



Chickasheen Brook

Watershed Description

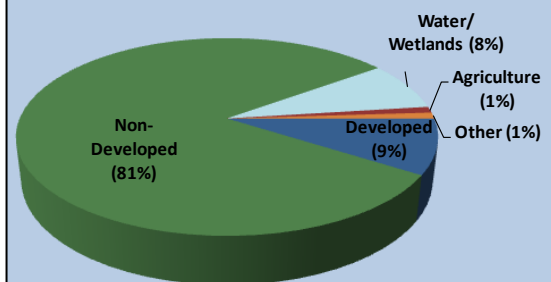
This **TMDL** applies to the Chickasheen Brook assessment unit (RI0008039R-05A), a 1.6-mile long stream located in Exeter, RI (Figure 1). The Town of Exeter is located in the southern portion of the state and Chickasheen Brook is located in the southern section of town. The Chickasheen Brook watershed is presented in Figure 2 with land use types indicated.

The headwaters of Chickasheen Brook originate in a wetland (locally known as Maple Swamp) located below the western slopes of Yorker Hill in a residential area east of Route 2. The brook flows west under Route 2 and enters Arrow Swamp. The brook flows southwesterly through Arrow Swamp, then through a culvert under the Miskiania Trail, before continuing southerly to the inflow of Yawgoo Pond at the border with South Kingstown. The headwaters to the inlet at Yawgoo Pond are impaired for enterococci and are addressed in this TMDL. Chickasheen Brook then leaves Yawgoo Pond and flows southeast where it joins with Mud Brook and eventually Barber Pond.

The Chickasheen Brook watershed covers 0.85 square miles. Non-developed areas occupy a large portion (81%) of the watershed. Wetlands and other surface waters, including Arrow Swamp cover 8%. Developed uses (including residential and commercial uses) occupy approximately 9%. Agricultural and other land uses occupy 1% each.

Assessment Unit Facts *(RI0008039R-05A)*

- **Town:** Exeter
- **Impaired Segment Length:** 1.6 miles
- **Classification:** Class A
- **Direct Watershed:** 0.85 mi² (545 acres)
- **Impervious Cover:** 4.7%
- **Watershed Planning Area:** Wood – Pawcatuck (#23)



Watershed Land Uses

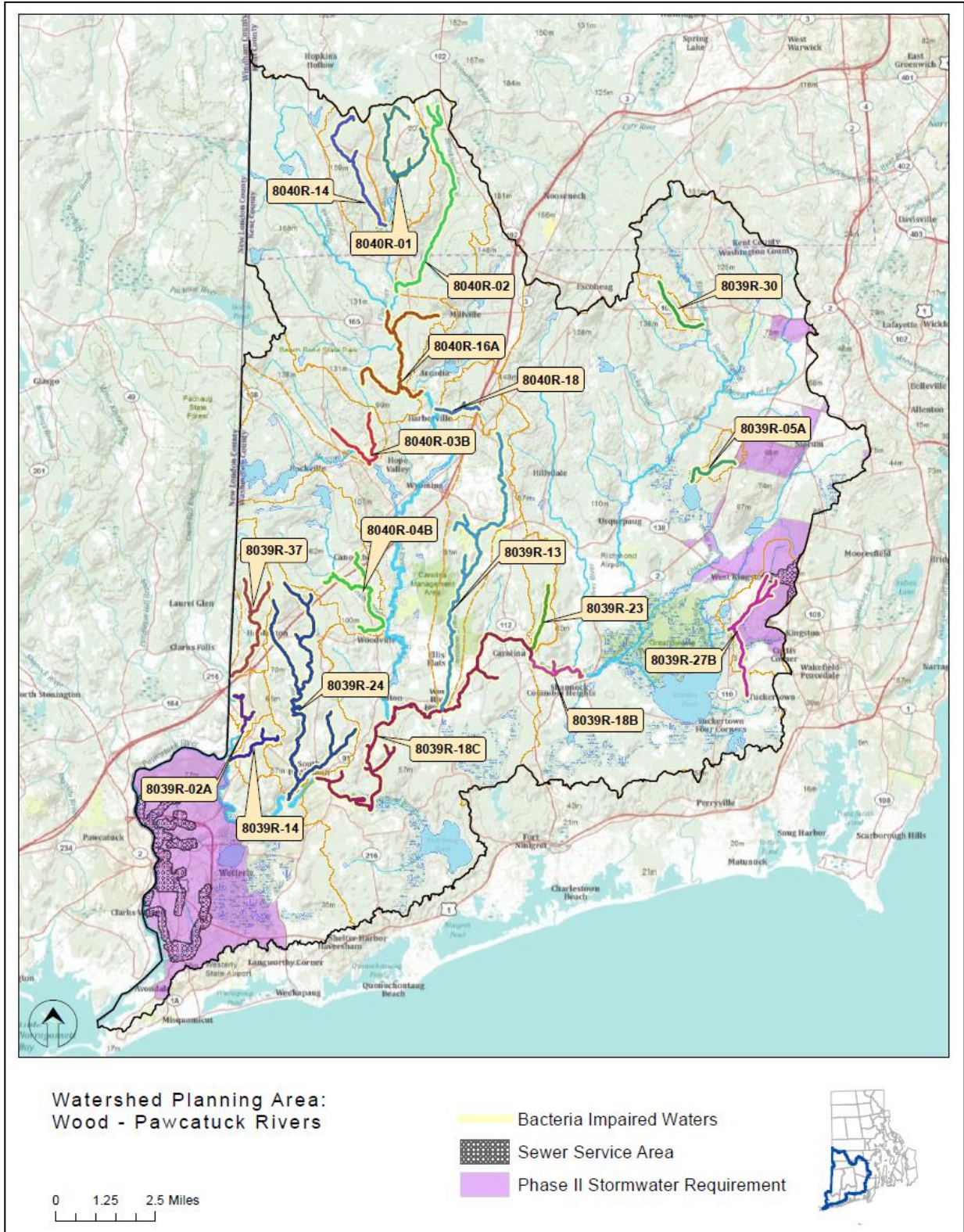


Figure 1: Map of the Wood-Pawcatuck Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewer service areas, and stormwater regulated zones.

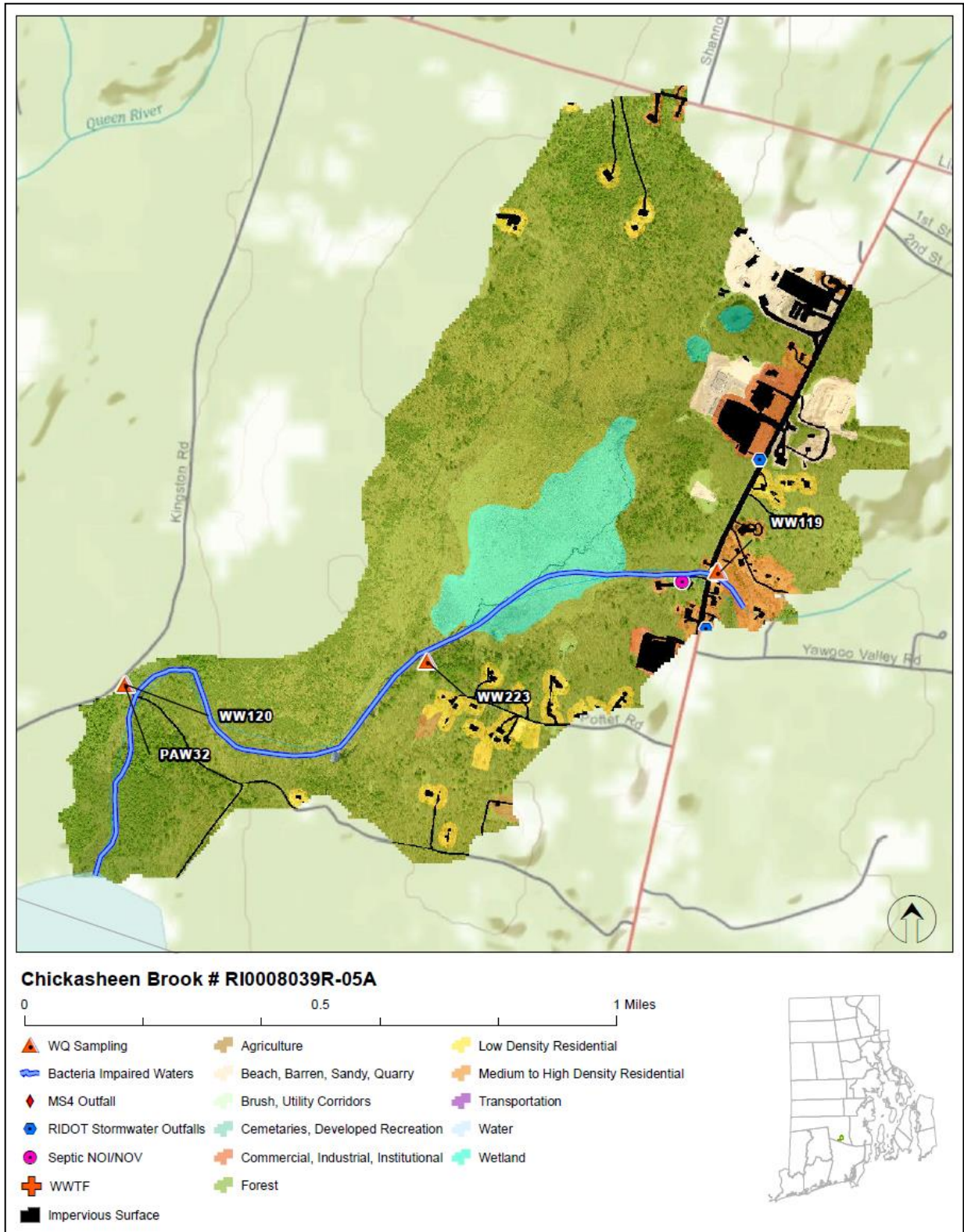


Figure 2: Map of the Chickasheen Brook watershed with impaired segment, sampling locations, and land cover indicated.

Why is a TMDL Needed?

Chickasheen Brook is a Class A fresh water stream, and its applicable designated uses are primary and secondary contact recreation and fish and wildlife habitat (RIDEM, 2009). From 2005-2008, water samples were collected from three sampling locations and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2005-2008 and associated statistics are presented in Table 1. The geometric mean exceeded water quality criteria for enterococci at stations WW120 and WW223. The geometric mean at station WW223 was extremely high (8,999 colonies/100mL).

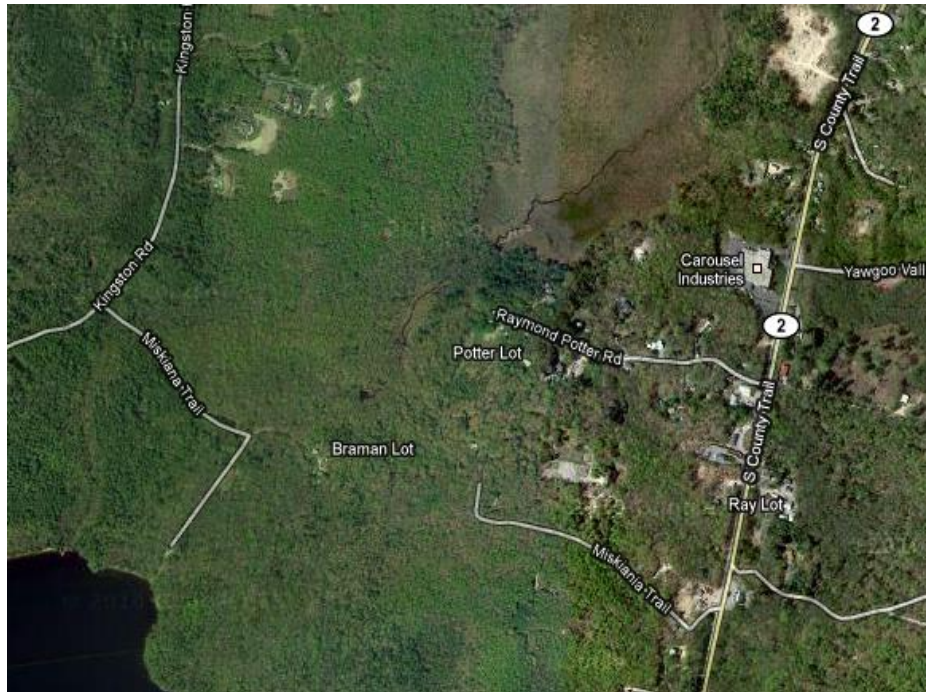


Figure 3: Partial aerial view of the Chickasheen Brook watershed (Source: Google Maps).

To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sample days. Both wet and dry-weather geometric mean values exceeded the water quality criteria for enterococci at stations WW120 and WW223, with the wet-weather values higher than the dry-weather values at both stations. The wet-weather geometric mean also exceeded water quality criteria at station WW119. Potential sources include improperly operating onsite wastewater treatment systems (OWTS), wastes from agriculture activities, as well as wastes from domestic pets. In wet weather, these sources can be carried to the brook in stormwater runoff.

Due to the elevated bacteria measurements presented in Table 1, Chickasheen Brook does not meet Rhode Island's bacteria water quality standards, is 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.

Chickasheen Brook has previously been assessed by RIDEM as not meeting water quality standards for total phosphorus. This impairment was addressed in the Total Phosphorus TMDL for Chickasheen Brook, Yawgoo and Barber Ponds completed in 2004.

Potential Bacteria Sources

There are several potential sources of bacteria in the Chickasheen Brook watershed including malfunctioning onsite wastewater treatment systems, waterfowl, wildlife, and domestic animal waste, and stormwater runoff from developed areas. As noted previously, this is a small largely undeveloped watershed. It is likely that wildlife is a significant bacteria source, particularly at those stations located downstream of large wetland complexes.

Onsite Wastewater Treatment Systems

All residents in the Town of Exeter and in the Chickasheen Brook watershed rely on onsite wastewater treatment systems (OWTS) such as cesspools and septic systems. Most of the soils in Exeter have moderate to severe septic system limitations (RIDEM, 2004). Failing or inadequate OWTS can be significant sources of bacteria by allowing improperly treated waste to reach surface waters (RI HEALTH, 2003). As shown in Figure 2, one OWTS Notice of Violation/Notice of Intent to Violate (NOV/NOI) has been issued by the RIDEM Office of Compliance and Inspection in the Chickasheen Brook watershed. This NOV/NOI was issued to a residence near Route 2, in a neighborhood adjacent to Chickasheen Brook.

Waterfowl, Wildlife, and Domestic Animal Waste

The Chickasheen Brook watershed is predominately undeveloped, particularly in the central portion of the watershed in Arrow Swamp. These large wetland and surface water areas are also home to various 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.

Though only a small portion of the watershed is characterized by residential development, much of this development is located near the headwaters of the brook. Waste from domestic animals such as dogs, may also be contributing to bacteria concentrations in Chickasheen Brook.

Developed Area Stormwater Runoff

Though most of the Chickasheen Brook watershed is undeveloped, the headwaters of the brook originate in a developed area near Route 2. The watershed has an impervious cover of approximately 4.7%.

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.

The Rhode Island Department of Transportation (RIDOT) has identified and mapped stormwater outfalls in the Chickasheen Brook watershed. As shown in Figure 2, two outfalls were found along Route 2. Stormwater is known to carry a suite of pollutants, including bacteria, and may be a source of bacterial contamination to Chickasheen Brook.

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 Chickasheen Brook watershed. These activities could include sampling at several different locations and under different weather conditions (e.g., wet and dry). Field reconnaissance surveys focused on stream buffers, stormwater runoff, and other source identification may also be beneficial.

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

Onsite Wastewater Management

All residents of the Chickasheen Brook watershed rely on OWTS (septic systems or cesspools). The Town of Exeter has a draft Onsite Wastewater Management Plan that provides a framework for managing the OWTS. As part of an onsite wastewater management planning process, Exeter should adopt ordinances for to establish enforceable mechanisms to ensure that existing OWTS are properly maintained and operated. RIDEM recommends that all communities create an inventory of onsite systems through mandatory inspections. Inspections help 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).

Exeter is not eligible for the Community Septic System Loan Program (CSSLP). CSSLP 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

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. Exeter 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 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 take several measures to minimize waterfowl-related impacts. The Brook's shores are largely vegetated. However, if the shore has been cleared, residents can allow tall, coarse vegetation to grow in areas along the shores of Chickasheen Brook 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, contributes to water quality impairments in Chickasheen Brook and can harm human health and the environment.

Stormwater Management

The Town of Exeter (RIPDES permit RIR040017) and RIDOT (RIPDES permit RIR040036) are municipal separate storm sewer (MS4) operators in the Chickasheen Brook watershed and have prepared the required Phase II Stormwater Management Plans (SWMPP). The regulated area in Exeter includes only a small portion of the headwaters of Chickasheen Brook. The remainder of the brook is outside of the regulated area.

Exeter's SWMPP outlines goals for the reduction of stormwater runoff to Chickasheen Brook 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 Exeter does not currently have an ordinance to address illicit discharges (Town of Exeter, 2004). This type of ordinance prohibits illicit discharges to the storm drain system and provides an enforcement mechanism. It is recommended that any stormwater outfalls discharging in the vicinity of

the sampling locations be monitored to check for illicit discharges. Illicit discharges can be identified through continued dry weather outfall sampling and microbial source tracking.

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. 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.

While these first steps are important to reduce the effects of stormwater runoff to Chickasheen Brook, additional efforts are needed to restore the river's water quality. The Chickasheen Brook Phosphorus TMDL required that Exeter and RIDOT implement the minimum measures in those portions of the watershed that were in the MS4-regulated area. The MS4-regulated area is in the headwaters of the Brook and includes drainage from the eastern-side of Route 2. Since RIDOT applies its stormwater program statewide, the six minimum measures are implemented to all Route 2 stormwater. The Chickasheen Brook TMDL stated that future monitoring would determine if additional measures would be needed. Changes to SWMPPs should be documented in a TMDL Implementation Plan (TMDL IP) and should comply with the 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. Further detail is also included in Section 6.3.

Land Use Protection

Woodland and wetland areas within the Chickasheen Brook watershed, particularly in the central portion of the watershed in Arrow Swamp, absorb and filter pollutants from stormwater runoff, and help protect both water quality in the stream and stream channel stability. As these areas represent over half of the land use in the Chickasheen Brook watershed, it is important to preserve 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 Chickasheen Brook.

Table 1: Chickasheen Brook Bacteria Data

Waterbody ID: RI0008039R-05A

Watershed Planning Area: 23 – Wood-Pawcatuck

Characteristics: Freshwater, Class A, 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: 100% (Includes Margin of Safety)

Data: 2005-2008 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for Chickasheen Brook (2005-2008) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WW119	Chickasheen Brook at Rte 2	10/30/2008	2	Dry	33
WW119	Chickasheen Brook at Rte 2	9/20/2008	82	Dry	
WW119	Chickasheen Brook at Rte 2	8/15/2008	162	Wet	
WW119	Chickasheen Brook at Rte 2	6/6/2008	109	Wet	
WW119	Chickasheen Brook at Rte 2	7/21/2007	131	Dry	
WW119	Chickasheen Brook at Rte 2	6/22/2007	5	Dry	
WW119	Chickasheen Brook at Rte 2	5/15/2007	19	Dry	
WW119	Chickasheen Brook at Rte 2	11/2/2006	18	Wet	74
WW119	Chickasheen Brook at Rte 2	9/30/2006	91	Wet	
WW119	Chickasheen Brook at Rte 2	8/22/2006	73	Dry	
WW119	Chickasheen Brook at Rte 2	7/26/2006	53	Dry	
WW119	Chickasheen Brook at Rte 2	7/26/2006	25	Dry	
WW119	Chickasheen Brook at Rte 2	6/30/2006	1011	Wet	
WW223	Chickasheen at Potter Road (Skagg's old dam)	9/19/2008	1326	Dry	8999 [†] (100%)*
WW223	Chickasheen at Potter Road (Skagg's old dam)	8/15/2008	9678	Wet	
WW223	Chickasheen at Potter Road (Skagg's old dam)	7/10/2008	15402	Dry	
WW223	Chickasheen at Potter Road (Skagg's old dam)	6/6/2008	41060	Wet	
WW223	Chickasheen at Potter Road (Skagg's old dam)	5/9/2008	7270	Wet	

Single Sample Enterococci (colonies/100 mL) Results for Chickasheen Brook (2005-2008) with Geometric Mean Statistics (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WW120	Chickasheen Brook at Miskiania Trail	10/30/2008	6	Dry	114
WW120	Chickasheen Brook at Miskiania Trail	9/20/2008	1299	Dry	
WW120	Chickasheen Brook at Miskiania Trail	8/15/2008	244	Wet	
WW120	Chickasheen Brook at Miskiania Trail	7/12/2008	159	Dry	
WW120	Chickasheen Brook at Miskiania Trail	6/6/2008	64	Wet	
WW120	Chickasheen Brook at Miskiania Trail	10/19/2007	401	Wet	68
WW120	Chickasheen Brook at Miskiania Trail	9/14/2007	1986	Dry	
WW120	Chickasheen Brook at Miskiania Trail	7/25/2007	65	Wet	
WW120	Chickasheen Brook at Miskiania Trail	7/20/2007	114	Wet	
WW120	Chickasheen Brook at Miskiania Trail	6/12/2007	3	Dry	
WW120	Chickasheen Brook at Miskiania Trail	5/12/2007	5	Dry	
WW120	Chickasheen Brook at Miskiania Trail	11/1/2006	5	Dry	48
WW120	Chickasheen Brook at Miskiania Trail	9/30/2006	248	Wet	
WW120	Chickasheen Brook at Miskiania Trail	8/22/2006	194	Dry	
WW120	Chickasheen Brook at Miskiania Trail	6/30/2006	130	Wet	
PAW32	Chickasheen Brook at Miskiania Trail	10/27/2006	1	Dry	
PAW32	Chickasheen Brook at Miskiania Trail	8/9/2006	310	Dry	
PAW32	Chickasheen Brook at Miskiania Trail	5/31/2006	13	Dry	
PAW32	Chickasheen Brook at Miskiania Trail	9/21/2005	210	Dry	

Shaded cells indicate an exceedance of water quality criteria
 * Includes Margin of Safety
 † Geometric mean used to determine 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
WW119	Chickasheen Brook at Rte 2	2006-2008	5	8	47	124	26
WW223	Chickasheen Brook at Potter Road (Skagg's old dam)	2008	3	2	8999	14242	4519
WW120 PAW32	Chickasheen Brook at Miskiania Trail	2005-2008	7	12	67	147	43

Shaded cells indicate an exceedance of water quality criteria
 Weather condition determined from rain gage at URI in Kingston, RI

References

- RIDEM (2004). Total Phosphorus TMDL for Chickasheen Brook, Yawgoo and Barber Ponds. Rhode Island Department of Environmental Services.
- 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 (2010a). MS4 Compliance Status Report for RI Statewide Bacteria TMDL. Rhode Island Department of Environmental Management.
- RIDEM (2010b). Total Maximum Daily Load Analysis for the Pawcatuck River and Little Narragansett Bay Waters (Bacteria Impairments). Rhode Island Department of Environmental Management.
- RI HEALTH (2003). Aquidneck Island 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 Supply.
- Town of Exeter (2004). Phase II Stormwater Management Program Plan. March 2004.
- 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.