-of-use functions that could be added to a final digital document, including a clickable table of contents to more easily navigate the report.

Future work

While beyond the scope of this document, which we note does not affect existing TMDLs, the statewide approach used here has clear benefits. We are curious whether future issuances of the statewide TMDL could incorporate all active TMDLs into one unified document (making sure not to ease any pollutant load requirements already in place through a TMDL), providing a clear central resource for all state, local, and non-governmental actors to refer to while pursuing improved water quality.

Conclusion

We applaud MassDEP for the work it has done to put this TMDL together. While we believe some additional information and some corrections (such as inclusion of additional impaired waters) would make this a stronger and more useful document in the protection of our critical water resources, it is clear that MassDEP has put significant effort into this approach. The Neponset River Watershed Association has a long history of working productively with MassDEP, including

by collecting useful pathogen concentration data for imperiled streams, and we hope that the TMDL can reflect the best and most up-to-date information possible.

Thank you for the considerable time and effort the agency has invested in creating this TMDL so far. We look forward to continuing to work together to protect Massachusetts' rivers, ecosystems, and communities from the impacts of climate change.

Sincerely,

Kerry Snyder
Managing Dir. for Community Resilience

Page 3 of 3

MassDEP Response:

Timeliness of Data

Please refer to General Comments and Responses at the beginning of this section.

Additional Information and Enforcement

Please refer to General Comments and Responses at the beginning of this section.

Missing Information and Utility

Please refer to General Comments and Responses at the beginning of this section. MassDEP intends this Response to Comments appendix to serve as the Frequently Asked Questions (FAQ) repository you have requested. Including a thorough documentation of comments received and MassDEP responses in the final TMDL report is the process for all MassDEP TMDLs. For examples of best practices for outreach please refer to the Watershed Planning Program's Nonpoint Source Management webpage:

https://www.mass.gov/info-details/nonpoint-source-pollution#tools-for-managing-nonpoint-source-pollution-

Future Work

Please see the General Comments and Responses at the beginning of this section.

28) Comments Received From OARS for the Sudburry and Assabet & Concord Rivers

OARS
FOR THE SUDBURY ASSABET & CONCORD RIVERS
23 Bradford Street • Concord, MA 01742
978 • 369 • 3956
office@oars3rivers.org
oars3rivers.org

June 6, 2024

MassDEP
Watershed Planning Program
Attention: Timothy Fox
8 New Bond Street
Worcester, MA 01606

Re: Statewide Pathogen TMDL (CN 515.0) Comments

Dear Mr. Fox,

OARS appreciates the opportunity to comment on the draft Massachusetts Statewide Pathogen TMDL. OARS is the watershed organization for the Concord basin, comprising the Sudbury, Assabet, and Concord rivers in a 400-square mile area west of Boston. A nonprofit organization founded in 1986, OARS works primarily through science-based advocacy and education to develop a scientific understanding of the causes of river degradation and works with communities to seek effective solutions. Its mission is "to protect, improve and preserve the Sudbury, Assabet, and Concord Rivers, their tributaries and watersheds, for public recreation, water supply, and wildlife habitat." We have a long-term quality-controlled water quality monitoring program and annually provide our data to the EPA and MassDEP through the EPA's WQX data portal.

We reviewed the draft Pathogen TMDL documentation, and we are very pleased that MassDEP is taking this step to formalize standards and goals for pathogens in surface waters. We have the following comments about some of the TMDL details:

- **Timeliness of Data** - The fact that the TMDL document and supporting appendices are based on old data (2018/2020 Integrated List or older) is quite unsatisfactory. This means that most of the data cited is outdated and unreliable. OARS puts a lot of care into providing quality-controlled *E. coli* monitoring data to MassDEP every year. However, the 2018/2020 Integrated List did not include any OARS data after 2017, and OARS' *E. coli* monitoring program only started in 2019. We have submitted to MassDEP five years of high-frequency *E. coli* data from around the watershed from 2019-2023, but none of it has been included in this TMDL document. These data should be included. Some of our E. coli data directly contradict the status of impairments listed in Appendix T:
    - The Concord River segment MA82A-07 is listed as being impaired for pathogens. However, this impairment listing is based on only five samples that were collected in 2006. OARS has collected 63 samples between 2019 and 2023 at the locations W1483 and W1484. Out of all 63 samples, none have exceeded the EPA's BAV of 235 CFU/100ml, and the geometric mean of the full set of results is only 30 CFU/100ml. This segment should not be listed as impaired.
- **Wildlife** – The sections on Wildlife Waste (3.2.4 and 5.8) do not mention beavers. In OARS' pathogen source-tracking research, we have found through DNA analysis that beavers often have a much larger presence in surface water DNA counts than birds or dogs. It would improve the TMDL if it included some guidance on how to think about beavers' role in pathogen pollution.
- **Basemap** - It is not clear why the basemap (Appendix T, Figure 2-1) does not show all continuous river segments. The impaired segments are highlighted in red. Some of the

unimpaired segments are highlighted in blue, but it is not clear why many other unimpaired segments are not depicted at all, including some segments of the mainstem Sudbury, Assabet, and Concord rivers (e.g., MA82A-08). This is confusing. We recommend that all unimpaired segments be highlighted in blue.

- **Table of Contents** - Please add clickable tables of contents to the appendix documents so that it is easier to navigate to individual waterbodies.
- **Enforcement** – This document is a very thorough analysis of how each waterbody stands regarding the standards for pathogen impairment, but it is not clear how these maximum allowable loads will be implemented or enforced. Will there be a mechanism for forcing municipalities to eliminate pollution sources if it is identified that they are exceeding the allowable load?
- **Watershed association monitoring** – In section 6 (Monitoring Plan) there is a list of organizations involved in water quality monitoring. Monitoring by volunteers through watershed associations is listed as the last item, giving the impression that this is the least significant group. Based on our observation, watershed groups are the primary and most active type of organization conducting water quality monitoring for pathogens in Massachusetts. It would be much more accurate and considerate to put them at the top of the list.
- **Additional monitoring** – OARS would like to do more pathogen monitoring in more locations around the watershed and do more source-tracking studies to identify pollution sources. We can leverage volunteer citizen scientists for the monitoring legwork, but we are limited by funding for staff time and lab expenses. This draft TMDL highlights many waterbodies with pathogen concerns based on old data. MassDEP has provided funding in past years, but it has been limited in amount and availability dates. Could MassDEP provide more funding to support monitoring to collect new data for these waterbodies that have not been monitored for many years?

We appreciate your focus on moving this TMDL forward and thank you for considering these comments. Please contact us if you have any questions.

Sincerely,

Benjamen Wetherill
OARS Staff Scientist

CC: Massachusetts Rivers Alliance

MassDEP Response:

Timeliness of Data

Please refer to General Comments and Responses at the beginning of this section. MassDEP appreciates the effort OARS has made to submit quality assured data to use in assessing water quality in the Concord River basin. The data will be used in a future Integrated Report to provide information on water quality status. Once USEPA approves a TMDL, subsequent water quality assessments that indicate attainment of applicable water quality criteria in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) would result in the bacteria cause of impairment being removed. The TMDL would then be protective, which would prevent the waterbody from being listed again and requiring a TMDL. For this reason, the TMDL will remain for MA82A-08.

Wildlife

The Wildlife section includes a mention of mammals, which is intended to include bacteria associated with beavers, ground hogs, squirrels and other mammals. Future TMDL implementation efforts and delisting decisions may involve studies of specific wildlife contributions. However, if indicator bacteria show that a waterbody is not meeting applicable requirements established in the Massachusetts SWQS, the waterbody is still considered impaired for pathogens regardless of the source bacteria.

Basemap

Thank you for your comment. Figure 2-1 in Appendix T has been updated.

Table of Contents

Thank you for your comment. A clickable table of contents was added to all the appendices.

Enforcement

Please refer to General Comments and Responses at the beginning of this section.

Watershed associated monitoring

MassDEP agrees that water quality monitoring by volunteers is an important source of pathogen data in the Commonwealth of Massachusetts. The order that agencies and organizations involved in water quality monitoring are presented is not meant to insinuate that volunteer monitoring is less important.

Additional monitoring

The Nonpoint Source Management Section in MassDEP's Watershed Planning Program administers two grant programs to address nonpoint source pollution: the Clean Water Act (CWA) Section 604(b) Water Quality Management Planning Grant and the CWA Section 319 Nonpoint Source Implementation Grant. The CWA Section 604(b) Water Quality Management Planning Grant can be used to fund water quality monitoring efforts that aim to determine the nature, extent and causes of water quality impairments and to develop plans to restore water quality in impaired waters. More information about the 604(b) grant program and other funding sources can be found here:
https://www.mass.gov/info-details/grants-financial-assistance-watersheds-water-quality

Please also refer to the response to Comment 7 above.

29) Comments Received From OARS for the Pioneer Valley Planning Commission

Catalyst for Regional Progress
PVPC
Kimberly H. Robinson, MUP
Executive Director

June 20, 2024

Mr. Timothy Fox, TMDL Analyst, Watershed Planning Program
Massachusetts Department of Environmental Protection
Delivered as directed via e-mail: Timothy.M.Fox@mass.gov

Re: Draft MA Statewide TMDL for Pathogen Impaired Waters_2024_03_25

Dear Mr. Fox:

Thank you very much for the work by your MassDEP team in pulling together the information and data for the draft TMDL for pathogen impaired waters document. The document reflects tremendous effort with good detail on segments and the controls already in place toward clean water in the Commonwealth's communities.

There are four major basins within the Pioneer Valley included in the draft TMDL: Connecticut River, Chicopee River, Westfield River, and Quaboag River. Among our municipalities located within watersheds of pathogen impaired waters, many are regulated under the EPA and MassDEP MS4 permit, and three continue to struggle with addressing the legacy of combined sewer infrastructure.

While establishing budgets for pollutant loading to our rivers and streams may be important to achieving clean water standards, I am concerned that there has been insufficient notice and conversation around the nature of this new program in Massachusetts and the implications for communities. The timing in issuing the draft TMDL document also overlapped with major efforts already under way to review, understand, and comment on the new draft stormwater regulations and handbook. Those knowledgeable on water quality issues understandably had attention focused elsewhere.

Our sense is that many who are essential to helping meet the draft TMDL objectives have no idea about this document and the new program. As such, PVPC highly recommends a few important adjustments in rolling out this new program in Massachusetts:

- Extend the deadline for comments on the draft TMDL document.
- Advance a far more robust conversation around the program so that key actors are aware of the role they will need to play and can make meaningful comments on the draft document.
- Host a public session on the draft TMDL in Western Massachusetts (I understand there have been sessions in central and southeastern parts of the state, but nothing out this way).

Thank you for your consideration of PVPC's comments.

Sincerely,

Kimberly H. Robinson

cc: Michael Gorski – MassDEP WERO Regional Director, Michael.Gorski@mass.gov
Saadi Motamedi MassDEP WERO Acting Director Water Resources, Saadi.Motamedi@mass.gov

Pioneer Valley Planning Commission 60 Congress Street, Springfield, MA 01104-3419
phone 413.781.6045 fax 413.732.2593 TTY 413.781.7168 www.pvpc.org

MassDEP response

Thank you for your comments. In response to your questions about the deadline extension, public engagement, and additional public information sessions, please refer to General Comments and Responses at the beginning of this section.

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30) Comments Received From Massachusetts Coalition for Water Reources Stewardship

MCWRS
Massachusetts Coalition for
Water Resources Stewardship

June 21, 2024

MassDEP
Watershed Planning Program
Attention: Timothy Fox
8 New Bond Street
Worcester, MA 01606

Via email to: Timothy.M.Fox@mass.gov

RE: Statewide Pathogen TMDL (CN 515.0) Comments

Dear Mr. Fox:

The Massachusetts Coalition for Water Resources Stewardship (MCWRS) is a non-profit organization representing the interests of municipalities, districts and commissions in the world of wastewater, stormwater and drinking water. Members include municipalities, wastewater, stormwater and drinking water utilities, engineering consultants, legal firms and stormwater coalitions.

MCWRS is pleased to provide the following comments on the draft Statewide Pathogen TMDL. Thank you for providing the opportunity to weigh in on this important document.

1. It is unclear as to the value of describing the TMDL in terms of a pollutant load in number of bacteria per day. MCWRS is not aware of anyone using a daily load for bacteria to describe conditions in a waterway. The TMDL concentration is the water quality standard at the point of discharge. The inclusion of the bacteria loading in CFU/day as described in section 4.2.2 only confuses things and fails to produce metrics that are of value to infrastructure managers, river advocates or the general public.

2. The Fact Sheet states, "This TMDL will be implemented through an iterative process that will require *establishing realistic goals*, source identification, and mitigation." The document then goes on to suggest many unrealistic goals. Expecting all urban stormwater to meet bathing beach standards for microbes at the point of discharge defies achievable operational and treatment practices. Calling for the elimination of CSOs in all river segments that currently receive CSO discharges is also grossly unrealistic unless the Commonwealth plans to provide tens of billions of dollars in grants to the 19 CSO communities to help make this happen.

c/o Regina Villa Associates | 20 Park Plaza, Suite 801 | Boston, MA 02116
(617) 357-5772 | www.mcwrs.org | info@mcwrs.org

Indeed, Section 5.3 of the TMDL recognizes this, with reference to the CDM study of the Merrimack River. "The CDM study of the Merrimack River suggests that CSO abatement on its own would not eliminate violations of the SWQS in the river's mainstem. Most of the river from Manchester, NH to downstream of Haverhill, MA would still exceed SWQS more than 10% of the time. According to the CDM study, CSO control plans with full separation of sewers in each city would only yield slight additional improvements..." This very real funding constraint aside, the associated work schedule required to meet these standards would be decades if not longer. As has been learned from the current MS4 General Permit, efforts required to meet TMDLs have already introduced major operational and budgetary challenges for municipal compliance. Having a TMDL with unrealistic expectations will not help advance further improvements in the water quality of our rivers but will only assure non-compliance for municipalities and promote unproductive conflict between these municipalities, regulators and river advocates.

3. Section 4.3, Margin of Safety, makes clear that the TMDLs do not consider dilution in the receiving water, nor do they consider in-stream processes such as bacteria die-off and settling which are known to reduce in-stream indicator bacteria concentrations. This assures that the TMDL applying indicator bacteria standards at the point of outfall is an unscientific and unreasonable approach. There are many tools available for calculating river flows and dilution factors. There are also numerous studies in scientific literature which can be used to support die-off rates for bacteria. The best available science must be used for TMDL development and that does not appear to be the case with the draft Pathogen TMDL.

4. Throughout the document and its appendices, CSOs are noted as being the highest priority source of pathogens and that CSOs "must be eliminated". As previously noted, such a proposition cannot occur without an enormous input of federal and state grant money to municipalities with combined sewers and unintended consequences. The federal and state approach to CSOs has historically been based on incremental advancement of attainable techniques to reduce the occurrence and volume of CSOs. The toolbox for CSO control includes combined sewer separation where feasible along with stormwater flow reductions and discharge treatment when applicable. That approach has been very effective in reducing CSOs from pre-Clean Water Act days to today. Every CSO community has made considerable investments in CSO control under their NPDES permits and has successfully reduced the volume and occurrence of CSOs. The TMDL should call for continuing efforts to further control and/or reduce the impact of CSOs and more federal and state grants to make this happen. It should not be making the unrealistic demand to eliminate all CSOs without resources in place to make this happen. See again the TMDL's Section 5.3 reference to the CDM studies. "Implementing CSO discharge controls (Phase I and certain high priority Phase II), as well as non-CSO stormwater conveyance controls, fixing illicit connections and failing infrastructure, and developing septic system maintenance programs would be necessary to significantly reduce the total number of indicator bacteria violation days (CDM, 2004; CDM Smith, 2017; CDM, 2006)." The unintended consequences of CSO elimination also cannot be overlooked. CSOs are designed to provide relief to the sewer system during extreme events so combined sewage does not flood streets and basements. With climate change and more intense rain events these relief valves are critical. In addition, in urban areas, stormwater contains pathogens. Combined systems in these areas which collect and convey the first flush from urban streets to the treatment system under smaller storm events can be beneficial to the environment.

5. The TMDLs for individual river segments include a summary of local management efforts. These sections appear very limited to items found on municipal websites and do a disservice to communities by understating the expenditures and efforts undertaken using public funds. Perhaps more outreach is needed to communities asking for a compilation of tasks undertaken to reduce pathogen levels in waters rather than relying upon a simple review of websites and postings of bylaws.

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(617) 357-5772 | www.mcwrs.org | info@mcwrs.org

6. Much of the data used in the individual river segment analysis is outdated. Bacteria test results from 2008 are often cited. This information is 16 years old and relying upon it to form an opinion of river health today fails to consider almost two decades of improvements to the management of regulated MS4 stormwater systems and the work and upgrades to numerous wastewater systems and treatment plants that have had positive impacts. All reports will inevitably rely on data from the past but more recent data must be used for TMDL development. MassDEP needs to develop a system to update test results with new data in a more rapid fashion so that TMDLs can become "living documents", continuously being refined as more recent information is obtained.

7. In some cases, the data provided fails to support the argument for impaired water. For example, in Connecticut River segment MA34-05, it is noted that 53 CSOs discharge to the segment. But the 2008 sampling data, consisting of five samples, found only one geometric mean exceedance of the E. coli standard and a maximum level of 260 E. coli/100mls, which is within the Statistical Threshold Value for E. coli. The text explains that this segment is under a presumptive impairment because of the CSOs, despite actual data showing microbial water quality being fairly reasonable for an urban stretch of a large river. Much of the data in Table 8 of the Statewide TMDL similarly fails to show that CSOs are inherently the main source of wet weather pathogens. This is another example of an unscientific approach to TMDL development. Data is everything and the data must be followed and be relatively current to prove impairment.

8. On page 27 of the Statewide TMDL, the first full paragraph states, "For segments with maximum indicator bacteria concentrations during dry weather, sources such as permitted discharges, failing septic systems, CSOs, illicit sanitary sewers connected to storm drains, and/or leaking sewers may be the primary contributors." CSOs are prohibited during dry weather and rarely occur, other than due to a catastrophic system failure. CSOs would not be a source of dry weather pathogens and should be removed from this list.

MCWRS finds that the Draft Statewide Pathogen TMDL is lacking in many critical aspects. Most importantly it falls short of "best available science" in many ways, ignores the potential results of the significant improvements made in stormwater and wastewater management in the past decade, and does not meet at least one of its stated objectives of establishing realistic goals. MassDEP should significantly rework the document to address these concerns and re-issue another draft for public review. MCWRS also encourages the agency to work more closely with municipal water infrastructure operators and their consultants to gain a better perspective of what has been accomplished and what can be done going forward.

Thank you for your consideration.

Sincerely,

Philip D. Guerin
President

Massachusetts Coalition for Water Resources Stewardship
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(617) 357-5772 | www.mcwrs.org | info@mcwrs.org

MassDEP Response:

1) Describing the TMDL in Terms of a Pollutant Load

This TMDL includes two types of pathogen TMDL targets: concentration and numerical load. This method is consistent with previous USEPA-approved pathogen TMDLs, including the Final Pathogen TMDL for the Boston Harbor, Weymouth-Weir, and Mystic Watersheds (MassDEP, 2018). Expressing a TMDL in terms of indicator bacteria concentrations based on applicable water quality criteria established in the Massachusetts Surface Water Quality Standards (314 CMR 4.00), as shown in Table 6 of the TMDL report, provides a clear expression of water quality goals. Concentration targets for indicator bacteria are also the primary guide for implementation (see Section 5 of the TMDL core document). As required under the federal CWA, the TMDL is also expressed in terms of indicator bacteria daily load or the number of organisms per day (CFU/day).

The expectation to attain applicable water quality standards in the Massachusetts SWQS at the point of discharge is conservative, and thus protective, and offers a practical means to identify and evaluate the effectiveness of control measures. In addition, this approach establishes clear objectives that can be easily understood by the public and individuals responsible for monitoring activities. While it is the goal of the TMDL to meet water quality standards at the point of discharge, compliance with the Massachusetts SWQS is judged by in-stream measurements. For instance, in an extreme case, it could be possible for a community to meet water quality standards in their storm drains and yet still be responsible for reducing the impacts of overland runoff if the in-stream concentrations of bacteria are not in compliance with the Massachusetts SWQS. Compliance is therefore determined by the concentrations in the ambient water, regardless of how the TMDL is expressed.

2) Establishing Realistic Goals

The targets established in the TMDL are based on the Massachusetts SWQS. For more information, please see the following technical document: Surface Water Quality Criteria for Bacteria: Implementation Guidance for the Protection of Human Health in Waters Designated for Primary Contact Recreation, which can be found on the Massachusetts Surface Water Quality Standards webpage: https://www.mass.gov/doc/bacteria-surface-water-quality-criteria-for-bacteria-implementation-guidance-for-the-protection-of-human-health-in-waters-designated-for-primary-contact-recreation-cn-5630/download

While reducing bacteria concentrations in stormwater and eliminating CSOs are stated goals in the TMDL, compliance with the Massachusetts SWQS is evaluated using in-stream measurements. The TMDL does not specify a schedule or timeline for restoration. MassDEP supports an adaptive management approach, where implementation mechanisms and controls are periodically evaluated and adjusted as necessary to protect water quality. Concentration-based waste load allocations and load allocations for stormwater discharges (Table 6 of the TMDL core document) are expected to be achieved through implementation of structural and non-structural best management practices, source reductions, and other controls to the maximum extent practicable. Towns are encouraged to apply adaptive management and implement comprehensive wastewater planning strategies to address water quality issues.

Additionally, USEPA developed an integrated planning framework to help address some of the concerns raised regarding budgetary constraints, competing priorities, schedules and municipal compliance. An integrated plan is a process that identifies efficiencies from separate wastewater and stormwater programs to best prioritize capital investments and achieve our human health and water quality objectives. More information can be found on USEPA's website. https://www.epa.gov/npdes/integrated-planning-municipal-stormwater-and-wastewater

3) The Margin of Safety

TMDLs are required to utilize a "Margin of Safety" (MOS) into the total load reduction calculations. The MOS accounts for the lack of certainty in the data used to in the study. USEPA guidelines state that the MOS can be explicit or implicit. An explicit MOS is usually expressed as a percentage of the total load reduction. An implicit MOS is implemented by using conservative assumptions. This TMDL utilizes an implicit MOS as described in section 4.3 of the core document. This conservative assumption will help ensure that applicable water quality criteria established in the Massachusetts SWQS are met when the TMDL is implemented.

4) Controlling and Mitigating CSOs vs. Eliminating CSOs

The TMDL recognizes that controlling CSOs via structural and non-structural improvements is essential to mitigating pollution from CSOs. However, the elimination or mitigation of CSOs remains a long-term objective. The Implementation section of the TMDL core document specifically states that:

> *"CSOs and stormwater runoff represent major sources of pathogens to the Commonwealth's rivers, and the current level of control is inadequate for applicable criteria established in the Massachusetts SWQS to be attained. Improving stormwater runoff quality is essential for restoring water quality and recreational uses. At a minimum and as required under the MS4 General Permit for applicable Phase I and Phase II communities, intensive application of non-structural BMPs is needed throughout Massachusetts to reduce pathogen loadings as well as loadings of other stormwater pollutants (e.g., nutrients and sediment) contributing to use impairment in Massachusetts' waterbodies. Depending on the degree of success of the non-structural stormwater BMP program, structural controls may become necessary."*

MassDEP recognizes that local communities have dedicated enormous amounts of financial resources to restoring water quality in the Commonwealth. MassDEP will continue to work with local governments and environmental groups to further reduce both point and nonpoint source pollution.

5) Summary of Local Management Efforts

MassDEP recognizes that the summaries of local management efforts are not exhaustive. This is not meant to ignore specific expenditures and efforts undertaken using public funds. Absent any specific recommended updates on local management efforts, we could not update the document.

6) Outdated Data

Please refer to General Comments and Responses at the beginning of this section.

7) Data Provided Fails to Support the argument for Impaired Water

Waterbodies that receive runoff from CSOs have a high probability of exceeding bacteria criteria established in the Massachusetts SWQS and are likely to increase the risk to human health. The assessment methodology for these waterbodies is described in the Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual for the 2022 Integrated Report (MassDEP, 2022a)*. See especially pages 62,63, 67,69.*

8) CSOs Being Considered a Risk During dry Weather

The text has been updated.

31) Comments Received From the Dartmouth Massachusetts Department of Public Works

D A R T M O U T H M A S S A C H U S E T T S

DEPARTMENT OF PUBLIC WORKS
Director
Timothy J. Barber

BOARD OF PUBLIC WORKS
Robert Almy.
Richard Alves, Jr., P.E.
Ronald Labelle

June 21, 2024

Watershed Planning Program
Attention: Timothy Fox
8 New Bond Street
Worcester, MA 01606

Sent by email

Subject: Statewide Pathogen TMDL (CN 515.0) Comments

The Board of Public Works offers the following comments on the draft Statewide Pathogen TMDL (CN 515.0). First, inadequate noticing was provided for this critical process. As apolitical subdivision of the Commonwealth responsible for a wide range of public services, the Town of Dartmouth should have received notice of the availability of the draft document and its related comment period. Lacking such notice, the Department of Public Works and other Town agencies were only informed of this process by outside parties and were forced to request an extension of time to prepare these comments. As such we have been unable to adequately inform and engage our residents and all relevant Town interests.

Our review has focused on the proposed "draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies" and Appendix Z which contains outdated water quality data and description information on the Paskamanset and Shingle Island Rivers. These two rivers are mainly within the Town of Dartmouth and their chemical and physical characteristics, as well as their uses, are well known to the Town and the Public Works Department.

Our review of the materials suggests that the area covered and number of waterbodies in the proposed TMDL is excessive for a single regulatory action, and that the proposed action and implementation are inadequately discussed. Specifically, nowhere in the public facing materials for this process does it specify what agency will approve the TMDL, what the specific action will be, and what opportunities are available to challenge or correct errors in the proposed action. This process suggests the DEP will somehow impose TMDL related regulatory requirements on over 200 stream reaches throughout the Commonwealth in one action. There is no discussion of subsequent actions so there is no explanation of how DEP proposes to set priority for implementation and/or enforcement. From our perspective, the draft TMDL document and descriptions of the Paskamanset and Shingle Island Rivers are wholly inadequate for the adoption or implementation of a pathogen TMDL. The proposed action is of statewide scope

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and we suspect that other water body descriptions may be inadequate based on our review of Appendix Z. We conclude this is an opaque process that is both arbitrary and capricious.

Our review of Appendix Z finds that the water quality data for the Paskamanset and Shingle Island Rivers are from samples taken in 2005 and 2013, thus are woefully outdated. In addition, no information is presented as to sampling methodology, sample-site conditions (e.g. antecedent weather and flow), qualification of the sampler(s), and chain of custody. No duplicate samples are reported thus the statistical analysis of such a limited number of samples is questionable, especially for comparison to numerical standards and possible enforcement action.

The description of the two local watersheds contained in Appendix Z is out of date. The Town has adopted planning documents, adopted a new storm water bylaw, acquired open space as watershed protection areas, seen changes in land use, as well as observed the rebuilding of stormwater facilities along State Route 6. None of these actions are mentioned in Appendix Z. Therefore, we believe the description of both watersheds is inadequate for adoption of any TMDL. DEP must update and expand the water quality data and make current discussions of land use and local regulations in both watersheds before further consideration of a pathogen TMDL.

As general guidance, the "draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies" document contains an overview of pathogen TMDL issues and mitigation measures, with the exception of Section 8 (Public Involvement), which contains no text. The general nature of the document precludes its use as a regulatory document. As such it may be useful for screening specific issues and potential measures for water bodies where otherwise up to date sampling and existing conditions warrant further bacterial control measures.

Any TMDL guidance must contain a complete and robust discussion of public involvement. In our experience public involvement is the most important part of any non-point source water quality program for 3 reasons:

1. change in behavior is the only effective control for important non-point sources;
2. citizen support is essential for the adoption of local regulations; and
3. public support is essential for the allocation of limited local tax dollars.

In conclusion, we applaud DEP's efforts to improve water quality through establishment of a pathogen TMDL in a number of possibly impaired waterbodies. However, we urge DEP to reconsider the proposed scope and basis for the statewide pathogen TMDL process. We suggest that DEP should further evaluate the various watersheds of concern and group them in much smaller areas based on priority such as demonstrated threat to public health at areas of body contact recreation or food production. However, DEP cannot do this important task alone. We recognize DEP would need to increase its staff.

We suggest DEP explore collaborating with EPA and regional planning agencies (such as MAPC and SRPEDD) to fund expanded and longer term water quality programs within DEP and the regional planning agencies. We suggest considering groups of towns working in an approach similar to that used for transportation planning. We observe that public health and safety is one of the most important roles of local government. DEP could then engage affected cities and towns directly and develop a collaborative process in each area. This means that rather than awarding grants piecemeal, we think some of the existing grant funding might be better channeled into broader, regionalized program development efforts.

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We appreciate the opportunity to comment on this important process. If you have any questions regarding these comments, please do not hesitate to contact the Dartmouth Department of Public Works.

Signed

Chairman of the Dartmouth Public Works Board

CC: Dartmouth Select Board
Dartmouth Town Administrator
Dartmouth Board of Health

Department of Public Works • 759 Russells Mills Rd. • Dartmouth, MA 02748-1106 • Telephone 508-999-0740 • Fax 508-999-0762

MassDEP Response:

Thank you for submitting your comments and concerns. We appreciate your feedback and suggestions on improving the TMDL development process and how regional collaboration could support implementation.

Lack of Notice

Please refer to General Comments and Responses at the beginning of this section.

Age of Data and Data Quality

Please refer to General Comments and Responses at the beginning of this section. All data are collected under Quality Assurance Project Plans. MassDEP data are available online at: https://www.mass.gov/guides/water-quality-monitoring-program-data

TMDL Process

Please refer to General Comments and Responses at the beginning of this section. The targets established in the TMDL are based on the Massachusetts Surface Water Quality Standards (314 CMR 4.00). Please also refer to the response for Comment 20, Comment 30 and General Comments and Responses. Please see sections 5- 7 in the TMDL core document for more information on approaches to implementation.

Descriptions of Local Watersheds are Out of Date

Thank you for your comments regarding current Town planning documents and bylaws. The information in Appendix Z has been updated. The TMDL appendices are not meant to contain an exhaustive description of pollution control efforts for each municipality. The efforts described in the comments are examples of TMDL implementation and will likely help impaired surface water meet water quality standards.

Discussion of Public Involvement

Please refer to General Comments and Responses at the beginning of this section.

Suggested Regional Collaboration

MassDEP is supportive of both regional monitoring and TMDL implementation activities. MassDEP has taken several efforts to promote regional water quality sampling by promoting collaborations in our Water Quality Monitoring Grant program, which is administered by the Watershed Planning Program (WPP). In addition, MassDEP has supported regional NPS pollution reduction efforts through the Clean Water Act (CWA) Section 319 NPS Implementation Grant program, administered by WPP's NPS Management Section. The most recent request for proposals included a category that sought proposals from Regional Planning Agencies to serve as Regional NPS Coordinators and advance the goals of the Massachusetts NPS Management Plan. Some other recent grant project categories to support capacity building included the CWA Section 319 Environmental Justice NPS Coordinator program, Agriculture Regional NPS Coordinator program, NPS Capacity Building and Technology Transfer and Development of Municipal and Regional Stormwater Collaboratives and Funding Mechanisms. We also agree that behavior change can be effective in reducing NPS pollution. MassDEP recently supported a Community Based Social Marketing (CBSM) project that aimed to build the capacity of project partners, including regional planning agencies, conservation districts, and nonprofits (e.g., watershed associations), through the implementation of CBSM. In the winter of 2023, MassDEP facilitated an Introductory Workshop on Community-Based Social Marketing that provided a comprehensive

introduction to CBSM and how it is being applied worldwide to foster behaviors that protect the environment. Please also refer to the response to comments 7,11,24 and 40 above.

32) Comments Received From the Town of Dartmouth Board of Health

Town of Dartmouth
Board of Health
400 Slocum Road
Dartmouth, MA 02747

Christopher Michaud, Director
Telephone: 508-910-1804
Fax Telephone: 508-910-1893

Public Health
Prevent. Promote. Protect.
Michelle Keith, Chair
Emily Michele Olmsted
Richard Romero

June 20, 2024

MassDEP Watershed Planning Program
Attention Timothy Fox
8 New Bond Street
Worcester, MA 01606

Re: Statewide Pathogen TMDL (CN 515.0) Comments

Dear Mr. Fox:

The purpose of this communication is in regard to the MassDEP Draft Massachusetts Statewide Pathogen Total Maximum Daily Load (TMDL) for Pathogen-Impaired Waterbodies. Initially, it appears that MassDEP did not intend to conduct targeted outreach on the proposed plan here in the Town of Dartmouth, either intentionally or perhaps for a broader purpose across the state. As best can be determined, the Department mostly relied upon a press release for the general public on the MassDEP webpage to announce the initiative on April 26, 2024, for the single in-person public hearing and informative session which occurred in Worcester on May 8, 2024, and a virtual of the same on May 9, 2024. All of this escaped Dartmouth officials until a journalist reached out by email on May 20, 2024, to ask for comments.[1]

It shall be noted, we have recently discovered by our research for these comments that MassDEP did publish in the MEPA Environmental Monitor of the notice of informational sessions in May and close of comment in early June; however, no such update was provided to the public in subsequent volumes and issues of the Environmental Monitor of the additional informational session, opportunity for in-person comments and extended written comment period. Why would the expanded opportunity for public participation be excluded from posting in the Environmental Monitor, especially if such notice was posted initially?

A conversation between myself and the Southeast Regional Director on May 22, 2024, revealed that he was not aware of the ongoing efforts by the Department with the open comment period for a Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies. This point alone reveals the lack of interest of MassDEP in working cohesively as a department by beginning proper outreach at their own regional offices. If one of the regional offices was unaware, how was the general public and overstretched municipal officials expected to know?

Perhaps, if the regional director was contacted, he may have suggested contacting the towns as was done in 2022 with the proposed revisions to 310 CMR 15.000 and was done when the draft nutrient TMDLs when proposed here in Dartmouth for the Slocums and Little River estuaries.

[1] Email dated May 20, 2024, from New Bedford Light reporter Adam Goldstein to Town of Dartmouth officials.

Dartmouth officials requested more opportunity for public and stakeholder outreach by MassDEP, a vital component to any government action. MassDEP in response to the request, provided one additional hybrid virtual/in-person informative session and extended written comment period by a mere eleven days.[2] While the one additional session and eleven extra days for comments was better than the initial approach, it falls far short of genuine public participation and stakeholder engagement in a state of almost seven million people, and being the 16th most populous state in the nation.

Ultimately, MassDEP will submit the Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies to the EPA for TMDL approval. Whereby, EPA approval may assess public participation in the TMDL development based on a listing of criteria on the EPA's website.[3] While the EPA notes in their TMDL Overview webpage that citizen involvement varies by state, can MassDEP defend that the mere two in-person sessions and one virtual the Department offered as engaging the public and stakeholders to obtain local knowledge and useful information about the waterbodies or waterways?

Clearly, public participation is intended by the end process with the EPA and needed. The EPA notes on the aforementioned webpage that "*citizen information and participation can improve the quality of TMDLs that are developed and can ultimately speed up cleanup of impaired waters or secure protection of threatened waters*". With 288 of the 351 municipalities hosting a waterway within the Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies, how was the fast-track nature of the public participation process adequate to assure citizen and stakeholder input was not bypassed throughout the Commonwealth of Massachusetts?

Additionally, attention must be brought to the Environmental Justice Policy of the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs. Within the policy is a directive on agencies that must follow the policy's requirements, including MassDEP.[4] Environmental justice populations are established based on several criteria with one being English language proficiency. With over 82% of the municipalities in Massachusetts having impaired segments of waterways, MassDEP was either confident that watersheds of the impaired waterway segments do not include areas with environmental justice populations based on language proficiency or had another motive not to be inclusive in their website where the information on meetings and documents was provided.[5] However, elsewhere on the same website MassDEP does provide translation opportunities for other Department matters involving stakeholder outreach or public participation, which raises a question. While the other matters providing translation for other languages are regulatory, and the Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies is not, why should people who are not fluent in the English language be excluded from participating in this important process? Furthermore, how does the omission of non-English language documents for the Draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies achieve compliance with the Environmental Justice Policy for community engagement?[6]

With just two in-person informative meetings and one hybrid, how is MassDEP assured that the scheduling of such meetings was convenient in time, location and in consideration of public

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[2] Draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies Fact Sheet and

[3] Overview of Total Maximum Daily https://www.epa.gov/tmdl/overview-total-maximum-daily-loads-tmdlsLoads (TMDLs) | US EPA

[4] Environmental Justic Policy of the Executive Office of Energy and Environmental Affairs, updated June 24, 2021, page 3, Applicability.

[5] https://www.mass.gov/info-details/massdep-public-hearings-comment-opportunities

[6] Environmental Justic Policy of the Executive Office of Energy and Environmental Affairs, updated June 24, 2021, page 10, EEA Agency Services, Enhancing Public Participation 15.

transportation as required by the Policy? While one can argue the virtual may be a means to address transportation, a problem with timing still exists. MassDEP, by extending the comment period and providing an additional informational meeting with comments, acknowledged more participation was needed. However, the time of the June 13, 2024, meeting occurred from 1:00 – 3:00 pm once again. What data can MassDEP provide to demonstrate that the early afternoon is convenient to environmental justice populations or was it selected to align with office hours for consideration of staff?[7]

Equally problematic in MassDEP's process of developing the Draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies is the length of time. First, is the time between testing periods, eight years, with the first tests in 2005 and then one more set in 2013. Why so long and what scientific data or studies can the Department provide to justify the eight-year gap? Are just two sets of data eight years apart enough? Next is the time to compile the draft report, coming eleven years after the last round of sampling. Why did it take so long to compile a report from such a limited sampling?

The time delay mentioned above is noteworthy because MassDEP is rushing this through to completion on some unspecified arbitrary deadline in the second most important phase of the process, public participation and stakeholder engagement. That said, why is MassDEP so focused on rushing through the public participation phase when it took almost twenty years from the first of two sampling sets to arrive at this point?

Lastly, another disturbing point needs to be addressed: disinterest in transparency. On May 22, 2024, a records request was submitted to MassDEP in regard to laboratory data reports and chain of custody forms for the two sampling periods.[8] The response from MassDEP was a fee in the amount of $387.50 would need to be paid to obtain the information that is foundational to the report. How does MassDEP prepare a report and not have immediate access to records that were used in the report and a fee in the amount of $387.50 would be needed for a mere eleven samples?[9]

Facing the deadline of June 21, 2024, for the close of written comments I had to streamline the request in hopes to avoid the fee process to begin the production of documents. MassDEP only accepts payment by mail to a drop box in Boston so that would obviously create a delay. Therefore, I requested the data from a single year, 2013 and offered additional concessions to two sampling dates within that year that revealed the highest pathogen counts.[10]

MassDEP did provide records for 2013, on June 12, 2024, and we are appreciative of that, however, that still leaves an unanswered question. Why should stakeholders and the public be prevented from obtaining records that are vital to the Statewide Plan due to MassDEP holding an arbitrary deadline for the public process and apparently having records so lost that it would cost a stakeholder $387.50 to cover Department time to find the records?

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[7] Environmental Justic Policy of the Executive Office of Energy and Environmental Affairs, updated June 24, 2021, page 10, EEA Agency Services, Enhancing Public Participation 15.
[8] Email dated May 22, 2024, from Christopher Michaud, Director of Public Health for the Town of Dartmouth to MassDEP staff.
[9] Email dated June 5, 2024, from MassDEP staff to Christopher Michaud, Director of Public Health for the Town of Dartmouth.
[10] Email dated June 6, 2024, from Christopher Michaud, Director of Public Health for the Town of Dartmouth to MassDEP staff.
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Good practice would be to have factual records immediately available to justify the report, which is cause for another question. If records are so hard to recover, how did MassDEP verify the accuracy of summaries in Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies?

In no way shall the comments above be construed as an attack of the intended outcome of a proposed pathogen TMDL for statewide planning. The comments herein are about the flawed process MassDEP has chosen with the Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies. As noted above, it has taken a reporter to advise stakeholders of an important ongoing process that was rushing to completion and not regional staff from MassDEP as customarily occurred. Furthermore, it was later revealed to Town of Dartmouth officials that the program leading up to this limited window of participation began almost twenty years ago and again without notice to the town. Why is such an important task of MassDEP shrouded in such secrecy to the municipalities, completely side-stepping of the Environmental Justice Policy of the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs and being rushed?

What other draft TMDLs has MassDEP proposed recently, including but not limited to the New Bedford Harbor embayment system and the Weweantic River in Wareham (both areas with significant EJ areas) and did MassDEP adhere to the aforementioned Environmental Justice Policy or follow the process of single language communications?

Unfortunately, bypassing public participation and stakeholder outreach in this phase of the Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies, is only going to relegate a final approved Pathogen TMDL to becoming another document that sits to the side, and nothing being done until a crisis unfolds like the litigation that brought MassDEP to propose changes to 310 CMR 15.000 in 2022 and promulgate in 2023.[11] Let us not repeat the mistakes of past TMDLs, and this time perform true outreach before submitting to the EPA.

Hopefully, the comments here will be an opportunity to stop this flawed process that is excluding people of the Commonwealth from this important opportunity for protection of public health and the environment. All people regardless of language fluency are deserving of the same opportunity from the Commonwealth of Massachusetts, and we can all agree based on the facts above that equal opportunity has not happened with the MassDEP Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies. Lastly, many of the points raised in this letter about communication efforts by the Department have been echoed by the public and perhaps threatened or filed as Title VI complaints with the EPA.[12] That said, can MassDEP defend their notification actions for the MassDEP Draft Massachusetts Statewide Pathogen Total Maximum Daily Load for Pathogen-Impaired Waterbodies against a Title VI complaint filed with the EPA?

Sincerely,

Christopher Michaud, Director of Public Health

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[11] Conservation Law Foundation, Inc. on behalf of affected residents of the Commonwealth, Plaintiffs, versus Massachusetts Department of Environmental Protection; the Town of Barnstable, Massachusetts; the Town of Mashpee, Massachusetts, Defendants.

[12] CLF, Community Challenge Expanded Waste Facility in New Bedford - Conser CLF, Community Challenge Expanded Waste Facility in New Bedford - Conservation Law Foundation vation Law Foundation

cc: Juan Carlos Hunt, EPA Office of Civil Rights: hunt.juancarlos@epa.gov
Kenneth Moraff, Director, Water Division, EPA: moraff.ken@epa.gov
Caroline Lenoine, Deputy Director of EJ for External Stakeholder Coordination: caroline.lenoine2@mass.gov
Stephanie Cooper, Undersecretary for the Environment: stephanie.cooper@mass.gov
Bonnie Heiple, Commissioner, MassDEP: Bonnie.Heiple@mass.gov

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MassDEP Response:

Lack of Notice and Public Outreach

Please refer to the General Comments and Responses at the beginning of this section. MassDEP received comments during the public comment period for the 2018/2020 Integrated Report requesting the development of pathogen TMDLs. MassDEP's priority concerns continue to be addressing impairments caused by nutrients (nitrogen and phosphorus) and pathogens that affect public health. More information about MassDEP's approach to TMDL prioritization can be found on our website: https://www.mass.gov/guides/the-basics-of-total-maximum-daily-loads-tmdls#-massdep's-tmdl-strategy-

Environmental Justice

Thank you for your comments regarding engagement with Environmental Justice communities. Please refer to the General Comments and Responses at the beginning of this section. MassDEP values feedback on improving our outreach process. Translation services are offered and available upon request. In addition, e-mail announcements regarding the draft TMDL were sent to MassDEP's most up-to-date Environmental Justice contact list. Please also see the response to comment 31.

Time Gap Between Testing Periods

Please refer to the General Comments and Responses at the beginning of this section. MassDEP's Watershed Planning Program is responsible for monitoring water quality for all waters of the state. To accomplish this, sampling is completed on a rotating basin schedule, resulting in a gap of when sampling is repeated in a particular watershed. When available, quality-assured data from external groups can help alleviate this data gap. However, the goal of ensuring that waterbodies meet applicable surface water quality criteria established in the Massachusetts Surface Water Quality Standards (314 CMR 4.00) remains. MassDEP has supported numerous volunteer water quality monitoring efforts through our grant programs. Please also see the response to comments 7,11,24 and 30.

Disinterest in Transparency

MassDEP follows 950 CMR 32.00: Public records access. Only data that were used to make assessment decisions and have gone through an extensive quality assurance and quality control process were used in the TMDL. For more information see: https://www.mass.gov/guides/water-quality-monitoring-quality-management-program. MassDEP water quality data are freely available online at: https://www.mass.gov/guides/water-quality-monitoring-program-data.

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33) Comments Received From Upper Blackstone Clean Water

UPPER BLACKSTONE CLEAN WATER

Stewardship Through Science

50 ROUTE 20 MILLBURY, MA 01527 P 508.755.1286 ubcleanwater.org

June 21, 2024

Commonwealth of Massachusetts
Department of Environmental Protection
Watershed Planning Program
Attention: Timothy Fox
8 New Bond Street
Worcester, MA 01606
Bureau of Water Resources

DELIVER BY EMAIL: Timothy.M.Fox@mass.gov

Subject: Statewide Pathogen TMDL (CN 515.0) Comments

To Whom It May Concern:

Upper Blackstone Clean Water (UBCW) appreciates the opportunity to provide comments on the Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies. As you may be aware, the UBCW treatment process includes disinfection and dechlorination of all effluent prior to discharge into the Blackstone River.

Appendix J of the Draft TMDL describes data and potential sources of pathogens in the Blackstone River watershed. This water quality characterization includes a description of UBCW's Wastewater Treatment Facility (WWTF) as a potential source of pathogens to Blackstone River segment MA51-03, referencing a 2003 power failure that caused a large discharge of pathogens into the Blackstone River:

> *An exceptional example of a large scale illicit discharge to this segment resulted from the failure of two electric grids and lack of backup generator at the Upper Blackstone WWTF on October 2, 2003, releasing approximately nine million gallons of untreated wastewater over six hours and resulting in maximum observed in-stream E. coli levels of 390,000 CFU/100mL near the discharge (MassDEP 2010).*

We are concerned that this statement suggests a risk that was mitigated by 2006 with the addition of standby power generators at the UBCW disinfection facility and headworks, as well as the complete replacement of electrical transmission and power feeds. Those upgrades were just one component of the massive investments in treatment capability and reliability that have taken place in the last 20 years, and continue today as part of our asset management program. Most recently, UBCW is procuring additional standby generators to further improve system resiliency, reliability, and reduce dependence on the utility grid.

UBCW is concerned that the discussion in Appendix J will suggest to the public that there is an ongoing risk of a future discharge of pathogens due to power failure. The prior and continued investments by UBCW in its treatment capability and systems and in standby power mean that the circumstances that resulted in the 2003 discharge would be very

unlikely to reoccur today. Therefore, we request that MassDEP revise the discussion in Appendix J to include these facility upgrades and how they are designed to prevent this type of event from occurring in the future.

Throughout the draft TMDL, much of the data used in the individual river segment analysis is old, often dating to 2008. Relying on old data fails to reflect improvements resulting from the last 16 years of wastewater and stormwater management investments. More timely data collection by MassDEP is needed to make a fair presentation of current conditions to the public and all stakeholders.

If you have any questions, please do not hesitate to contact me at ksangrey@ubcleanwater.org or (508) 755-1286.

Very truly yours,
UPPER BLACKSTONE CLEAN WATER

Karla H. Sangrey, P.E.
Engineer Director/Treasurer

C: Zach Eichenwald, CDM Smith
Matthew Labovites, Board Chair

A:\MCWRS\Upper Blackstone Comments Bacteria TMDL 06-21-24.docx

MassDEP Response:

Thank you for your comment. MassDEP has revised the language in Appendix J.

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34) Email from John Haran <john.haran@comcast.net>, Dartmouth Resident, June 16, 2024

Please schedule a open public meeting to discuss the situation with the rivers in Dartmouth.We deserve that much.

The Town of Dartmouth asks for another public meeting to discuss the two rivers in Dartmouth. Please schedule a meeting in the near future.

MassDEP Response

There were three public information sessions hosted by MassDEP that were open to the public. Please refer to the General Comments and Responses at the beginning of this section.

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35) Email from Debra and Mark Hartman <debzweb274@comcast.net>, Dartmouth Residents, June 16, 2024

We are residents of Dartmouth MA and would like to request a delay in the rulemaking changes and would like you to please come to Dartmouth to host a public meeting regarding any changes in regulations regarding the Statewide Pathogen TMDL (CN 515.0).

MassDEP Response

The TMDL is not a change in regulation. Please refer to the General Comments and Responses at the beginning of this section.

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36) Email from Maurice Lemieux <jumpingcups@aol.com>, Dartmouth Resident, June 17, 2024

It has recently come to my attention that the MADEP is looking to implement sweeping changes to the Total Maximum Daily Load for Pathogen-Impaired Waterbodies. As a stakeholder concerning these issues, I personally and the towns need more time and outreach information. I am asking you to delay to these changes to allow the affected communities to have direct input. I am also requesting that MADEP come to Dartmouth and or Westport to hold a public hearing on this subject to inform us on this very important matter.

MassDEP Response

Please refer to the General Comments and Responses at the beginning of this section.

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37) Email from Janessa Carvalho <janessacarvalho@gmail.com>, Dartmouth Resident, June 17, 2024

I am writing out of deep concern about the Statewide Pathogen TMDL and more importantly its implications on all taxpayers who are already facing great challenges and concerns regarding finances as MA residents. There should be no changes nor broad expectations on this topic.

At a minimum, I request that the DEP delay any rulemaking changes and, further, as a taxpayer, I expect that the program comes to each affected town, including my town of Dartmouth and host an in person public meeting to talk specifics on the local implications of your proposed regulatory changes and be available to answer questions in order to have a transparent discussion.

MassDEP Response

The TMDL report is not proposing any regulatory changes. Please refer to the General Comments and Responses at the beginning of this section.

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38) Email from Jill Lemieux <jlemieux08@gmail.com>, Dartmouth Resident, June 17, 2024

It has recently come to my attention that the MADEP is looking to implement sweeping changes to the Total Maximum Daily Load for Pathogen-Impaired Waterbodies. As a stakeholder concerning these issues, I personally and the towns need more time and outreach information. I am asking you to delay to these changes to allow the affected communities to have direct input. I am also requesting that MADEP come to Dartmouth and or Westport to hold a public hearing on this subject to inform us on this very important matter.

MassDEP Response

Please refer to the General Comments and Responses at the beginning of this section.

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39) Email from Dan Turner <dturner@bluewhaletechnologies.com>, Dartmouth Resident, June 18, 2024

I have lived in the Town of Dartmouth for 24 years. I am process design engineer specializing in wastewater treatment systems for Advanced High Rate Biological Treatment, Membrane Separations, etc., for industrial clients throughout North America. I am requesting a delay to any changes in policy and regulations. It is imperative that MADEP comes to Dartmouth and host an in person public meeting to talk specifics on the local implications of the proposed regulatory changes. I also ask that MADEP tales the time to be available to answer questions and have an open and transparent discussion with the citizens of Dartmouth.

MassDEP Response

Please refer to the General Comments and Responses at the beginning of this section.

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40) Email from Mare Maccini <reillybean@comcast.net>, Dartmouth Resident, June 19, 2024

It's my understanding that MADEP didn't provide enough advanced notice to Dartmouth on these proposed changes, which prevents town officials and citizens from properly engaging as stakeholders concerning issues that are very local/site specific to our impaired waterbodies. DEP is attempting to address issues like they did with Title 5, this time by imposing sweeping mandates on the entire state. This process seems to be very similar to the Title 5 process and totally lacks transparency. This affects my life and my financial well being and I have a loud objection. I am requesting the DEP delay any rulemaking changes and demand that they come to Dartmouth and host an in person public meeting to talk specifics on the local implications of their proposed regulatory changes and be available to answer questions and have a transparent discussion.

MassDEP Response

The TMDL report is not proposing any regulatory changes. Please refer to the General Comments and Responses at the beginning of this section.

41) Email from Chris Fay <cjf333@yahoo.com>, Dartmouth Resident, June 21, 2024

I'm writing to request a delay in the process to formalize/adopt any regulations regarding Statewide Pathogen TMDL (CN 515.0). I live in the Town of Dartmouth, and these regulations would impact at least 2 of our waterways. This process has the same feel as the flawed Title 5 public notification/engagement process, which lacked the proper advanced notice and engagement of local stakeholders. I understand that MADEP has granted a minor time extension for comments and thankfully that happened, because the method of public notification seems to be an archaic process that allows for very limited public notification (that actually makes it to the citizen level) when there is much at stake for local communities, this in turn leaves citizens and local leaders with very little time for meaningful engagement in the public process that affects our lives and wallets. I feel that MADEP needs to enhance the public notification process, and work with local communities to ensure that the messaging gets out to the citizen level in a broader and more efficient way.

On behalf of many other concerned and engaged citizens in Dartmouth, I am respectfully requesting that DEP come to Dartmouth for an in person public meeting to discuss site specific issues in our waterways and the local implications regarding this issue and any potential mitigation. The public meeting held in Lakeville during the workday on 6/13 from 1 to 3 PM was not a time that would have generated meaningful public engagement from citizens that are working at their jobs. I also ask that MADEP be available to answer questions at a meeting in Dartmouth and have an open and transparent discussion with the citizens. The discussion would ideally include an executive summary of local issues along with any planned mitigation, which would be helpful to the average citizen.

We all appreciate the need for clean waterways. But we also want to have a voice and be a part of the process that would have implications to our town and citizens.

MassDEP Response

Please refer to the General Comments and Responses at the beginning of this section.

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42) Email from Kenneth Loranger <KLoranger@mapfreusa.com>, Dartmouth Resident, June 21, 2024

Good morning.

I am writing to you folks as asked in a DEP meeting concerning the TMDL changes that the DEP would like to make.

I ask that the DEP waits on implementing any type of changes concerning the Pathogen findings. We in Dartmouth would like the chance to be heard along with listening as a group/taxpayer to understand where the reports came from. Who will this impact and how will this impact the town citizen. We need to know where the data come from and how old is the data.

The DEP has not done its due diligence in retrospect to notifying any of the affected taxpayers. There should have been town meetings MA mailers to all taxpayers and a meeting held at a time and place that taxpayers could make not during the week between 1:00pm and 3:00 when all are working.

Please wait until we can all understand the who, what, and why.

Thank you.

Kenneth Loranger

Material Damage Supervisor

MAPFRE Insurance

11 Gore Road

Webster, MA 01570

Phone. 508-949-9000 Fax 508-949-9655

Cell. 774-280-0220

Email kloranger@mapfreusa.com

MassDEP Response

Please refer to the General Comments and Responses at the beginning of this section.

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43) Email from Michelle Keith < michellekeithesq@gmail.com>, Dartmouth Resident and member of the Dartmouth Board of Health, June 21, 2024

Re: Statewide Pathogen TMDL (CN 515.0) Comments

Dear Mr. Fox,

Please note as an elected member of the Dartmouth Board of Health I support the extensive comments and report submitted on behalf of Dartmouth's Board of Health by Director of Public Health Christopher Michaud dated June 20, 2024, entitled Re: Statewide Pathogen TMDL (CN 515.0) Comments.

In reference to these comments, as a private citizen and resident of Dartmouth, I ask for you to: (1) provide improved public and stakeholder outreach by MassDEP to ensure genuine public participation and engagement especially in light of the Environmental Justice Policy of the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs and lack of notice in multiple languages, (2) streamline record requests for laboratory data reports and chain of custody forms for the two sampling periods pertaining to developing the Draft Massachusetts Statewide Total Maximum Daily Load for Pathogen-Impaired Waterbodies.

The EPA notes on its TMDL Overview webpage: "citizen information and participation can improve the quality of TMDLs that are developed and can ultimately speed up cleanup of impaired waters or secure protection of threatened waters." With 288 of the 351 (82%) Massachusetts cities and towns affected by impaired waterways, imagine the improved progress we could make if there was adequate outreach by MassDEP to ensure genuine public participation and engagement?

Perhaps providing direct notice to cities and towns electronically would improve outreach? Or, as the Federal Register provides, allow cities, towns, the public, and other stakeholders to subscribe to the public notices of their choice so they may receive immediate notice upon posting?

Thank you for trying to take action to establish Statewide Pathogen TMDLs. However, The MassDEP's mission "to protect and enhance our natural resources – air, water, and land" would be best served by adequately engaging the public and basing decisions on current scientific data to develop well-reasoned, comprehensive, coordinated, and successfully executable TMDLs. The availability of merely two outdated laboratory data reports from 2005 and 2013 may not adequately inform TMDL decisions.

Sincerely,

Michelle Keith

P.O. Box 79488

North Dartmouth, MA 02747

--

Michelle Keith

Attorney at Law, M.B.A., LL.M

http://www.linkedin.com/in/michellekeithus

P.O. Box 79488

Dartmouth, MA 02747

508.863.6022 mobile

MassDEP Response

Please refer to the General Comments and Responses at the beginning of this section. Public Notices are published in the Environmental Monitor. Additional information can be found on the Mass.gov website here: https://www.mass.gov/info-details/the-environmental-monitor.

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44) Email from Dan Turner <dturner@bluewhaletechnologies.com>, Dartmouth Resident, June 24, 2024

Holly, Timothy, etc.

Based on Total Maximum Daily Loadings (TMDLs) of caused by Combined Sewer Overflows (CSOs) into the New Bedford Harbor, the BOD/COD ammonia-nitrogen associated with raw untreated sewage are considered to be a major cause of generating significant levels of Statewide Pathogen TMDL related pollution of the Buzzards Bay watershed. Please refer to the local news provided in the link below.

https://www.wpri.com/news/local-news/se-mass/buzzards-bay-swim-canceled-for-the-1st-time-in-31-years/

These CSO events occur quite regularly discharge millions of gallons of raw untreated sewage into the Buzzards Bay watershed. Don't you think it would be a better plan to eliminate these CSO releases from occurring into the Buzzards Bay watershed along with upgrading the New Bedford wastewater treatment plant into a Total Nitrogen removal facility? Other significant TMDL sources are the Dartmouth WWTP, Mattapoisett WWTP , Bourne WWTP, and Compost Pile Leachate Streams that the MADEP is promoting. Once the New Bedford WWTP and other TMDL Sources are upgraded to treat for Total Nitrogen Removal (TN) via either Modified Ludzak Ettinger process (MLE <10 mg/L TN) or the 4-Stage Barden Pho ,(<3 mg/L TN) , then the MADEP can focus on other TMDL sources such as residential septic tanks and other sources that should be upgraded to meet Title 51 regulations.

Please address this issue when you come to Dartmouth, MA to discuss the Statewide Pathogen TMDL (CN 515.0) program and please provide factual data to back up your claims that the MADEP as looking for a resolution that properly address the TMDL loading we are experiencing. Please note that we care for our watershed, and we are deeply concerned about how Total Nitrogen and Pathogenic contamination of Buzzards Bay is currently being handled by the MADEP.

As previously submitted comments, please confirm your receipt of this email.

Regards,

Dan Turner
2 Christine Drive
Dartmouth, MA 02747

24 year Resident of Dartmouth

MassDEP Response

Please refer to the General Comments and Responses at the beginning of this section and MassDEP Response to Comment 30 regarding CSOs. Towns are encouraged to apply adaptive management and implement comprehensive wastewater planning strategies to address water quality issues.

References

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Sign-In Sheet, Public Information Session (5/08/2024), MassDEP CERO Office, Worcester:

SIGN IN SHEET (05/08/2024)
Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies Information Session

	Print Name	Affiliation
1.	Timothy Fox	Mass Dep
2.	Marielena Lima	CRWA
3.	Howard Erlichman	Howard J. Erlichman
4.	KATHARINE LANGE	MASS RIVERS
5.	Andrew Boucher	Spectrum News 1
6.	Matthew Reardon	MassDEP
7.	Holly Brown	MASSDEP
8.	RICHARD CAREY	MASSDEP
9.	Stephen Humphrey	MassDEP
10.		
11.		
12.		

Virtual Attendees, Public Information Session (5/09/2024), Zoom

Name	Email	City	State/Province
Kerry Snyder	snyder@neponset.org	Canton	MA
Rebecca Jascot	rebecca.jascot@ct.gov	Hartford	CT
Sara Cohen	sara.cohen@mass.gov	Medford	MA
Angela Catalano	angela.catalano@tnc.org	Boston	MA
Andreae Downs	andreae.wac@gmail.com	Newton	MA
Laura Russell	laurarussell2@comcast.net	Sharon	MA
Chris Welch	cwelch@uxbridge-ma.gov	Uxbridge	MA
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Sign-In Sheet, Public Information Session (6/13/2024), MassDEP SERO Office, Lakeville

SIGN IN SHEET (06/13/2024)
Massachusetts Statewide TMDL for Pathogen-Impaired Waterbodies Information Session

	Print Name	Affiliation
1.	Stephen Humphrey	MassDEP
2.	Matthew Reardon	MassDEP
3.	RICHARD CAREY	MASSDEP
4.	Robert Almy	Dartmouth DPW
5.	Timothy Fox	Mass Dep
6.	Holly Brown	Mass DEP
7.	Lealdun Langley	MassDEP
8.	GERARD MARTIN	MASS DEP
9.		
10.		
11.		
12.		

*Anna Milton in attendance, Reporter Nemasket Week, not signed-in

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