Stillwater River

Watershed Description

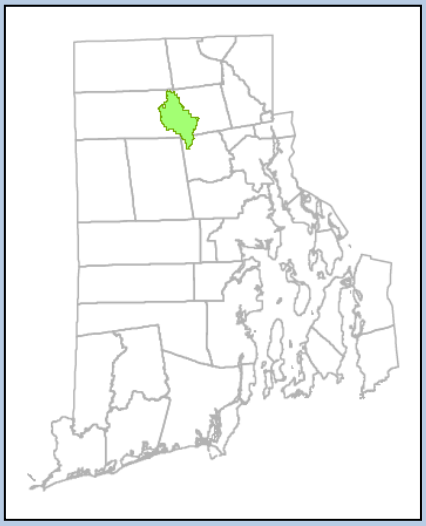
This **TMDL** applies to the Stillwater River assessment unit (RI0002007R-09), a 6.1-mile long river located in Smithfield, RI (Figure 1). The Town of Smithfield is located in the north-central portion of Rhode Island. The Stillwater River is located in the western section of Smithfield. The Stillwater River watershed is presented in Figure 2 with land use types indicated.

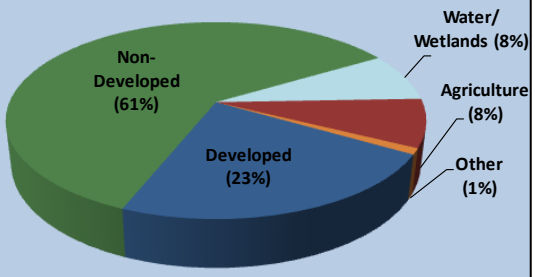
The headwaters of the Stillwater River begin near the intersection of Tarkiln and Paine Roads in Glocester, RI. The river flows south parallel to Tarkiln Road, and empties into the Waterman Reservoir. The impaired segment of the Stillwater River begins at the outlet of the Waterman Reservoir. Cutler Brook, another impaired segment, also empties into the Waterman Reservoir. The Stillwater River leaves the Waterman Reservoir at the intersection of W. Greenville Road and Putnam Pike, in Smithfield. The river travels east as it flows through several impoundments parallel to Putnam Pike. The river then passes under Austin Avenue where it is met by a small tributary draining the Slack Reservoir. The river continues northeast and is joined by a northern tributary, and flows into the Sprague Lower Reservoir, just before it passes under RI Route 116 (Pleasant View Avenue) near the intersection of Spragueville Road. The river flows into the Stillwater Reservoir east of the intersection of Richard Street and Mountaindale Road.

The Stillwater River watershed covers 12.9 square miles. As shown in Figure 3, non-developed areas occupy a large portion (61%) of the watershed. Developed uses occupy approximately 23% of the land area. Impervious surfaces cover a total of 9.3% and are concentrated in the southern portion of the watershed. Wetland and surface waters occupy 8%, and agricultural use covers 8%.

Assessment Unit Facts (RI0002007R-09)

- **Town:** Smithfield
- **Impaired Segment Length:** 6.1 miles
- **Classification:** Class B
- **Direct Watershed:** 12.9 mi² (8,248 acres)
- **Impervious Cover:** 9.3%
- **Watershed Planning Area:** Woonasquatucket (#24)





Watershed Land Uses

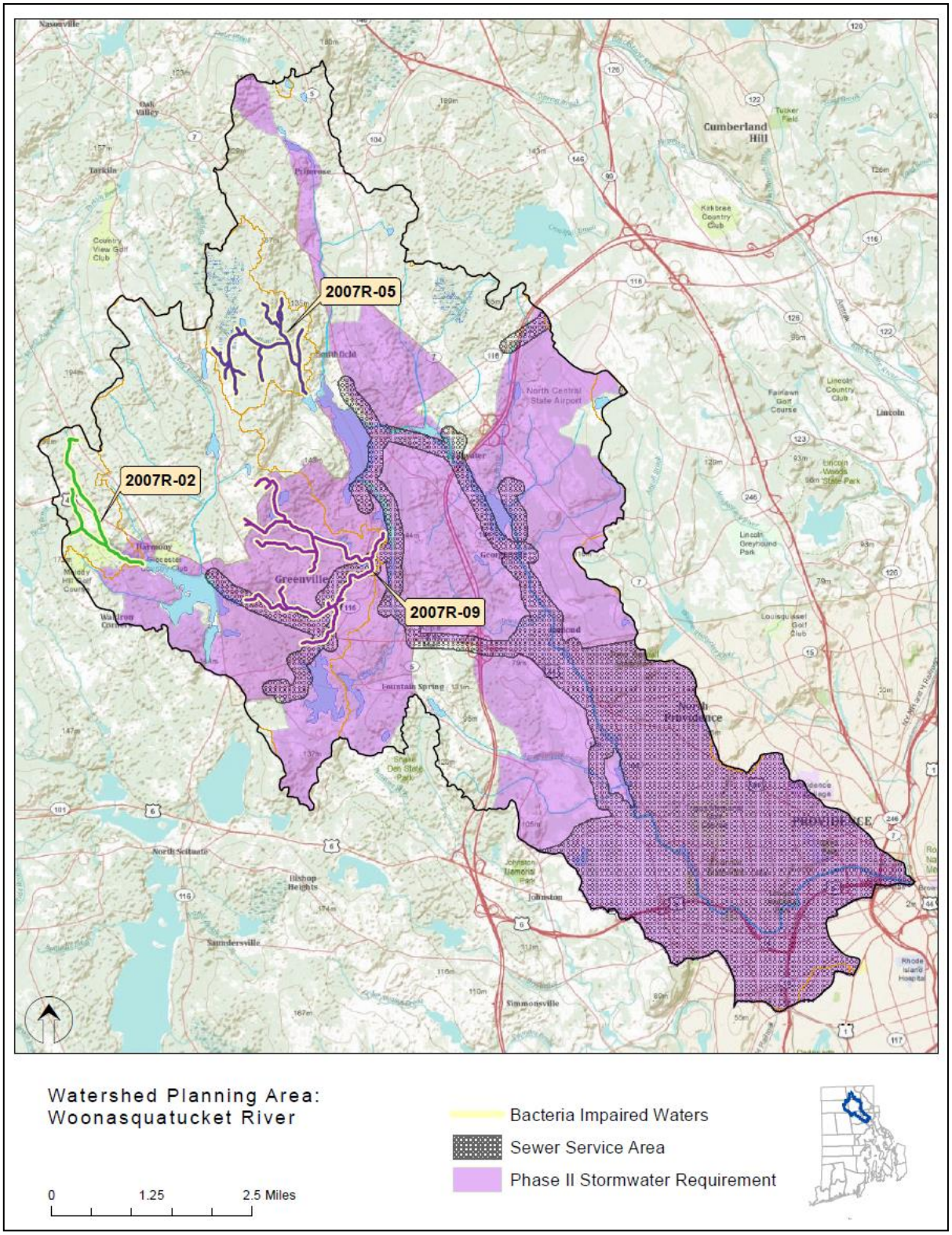


Figure 1: ***Map of the Woonasquatucket River Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewered areas, and stormwater regulated zones.***

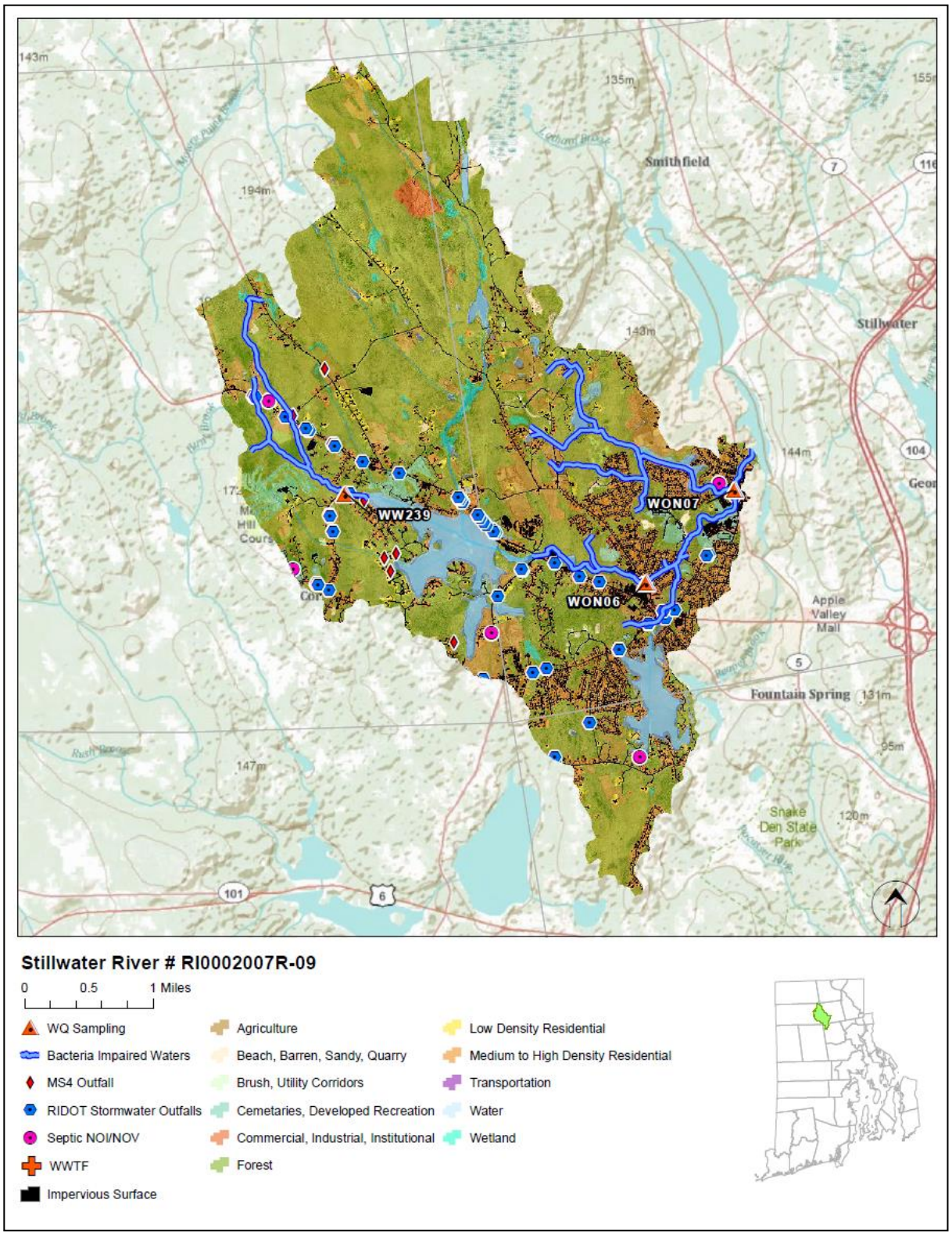


Figure 2: ***Map of the Stillwater River watershed with impaired segments, sampling locations, and land cover indicated.***

Why is a TMDL Needed?

The Stillwater River is a Class B fresh water river with designated uses of primary and secondary contact recreation and fish and wildlife habitat (RIDEM, 2009). From 2008-2009, water samples were collected from two sampling locations (WON06 and WON07) and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2008-2009 and associated statistics are presented in Table 1. The geometric mean was calculated for stations WON06 and WON07 and exceeded the water quality criteria for enterococci. All samples were taken in dry-weather conditions.

Figure 3: ***Partial aerial view of the Stillwater River watershed (Source: Google Maps)***

Due to the elevated bacteria measurements presented in Table 1, the Stillwater River does not meet Rhode Island's bacteria 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 impairments and identifies measures needed to restore water quality. The goal is for all water bodies to comply with state water quality standards.

Potential Bacteria Sources

There are several potential sources of bacteria in the Stillwater River watershed including malfunctioning onsite wastewater treatment systems, illicit discharges, wildlife and domestic animal waste, and stormwater runoff from developed areas.

Onsite Wastewater Treatment Systems

Many of the residents within the Stillwater River watershed rely on onsite wastewater treatment systems (OWTS) such as septic systems and cesspools. While 60% of residents have access to the municipal wastewater system, the majority of the Stillwater River watershed, especially the land surrounding the tributaries, is mostly undeveloped and does not have access to the municipal wastewater system (BETA, 2003). Failing OWTS can be significant sources of bacteria by allowing improperly treated waste to reach surface waters (RI HEALTH, 2003).

If systems are improperly sized, malfunctioning, or in soils poorly suited for septic waste disposal, microorganisms such as bacteria, can enter surface water (USEPA, 2002). The majority of Smithfield (62%) has well drained soils suitable for onsite waste disposal. However, 24% of the soils in town have very poor to moderate draining capabilities. These soils have a lower hydraulic conductivity and their risk of conveying septic waste seepage to surface water is higher than that of well-drained soils (Town of Smithfield, 2006). Some of these soils are present within the Stillwater River watershed, particularly in areas not currently serviced by the municipal wastewater treatment system (BETA, 2003). As shown in Figure 2, five OWTS Notices of Violation/Notices of Intent to Violate have been issued by the RIDEM Office of Compliance and Inspection in the Stillwater River watershed.

Sewer Leaks

Portions of the watershed are serviced by a municipal sanitary sewer system. Any leaks in these lines could be contributing bacteria to Stillwater Brook.

Waterfowl, Wildlife, and Domestic Animal Waste

Domestic animals within the Stillwater River watershed represent a potential source of bacteria. Residential developments are located directly adjacent to the river in several areas. If residents are not properly disposing of pet waste, the bacteria from that waste could enter and contaminate the river. Portions of the Stillwater River watershed are protected and provide a sanctuary to a variety of wildlife including waterfowl. Many of these conservation areas surround the river (Smithfield, 2007) concentrating wildlife in these locations. There are also numerous small impoundments along the river, providing ideal habitat for waterfowl (Woonasquatucket, 2011). 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. Several years ago, Smithfield was forced to close the town beach at one of the reservoirs due to bacterial contamination from waterfowl (Town of Smithfield, 2006). While this beach is not within the Stillwater River watershed, it shows the potential for bacterial contamination from wildlife in this area.

Developed Area Stormwater Runoff

The Stillwater River watershed has an impervious cover of 9.8%. 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. While runoff from impervious areas in developed portions of the watershed may be contributing bacteria to the Stillwater River, as discussed in Section 6.3 of the Core TMDL Document, as a general rule, impaired streams with watersheds having less than 10% impervious cover are assumed to be caused by sources other than urbanized stormwater runoff.

As part of Phase II requirements, the Town of Smithfield and RIDOT have mapped outfalls to surface waterbodies (Figure 2) (Town of Smithfield, 2006). The Stillwater River has been shown to receive discharges from multiple stormwater outfalls.

Existing Local Management and Recommended Next Steps

Additional bacteria data collection would be beneficial to support identification of sources of potentially harmful bacteria in the Stillwater River watershed. These activities could include sampling at several different locations and under different weather conditions. Field reconnaissance surveys focusing on stream buffers, stormwater runoff, and other source identification would also be beneficial.

Based on existing ordinances and previous investigations, the following steps are recommended to support water quality goals.

Onsite Wastewater Management

Many of residents of the Stillwater River watershed rely on OWTS. Currently, the Town of Smithfield has a draft Onsite Wastewater Management Plan (BETA, 2003). However, the town does not have an OWTS ordinance requiring testing and replacement of failing systems. As part of the onsite wastewater planning process, Smithfield 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 Smithfield is currently not eligible for Rhode Island's Community Septic System Loan Program (CSSLP). CSSLP is a program that assists citizens with the replacement of older and failing systems through low-interest loans. 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

Stormwater Phase II requirements include an educational program to inform the public about the impact of stormwater. Smithfield's education and outreach programs currently highlight the importance of picking up after dogs and other pets (Town of Smithfield, 2006). The town should also incorporate educational materials focused on not feeding waterfowl, particularly around the small impoundments within the watershed. Animal wastes should be disposed of away from any waterway or stormwater system. Smithfield should work with volunteers from the town to map locations where animal waste 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 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 also take several measures to minimize waterfowl-related impacts. They can allow tall, coarse vegetation to grow in areas along the shores of the many small impoundments along the rivers course, which 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 Stillwater River and can harm human health and the environment.

Stormwater Management

Smithfield (RIPDES permit RIR040034) and RIDOT (RIPDES permit RIR040036) are municipal separate storm sewer system (MS4) operators in the Stillwater River watershed and have prepared Phase

II Stormwater Management Plans (SWMPP). The entire watershed is regulated under the Phase II program.

Smithfield's SWMPP outlines goals for the reduction of stormwater runoff to the Stillwater River through the implementation of Best Management Practices (BMPs). Many of these BMPs are now in place, including mapping all stormwater outfalls, 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 (RIDEM, 2010a).

The Town of Smithfield recently had an illicit discharge detection and elimination (IDDE) ordinance adopted on January 4th, 2011. These types of ordinances prohibit illicit discharges to the MS4 and provide an enforcement mechanism. The town also has procedures in place to detect illicit discharges. Detecting these discharges is a central component of the IDDE program. Illicit discharges can be a significant source of bacterial contamination and Smithfield should continue to have thorough measures in place for detection (Town of Smithfield, 2006).

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. Storm Water Pollution Prevention Plans (SWMPP) 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.

As it is assumed that stormwater runoff is not the major contributor of bacteria to the Stillwater River based on the watershed's imperviousness, Smithfield and RIDOT will have no changes to their Phase II permit requirements and no TMDL Implementation Plan (TMDL IP) will be required at this time. The Town of Smithfield should continue to implement the goals of its Phase II SWMPP (2006). RIDOT should also continue to implement the goals of its Phase II SWMPP.

Land Use Protection

Smithfield's Comprehensive Community Plan proposes to have a minimum of 15% of town land held in conservation (Smithfield, 2007). Preserving these natural areas is important because woodland and wetland areas within the Stillwater River watershed absorb and filter pollutants from stormwater, and help protect both water quality in the stream and stream channel stability. As these areas represent

approximately 69% of the land use in the Stillwater River watershed, it is important to continue the preservation of these undeveloped areas, and institute controls on development in the watershed.

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

Table 1: Stillwater River Bacteria Data

***Waterbody ID*:** RI0002007R-09

Watershed Planning Area: 24 – Woonasquatucket

Characteristics: Freshwater, Class B, Primary and Secondary Contact Recreation, Fish and Wildlife Habitat

Impairment: Enterococci (colonies/100mL)

Water Quality Criteria for Enterococci: Geometric Mean: 54 colonies/100 mL

Percent Reduction to meet TMDL: **63% (Includes 5% Margin of Safety)**

Data: 2008-2009 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for Stillwater River (2008-2009) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WON06	Stillwater River at Austin Ave off of Rte 44 (Greenville)	8/25/2009	162	Dry	89
WON06	Stillwater River at Austin Ave off of Rte 44 (Greenville)	8/4/2009	40	Dry	
WON06	Stillwater River at Austin Ave off of Rte 44 (Greenville)	6/17/2009	38	Dry	
WON06	Stillwater River at Austin Ave off of Rte 44 (Greenville)	6/1/2009	89	Dry	
WON06	Stillwater River at Austin Ave off of Rte 44 (Greenville)	9/17/2008	260	Dry	

Single Sample Enterococci (colonies/100 mL) Results for Stillwater River (2008-2009) with Geometric Mean Statistics (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WON07	Stillwater River at corner of Pleasant View and Spraugueville Road (Rte 5/116)	8/25/2009	326	Dry	**129† (63%)***
WON07	Stillwater River at corner of Pleasant View and Spraugueville Road (Rte 5/116)	8/4/2009	131	Dry	
WON07	Stillwater River at corner of Pleasant View and Spraugueville Road (Rte 5/116)	6/17/2009	122	Dry	
WON07	Stillwater River at corner of Pleasant View and Spraugueville Road (Rte 5/116)	6/1/2009	110	Dry	
WON07	Stillwater River at corner of Pleasant View and Spraugueville Road (Rte 5/116)	9/18/2008	61	Dry	

Shaded cells indicate an exceedance of water quality criteria
* Includes a 5% Margin of Safety
† Geometric Mean used to calculate percent reduction

Wet and Dry Weather Geometric Mean Enterococci Values for all Stations

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
WON06	Stillwater River at Austin Ave off of Rte 44 (Greenville)	2008-2009	0	5	89	NA	89
WON07	Stillwater River at corner of Pleasant View and Spraugueville Rd (Rt 5/116)	2008-2009	0	5	129	NA	129

Shaded cells indicate an exceedance of water quality criteria
Weather condition determined from the Weather Underground rain gage in Lincoln, RI

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USEPA (2002). Onsite Wastewater Treatment Systems Manual – Office of Water, Office of Research and Development – EPA/625/R-00/008. Online: www.epa.gov/owm/septic/pubs/septic_2002_osdm_all.pdf.

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