Moswansicut Stream

Watershed Description

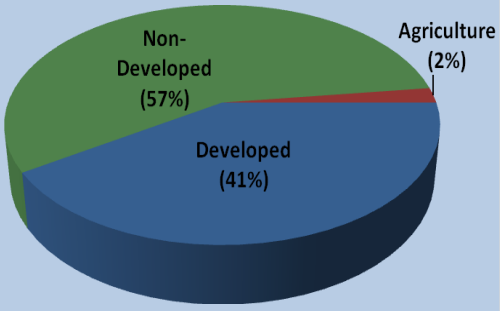
This **TMDL** applies to the Moswansicut Stream assessment unit (RI0006015R-16), a 0.1-mile long stream located in Scituate, RI (Figure 1). The Town of Scituate is located in north-central Rhode Island and the Moswansicut Stream is situated in the northeast corner of town. The Moswansicut Stream watershed is presented in Figure 2 with land use types indicated.

Moswansicut Stream begins in a forested area south of Route 6 in the Village of North Scituate. The stream flows through a medium to high-density residential area, adjacent to a commercial area, and crosses under Danielson Pike. The stream continues north through a wooded area, flows under Route 6, and empties into Moswansicut Pond, which serves as a public drinking water supply. Moswansicut Pond has been designated by RIDEM as a Special Resource Protection Water (SRPW), providing it with special provisions under RIDEM's Antidegradation Provisions. SRPWs are high quality surface waters that have been identified as having significant ecological or recreational uses and/or are public water supplies.

The Moswansicut Stream watershed covers 0.2 square miles and is predominantly non-developed (57%). However, most of the development in the watershed is concentrated around the impaired stream. Developed land uses, including the Village Plaza Mall, Macera's Stone, and other commercial, residential, and transportation land uses occupy 41% of the watershed. Development within the watershed is predicted to increase in response to increasing residential development (RI HEALTH, 2003). Agricultural uses occupy 2% of the land area.

Assessment Unit Facts (RI0006015R-16)

- **Town:** Scituate
- **Impaired Segment Length:** 0.1 mile
- **Classification:** Class AA
- **Direct Watershed:** 0.2 mi^2 (141 acres)
- **Impervious Cover:** 20.4%
- **Watershed Planning Area:** Pawtuxet (#12)



Watershed Land Uses

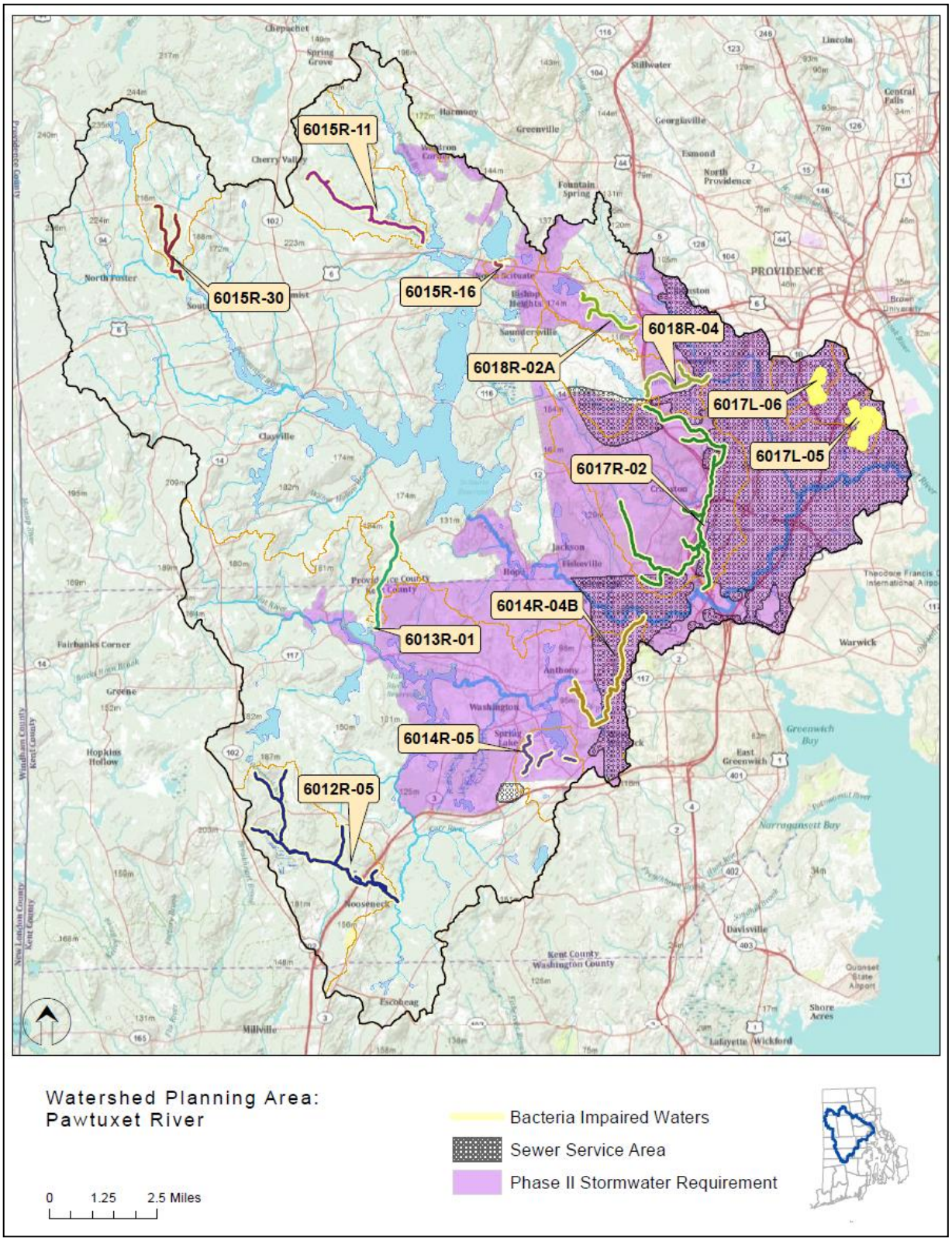


Figure 1: ***Map of Pawtuxet Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewered areas, and stormwater regulated zones.***

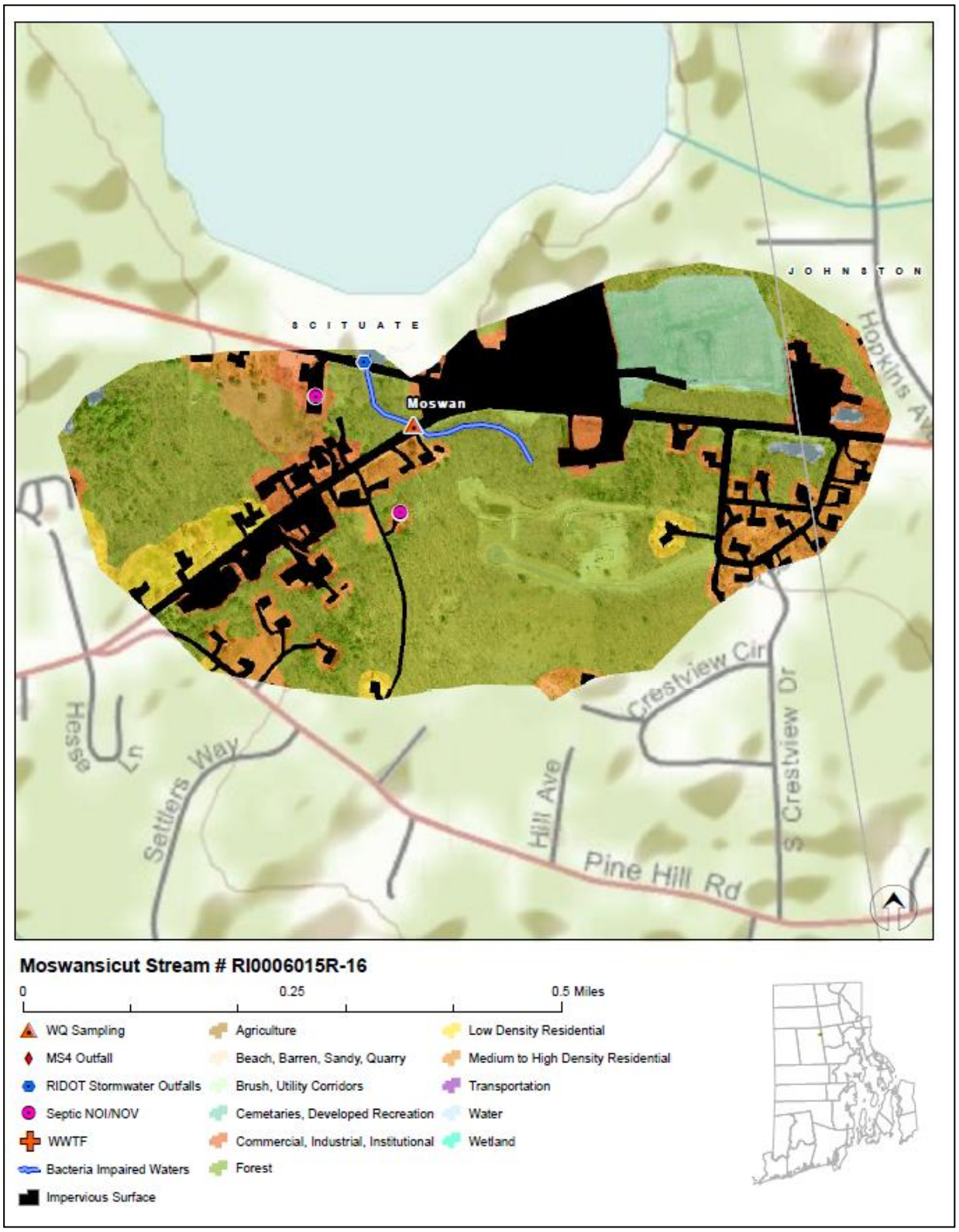


Figure 2: ***Map of the Moswansicut Stream watershed with impaired segment, sampling location, and land cover indicated.***

Why is a TMDL Needed?

Moswansicut Stream is a Class AA freshwater stream and is a tributary within the Scituate Reservoir watershed, which is the source of supply to the Providence Water Supply Board public drinking water supply system. However, as it is not a terminal reservoir, its applicable designated uses are primary and secondary contact recreation (RIDEM, 2009). From 2003-2007, water samples were collected from one sampling location and analyzed for the indicator bacteria, *Escherichia coli* (*E. coli*). USEPA recommends *E.coli* as an indicator of health risk from water contact in freshwater recreational waters (USEPA, 2010). Although no water quality standard for *E.coli* currently exists in Rhode Island, *E.coli* can be used to assess water quality in cases where there is no fecal coliform or enterococci data available. The water quality criteria for *E.coli*, along with bacteria sampling results from the 2003-2007 study and associated statistics are presented in Table 1. The geometric mean at the sampling site exceeded the water quality criteria value for *E.coli*. To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sampling days, where appropriate. Wet and dry geometric mean values were similar and both exceeded the water quality criteria for enterococci.

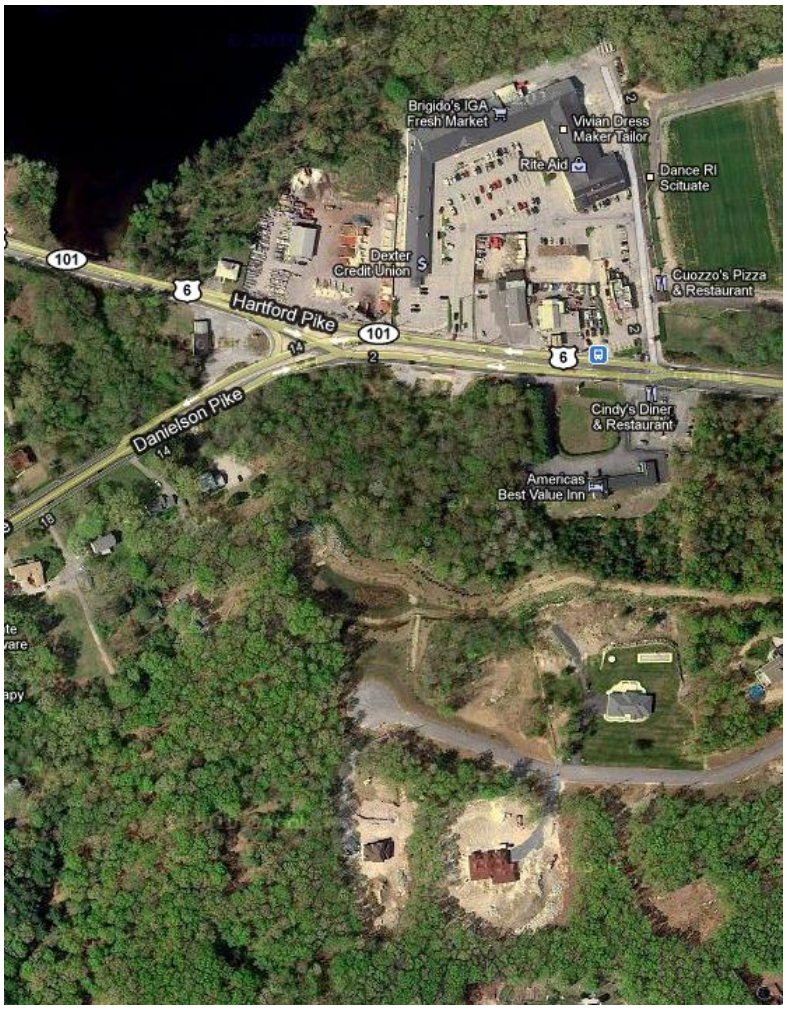


Figure 3: ***Partial aerial view of Moswansicut Stream watershed (Source: Google Maps)***

Due to the elevated bacteria measurements presented in Table 1, the Moswansicut Stream assessment unit does not meet Rhode Island's water quality standards, was identified as impaired and was placed on the 303(d) list (RIDEM, 2008). The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

Potential Bacteria Sources

Previous investigations have concluded that there are several potential sources of harmful bacteria in the Moswansicut Stream watershed including stormwater runoff from developed areas, failing onsite wastewater management systems, and wildlife and domestic pet waste. A stream buffer survey found that 21% of the streamside is disturbed, high intensity land use covers 5% of this area (RI HEALTH, 2003). Intensive land use near the stream is likely to result in increased adverse impacts as the natural land buffering system of the stream has been removed. Each type of potential bacteria sources is described briefly below.

Developed Area Stormwater Runoff

Though the majority of the Moswansicut Stream watershed is non-developed, impervious surfaces cover approximately 20.4%, particularly along Route 6 and Danielson Pike. Impervious cover is defined as land surface areas, such as roofs and roads, that force water to run off land surfaces, rather than infiltrating into the soil. Impervious cover provides a useful metric for the potential for adverse stormwater impacts. Impervious cover has previously been identified as a pollutant source in the larger Moswansicut Pond basin (RI HEALTH, 2003). As discussed in Section 6.3 of the Core TMDL Document, as a general rule, impaired streams with watersheds having higher than 10% impervious cover are assumed to be affected by stormwater runoff.

In accordance with Phase II requirements, Scituate has identified and mapped outfalls to surface water bodies. The Rhode Island Department of Transportation (RIDOT) has also mapped stormwater outfalls within the Moswansicut Stream watershed. As shown in Figure 2, one outfall was found downstream of the sampling site, directly adjacent to the outlet of the stream to Moswansicut Pond. As stormwater is known to carry a suite of pollutants, including bacteria, stormwater may be a potential source of bacterial contamination to Moswansicut Stream.

Onsite Wastewater Treatment Systems

The Moswansicut Stream watershed relies entirely on onsite wastewater treatment systems (OWTS) such as septic systems and cesspools. Failing OWTS can be significant sources of bacteria by allowing improperly treated waste to reach surface waters (RI HEALTH, 2003). Soils in the area are described as "excessively permeable" by the State of Rhode Island (RI HEALTH, 2003), increasing the potential for bacterial contamination of waterways. As shown in Figure 2, two OWTS Notices of Violation/Notices of Intent to Violate have been issued by the RIDEM Office of Compliance and Inspection to property owners in the Moswansicut Stream watershed.

Waterfowl, Wildlife, and Domestic Animal Waste

Non-developed land accounts for 57% of the watershed area. Forests and open water areas are home to multiple species of wildlife and waterfowl. Wildlife, including waterfowl, may be a significant bacteria source to surface waters. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. As such these physical land alterations can exacerbate the impact of these natural sources on water quality.

Domestic animals are another potential source of bacteria to the Moswansicut Stream. Medium to high density residential developments are located near the stream in some areas of the watershed. If residents are not properly disposing of pet waste, the bacteria from that waste could enter and contaminate the stream either directly or through stormwater.

Existing Local Management and Recommended Next Steps

Scituate has developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of Moswansicut Stream. Additional bacteria data collection would be beneficial to support identification of sources of potentially harmful bacteria in the Moswansicut Stream watershed. These activities could include sampling at several different locations and under different weather conditions (e.g., wet and dry). Field reconnaissance surveys focusing on stream buffers, stormwater runoff, and other source identification may also be beneficial.

Scituate has a Comprehensive Plan that provides technical resources for protection of the Moswansicut Stream watershed. A brief description of existing local programs and recommended next steps from this plan, as well as Scituate's Onsite Wastewater Management Plan are provided below. Stakeholders should review these documents directly for more detailed information.

Stormwater Management

The Town of Scituate (RIPDES permit RIR040027) and RIDOT (RIPDES permit RIR040036) are municipal separate storm sewer (MS4) operators in the Moswansicut Stream watershed. Almost the entire watershed area is regulated under the Phase II program.

RIDOT has prepared the required Phase II Stormwater Management Plan (SWMPP) for state-owned roads within the watershed. RIDOT's SWMPP and its 2011 Compliance Update outline its goals for compliance with the General Permit statewide. It should be noted that RIDOT has chosen to enact the General Permit statewide, not just for the urbanized and densely populated areas that are required by the

permit. RIDOT has finished mapping its outfalls throughout the state and is working to better document and expand its catch basin inspection and maintenance programs along with its BMP maintenance program. Stormwater Pollution Prevention Plans (SWMPPs) are being utilized for RIDOT construction projects. RIDOT also funds the University of Rhode Island Cooperative Extension's Stormwater Phase II Public Outreach and Education Project, which provides participating MS4s with education and outreach programs that can be used to address TMDL public education recommendations.

The Town of Scituate has an incomplete Phase II SWMPP. Scituate has mapped stormwater outfalls, but has not fulfilled the other requirements of the SWMPP which include instituting annual inspections and cleaning of the town's catch basins, implementing an annual street-sweeping program, adopting construction erosion and sediment control and post-construction stormwater control ordinances, and conducting public education activities. Scituate should complete their SWMPP and ensure that it outlines goals for the reduction of stormwater runoff to Moswansicut Stream through the implementation of Best Management Practices (BMPs).

The Town of Scituate has not adopted an IDDE ordinance (RIDEM, 2010). This type of ordinance prohibits illicit discharges to the MS4 and provides an enforcement mechanism. It is recommended that any stormwater outfalls discharging in the vicinity of the sampling location be monitored to check for illicit discharges. Illicit discharges can be identified through dry weather outfall sampling and microbial source tracking.

While these first steps are important to reduce the effects of stormwater runoff to Moswansicut Stream, additional efforts are needed to restore the river's water quality. As mentioned previously, the Moswansicut Stream watershed has an impervious cover of 20.4%, a level where stormwater impacts are expected. At this threshold, RIDEM is requiring the MS4 operators to revise their post-construction stormwater ordinances as described in Section 6.3 of the Core TMDL Document. RIDEM also requires the MS4 operators to evaluate the sufficiency of their six minimum measures in achieving the TMDL provisions. Changes to the SWMPPs should be documented in a TMDL Implementation Plan (TMDL IP) and should comply with relevant provisions Part IV.D of the RIPDES Stormwater General Permit (RIDEM, 2010b), which are summarized in Section 6.2 (Numbers 1 through 5) of the Core TMDL Document.

Onsite Wastewater Management

All residents in the Moswansicut Stream watershed rely on OWTS (Figure 1). Scituate has an Onsite Wastewater Management Plan that provides a framework for managing the OWTS. However, the town has not adopted an OWTS ordinance requiring all OWTS to be inspected and pumped routinely. No sewer expansion is planned for this area (Town of Scituate, 2004). As part of the onsite wastewater planning process, Scituate should adopt ordinances to establish enforceable mechanisms to ensure that

existing OWTS are properly operated and maintained. RIDEM recommends that all communities create an inventory of onsite systems through mandatory inspections. Inspections encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard OWTS within a reasonable time frame should be adopted. The Rhode Island Wastewater Information System (RIWIS) can help develop an initial inventory of OWTS and can track voluntary inspection and pumping programs (RIDEM, 2010b).

The Town of Scituate is currently not eligible for Rhode Island's Community Septic System Loan Program (CSSLP). The CSSLP program provides low-interest loans to residents to help with maintenance and replacement of OWTS. It is recommended that the town develop a program to assist citizens with the replacement of older and failing systems.

Waterfowl, Wildlife, and Domestic Animal Waste

Scituate's education and outreach programs should highlight the importance of picking up after dogs and other pets and not feeding waterfowl. Animal wastes should be disposed of away from any waterway or stormwater system. Scituate should work with volunteers to map locations where animal waste is a significant and chronic problem. This work should be incorporated into the town's Phase II plan and should result in an evaluation of strategies to reduce the impact of animal 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.

Towns and residents can take several measures to minimize waterfowl-related impacts. They can allow tall, coarse vegetation to grow in areas along the shores of Moswansicut Stream that are 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 migration. With few exceptions, Part XIV, Section 14.13 of Rhode Island's Hunting Regulations prohibits feeding wild waterfowl at any time in the state of Rhode Island. Educational programs should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in the Moswansicut Stream and can harm human health and the environment.

Land Use Protection

The majority (57%) of Moswansicut Brook watershed is undeveloped, however only a small portion of the watershed is protected as open space. As source waters to Providence's water supply, preserving these natural areas is particularly important. Woodland and wetland areas within the Moswansicut Stream watershed absorb and filter pollutants from stormwater runoff, and help protect both water

quality in the stream and stream channel stability. It is important to preserve these undeveloped areas, and institute controls on development in Moswansicut Stream watershed (RI HEALTH, 2003).

The steps outlined above will support the goal of mitigating bacteria sources and meeting water quality standards in Moswansicut Stream.

Table 1: Moswansicut Stream Bacteria Data

***Waterbody ID*:** RI0006015R-16

Watershed Planning Area: 12 – Pawtuxet

Characteristics: Freshwater, Class AA, Tributary within a Public Drinking Supply, Primary and Secondary Contact Recreation

Impairment: *E.coli* (colonies/100 mL)

Water Quality Criteria for E. coli (EPA): Geometric Mean: 126 colonies/100 mL

Percent Reduction to meet TMDL: **42% (Includes 5% Margin of Safety)**

Data: 2003-2010 from RIDEM

Single Sample *E. coli* (colonies/100 mL) Results for Moswansicut Stream (2003-2007) with Geometric Mean Statistics

Station Name	Station Location	Date‡	Result	Wet/Dry	Geometric Mean
Moswansicut Stream	Old Danielson Pike	07/12/10	2400	Dry	64
Moswansicut Stream	Old Danielson Pike	06/16/10	43	Wet	
Moswansicut Stream	Old Danielson Pike	05/10/10	150	Dry	
Moswansicut Stream	Old Danielson Pike	04/12/10	<3	Dry	
Moswansicut Stream	Old Danielson Pike	03/08/10	<3	Dry	
Moswansicut Stream	Old Danielson Pike	02/08/10	23	Dry	
Moswansicut Stream	Old Danielson Pike	01/11/10	3	Dry	
Moswansicut Stream	Old Danielson Pike	12/14/09	23	Wet	187
Moswansicut Stream	Old Danielson Pike	11/09/09	<3	Dry	
Moswansicut Stream	Old Danielson Pike	10/29/09	2400	Wet	
Moswansicut Stream	Old Danielson Pike	09/14/09	240	Dry	
Moswansicut Stream	Old Danielson Pike	08/17/09	150	Dry	
Moswansicut Stream	Old Danielson Pike	07/13/09	1100	Dry	
Moswansicut Stream	Old Danielson Pike	05/11/09	240	Dry	
Moswansicut Stream	Old Danielson Pike	04/13/09	43	Dry	
Moswansicut Stream	Old Danielson Pike	03/09/09	2400	Wet	
Moswansicut Stream	Old Danielson Pike	02/09/09	43	Dry	
Moswansicut Stream	Old Danielson Pike	01/12/09	23	Wet	

Single Sample *E.coli* (colonies/100 mL) Results for Moswansicut Stream (2003-2007) with Geometric Mean Statistics (continued)

Station Name	Station Location	Date‡	Result	Wet/Dry	Geometric Mean
Moswansicut Stream	Old Danielson Pike	12/08/08	43	Dry	**199† (42%)***
Moswansicut Stream	Old Danielson Pike	11/10/08	23	Dry	
Moswansicut Stream	Old Danielson Pike	10/29/08	2400	Wet	
Moswansicut Stream	Old Danielson Pike	09/08/08	2400	Wet	
Moswansicut Stream	Old Danielson Pike	08/15/08	23	Dry	
Moswansicut Stream	Old Danielson Pike	06/09/08	2400	Dry	
Moswansicut Stream	Old Danielson Pike	05/12/08	2400	Dry	
Moswansicut Stream	Old Danielson Pike	04/14/08	23	Dry	
Moswansicut Stream	Old Danielson Pike	03/10/08	23	Wet	
Moswansicut Stream	Old Danielson Pike	01/14/08	240	Wet	
Moswansicut Stream	Old Danielson Pike	08/01/07	2400	Dry	148
Moswansicut Stream	Old Danielson Pike	07/09/07	150	Dry	
Moswansicut Stream	Old Danielson Pike	06/11/07	2400	Dry	
Moswansicut Stream	Old Danielson Pike	05/14/07	39	Dry	
Moswansicut Stream	Old Danielson Pike	04/09/07	2.9	Dry	
Moswansicut Stream	Old Danielson Pike	03/12/07	43	Dry	
Moswansicut Stream	Old Danielson Pike	02/12/07	23	Dry	
Moswansicut Stream	Old Danielson Pike	01/08/07	2400	Wet	
Moswansicut Stream	Old Danielson Pike	12/11/06	43	Dry	180
Moswansicut Stream	Old Danielson Pike	11/13/06	240	Wet	
Moswansicut Stream	Old Danielson Pike	10/30/06	2400	Wet	
Moswansicut Stream	Old Danielson Pike	07/10/06	2400	Dry	
Moswansicut Stream	Old Danielson Pike	06/12/06	240	Dry	
Moswansicut Stream	Old Danielson Pike	05/08/06	460	Dry	
Moswansicut Stream	Old Danielson Pike	04/10/06	1100	Dry	
Moswansicut Stream	Old Danielson Pike	03/13/06	23	Dry	
Moswansicut Stream	Old Danielson Pike	02/13/06	2.9	Wet	
Moswansicut Stream	Old Danielson Pike	01/09/06	75	Dry	

Single Sample *E.coli* (colonies/100 mL) Results for Moswansicut Stream (2003-2007) with Geometric Mean Statistics (continued)

Station Name	Station Location	Date‡	Result	Wet/Dry	Geometric Mean
Moswansicut Stream	Old Danielson Pike	12/12/05	2400	Dry	91
Moswansicut Stream	Old Danielson Pike	11/14/05	75	Dry	
Moswansicut Stream	Old Danielson Pike	10/31/05	23	Dry	
Moswansicut Stream	Old Danielson Pike	08/01/05	2400	Dry	
Moswansicut Stream	Old Danielson Pike	07/11/05	75	Dry	
Moswansicut Stream	Old Danielson Pike	06/13/05	2400	Dry	
Moswansicut Stream	Old Danielson Pike	05/09/05	240	Dry	
Moswansicut Stream	Old Danielson Pike	04/11/05	2.9	Dry	
Moswansicut Stream	Old Danielson Pike	03/14/05	2.9	Dry	
Moswansicut Stream	Old Danielson Pike	02/14/05	4	Wet	
Moswansicut Stream	Old Danielson Pike	01/10/05	250	Dry	
Moswansicut Stream	Old Danielson Pike	12/13/04	2.9	Dry	121
Moswansicut Stream	Old Danielson Pike	11/23/04	23	Dry	
Moswansicut Stream	Old Danielson Pike	10/20/04	2400	Wet	
Moswansicut Stream	Old Danielson Pike	07/12/04	2400	Dry	
Moswansicut Stream	Old Danielson Pike	06/14/04	2400	Dry	
Moswansicut Stream	Old Danielson Pike	05/10/04	43	Dry	
Moswansicut Stream	Old Danielson Pike	04/12/04	4	Wet	
Moswansicut Stream	Old Danielson Pike	03/08/04	2400	Dry	
Moswansicut Stream	Old Danielson Pike	02/09/04	15	Dry	
Moswansicut Stream	Old Danielson Pike	12/16/03	43	Wet	123
Moswansicut Stream	Old Danielson Pike	11/10/03	23	Dry	
Moswansicut Stream	Old Danielson Pike	10/08/03	23	Dry	
Moswansicut Stream	Old Danielson Pike	09/08/03	1100	Dry	
Moswansicut Stream	Old Danielson Pike	08/18/03	2400	Dry	
Moswansicut Stream	Old Danielson Pike	07/14/03	1100	Dry	
Moswansicut Stream	Old Danielson Pike	06/09/03	2400	Dry	
Moswansicut Stream	Old Danielson Pike	05/12/03	23	Wet	
Moswansicut Stream	Old Danielson Pike	04/16/03	2400	Dry	
Moswansicut Stream	Old Danielson Pike	03/10/03	<3	Dry	
Moswansicut Stream	Old Danielson Pike	01/09/03	4	Dry	

Shaded cells indicate an exceedance of water quality criteria
*Includes 5% Margin of Safety
†Geometric mean used to determine percent reduction
‡Data collected by Providence Water Supply Board

Wet and Dry Weather Geometric Mean *E.coli* Values for the Moswansicut Stream

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
Moswansicut Stream	Old Danielson Pike	2003-2010	18	56	128	143	134

Shaded cells indicate an exceedance of water quality criteria
Weather condition determined from the rain gage at T.F. Green Airport in Warwick, RI

References

Fuss & O'Neill (2003). Phase II Stormwater Management Plan: Town of Scituate, Rhode Island (Draft). Submitted by Fuss & O'Neill, Inc, Providence, RI. Revised March 2004.

RIDEM (2008). State of Rhode Island and Providence Plantations 2008 303(d) List – List of Impaired Water Bodies. Rhode Island Department of Environmental Management.

RIDEM (2009). State of Rhode Island and Providence Plantations Water Quality Regulations. Amended December, 2009. Rhode Island Department of Environmental Management.

RIDEM (2010). MS4 Compliance Status Report for RI Statewide Bacteria TMDL. Rhode Island Department of Environmental Management.

RIHEALTH (2003). The Scituate Reservoir Source Water Assessment. University of Rhode Island Cooperative Extension in cooperation with Rhode Island Department of Health Source Water Assessment Program, Office of Drinking Water Quality.

Town of Scituate (1994). Scituate, Rhode Island Comprehensive Plan. Prepared by the Situate Planning Board and the Successful Communities Advisory Committee and the Conservation Foundation. Updated June 2003.