South Branch Pawtuxet River

Watershed Description

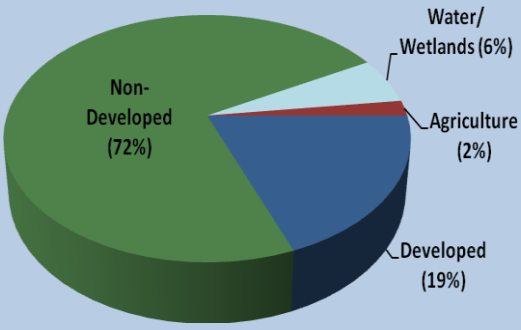
This **TMDL** applies to the South Branch Pawtuxet River assessment unit (RI0006014R-04B), a 5.2-mile long river located in Kent County in Coventry and West Warwick, RI (Figure 1). The watershed for the impaired segment is presented in Figures 2 and 3 with land use types indicated.

The South Branch Pawtuxet River begins at the eastern outlet of the Flat River Reservoir in Coventry, RI. The impaired segment of the South Branch Pawtuxet River begins downstream at the outflow of the Laural Avenue Dam just above Concordia Manufacturing. The river flows through two dams that divert water to an industrial area that includes Clariant Corporation, a pigments plant whose manufacturing operations ceased in 2008.

The diverted water rejoins the river at the end of the industrial park and flows through a woodland area bordered by high-density residential land uses. The river crosses the border into West Warwick and flows north behind the commercial area of Tiogue Avenue and the New London Square Plaza. The river reaches another dam near Manchester Street Park and continues under Pulaski Street through high-density residential neighborhoods. The river flows under Main Street, over another dam, and continues to the Factory Street Dam. Outflow from the Factory Street Dam continues north through the River Walk Phase 1 site, a protected area, and the John Deering Middle School and West Warwick High School fields. The river then flows over a dam at Royal Mills at Riverpoint. The South Branch flows under Route 115 and the Washington Secondary Trail before joining with the North Branch of the Pawtuxet River to form the Pawtuxet River.

Assessment Unit Facts (RI0006014R-04B)

- **Town:** Coventry and West Warwick
- **Impaired Segment Length:** 5.2 miles
- **Classification:** Class B1
- **Direct Watershed:** 72.7 mi² (46,536 acres)
- **Impervious Cover:** 8.6%
- **Watershed Planning Area:** Pawtuxet (#12)



Watershed Land Uses

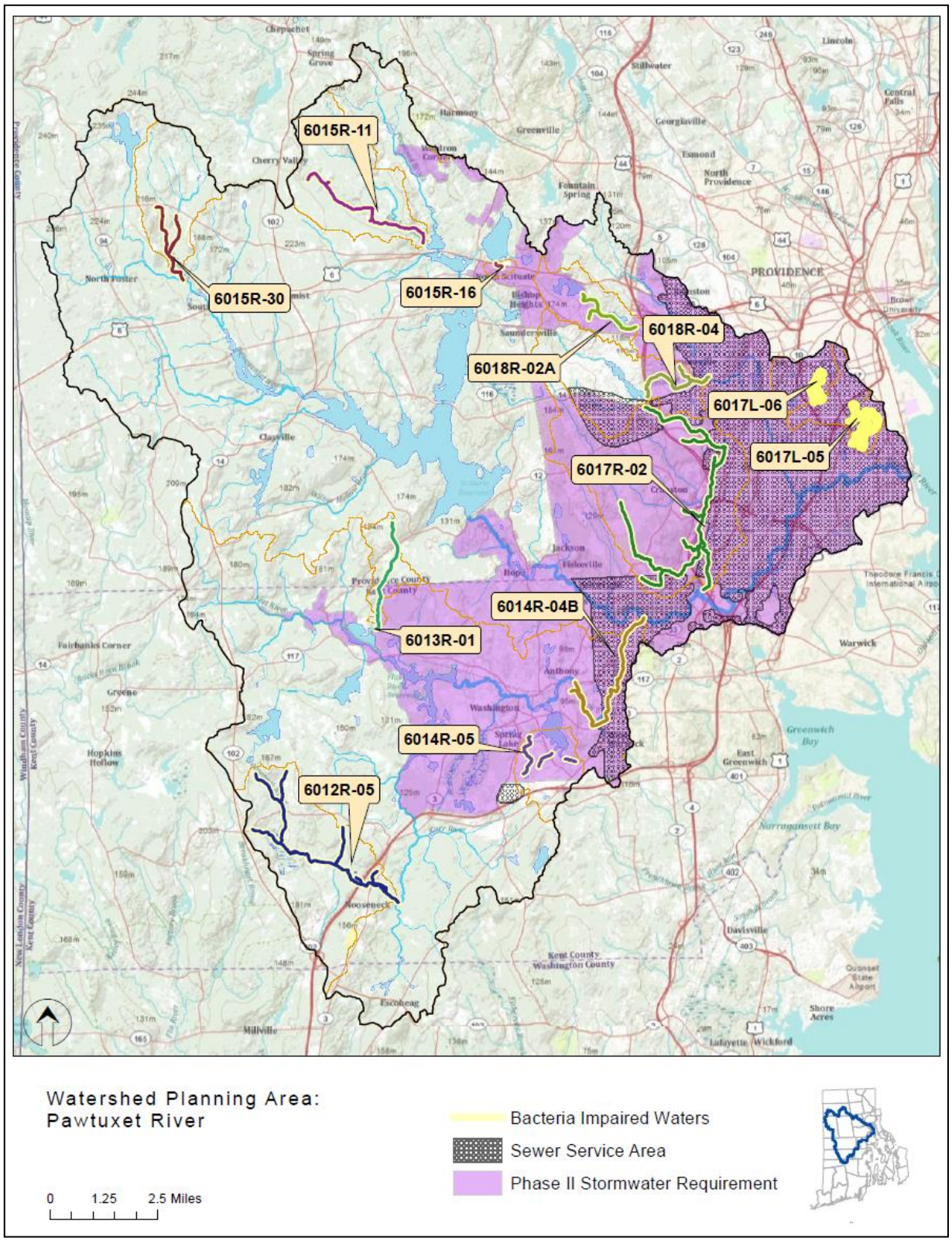


Figure 1: ***Map of the Pawtuxet Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewered areas, and stormwater regulated zones.***

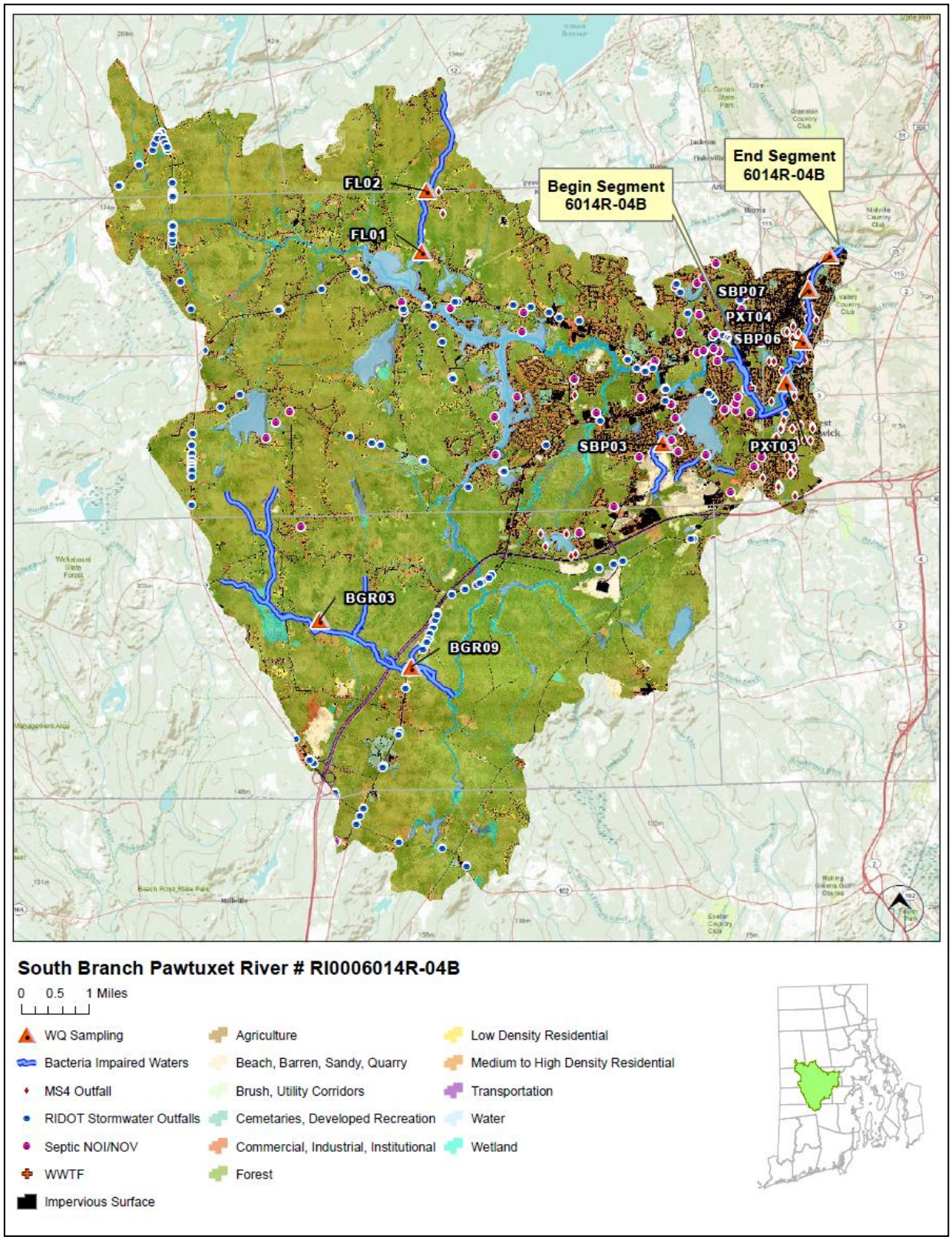


Figure 2: ***Map of the South Branch Pawtuxet River watershed with impaired segments, sampling locations, and land cover indicated.***

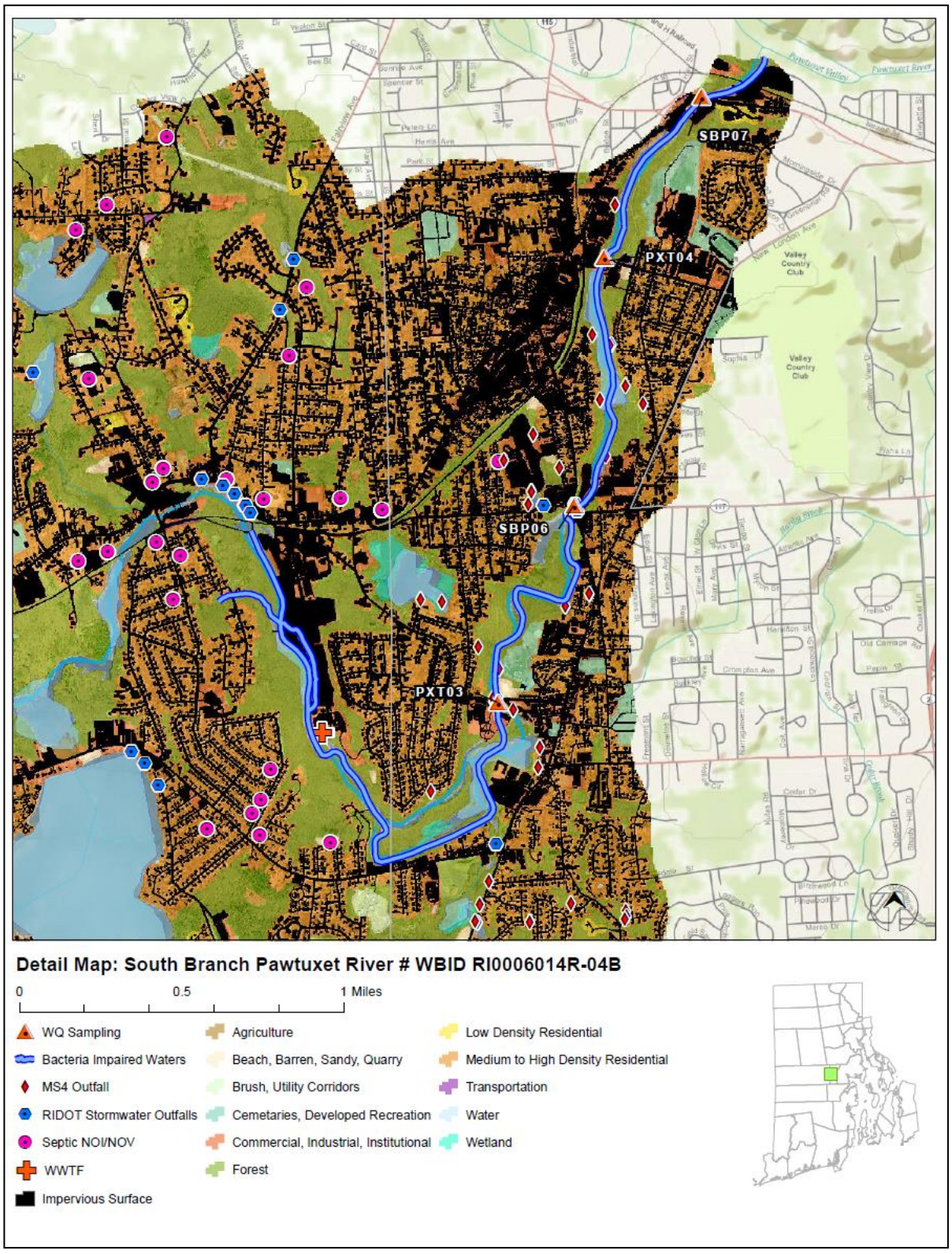


Figure 3: ***Zoomed map of the South Branch Pawtuxet River watershed with impaired segments, sampling locations, and land cover indicated.***

Why is a TMDL Needed?

This impaired segment of the South Branch Pawtuxet River is a Class B1 fresh water river with applicable designated uses of primary and secondary contact recreation and fish and wildlife habitat. Primary recreational activities may be impacted from pathogens from approved discharges in Class B1 waters (i.e., Clariant Corporation). However, all Class B criteria must be met (RIDEM, 2009). This segment of the South Branch Pawtuxet River historically received discharges of domestic and industrial wastewater from the Clariant Corporation.

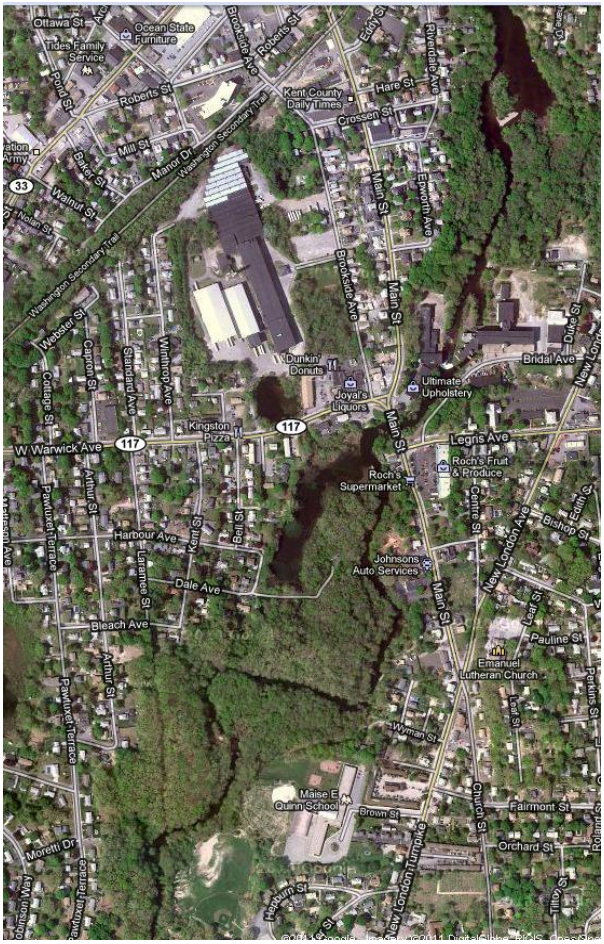


Figure 4: ***Partial aerial view of the South Branch Pawtuxet River watershed. (Source: Google Maps)***

From 2006-2008, samples were collected from four sampling locations and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2006-2008 and associated statistics are presented in Table 1. The geometric mean was calculated for each station and exceeded the water quality criteria for bacteria at Stations PXT03, PXT04, and SBP06.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for wet and dry-weather sample days, where appropriate. Dry-weather geometric mean values exceeded the water quality criteria for enterococci at Stations PXT03, PXT04, and SBP06. The consistent, relatively high bacteria concentrations during dry weather are indicative of a persistent bacteria contamination problem in this reach of the South Branch of the Pawtuxet River.

Due to the elevated bacteria measurements presented in Table 1, South Branch Pawtuxet 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 South Branch Pawtuxet River has previously been assessed by RIDEM as impaired for lead. No TMDL has been developed to address this impairment.

Potential Bacteria Sources

Previous investigations have concluded that there are several potential sources of harmful bacteria in the South Branch Pawtuxet River watershed including stormwater runoff from developed areas, illicit discharges, malfunctioning onsite wastewater treatment systems, and wildlife and domestic animal waste (Weston & Sampson, 2003, Garofalo, 1997). Each type of potential bacteria source is described briefly below.

Onsite Wastewater Treatment Systems

Though some of the South Branch Pawtuxet River watershed is sewered, the majority of residents, particularly in the western portion of the watershed, rely on onsite wastewater treatment systems (OWTS). More specifically, the Town of West Warwick is predominately sewered, and while the Town of Coventry plans to construct sewers to service most of the densely populated eastern portion of town, sewers are currently available only to approximately 2% of Coventry residents (Weston & Sampson, 2010). Coventry's Facilities Plan, prepared in 1995 and updated in 2009, documents wide-spread problems with onsite wastewater management systems in the eastern portion of town. The Facilities Plan recommends phased construction of sewers with the most critical areas to be completed by early 2013 as part of Phase I. The largest expansion of the sewer system in eastern Coventry is proposed to take place under Phase II slated for completion in early 2018. The remaining areas in eastern Coventry would be sewered under Phase III which is slated for completion in 2030 (Weston & Sampson, 2010). Failing OWTS can be significant sources of bacteria by allowing raw waste to reach surface waters (RI HEALTH, 2003). If systems are improperly sized, are malfunctioning, or are in soils poorly suited for septic waste disposal, bacteria can easily be transported to adjacent surface waters (USEPA, 2002). As shown in Figures 2 and 3, multiple OWTS Notices of Violation/Notices of Intent to Violate (NOV/NOIs) have been issued by the RIDEM Office of Compliance and Inspection in the eastern portion of the Town of Coventry that drains to the South Branch Pawtuxet River watershed.

Sewer Leaks

The eastern portion of the South Branch Pawtuxet River watershed in West Warwick relies on a municipal sanitary sewer system. As described above, there is currently only a very limited wastewater collection and treatment system in the Town of Coventry, however as the town's wastewater is treated at the West Warwick Wastewater Treatment Plant, sewer mains traverse the eastern portion of Coventry. Any leaks in the sewer lines may be contributing bacteria to the river.

Developed Area Stormwater Runoff

Though the majority of the South Branch Pawtuxet River watershed is undeveloped, impervious surfaces cover approximately 8.6%, particularly in the northeast portion of the watershed in downtown West Warwick. 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 South Branch Pawtuxet 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.

In accordance with Phase II requirements, West Warwick and Coventry have identified and mapped all known outfalls to surface water bodies in their regulated areas. The Rhode Island Department of Transportation (RIDOT) has also mapped stormwater outfalls within the South Branch Pawtuxet River watershed. As shown in Figures 2 and 3, numerous outfalls discharge to the river.

Clariant Corporation

This impaired segment of the South Branch Pawtuxet River received a discharge from the Clariant Corporation's Wastewater Treatment Facility (WWTF). Clariant Corporation was a pigments plant that ceased manufacturing operations in 2008, and no longer has an active discharge. The Clariant Corporation's RIPDES permit (RI0100132) expired in 2007.

Wildlife and Domestic Animal Waste

Non-developed land accounts for 72% of the watershed area, particularly in the western portion of the watershed. Forests and open water areas are home to multiple species of wildlife and waterfowl. Continued development and encroachment into wildlife areas can cause animal densities to increase and animal waste to be more prevalent closer to the river. In some areas, 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 South Branch Pawtuxet River. High-density residential developments are found in the northeastern portion of the watershed. If residents are not properly disposing of pet waste, the bacteria from that waste could enter and contaminate the river either directly or through stormwater.

Existing Local Management and Recommended Next Steps

Both West Warwick and Coventry have developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of the South Branch Pawtuxet River. Additional bacteria data collection would be beneficial to support identification of sources of potentially harmful bacteria in the South Branch Pawtuxet River 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 river buffers, stormwater runoff, and other source identification may also be beneficial.

Both West Warwick and Coventry have Comprehensive Plans that provide technical resources for protection of the South Branch Pawtuxet River watershed. A brief description of existing local programs and recommended next steps from Coventry's Onsite Wastewater Management Plan, and the Stormwater Phase II reports and Wastewater Facilities Plans of both Coventry and West Warwick are provided below. Stakeholders should review these documents directly for more detailed information.

Onsite Wastewater Management

Though the developed portion of the South Branch Pawtuxet River watershed in West Warwick is sewered, most residents in the watershed rely on OWTS. Currently, the Town of Coventry has an Onsite Wastewater Management Plan, however Coventry has not adopted an OWTS ordinance requiring all OWTS to be inspected and pumped routinely. As part of the onsite wastewater planning process, Coventry should adopt ordinances to establish enforceable mechanisms to ensure that existing OWTS are properly operated and maintained. This ordinance should apply to all areas of town where OWTS have been identified as the long-term solution for wastewater disposal as well as for those areas where sewers have been identified as the long-term solution however are not scheduled for construction for some time (e.g. Facilities Plan's Phase II and Phase III sewer program). 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).

Clariant Corporation

The Clariant Corporation's WWTF (RIPDES permit RI0100132) is located along the South Branch Pawtuxet River in the Town of West Warwick. As described previously, the plant ceased operations in 2008 and its RIPDES permit expired in 2007. RIDEM has approved a facilities plan for Town of Coventry that includes sewer service for the Clariant property. Clariant is in the process of submitting

an Order of Approval application to RIDEM for the design of sewers to connect to the Coventry sewer system. If for some reason, the RIPDES permit is reissued, the allocations for the Clariant Corporation's effluent will be the same in dry and wet weather and, consistent with EPA policy, will be set to meet the bacteria standards at the point of discharge. Since Rhode Island has adopted recreational enterococci criteria, if the discharge permit for Clariant Corporation's WWTF is reissued, the permit will include permit limits consistent with Rhode Island Water Quality regulations and its wasteload allocation. The Class B1 enterococci criterion is a geometric mean concentration of 54 colonies per 100 mL.

Stormwater Management

The Towns of Coventry (RIDPES permit RIR040006) and West Warwick (RIDPES permit RIR040015), and RIDOT (RIPDES permit RIR040036) are municipal separate storm sewer system (MS4) operators in the South Branch Pawtuxet River watershed and have prepared the required Phase II Stormwater Management Plans (SWMPP). The entire watershed area is regulated under the Phase II program.

Coventry and West Warwick's SWMPPs outline goals for the reduction of stormwater runoff to the South Branch Pawtuxet 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 ordinances, and conducting public education activities (RIDEM, 2010a).

In 2009, the Towns of Coventry and West Warwick adopted illicit discharge detection and elimination ordinances (RIDEM, 2010). This type of ordinance prohibits illicit discharges to the MS4 and provides an enforcement mechanism. Both Coventry and West Warwick should continue to locate priority areas to identify and eliminate illicit discharges in the South Branch Pawtuxet River watershed. Elevated dry weather bacteria concentrations in this segment of the river and documented problems with onsite wastewater treatment systems in eastern Coventry suggest that OWTS may still be a source of bacteria to the South Branch Pawtuxet River. As such, it is recommended that Coventry, working with RIDOT prioritize future illicit discharge detection and elimination efforts along the South Branch Pawtuxet River in areas having documented septic system failure problems. Illicit discharges can be identified through continued dry weather outfall sampling and microbial source tracking. West Warwick should also implement a program to evaluate its sanitary sewer system and identify and reduce leaks and overflows.

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.

Coventry, West Warwick 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.

Wildlife and Domestic Animal Waste

Coventry and West Warwick'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. West Warwick and Coventry should work with volunteers to map locations where animal waste is a significant and chronic problem. 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 the South Branch Pawtuxet River 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 South Branch Pawtuxet River and can harm human health and the environment.

Land Use Protection

The majority of the South Branch Pawtuxet River watershed is undeveloped. Woodland areas within the South Branch Pawtuxet River, particularly in the western portion of the watershed, absorb and filter pollutants from stormwater and agricultural runoff, and help protect both water quality in the river and river channel stability. It is important to preserve these undeveloped areas and institute controls on development in the South Branch Pawtuxet River watershed.

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

Table 1: South Branch Pawtuxet River Bacteria Data

***Waterbody ID*:** RI0006014R-04B

Watershed Planning Area: 12 – Pawtuxet

Characteristics: Freshwater, Class B1, 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: **85% (Includes 5% Margin of Safety)**

Data: 2006-2008 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for South Branch Pawtuxet River (2006-2008) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
PXT03	South Branch at Pulaski St	8/20/2008	378	Dry	**266[†] (85%)***
PXT03	South Branch at Pulaski St	7/15/2008	437	Dry	
PXT03	South Branch at Pulaski St	6/27/2008	352	Dry	
PXT03	South Branch at Pulaski St	5/15/2008	62	Dry	
PXT03	South Branch at Pulaski St	11/1/2007	365	Dry	
SBP06	South Branch Pawtuxet River	8/20/2008	148	Dry	85
SBP06	South Branch Pawtuxet River	7/15/2008	33	Dry	
SBP06	South Branch Pawtuxet River	6/27/2008	150	Dry	
SBP06	South Branch Pawtuxet River	5/15/2008	66	Dry	
SBP06	South Branch Pawtuxet River	11/1/2007	261	Dry	
SBP06	South Branch Pawtuxet River	8/9/2007	330	Dry	
SBP06	South Branch Pawtuxet River	7/9/2007	200	Dry	
SBP06	South Branch Pawtuxet River	6/26/2007	220	Dry	
SBP06	South Branch Pawtuxet River	6/12/2007	110	Wet	
SBP06	South Branch Pawtuxet River	10/9/2006	1	Dry	

Single Sample Enterococci (colonies/100 mL) Results for South Branch Pawtuxet River (2006-2008) with Geometric Mean Statistics (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
PXT04	South Branch at Factory St	8/20/2008	687	Dry	265
PXT04	South Branch at Factory St	7/15/2008	534	Dry	
PXT04	South Branch at Factory St	6/27/2008	162	Dry	
PXT04	South Branch at Factory St	5/15/2008	50	Dry	
PXT04	South Branch at Factory St	11/1/2007	435	Dry	
SBP07	South Branch at Royal Mills Bridge	8/9/2007	80	Dry	25
SBP07	South Branch at Royal Mills Bridge	7/9/2007	66	Dry	
SBP07	South Branch at Royal Mills Bridge	6/26/2007	27	Dry	
SBP07	South Branch at Royal Mills Bridge	6/12/2007	69	Wet	
SBP07	South Branch at Royal Mills Bridge	10/9/2006	1	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 Values for all Stations

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
SBP06	South Branch Pawtuxet River	2006-2008	1	9	85	NA	83
PXT03	South Branch at Pulaski St	2007-2008	0	5	266	NA	266
SBP06	South Branch Pawtuxet River	2006-2008	1	9	85	NA	83
PXT04	South Branch at Factory St	2007-2008	0	5	265	NA	265
SBP07	South Branch at Royal Mills Bridge	2006-2007	1	4	25	NA	19

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gage at T.F. Green Airport in Warwick, RI

References

Fuss & O'Neill (2004a). Phase II Stormwater Management Plan: Town of Coventry, Rhode Island. Submitted by Fuss & O'Neill, Inc, Providence, RI.

Fuss & O'Neill (2004b). Phase II Stormwater Management Plan: Town of West Warwick, Rhode Island. Submitted by Fuss & O'Neill, Inc, Providence, RI.

Garofalo & Associates (1997). Wastewater Facilities Plan. Town of West Warwick, in conjunction with Earth Tech. Updated January 1997.

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.

RIDEM (2005). Total Maximum Daily Load Analysis for Greenwich Bay Waters, Pathogen/Bacteria Impairments. Rhode Island Department of Environmental Management, Office of Water Resources, December 2005.

RI HEALTH (2003). Kent County Water Authority Drinking Water Assessment Results, Source Water Protection Assessment conducted by the University of Rhode Island for the Rhode Island Department of Health, Office of Drinking Water Quality.

Town of West Warwick (2005). Strategy for Reducing Risks from Natural Hazards in West Warwick, Rhode Island. Town of West Warwick Local Hazard Mitigation Committee, in collaboration with URI Coastal Resources Center and Integrated Management Solutions, Jamestown, RI. Approved November 2005.

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.

Weston & Sampson (1995). Wastewater Facilities Plan: Town of Coventry, Rhode Island. Submitted by Weston & Sampson Engineers, Inc, Warwick, RI. June 1995.

Weston & Sampson (2003). Onsite Wastewater Management Plan: Town of Coventry, Rhode Island. Submitted by Weston & Sampson Engineers, Inc, Warwick, RI. October 2003.

Weston & Sampson (2010). Facilities Plan Update Town of Coventry, Rhode Island. Submitted by Weston & Sampson Engineers, Inc. Coventry, RI. February 2010.