Total Maximum Daily Load (TMDL) Report

for 44 Bacteria Impaired Waters in New Hampshire

(Final Report)

Printed on Recycled Paper

Table of Contents

List of Tables

List of Figures

List of Appendices

Appendix A: Saco River Watershed

Appendix B: Salmon Falls-Piscataqua River Watershed

Appendix C: Pemigewasset River Watershed

Appendix D: Winnipesaukee River Watershed

Appendix E: Contoocook River Watershed

Appendix F: Nashua River Watershed

Appendix G: Merrimack River Watershed

Appendix H: Upper Connecticut River - Mascoma

Appendix I: Black-Ottauquechee River

Appendix J: West River

Appendix K: Middle Connecticut River

Appendix L: Miller River

Appendix M: TMDL Expressed as Daily Load

_____

1. INTRODUCTION

1.1 Overview of 303(d) List and TMDLs

Section 303(d) of the Federal Clean Water Act (CWA) and Federal Water Quality Planning and Management Regulations (40 CFR Part 130) require states to place certain waterbodies that do not meet established water quality standards (WQS) on a list of impaired waterbodies, commonly referred to as the 303(d) List. In New Hampshire, the Department of Environmental Services (DES) is responsible for the 303(d) Listing process. The 303(d) List is updated, issued for public comment and submitted to the USEPA for approval every two years. The 303(d) List includes surface waters that: (1) are impaired or threatened by one or more pollutants; (2) are not expected to meet water quality standards even after implementation of technology-based controls; and (3) require a Total Maximum Daily Load (TMDL) study for the pollutant(s) causing the impaired or threatened status.   In general, surface waters on the 303(d) list can only be removed if: (1) a TMDL has been conducted and approved by the USEPA; (2) there is sufficient evidence showing the waterbody is meeting water quality standards; or, (3) the reasons for listing the waterbody as impaired were found to be in error.

A TMDL establishes the allowable loadings for specific pollutants that a waterbody can receive without exceeding water quality standards. Water quality standards include numeric and narrative criteria that must be met to protect the uses of the surface water such as swimming, boating, aquatic life, and fish/ shellfish consumption. The TMDL process maps a course for states and watershed stakeholders to follow that should lead to restoration of the impaired water and its uses.

1.2 Purpose of this Report

On September 21, 2010, the New Hampshire Department of Environmental Services (DES) received approval from the United States Environmental Protection Agency (USEPA) of a statewide total maximum daily load (TMDL) report for bacteria impaired waters[1] (the Statewide Bacteria TMDL).   Bacterial contamination can render surface waters[2] unsuitable for uses such as swimming and shellfish consumption and may result from a variety of sources including human waste, excrement from barnyard animals, pet feces, and agricultural applications of manure.

The purpose of the Statewide Bacteria TMDL was to:

> 1. Provide documentation of impairment in each impaired waterbody segment;

_____

[1] Final Report New Hampshire Statewide Total Maximum Daily Load . Prepared by F.B. Environmental Associates, Inc. for the New Hampshire Department of Environmental Services.   September, 2010.   A copy may downloaded from
http://des.nh.gov/organization/divisions/water/wmb/tmdl/categories/publications.htm.

[2] Surface waters are defined in Env-Wq 1702.46. Examples of surface waters include rivers, streams, lakes, ponds, tidal waters and certain wetlands.

2. Determine the TMDLs that will achieve water quality standards; and,

3. Provide an estimate of the reductions necessary to achieve the TMDLs.

The Statewide Bacteria TMDL specifically addressed 379 bacteria impaired surface water segments (called assessment units or AUs) that were on the 2008 303(d) List of impaired waters. Since then, the 2012 303(d) list has been prepared which includes additional AUs impaired by bacteria impaired.   The purpose of this document is to provide TMDLs for 44 bacteria impaired AUs on the 2012 303(d) list. A complete list of all 44 impaired AUs is provided in Table 2-1 of this report.

Table 1-1 and Figure 1-1 show the number of bacteria impaired surface waters in each HUC-8 (Hydrologic Unit Code 8) watershed. As shown, the 44 impaired AUIDs are spread among 12 of the 16 HUC 8 watersheds in New Hampshire and all of them are impaired for E coli.

Table 1-1: Number of Bacteria Impaired Assessment Units in New Hampshire by Watershed

HUC 8 Watershed ID Number	HUC 8 Watershed Name	Number of Impairments
01060002	Saco River	1
01060003	Salmon Falls-Piscataqua Rivers	5
01070001	Pemigewasset River	3
01070002	Winnipesauke River	4
01070003	Contoocook River	6
01070004	Nashua River	2
01070006	Merrimack River	7
01080104	Upper Connecticut River-Mascoma	2
01080106	Black-Ottauquechee River	3
01080107	West River	5
01080201	Middle Connecticut River	5
01080202	Miller River	1
TOTAL		**44**

Figure 1-1: Map of 2012 Bacteria Impaired Waters in New Hampshire, by HUC 8 Watershed.
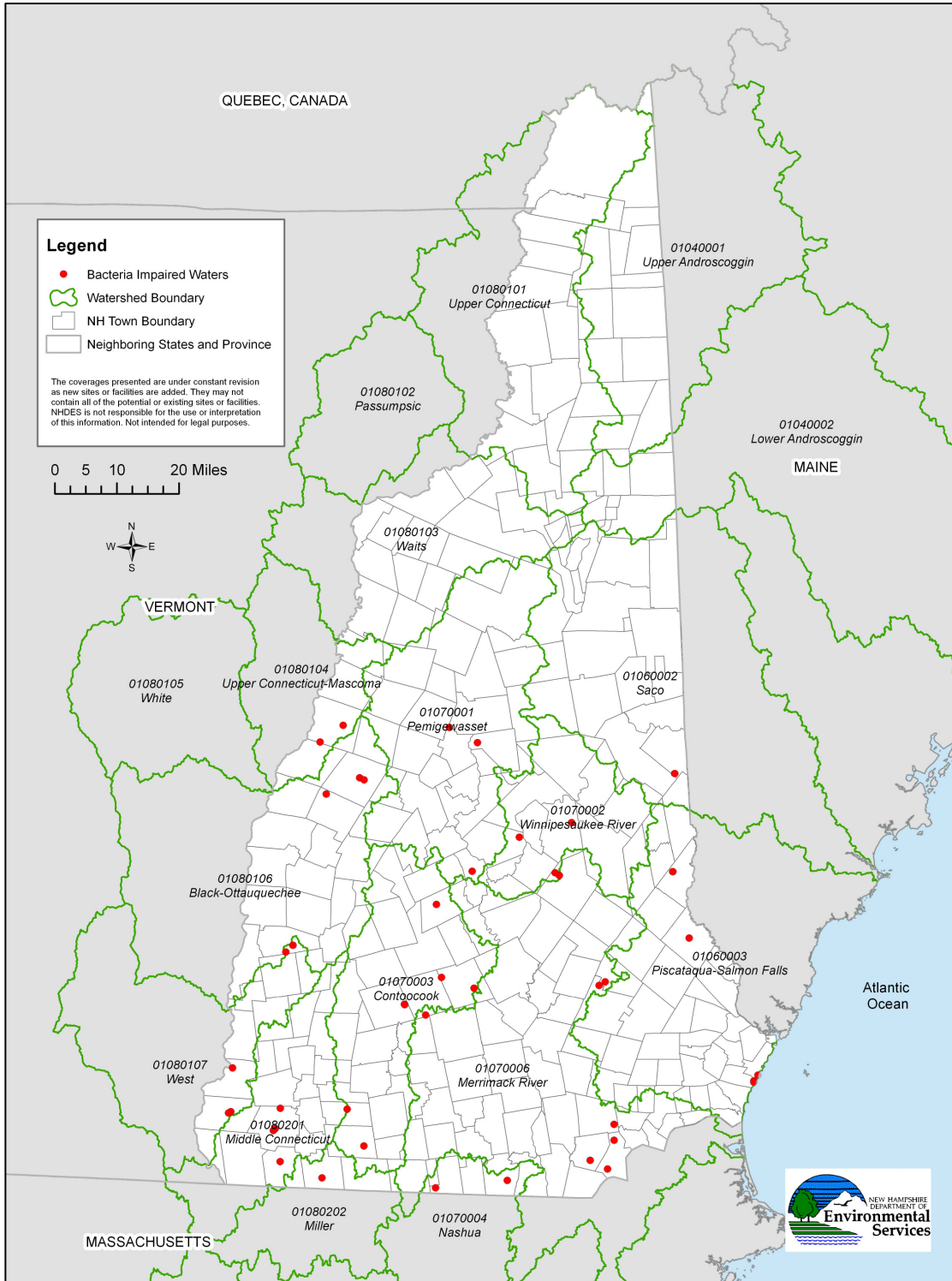
1.3 Where to Find TMDL Information for the 44 Impaired AUs

This report for 44 bacteria TMDLs serves as an extension of the approved Statewide Bacteria TMDL. As such it relies, in part, on portions of the Statewide Bacteria TMDL to satisfy federal TMDL requirements. A list of the various TMDL elements and where they are addressed is provided in Table 1-2.

Table 1-2: Where to Find Information for Each TMDL Element

TMDL Element	Where to find this information
Water Quality Standards for Bacteria - Includes an overview of potential pathogenic impacts of bacteria; the selection of indicator bacteria to assess pathogen levels in waterbodies; and; a brief summary of New Hampshire bacteria standards for surface waters.	Statewide Bacteria TMDL - section 2
Bacteria Pollution Sources– Defines point and non-point sources of bacteria pollution and provides examples of bacteria sources that affect New Hampshire's waterbodies	Statewide Bacteria TMDL - section 3
Bacteria Impaired Waters - Provides a brief introduction to all bacteria impaired waters in New Hampshire (based on the *2008 303(d) List*). This section also includes an overview of the 303(d) listing process; a summary of agencies that collect bacteria data in New Hampshire; and, a description of the TMDL prioritization process.	Statewide Bacteria TMDL - section 4
TMDL Development - Provides a description of the TMDL calculation process including the key required elements for TMDL development and includes concentration based TMDLs and associated wasteload and load allocations for freshwaters (primary contact recreation) and tidal waters (primary contact recreation and shellfish consumption).	Statewide Bacteria TMDL - section 5
Implementation Plan - Provides a description of the implementation process, including coordination with local stakeholders and development of watershed based plans, and a menu of mitigative actions (organized by type of source) to reduce bacteria loadings.	Statewide Bacteria TMDL - section 6
Funding and Community Resources – Provides a description of funding sources available to address impaired waters in New Hampshire.	Statewide Bacteria TMDL - section 7
Watershed-Specific Bacteria Data Summaries and Reductions – For each HUC 8 watershed this section includes available bacteria data, reductions needed for each impaired segment, and GIS maps of HUC watersheds and land cover.	This document - section 2 and Appendices A through M
Public Participation – Includes a review of the process used to solicit public comment and DES' response to comments.	This document - section 3
TMDL Expressed as a Daily Load	This document - Appendix N
Examples of Detailed Implementation Plans to address bacteria impairment. One example is a Watershed-based Restoration Plan and the other is a Storm Drain Illicit Discharge Detention and Elimination Investigation.	Statewide Bacteria TMDL - section 9 and Appendices Q and R.

2. WATERSHED-SPECIFIC BACTERIA DATA SUMMARIES AND REDUCTION ESTIMATES

2.1 Overview

As discussed in section 1.3 and as shown in Table 1-2, this TMDL document relies on many sections in the Statewide Bacteria TMDL approved in 2010 to address many of the federally required TMDL elements. However, specific bacteria information for each of the 44 impaired AUs are provided herein in Appendices A through L. Also included in this document is a description of the methodology used to estimate load reductions (see section 2.2), a summary of the estimated load reductions in each impaired AU (see Table 2-1), and an expression of the TMDL in terms of a daily Load (see Appendix M).

The bacteria data in appendices A through L are organized by watershed with each appendix representing one of 12 HUC 8 watersheds in the State.

Appendix A: Saco River Watershed
Appendix B: Salmon Falls-Piscataqua River Watershed
Appendix C: Pemigewasset River Watershed
Appendix D: Winnipesauke River Watershed
Appendix E: Contoocook River Watershed
Appendix F: Nashua River Watershed
Appendix G: Merrimack River Watershed
Appendix H: Upper Connecticut River- Mascoma
Appendix I: Black-Ottauquechee River
Appendix J: West River
Appendix K: Middle Connecticut River
Appendix L: Miller River

Each watershed-specific appendix contains:

1. A description of the HUC 8 watershed (size, location, and major features).

2. A watershed map, showing the locations of the impaired segments within the HUC 8 watershed.

3. A land cover map, showing land cover types within the HUC 8 watershed.

4. Data tables with recent (within 10 years) bacteria data for each impaired segment (when available) and estimates of reductions needed to meet water quality standards.

2.2 Estimated Load Reductions for each Impaired AU

TMDL reductions necessary to meet water quality standards were calculated for a rough estimation of pollution abatement action needed. The estimate of percent (%) reduction needed is calculated based on the difference between measured ambient bacteria data and the water quality criteria for bacteria. In a few cases, where segments were listed based on the presence of known

sources rather than monitoring data, percent reductions were calculated based on presumed concentrations associated with the known sources. For each segment in Table 2-1, the basis for the calculation of the percent reduction (along with available monitoring data) is explained in the applicable appendix report.

For segments impaired by *E. coli* or enterococci, the necessary % reduction was calculated based on both single sample and geometric mean water quality standards. The following process was used to estimate the % reduction necessary to achieve the water quality standard in each impaired segment:

For E. coli and enterococci impaired segments: Select highest concentration level of <u>single sample</u> indicator bacteria among all current samples (both dry and wet conditions) taken within an impaired segment. For the highest concentration of bacteria for the impaired segment, calculate the % reduction in bacteria levels needed to meet the appropriate single sample water quality criteria. For example, if the highest single sample value from a Class B impaired tidal segment is 1,000 enterococci/100mL, the % reduction needed to meet the single sample criterion is [(1000 – 104)/1000] x 100 = 89.6% reduction).

For all impaired segments: Select highest <u>geometric mean</u> value, based on a rolling average of at least 3 independent samples within an impaired segment collected within 60 consecutive days, or at least 3 samples collected at the same location within the impaired segment provided at least 2 of the samples are separated by a period of at least one day (for more information on geometric mean calculation refer to the 2012 New Hampshire Consolidated Assessment and Listing Methodology report at: http://des.nh.gov/organization/divisions/water/wmb/swqa/documents/2012calm.pdf.). For the highest geometric mean value, calculate the % reduction in bacteria levels needed to meet the appropriate geometric mean water quality criteria.

While both single sample and geometric mean percent reductions are presented, it is recommended that the reductions needed to attain the geometric mean be used (when available) for implementation planning purposes in most cases. Bacteria sampling results can be highly variable and the geometric mean helps to reduce undue influence of any one data point.

Table 2-1: Summary of Estimated Percent Reductions for Bacteria Impaired Segments.

Watershed	Assessment Unit #	Waterbody Name	Primary Town	Impairment	% Reduction to meet TMDL (Geometric Mean)	% Reduction to meet TMDL (Single Sample)
Saco River	NHRIV600020902-07	UNNAMED BROOK - CAMPGROUND INLET TO PROVINCE LAKE	EFFINGHAM	Escherichia coli	complies	62%
	NHIMP600030603-02	COCHECO RIVER - HATFIELD	ROCHESTER	Escherichia coli	36%	35%
	NHRIV600030402-04	JONES BROOK	MILTON	Escherichia coli	11%	6%
Salmon Falls-Piscataqua Rivers	NHRIV600031002-10	UNNAMED BROOK - FROM EEL POND TO ATLANTIC OCEAN RYE OUTFALL	RYE	Escherichia coli	56%	80%
	NHRIV600031002-23	TRIBUTARY TO CHAPEL BROOK	NORTH HAMPTON	Escherichia coli	77%	50%
	NHRIV600031002-24	CHAPEL BROOK	NORTH HAMPTON	Escherichia coli	55%	92%
	NHRIV700010307-13	UNNAMED BROOK TO LOON LAKE	PLYMOUTH	Escherichia coli	complies	60%
Pemigewasset River	NHRIV700010404-01	UNNAMED BROOK - ALONG MEADOWVIEW DRIVE	HOLDERNESS	Escherichia coli	23%	complies
	NHRIV700010804-18	LAKE AVE. TRIBUTARY	FRANKLIN	Escherichia coli	complies	33%
	NHLAK700020110-02-39	LAKE WINNIPESAUKEE - ELLACOYA RV PARK BEACH	GILFORD	Escherichia coli	complies	67%
Winnipesauke River	NHLAK700020201-05-02	TOWN BEACH #1 WINNISQUAM LAKE	SANBORNTON	Escherichia coli	complies	78%
	NHRIV700020202-11	BADGER BROOK	GILMANTON	Escherichia coli	73%	76%
	NHRIV700020202-18	NORTHERN INLET TO SAWYER LAKE	GILMANTON	Escherichia coli	81%	65%

Watershed	Assessment Unit #	Waterbody Name	Primary Town	Impairment	% Reduction to meet TMDL (Geometric Mean)	% Reduction to meet TMDL (Single Sample)
	NHIMP700030507-01-02	UNKNOWN RIVER - KIMBALL POND - HOPKINTON TOWN BEACH	HOPKINTON	Escherichia coli	complies	54%
	NHLAK700030501-01-02	GOULD POND - EASTMAN PARK BEACH	HILLSBOROUGH	Escherichia coli	complies	27%
Contoocook River	NHLAK700030501-01-04	GOULD POND - EMERALD BEACH	HILLSBOROUGH	Escherichia coli	39%	78%
	NHLAK700030505-01-02	CAMP MERRIMAC BEACH	HOPKINTON	Escherichia coli	complies	66%
	NHRIV700030101-37	SUNSET LANE BROOK	JAFFREY	Escherichia coli	99%	99%
	NHRIV700030403-17	BLACKWATER RIVER	SALISBURY	Escherichia coli	60%	45%
	NHRIV700040301-05	SQUANNACOOK RIVER	MASON	Escherichia coli	49%	74%
Nashua River	NHRIV700040402-03	FLINTS BROOK,	HOLLIS	Escherichia coli	89%	80%
	NHLAK700060502-09-02	PLEASANT LAKE-VEASEY PARK	DEERFIELD	Escherichia coli	complies	65%
	NHLAK700060601-03-02	PLEASANT LAKE-PUBLIC ACCESS	HENNIKER	Escherichia coli	complies	78%
Merrimack River	NHLAK700061101-04-03	ARLINGTON MILL RESERVOIR-ARLINGTON POND IMPROVEMENT ASSOC	SALEM	Escherichia coli	56%	78%
	NHLAK700061102-13	SALEM TOWN BEACH-HEDGEHOG POND	SALEM	Escherichia coli	76%	78%
	NHLAK700061204-01-03	TOWN BEACH - COBBETTS POND	WINDHAM	Escherichia coli	33%	78%
	NHRIV700060502-30	LYNN GROVE BROOK	NORTHWOOD	Escherichia coli	complies	53%
	NHRIV700061101-05	TAYLOR BROOK	DERRY	Escherichia coli	16%	65%
Upper Connecticut River-Mascoma	NHRIV801040204-06	ROBINSON POND EAT INLET	LYME	Escherichia coli	no data	97%
	NHRIV801040402-04	HEWES BROOK	LYME	Escherichia coli	69%	80%

Watershed	Assessment Unit #	Waterbody Name	Primary Town	Impairment	% Reduction to meet TMDL (Geometric Mean)	% Reduction to meet TMDL (Single Sample)
	NHRIV801060101-09	CANAAN STREET LAKE OUTLET STREAM	CANAAN	Escherichia coli	68%	68%
Black-Ottauquechee River	NHRIV801060101-16	CANAAN STREET LAKE - INLET AT FERNWOOD FARMS	CANAAN	Escherichia coli	no data	44%
	NHRIV801060105-11	MASCOMA RIVER	ENFIELD	Escherichia coli	no data	80%
	NHRIV801070201-01	COLD RIVER	UNITY	Escherichia coli	no data	80%
	NHRIV801070201-03	UNNAMED BROOK TO CRESCENT LAKE	UNITY	Escherichia coli	no data	66%
West River	NHRIV801070502-04	CHICKERING FARM BROOK	WESTMORELAND	Escherichia coli	no data	98%
	NHRIV801070503-07	WASES GROVE INLET	CHESTERFIELD	Escherichia coli	17%	62%
	NHRIV801070503-08	CAMP SPOFFORD INLET - UNNAMED BROOK	CHESTERFIELD	Escherichia coli	72%	85%
	NHLAK802010402-01-02	CAMP WIYAKA BEACH	RICHMOND	Escherichia coli	complies	78%
	NHRIV802010202-44	ALDRIDGE	DUBLIN	Escherichia coli	no data	65%
Middle Connecticut River	NHRIV802010301-11	ASHUELOT RIVER	SWANZEY	Escherichia coli	complies	41%
	NHRIV802010302-06	UNNAMED BROOK - PINE INLET B	SWANZEY	Escherichia coli	no data	22%
	NHRIV802010302-07	PINE INLET A	SWANZEY	Escherichia coli	no data	78%
Miller River	NHRIV802020202-07	LAUREL LAKE - KEENE AVE. TRIBUTARY	FITZWILLIAM	Escherichia coli	complies	80%

_____

3. PUBLIC PARTICIPATION

EPA regulations [40 CFR 130.7 (c) (ii)] require that calculations to establish TMDLs be subject to public review. The Draft Report was released for public review and comment on January 14, 2013 and written comments were accepted through 4pm on February 22, 2013 (40 days). The Draft Report and public notice announcing the availability of the draft report for public comment was posted on the DES TMDL website at:
http://des.nh.gov/organization/divisions/water/wmb/tmdl/index.htm. An article about the public release was included in the monthly E-Newsletter to the Volunteer Lake Association Program Monitoring Groups and the following were notified directly by email or mail:

- The 37 cities/towns where impaired waterbodies in this TMDL are located.
- The Volunteer River Assessment Program Groups associated with the impaired waterbodies.
- The Lake and/or Watershed Associations associated with the impaired waterbodies.
- The New Hampshire Water Quality Standards Advisory Committee (WQSAC).

A copy of the public notice is provided at the end of this section (Figure 3-1 below). Although 52 bacteria impaired waters were public noticed, only 44 TMDLs are being submitted at this time. DES did not receive any written comments from the stakeholders on the draft report, therefore no substantial changes were made in the final report.

_____

Figure 3-1: Public Notice

Date: January 14, 2013

Subject: **PUBLIC NOTICE–New Hampshire Statewide Total Maximum Daily Load (TMDL) Report for Bacteria Impaired Waters Available for Public Comment**

PUBLIC COMMENTS WILL BE ACCEPTED UNTIL 4 PM ON February 22, 2013

Dear Interested Party or Stakeholder:

The Draft Statewide Total Maximum Daily Load (TMDL) Study for Bacteria Impaired Waters is now available for public review and comment on the New Hampshire Department of Environmental Services website at: http://des.nh.gov/organization/divisions/water/wmb/tmdl/categories/publications.htm.
High levels of bacteria can indicate the presence of waterborne disease organisms, known as pathogens, which can pose a public health risk and render a surface water unsuitable for uses such as swimming and shellfishing (in tidal waters). Surface waters include rivers, streams, lakes, ponds, wetlands and tidal waters. Examples of bacteria sources include improperly treated human waste and storm water runoff that has come in contact with feces from domesticated animals (pets, barnyard animals, etc.) and wildlife.

The purpose of a TMDL is to calculate the amount of pollutant (such as bacteria) that a surface water can assimilate without exceeding State surface water quality standards. The allowable pollutant load is then allocated to specific sources. Another important goal of the TMDL process is to promote, encourage, and inform local community action for water quality improvement and protection of public health by addressing sources of bacterial contamination. To this end this report also provides valuable information to help communities, watershed groups and stakeholders to implement the TMDL in a phased, community-based approach that will ultimately result in attainment of water quality standards.

This TMDL specifically addresses 52 bacteria impaired surface waters in 38 New Hampshire communities. Estimates of the percent reduction needed to meet water quality standards for bacteria in each impaired waterbody are provided in Table 2-1. Bacteria data for the impaired segments are provided in the appendices on a watershed basis.   Recommendations regarding watershed remediation activities to reduce bacteria inputs to waterbodies are provided in Chapter 6 (Implementation Plans) of the New Hampshire Statewide TMDL for Bacteria Impaired Waters Report, which has was approved by EPA on September 21, 2010. Examples of detailed implementation plans to restore impaired waters are included in appendices Q and R of that report and can be found at:

http://des.nh.gov/organization/divisions/water/wmb/tmdl/categories/publications.htm.
Comments will be accepted until 4 pm on February 22, 2013. Only written comments will be accepted. All comments must include the name of the TMDL, the date and contact information (your name, address, phone, e-mail, and organization). If you require additional time, information about the project or background data/materials to facilitate your review and prepare and submit your comments please contact Margaret Foss, NHDES TMDL Coordinator at (603) 271-5448 or via email at mfoss@des.state.nh.us.

Comments can be mailed to:	TMDL Program, NHDES Watershed Management Bureau, 29 Hazen Drive, P.O. Box Concord, NH 03302, Attention Margaret P. Foss, TMDL Coordinator
or emailed to:	TMDL@des.nh.gov

For convenience, a public comment cover sheet for submitting comments is available at http://des.nh.gov/organization/divisions/water/wmb/tmdl/documents/commentform.pdf. Use of the cover sheet is optional.