TOTAL MAXIMUM DAILY LOAD ANALYSIS FOR POINT JUDITH POND WATERS
PATHOGEN / BACTERIA IMPAIRMENTS

BILLINGTON COVE
CHAMPLIN COVE
POINT JUDITH POND
LOWER SAUGATUCKET RIVER

NARRAGANSETT
SOUTH KINGSTOWN

FINAL
May 2008

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Best Management Practice (BMP). Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of and impacts upon waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Clean Vessel Act (CVA). Grant program that aims to reduce pollution from vessel sewage discharge. The pump-out grant program is administered by the states using federal funding from the United States Fish and Wildlife Service. This federal aid provides 75% funding for waste disposal options for boaters such as land based pump-out facilities and mobile pump-out boats. Rhode Island uses the funding to build the infrastructure needed to maintain its Federal No Discharge designation, received in 1998.

Code of Federal Regulations (CFR). Document that codifies all rules of the executive departments and agencies of the federal government. It is divided into fifty volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) lists all environmental regulations

Coastal Resource Management Center (CRMC). A Rhode Island management agency with regulatory functions. Its primary responsibility is for the preservation, protection, development and where possible the restoration of the coastal areas of the state via the issuance of permits for work with the coastal zone of the state

Depuration is the artificial holding of shellfish for purification purposes.

Designated uses are those uses specified in water quality standards for each waterbody or segment whether or not they are being attained. In no case shall assimilation or transport of pollutants be considered a designated use.

Environmental Protection Agency (EPA). The US agency responsible for efforts to control air and water pollution, radiation and pesticide hazards, ecological research, and solid waste disposal.

Fecal coliform bacteria are found in the intestinal tracts of warm-blooded animals. Their presence in water or sludge is an indicator of pollution and possible contamination by pathogens, disease-causing organisms.

Food and Drug Administration (FDA). The US agency responsible for protecting public health by assuring the safety, efficacy and security of human and veterinary drugs, foods and cosmetics.

Loading capacity means the maximum amount of loading that a surface water can receive without violating water quality standards.

Low Impact Development (LID). A design strategy with the goal of maintaining or replicating

the pre-development hydrologic regime through the use of design techniques to create a functionally equivalent hydrologic site design.

Margin of Safety (MOS). A required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant loads and the quality of the receiving waterbody.

Marine Sanitation Device (MSD). A holding tank on a boat to store raw sewage so that it may be pumped out and disposed of in an approved manner.

Most Probable Number (MPN). An estimate of microbial abundance per unit volume of water sample, based on probability theory.

Municipal Separate Storm Sewer System (MS4). A conveyance or system of conveyances, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man catch basins, curbs, gutters, ditches, man-made made channels, or storm drains owned or operated by a State, city, town, county, or other public body.

National Shellfish Sanitation Program (NSSP) is a Federal, State, Industry voluntary cooperative program that relies on regulatory controls by State Shellfish Authority (SSA) to ensure safe molluscan shellfish

Natural background conditions are all prevailing dynamic environmental conditions in a waterbody or segment thereof, other than those human-made or human-induced.

Nonpoint Source (NPS). Any discharge of pollutants that does not meet the definition of Point Source in section 502.(14) of the Clean Water Act and these regulations. Such sources are diffuse, and often associated with land-use practices, and carry pollutants to the waters of the State, including but not limited to, non-channelized land runoff, drainage, or snowmelt; atmospheric deposition; precipitation; and seepage.

Onsite Wastewater Treatment System (OWTS). Any system of piping, tanks, disposal areas, alternative toilets, or other facilities designed to function as a unit to convey, store, treat, and/or dispose of sanitary sewage by means other than a public sewer system.

Onsite Wastewater Management Plan (OWMP). An OWMP describes the elements of the municipal management program for onsite wastewater treatment systems (OWTS). Program elements may include, for example, passing an ordinance requiring system inspections, enhancing homeowner education, or specifying stronger treatment requirements in environmentally sensitive areas.

Point source means any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation or vessel, or other floating craft, from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture.

Primary contact recreational activities are those activities in which there is prolonged and

intimate contact by the human body with the water, involving considerable risk of ingesting water, such as swimming, diving, water skiing and surfing.

Rhode Island Department of Environmental Management (RIDEM). The state department charged with preserving the quality of the environment, maintaining the health and safety of its residents, and protecting the natural systems.

Rhode Island Department of Health (HEALTH). The state department whose mission is to prevent disease and to protect and to promote the health and safety of the people of Rhode Island.

Rhode Island Department of Transportation (RIDOT). The state department who maintains and provides an intermodal transportation network, including state-owned roadways and their associated drainage systems.

Rhode Island Pollutant Discharge Elimination System (RIPDES). The Rhode Island system for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing point source discharge permits and imposing and enforcing pretreatment requirements pursuant to Title 46, Chapter 12 of the General Laws of Rhode Island and the Clean Water Act.

Salt Pond Coalition (SPC). A volunteer group that aims to educate residents about the Rhode Island salt pond region, to act as a conduit between residents and the state and local government, and to implement programs that enhance and protect the salt ponds. The SPC monitors for fecal coliform in Point Judith Pond, Potter Pond, and the Saugatucket River at nine stations, six times a year.

Secondary contact recreational activities are those activities in which there is minimal contact by the human body with the water, and the probability of ingestion of the water is minimal, such as boating and fishing.

Stormwater means precipitation-induced runoff.

Stormwater Management Project Plan (SWMPP). A plan for communities outlining activities to be taken to reduce the amount of stormwater entering waters of the state. It outlines six best management practices including: public education and outreach, public involvement and participation, illicit discharge detection and elimination, construction site runoff control, post construction runoff control, and pollution prevention and good housekeeping techniques.

Surface waters are any waters of the state that are not groundwaters.

Total Maximum Daily Load (TMDL). The amount of a pollutant that may be discharged into a waterbody and still maintain water quality standards. The TMDL is the sum of the individual wasteload allocations for point sources and the load allocations for nonpoint sources and natural background taking into account a margin of safety.

Wasteload allocation means the portion of a receiving water's loading capacity that is allocated

to its point sources of pollution.

Water quality criteria means the elements of the State water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use.

Water quality standard means provisions of State or Federal law, which consist of designated use(s) and water quality criteria for the waters of the State. Water Quality Standards also consist of an antidegradation policy.

ABSTRACT

This Total Maximum Daily Load (TMDL) plan addresses fecal coliform impairments to Point Judith Pond waters, including the upper Pond, Billington Cove, Champlin Cove, and the Lower Saugatucket River, located in the Towns of South Kingstown and Narragansett, Rhode Island. These waters are listed on Rhode Island's 2006 303(d) List of Impaired Waters as Group 1 waters. These waters do not support their designated uses that are associated with the fecal coliform bacteria criteria, which includes primary recreation for all waters and shellfish harvesting for those waters classified as SA.

This TMDL aims to restore water quality by identifying necessary fecal coliform reductions, locating pollution sources, and outlining an implementation strategy to abate fecal coliform sources such that water quality standards can ultimately be attained during all weather conditions.

With few exceptions, bacteria impairments in Point Judith Pond occur in the upper reaches of the pond in the vicinity of the Saugatucket River. Water quality generally improves as water travels from the northern reaches of the pond towards the channel connecting the pond to the Harbor of Refuge in the southern reaches of the pond, indicating that the Saugatucket River is a primary bacteria source to the study area, although localized problems do exist in other parts of the study area. Localized impairments are present in Billington Cove and Champlin Cove. An analysis of historical data showed that geometric mean and 90^{th} percentile values were noticeably higher in wet weather than in dry weather. This analysis emphasizes the importance of wet weather reductions to achieve water quality standards. Required percent reductions range from 62.3% to 91.4% throughout the impaired segments.

Significant water quality improvements will result from implementation of recommendations to the Saugatucket River. These measures are addressed in the *Pathogen TMDL for Saugatucket River, Mitchell Brook, Rocky Brook, and Indian Run Brook, 2003.* In addition to improvements outlined for the Saugatucket River, recommended implementation activities for the immediate Point Judith Pond watershed focus on stormwater and wastewater management. Ongoing efforts to ensure proper operation and maintenance of individual sewage disposal systems should continue. Achieving water quality standards will also require that both the amount of stormwater and the bacteria concentrations in that stormwater reaching the ponds be reduced.

To reduce runoff volumes and treat stormwater, use of infiltration basins or similar structures is recommended. A targeted approach to construction of stormwater retrofit best management practices (BMPs) at state and municipally owned stormwater outfalls are recommended. Priority areas for BMP construction within the Town of Narragansett include the Briggs Farm neighborhood, and for the Town of South Kingstown, the Wakefield and Peacedale areas. This TMDL also recommends pollution prevention efforts to encourage residents to pick up after their pets and to ensure that boats comply with the *No Discharge* requirements of Rhode Island marine waters.

1.0 INTRODUCTION

Section 303(d) of the Clean Water Act and Environmental Protection Agency's (EPA) implementing regulations in 40 CFR§130 direct each state to develop Total Maximum Daily Load (TMDL) plans for waterbodies that are not meeting their water quality standards. The purpose of this report is to establish a Total Maximum Daily Load to address fecal coliform contributions to the impaired waterbodies of Point Judith Pond and the saltwater reaches of the Saugatucket River. This TMDL serves as a restoration study aimed at abating pollution sources so that fecal coliform standards can be attained in the associated regions of each waterbody.

1.1 Study Area

The study area consists of Point Judith Pond waters, including the saltwater portion of the Saugatucket River. Point Judith Pond and its connecting pond, Potter Pond, are the easternmost waterbodies in Rhode Island's Salt Pond Region, and are located just west of Narragansett Bay and immediately north of Block Island Sound, along the southern coast of Rhode Island. Point Judith Pond is the boundary between the Towns of South Kingstown and Narragansett, Rhode Island. Potter Pond and the Saugatucket River are located entirely in South Kingstown, Rhode Island. This study area is shown in Figure 1.1. Table 1.1 contains a list of the impaired waters and their water quality classifications (RIDEM, 2006) within the study area. Locations may be seen in Figure 1.2.

Table 1.1 does not include Potter Pond channel (RI0010043E-06H), which was included on the 2006 303(d) list as impaired for violating the fecal coliform criteria applicable to Class SA waterbodies. Since no violations were found during an analysis of the most recent data collected in this segment[1], RIDEM is proposing to delist this waterbody segment on its 2008 303(d) list.

Table 1.1 – Impaired Waters in the Study Area and their Water Quality Classifications.

Waterbody ID	Waterbody Name / Description	WQ Class	Area Size
RI0010045R-05C	Saugatucket River from the Main Street Dam in Wakefield to the Route 1 overpass. South Kingstown.	SB	0.2357 M
RI0010043E-06B	Upper Point Judith Pond from the mouth of the Saugatucket River at Route 1, downstream to Can Buoy 33. Narragansett and South Kingstown.	SB	0.077 S
RI0010043E-06C	Upper Point Judith Pond, south of Can Buoy 33 and north and east of a line from Buttonwood Point to the southern extremity of Cummock Island, to the flagpole at the northwest extremity of Betty Hull Point excluding the marina area described in RI0010043E-06D below. Narragansett, South Kingstown.	SA	0.294 S
RI0010043E-06D	Point Judith Pond waters in the vicinity of Billington Cove Marina as shown on the plan entitled "Billington Cove marina: Marina Perimeter Plan", dated	SA{b}	0.0087 S

[1] The segment was originally listed as impaired for fecal coliform in 1996, since data collected at shellfish monitoring station GA10-23, located mid-channel, was not meeting Class SA fecal coliform criteria. Specifically, the area met the geometric mean fecal coliform criteria, however, did not meet the variability portion of the shellfishing criteria when evaluating the 30 most recent sampling points taken from 1991 through 1995 (consistent with the NSSP-approved Shellfish Monitoring Program's data evaluation protocol). An analysis of the most recent 30 data points collected by RIDEM's Shellfish Monitoring Program from 2003 through 2007 at station GA10-23, shows that the waterbody segment no longer violates Class SA fecal coliform criteria.

Waterbody ID	Waterbody Name / Description	WQ Class	Area Size
	August 1994 by Coastal Engineering Group, Inc., east of a line from the western edge of the rip-rap retaining wall, 221 feet seaward, and west of a line from the flagpole, 280 feet seaward, and north of the line that connects these two lines. South Kingstown.		
RI0010043E-06K	Point Judith Pond waters in the vicinity of Champlin Cove, north of a line from the westernmost extension of Delray Drive to the easternmost extension of Flintstone Road, located on Harbor Island. Narragansett.	SA	0.02 S

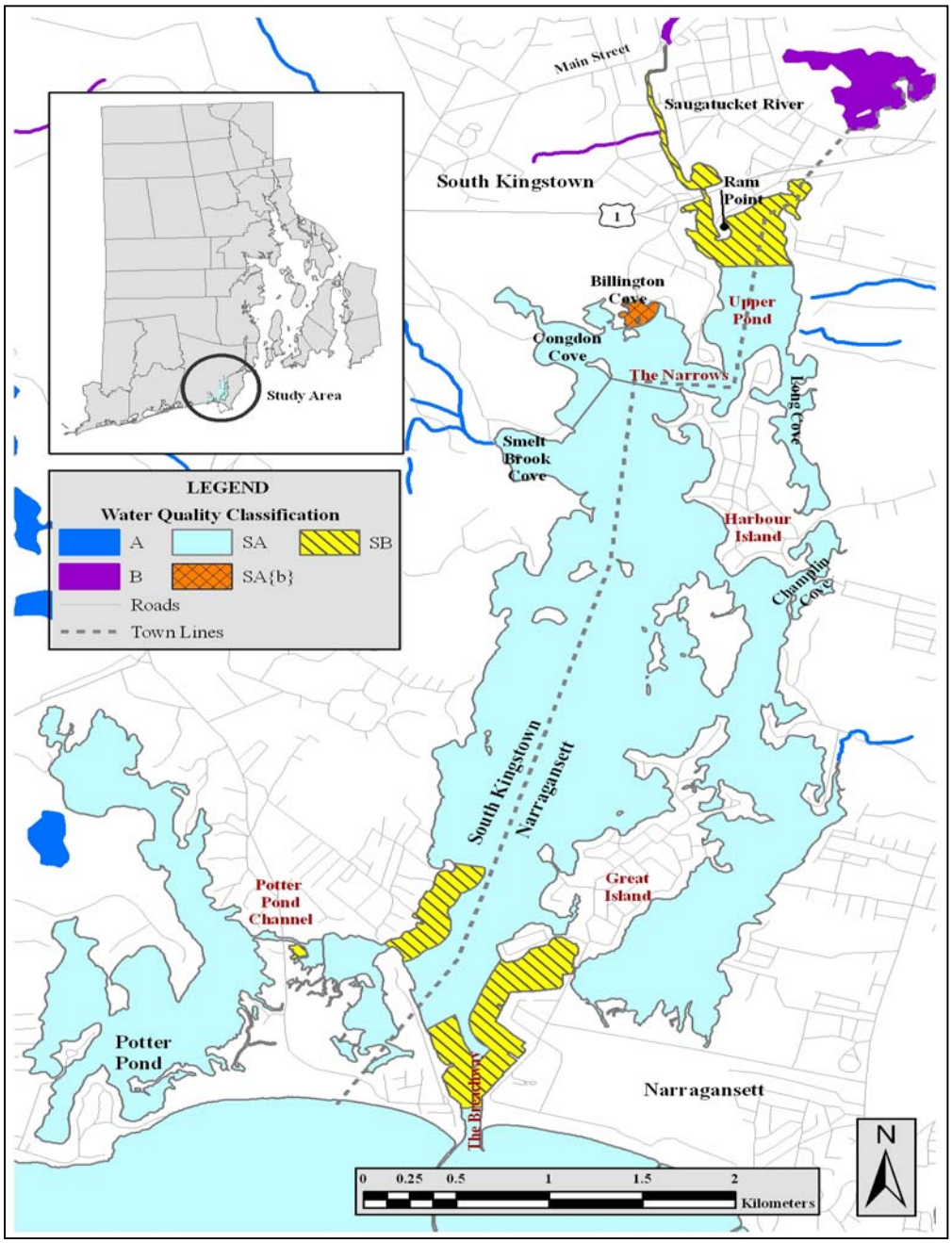

Figure 1.1 – Point Judith Pond Waters

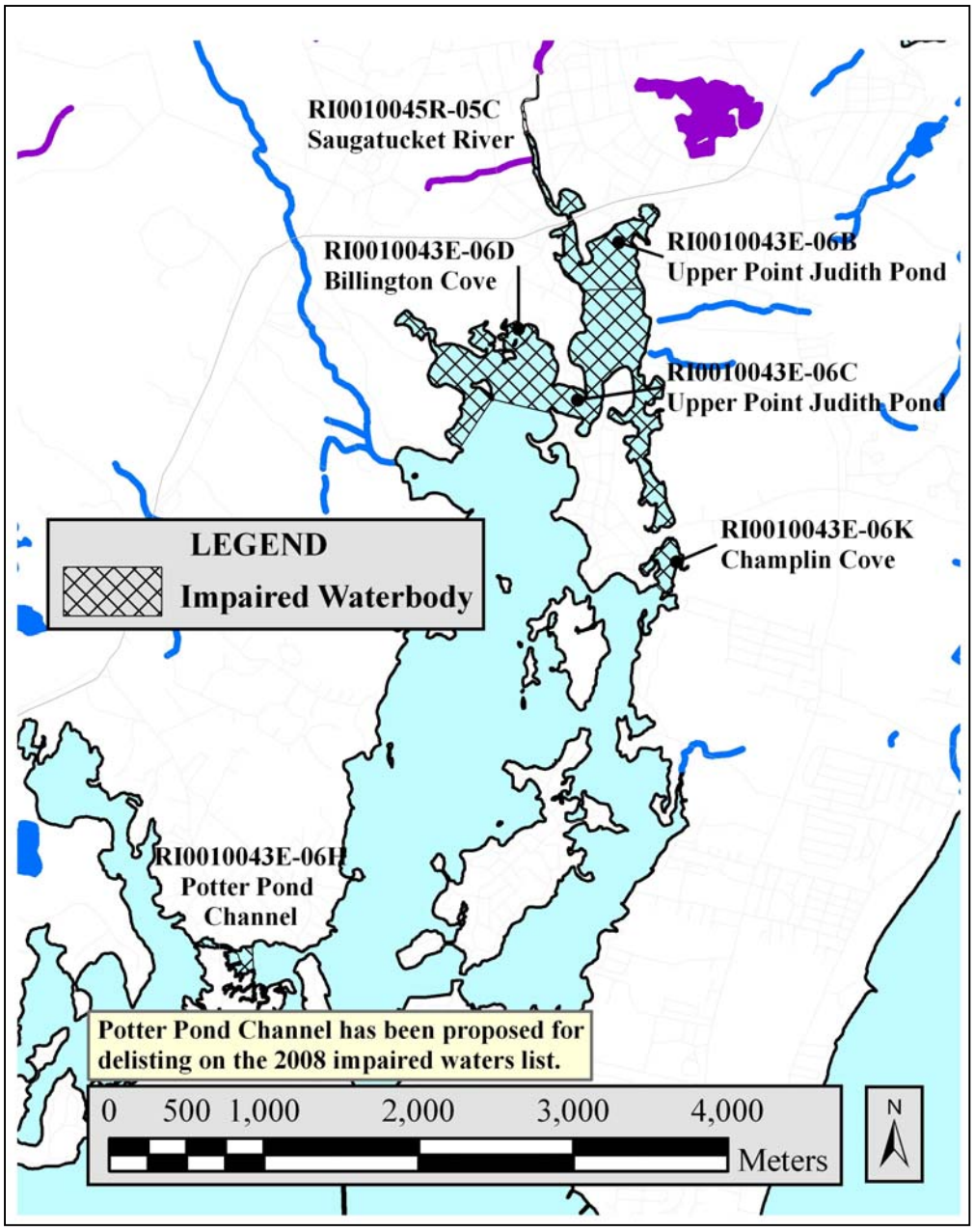

Figure 1.2 – Impaired Waters

1.2 Pollutant of Concern

The pollutant of concern is fecal coliform, a parameter used by Rhode Island as an indicator of potential pathogen contamination.

1.3 Priority Ranking

Point Judith Pond and the Saugatucket River are listed as a Group 1 waterbodies on the 2006 303(d) List of Impaired Waters. Group 1 Waters have the highest priority for Total Maximum Daily Load (TMDL) development.

1.4 Applicable Water Quality Standards

Designated uses and water quality standards vary depending on the water quality classification of a waterbody. Both are described in the State of Rhode Island's Water Quality Regulations (2006). Point Judith Pond and the saltwater Saugatucket River are composed of three different water quality classifications, Class SA, Class SA{b}, and Class SB. Standards comply with the requirements of the federal Clean Water Act of 1972 and Rhode Island General Laws (Chapter 46-12).

Designated Uses

Section 8.B(2) of the Water Quality Regulations (2006) describes the water use classification of Class SA, SA{b), and SB waters. It is important to note the differing waterbody classes because the waterbody classifications are developed from varying *designated* uses, including shellfish harvesting and marina activity. All water quality classifications and locations are shown in Figure 1.2.

Class SA waters are designated for shellfish harvesting for direct human consumption, primary and secondary contact recreational activities, and fish and wildlife habitat.

Class SA{b} waters are designated for shellfish harvesting for direct human consumption, primary and secondary contact recreational activities, and fish and wildlife habitat. These waters are in the vicinity of marinas and/or mooring fields and therefore seasonal shellfishing closures are required. Class SA criteria must be attained at all times.

Class SB waters are designated for primary and secondary contact recreational activities; shellfish harvesting for controlled relay and depuration; and fish and wildlife habitat.

Numeric Water Quality Criteria

The Water Quality Regulations contain the following numeric water quality criteria for fecal coliform concentrations.

Class SA and Class SA{b} fecal coliform concentrations are not to exceed a geometric mean MPN value of 14 and not more than 10% of the samples shall exceed an MPN value of 49 for a 3-tube decimal dilution. RIDEM evaluates compliance with these criteria in accordance with Rhode Island's Food Shellfish Growing Area Monitoring Program as approved by the United States Food and Drug Administration (FDA).

Class SB fecal coliform concentrations are not to exceed a geometric mean MPN value of 50 and not more than 10% of the samples shall exceed an MPN value of 400. This fecal coliform standard is applied only when adequate enterococci data are not available to assess for primary contact recreational/swimming uses in sea waters.

Other Applicable Standards

The closure of shellfish areas to harvesting is not solely based on the ambient water quality data. In accordance with the National Shellfish Sanitation Program (NSSP), a shellfish growing area shall be classified as Prohibited if no current sanitary survey has been performed or if a sanitary survey or other monitoring program data indicates that fecal coliform material may reach the area in excessive concentrations. If it has been determined that there is a good potential for harvested shellfish to be contaminated due to the nature of an upland source, then the affected growing area is closed (NSSP, 1997).

Antidegradation Policy

Rhode Island's antidegradation policy requires that, at a minimum, the water quality necessary to support existing uses be maintained (see Rule 18, Tier 1 in the State of Rhode Island's Water Quality Regulations). If water quality for a particular parameter is of a higher level than necessary to support an existing use (i.e. bacterial levels are below Class SA or SB standards), that improved level of quality should be maintained and protected (see Rule 18, Tier 2 in the State of Rhode Island's Water Quality Regulations). Because water quality violates standards in several locations, Tier 2 does not apply.

Numeric Water Quality Target

The numeric water quality targets are set at the applicable water quality criteria or standard for each portion of Point Judith Pond, Potter Pond, and the Saugatucket River. In some areas, a waterbody segment with higher allowable fecal coliform bacteria limits discharges to a waterbody with more stringent criteria. In these places, the numeric water quality target must be set to the more strict criteria of the two standards at the point of discharge.

The numeric water quality targets are set to the fecal coliform concentrations necessary to restore the designated uses to the waterbodies. For example, targets are set to what is necessary to reopen the shellfish waters during all weather conditions, in accordance with Rhode Island's Shellfish Program approved by the United States Food and Drug Administration (FDA).

2.0 DESCRIPTION OF STUDY AREA

The southern Rhode Island Salt Pond Region consists of shallow coastal lagoons that are productive marine embayments separated from the ocean. The region is one of the fastest growing areas of the state and has experienced steady population growth over the past forty years. Its population increased 69% between 1981 and 1992, exceeding the national trend of 60% for other coastal regions (Culliton et al. 1990, Lee and Ernst 1996).

The waters of Point Judith Pond are home to one licensed bathing beach located at Camp Fuller, and over 800 boats moored or docked at marinas throughout the pond. During the winter months when inclement weather makes harvesting shellfish more difficult in Narragansett Bay, local commercial shellfisherman rely on the Point Judith Pond shellfish resource to supplement their annual harvest.

2.1 Background Information

Point Judith Pond is heavily influenced by water flowing into its northern reaches from the Saugatucket River, which drains a large portion South Kingstown and a smaller area of North Kingstown. Point Judith Pond is approximately 1,530-acres (6.2 sq km) and is located in the Towns of Narragansett and South Kingstown, Rhode Island. Potter Pond occupies approximately 329-acres (1.3 sq km) and is located entirely within the Town of South Kingstown (CRMC, 1999). An outline of the physical characteristics of the ponds is listed in Table 2.1.

Table 2.1 – Point Judith Pond and Potter Pond Physical Characteristics.

Parameter	Point Judith Pond		Potter Pond	
Area	1,530 acres	6.2 sq km	329 acres	1.3 sq km
Average depth	6 feet	1.8 m	2 feet	0.6 m
Flushing Time	2.0 days	2.0 days	1.5 days	1.5 days
Longest reach	17,000 feet	5181.6 m	5,000 feet	1524.0 m
Widest reach	5,500 feet	1676.4 m	3,375 feet	1028.7 m
Deepest Point	13 feet	4.0 m	20 feet	6.1 m

Source: CRMC, 1999, RIDEM, 1990, URI, 2002. Values are approximate

Breachway

The southern end of Point Judith Pond consists of a breachway constructed between 1902 and 1910 that is protected by the breakwaters of the Harbor of Refuge. The principle motivation for building the breachway was easy boat access between the ponds and the ocean. The seasonal breachway between Potter Pond and the ocean was allowed to fill and a man-made channel was dredged connecting Potter Pond to Point Judith Pond through Gooseberry Hole and is the only surface water connection between the two ponds. With the breachway permanently open, the water level within the pond has equilibrated with sea level. This has caused a loss of two to three feet in water depth in the ponds. Other changes in hydrology include more rapid flushing and periodic episodes of extremely low water when sustained northwest winds in the winter months force much of the water out of the pond (CRMC, 1984).

Tides

The mean tidal amplitude within Point Judith Pond, according to the National Oceanic and Atmospheric Administration (NOAA) "Point Judith Harbor" nautical chart is 3.3-feet. Although records of tidal amplitude in Potter Pond could not be found, RIDEM Shellfish Program staff have observed the tidal amplitude to be approximately half that of Point Judith Pond. Further, since the channel that connects the two ponds is very restricted in width, there is approximately a 3-hour delay in tide times for the two ponds. In the northern region of Point Judith Pond, the water level rises and falls in a simple pumping motion in response to the tides and, consequently, the currents are weak and flushing minimal (CRMC, 1984). Typical of an estuary, there is a two-layered flow of nontidal currents that is frequently present along the main channel to Ram Point. Saline water from the lower pond flows slightly up the pond along the bottom, while a layer of fresh water from the Saugatucket River and groundwater inputs flow gradually seaward.

Winds

When the southwesterly breeze is prevalent, winds travel in a northeast direction towards the upper portions of the Point Judith Pond. Sustained winds in this direction may detain polluted waters in upper portions of Point Judith Pond. In the fall and winter, the opposite occurs. Cold, dense air over the land surface creates a north/northwesterly wind direction. During the winter, sustained northwest winds reverse this trend and may flush much of the water in the Pond out through the breachway. Furthermore, wave action as a result of wind velocity may also stir sediments that have bacteria in them (RIDEM, 2002b).

Soils

The principle parent materials of the Point Judith Pond watershed soils are glacial ice-contact and outwash deposits. A majority of the soils adjacent to the ponds and other waterways are characterized as having moderate to rapid permeability, moderate available water capacity, slow runoff, and high groundwater table.

Groundwater

The groundwater resources of Point Judith Pond are designated by RIDEM as GA. Class GA groundwater are those groundwater resources which the director has designated to be suitable for public or private drinking water use without treatment (RIDEM, 2005).

2.2 Point Judith Pond Sub-Watersheds

Figure 2.1 shows the study area watershed divided into three sub-watersheds: Saugatucket River and the Point Judith Pond watershed split into eastern and western halves at the Narragansett / South Kingstown town boundary. Characteristics and land uses within these sub-watersheds vary. Table 2.2 describes the land uses within both the entire watershed and the three sub-watersheds. Land use is given both by total area in square kilometers (km^2) and by percentage. The surface area of Point Judith Pond and Potter Pond is not included. The sections following Table 2.2 detail land use and other information about these sub-watersheds.

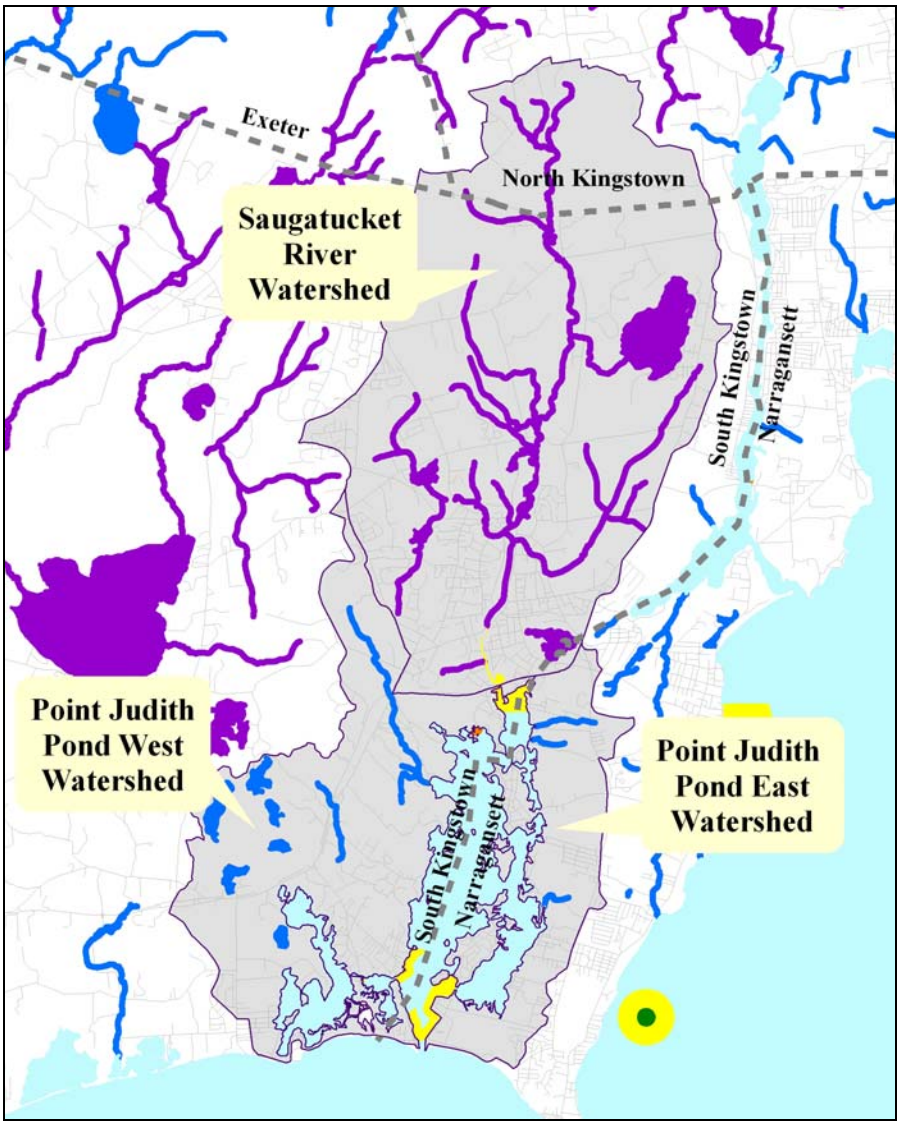

Figure 2.1 – Map of Sub-watersheds

Table 2.2 – Sub-watershed Land Use by Area (km^2)[1] and Percentage (RIGIS, 1999).

	Medium to High Density Residential	Low to Medium Density Residential	Commercial And Industrial	Roads, Airports, Utilities, etc.	Recreation and Cemeteries	Pastures, Orchards And Farmland	Brushland and Forests	Water, Wetlands, and Sandy Areas
PJP East	2.01	0.65	0.42	0.23	0.27	0.17	2.49	2.29
9 km^2 / 12%	23.64%	7.58%	4.88%	2.66%	3.12%	1.97%	29.28%	26.87%
PJP West	1.39	3.14	0.26	0.48	0.31	3.07	7.89	2.86
19 km^2 / 26%	7.19%	16.19%	1.32%	2.45%	1.61%	15.82%	40.68%	14.74%
Saugatucket	4.67	5.97	3.47	1.16	0.29	3.40	17.59	9.47
46 km^2 / 62%	10.15%	12.98%	7.55%	2.53%	0.63%	7.38%	38.22%	20.57%
Total	8.08	9.76	4.15	1.87	0.87	6.63	27.97	14.62
74 km^2	10.93%	13.20%	5.61%	2.52%	1.17%	8.97%	37.83%	19.77%

[1]The conversion from km^2 to acres is 1 km^2 is 247 acres.

Point Judith Pond East

The eastern watershed covers a surface area of approximately 9 km^2 and is located within the Town of Narragansett. In addition to running the entire eastern coast of Point Judith Pond, the eastern watershed contains a number of islands, including the heavily developed Harbour Island and Great Island. This watershed is also home to the port of Galilee, the primary fishing port for Rhode Island.

The eastern Point Judith Pond watershed is largely composed of medium to high-density residential development. Remaining areas are largely undeveloped, consisting primarily of forests and wetland areas. Route 108 (Kingstown Road) is the major access route for the southern end of Narragansett and is located at the eastern boundary of the watershed. There are also two wellhead protection areas that overlap each other. They are located in the northeast area of Point Judith Pond in Narragansett. These areas are known as "Long Cove Campsites #1" and "Long Cove Campsites #2".

Though densely populated year-round, the summertime shows an increase in the number of people staying and visiting Narragansett. Summer months see a population swell as summer houses not rented during the winter months are opened for the summer. The beaches in the area are also popular day trip destinations for people around the state. Summer months also see a substantial increase in boat traffic to the area.

Point Judith Pond West and Potter Pond

The western watershed covers a surface area of approximately 19 km^2 and is located entirely within the Town of South Kingstown. The western Point Judith Pond watershed is the least developed area of the ponds, consisting largely of medium to low-density residential properties, farmland, and undeveloped forests. Homes in the area tend to be larger than average homes located on comparatively large lots compared to houses in the other watersheds.

Also contained within the watershed is Route 1, the primary connector road between South County and Connecticut. Other than Route 1, the major roadways run from the highway to the Snug Harbor, Matunuck and Jerusalem areas. These three areas represent the only heavily developed areas within the sub-watershed. The "Camp Fuller/YMCA" non-community wellhead protection area is located south of Smelt Brook Cove and north of Turner Cove.

The Town of South Kingstown does have a wastewater management district that requires inspections for all onsite wastewater systems every five years. Homeowners are required to replace all cesspools with an onsite wastewater system which conforms to current state and local standards within 12 months after the sale of a property or within five years of the date of the First Maintenance (Baseline) Inspection, whichever comes first.

The Saugatucket River flows into Point Judith Pond at the northernmost point of the pond. Waters in the upper pond must flow through a choke point near Harbor Island, channeling all flows from the Saugatucket River and upper pond through a narrow opening known as "The Narrows" before widening into the rest of the pond.

Saugatucket River

The headwaters of the Saugatucket River are located in North Kingstown. The river flows from north to south through the villages of Peace Dale and Wakefield in South Kingstown. The river has a length of 7.1 miles and drains an area approximately 16.5 square miles (10,560 acres) in size. It has three major tributaries: Rocky Brook, Indian Run Brook, and Mitchell Brook.

Two impoundments are located on the Saugatucket River. The first, most northerly impoundment is located in Peace Dale approximately 350 feet north of Kingstown Road. This impoundment is commonly referred to as Saugatucket Pond or Peace Dale Pond and is approximately 41 acres in size with a maximum depth of 9.8 feet. The river enters the pond approximately 500 feet south of where Saugatucket Road crosses the river. The pond roughly runs lengthwise parallel to North Road in Peace Dale with the northwestern section bisected by North Road. The second impoundment is located approximately 100 feet north of where Main Street crosses the Saugatucket. This impoundment is known as Wakefield Pond and is approximately 10.7 acres in size. The impoundment is very linear in shape and extends northward to a point near the southern side of Church Street.

Land use in the Saugatucket watershed varies from densely commercialized areas to large forested lands. The villages of Wakefield and Peace Dale are located in the downstream reaches of the Saugatucket River. They form a highly developed region that contains commercial, light industrial, and medium and high-density residential land uses which contribute significant quantities of stormwater to the river during rainfall events. The majority of developed properties within the watershed are connected to municipal sewers. Property in South Kingstown that is not connected to the sewer system is covered under the municipal onsite wastewater systems inspection requirements. Other areas in the watershed are largely undeveloped or low-density residential housing developments. These areas are generally located near the headwaters of the Saugatucket River before the river enters Wakefield and Peacedale.

The Saugatucket watershed has a number of major roadways including Route 1, which is located along the eastern edge of the sub-watershed. This area contains portions of Route 138, Route 108, and other large local roads such as Old Tower Hill Road and Main Street, all of which support substantial traffic flows year-round due to beach traffic during the summertime and University of Rhode Island traffic during the rest of the year.

The Saugatucket River becomes tidally influenced at the Main Street Bridge in Wakefield, which marks the beginning of the TMDL study area. According to flow data taken during the 1996 URI dry weather surveys of the Saugatucket River, flows during the spring and fall are approximately 0.85 cubic meters per second (m^3/s) or 30 cubic feet per second (cfs) while summer flows are approximately 0.28 m^3/s or 10 cfs. Wet weather flows would be substantially higher. RIDEM completed a pathogen TMDL study in 2003 for the freshwater Saugatucket River and its tributaries.

2.3 Water Quality History

Point Judith Pond and Potter Pond are part of the Rhode Island Shellfish Program's Growing Area 10 and are sampled at twenty-three locations. Data is collected at each station six times per

year to evaluate the shellfish harvesting grounds. Closure areas are modified and adjusted as needed.

Historical Shellfish maps are available for Rhode Island between 1942 and the present. A review of these maps reveals that as early as 1942, the Rhode Island Department of Health prohibited shellfish harvesting in the upper reaches of Point Judith Pond. These shellfish closures were generally limited to the upper reaches of the pond through the 1970s. In the 1980s, closures were modified to include areas in the vicinity of marinas. During this time, seasonal shellfish closures were established for the areas surrounding Galilee, Jerusalem, Snug Harbor, and the Potter Pond channel. The seasonal closures prohibited shellfish harvesting during the summer months only. Only the area of the pond north of the Narrows contained a permanent year-round closure. This changed in the mid-1980s when all the seasonal closures were changed to permanent closures.

Throughout the 1990's, the closure line for the upper reaches of Point Judith Pond varied between the mouth of The Narrows to as far south as Crown Point. In the late 1990's, the line settled, running from Buttonwood Point to the opening of The Narrows. In 2002, the closure line was modified slightly to run from Buttonwood Point to Cummock Island before connecting back to The Narrows. In addition, waters within Champlin Cove were also prohibited from shellfishing due to elevated fecal levels. Most recently in 2005, the line was modified further south to include portions of Smelt Brook Cove to The Narrows.

Historic data collection has shown that water quality has degraded over the years, particularly within the most recent decade. The shellfishing closure line is moving south to include more of Point Judith Pond as water quality continues to degrade. Water quality in Potter Pond has remained largely the same throughout the past twenty years.

2.4 Supporting Documentation

Recent water quality studies are presented in Table 2.3. These references were used to characterize present water quality conditions and to identify water quality trends.

Table 2.3 – Supporting Documentation.

Primary Organization	Title	Date of Report	Approximate Date of Study
Rhode Island Department of Environmental Management Shellfish Surface Water Monitoring Program, Office of Water Resources	Shellfish Surface Water Monitoring Program data	ongoing	ongoing
Rhode Island Department of Environmental Management TMDL Program, Office of Water Resources	Pathogen TMDL for Saugatucket River, Mitchell Brook, Rocky Brook and Indian Run Brook	2003	Jul, Aug, Sept, Oct; 2000
Rhode Island Department of Environmental Management Shellfish Surface Water Monitoring Program, Office of Water Resources	Point Judith and Potter Ponds Twelve Year Sanitary Shoreline Survey	2002	May, Jun; 2002
Department of Civil and Environmental Engineering, University of Rhode Island	Saugatucket River Water Quality Investigations: Water Quality Data Report	1999	Mar, Jul, Oct; 1996 Apr, Aug, Sep; 1997

3.0 PRESENT CONDITION OF THE WATERBODY

The impacts of elevated bacteria concentrations in Point Judith Pond can be seen in closures of the shellfish harvesting grounds. Shellfish closures in the Class SA areas include upper Point Judith Pond, Smelt Brook Cove, Congdon Cove, The Narrows, Long Cove, Champlin Cove.

The current water quality conditions throughout the study area are detailed in the following sections. Data collected at stations from within the ponds collected by both the Rhode Island Shellfish Monitoring Program and the Salt Ponds Coalition are discussed. Other sections discuss the pollution sources to the study area.

3.1 Instream Water Quality

Rhode Island Shellfish Program Growing Area Monitoring

The Shellfish Growing Area Water Quality Monitoring Program is part of the State of Rhode Island's agreement with the United States FDA under the National Shellfish Sanitation Program (NSSP). NSSP requires Rhode Island to conduct routine bacteriological monitoring and shoreline surveys of the State's waters where shellfish is intended for direct human consumption. The purpose of these programs is to maintain national health standards by regulating the interstate shellfishing industry, and as administered by RIDEM, to also be protective of recreational shellfishing activities.

Growing Area 10 consists of both Point Judith Pond and Potter Pond. This growing area is classified as approved. It is not impacted by either sewage treatment facilities or combined sewer overflows (CSO). The RIDEM Shellfish Program monitors Growing Area 10 in accordance with the guidelines set forth in the NSSP Manual of Operations for systematic random sampling. A random sampling plan for the growing area is scheduled yearly, with a representative cross section of all meteorological, hydrographic, and/or pollution events that may affect water quality and subsequent shellfish contamination. The growing area is monitored less frequently in January and February due to inclement weather conditions and/or ice-overs of certain monitoring stations. A reasonable attempt is made to collect samples on the pre-established days; any monitoring missed due to inclement weather or ice-overs is made up over the year.

The twenty-three shellfish monitoring stations in Growing Area 10 are sampled six times per year. Fifteen stations are in Point Judith Pond, six stations are in Potter Pond, one station is in the channel between the two ponds and one station is in the Harbor of Refuge. Nineteen stations are in Class SA waters, with three of these stations in waters presently closed to shellfish harvesting due to elevated bacteria concentrations. An additional station is located in Potter Pond Channel. Four stations are located in Class SB waters. Figure 3.1 shows the location of all shellfishing stations within the Ponds.

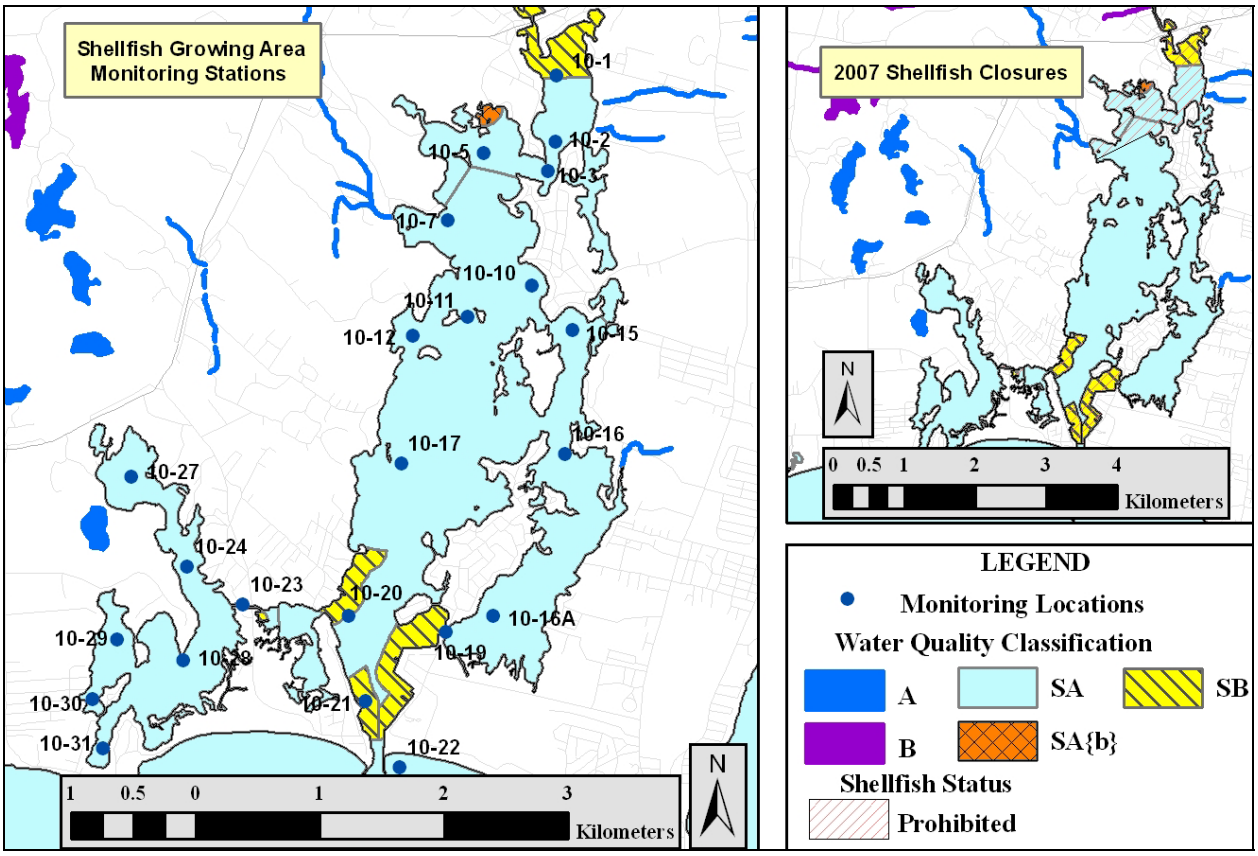

Figure 3.1 – Shellfish Growing Area Monitoring Stations

With the exceptions of the upper reaches of Point Judith Pond, Billington Cove, and Champlin Cove, , the Class SA waters of Point Judith Pond and Potter Pond are approved for the direct harvesting of shellfish. Figure 3.1 shows the shellfish harvesting closure lines for May 2007 to May 2008.

Annual statistical evaluations for geometric mean and 90th percentile are completed on the most recent thirty samples to determine if the water quality in the Class SA waters is sufficient for the direct harvesting of shellfish. Data collected through 2006 were used to set the closures lines for the May 2007 to May 2008 time period. The 2007 Notice of Polluted Shellfishing Grounds (RIDEM, 2007) documents six permanent shellfish closure areas in Point Judith Pond, including the lower Saugatucket River.

Table 3.1 summarizes water quality data for Point Judith Pond and Potter Pond for 2002 through 2006 (data presented in Appendix A). Numbers shown in bold in Table 3.1 exceed the applicable criterion. Four stations exceed the geometric mean criteria, and five stations exceed the 90th percentile standard. In 2007, the shellfish areas surrounding these stations were closed to shellfishing. It is noted that the two northern most stations in Point Judith Pond also violate the SB criteria established for the protection of swimming and other direct contact recreational uses. Stations violating water quality regulations are generally located in the northern portions of Point Judith Pond. Stations located in the lower half of Point Judith Pond as well as Potter Pond meet water quality standards.

Table 3.1 – Rhode Island Shellfish Program Monitoring Data (2002 – 2006).

Station	Location	Water Quality Class	Number of Samples[1]	Geometric Mean (MPN/100 mL)		90th Percentile (MPN/100 mL)	
				Target	2002-06[1]	Target	2002-06[1]
GA10-1	Point Judith Pond	SB[2]	30	14	**93.9**	49	**1100**
GA10-2	Point Judith Pond	SA	30	14	**63.9**	49	**507**
GA10-3	Point Judith Pond	SA	30	14	**32.3**	49	**309**
GA10-5	Point Judith Pond	SA	30	14	**19.4**	49	**240**
GA10-7	Point Judith Pond	SA	30	14	12.8	49	**240**
GA10-10	Point Judith Pond	SA	30	14	6.5	49	43
GA10-11	Point Judith Pond	SA	30	14	6.5	49	48
GA10-12	Point Judith Pond	SA	30	14	5.9	49	25
GA10-15	Point Judith Pond	SA	30	14	5.9	49	25
GA10-16	Point Judith Pond	SA	30	14	5.1	49	25
GA10-16a	Point Judith Pond	SA	30	14	7.9	49	43
GA10-17	Point Judith Pond	SA	30	14	5.4	49	25
GA10-19	Point Judith Pond	SB	30	50	6.5	400	25
GA10-20	Point Judith Pond	SB	30	50	4.6	400	25
GA10-21	Point Judith Pond	SB	30	50	6.4	400	25
GA10-22	Harbor of Refuge	SA	30	14	3.3	49	10
GA10-23	Potter Pond Channel	SA	30	14	6.0	49	23
GA10-24	Potter Pond	SA	30	14	4.0	49	16
GA10-27	Potter Pond	SA	30	14	3.7	49	16
GA10-28	Potter Pond	SA	30	14	3.7	49	12
GA10-29	Potter Pond	SA	30	14	3.0	49	8
GA10-30	Potter Pond	SA	30	14	4.1	49	23
GA10-31	Potter Pond	SA	30	14	5.0	49	23

[1] The data were analyzed using the last thirty samples collected. The sampling dates may not be the same for all stations because some stations may be sampled more than six times per year if a sampling run must be repeated due to weather or mechanical problems. The data from the partial run are included in the shellfish database.
[2]This station is close to the Class SA line and must meet Class SA standards for this TMDL. It also violates its Class SB standards.

Other Instream Monitoring

The Salt Ponds Watchers were founded in 1985. In 1993, this volunteer water quality monitoring group merged with the Salt Ponds Coalition, a non-profit organization dedicated to the protection and preservation of nine coastal salt ponds along the Rhode Island Atlantic Coastline. As part of the Salt Ponds Coalition, the Pond Watchers continue to collect bacterial water quality samples at three locations within the Saugatucket River, four locations within Point Judith Pond, and two locations within Potter Pond. Three stations, including two stations within Champlin Cove are usually measured by boat. All other stations are measured from shore. The Salt Ponds Coalition has been collecting data in the Point Judith Pond area since 1997. Samples are collected between four and nine times per year from May through September when fecal

coliform concentrations are generally highest (see Appendix B). Samples are then analyzed using the MPN methodology at the URI Advanced Microbiology Laboratory.

The Salt Ponds Coalition data were used to characterize current conditions in areas where the Shellfish Program does not sample regularly. RIDEM used data from two of the three Salt Pond Coalition Saugatucket River monitoring sites. The third location has not been sampled since 2002 and is upstream of the study area. RIDEM also used data from the two monitoring locations in Champlin Cove, an impaired area that has no routine Shellfish Program stations.

In addition to the Salt Ponds Coalition data, other data collected by RIDEM were also used to characterize water quality conditions in the Saugatucket River and Champlin Cove. Data collected by the RIDEM Shellfish and TMDL Programs from shoreline surveys and other periodic monitoring in the Saugatucket River and Champlin Cove are included in the Table 3.2 and is shown in Appendix B. This includes data collected by the RIDEM TMDL Program in 2005 and 2006 (see Attachment A).

Samples were taken at four points throughout the saltwater Saugatucket River over the past seven years by the RIDEM TMDL program and the Salt Ponds Coalition. All stations have geometric mean averages at least four times higher than Class SB standards. Results are highest at the northernmost point of the river, located just downstream of the Main Street dam and generally decrease as the river flows south towards Point Judith Pond. The Saugatucket River discharges to the upper portion of Point Judith Pond.

The additional monitoring stations and adjacent Shellfish Program monitoring locations for Point Judith Pond, Potter Pond and the Saugatucket River are shown in Figure 3.2. Geometric mean and 90th percentile statistics for the past five years of data are shown in Table 3.2. Values exceeding water quality standards are shown in bold.

Table 3.2 – Other Instream Monitoring Data

Station	Location	Water Quality Class	Number of Samples	Geometric Mean (MPN/100 mL)		90th Percentile (MPN/100 mL)	
				Target	2000-06	Target	2000-06
SR06-D	Saugatucket River	SB	12	50	**581.7**	400	**4000**
49	Saugatucket River	SB	4	50	**112.4**	400	**887**
SR-1	Saugatucket River	SB	46	50	**334.2**	400	**1600**
SR-0	Saugatucket River	SB	55	50	**290.1**	400	**1328**
PJ-15	Champlin Cove	SA	51	14	**22.2**	49	**130**
PJ-16	Champlin Cove	SA	51	14	**18.0**	49	**130**

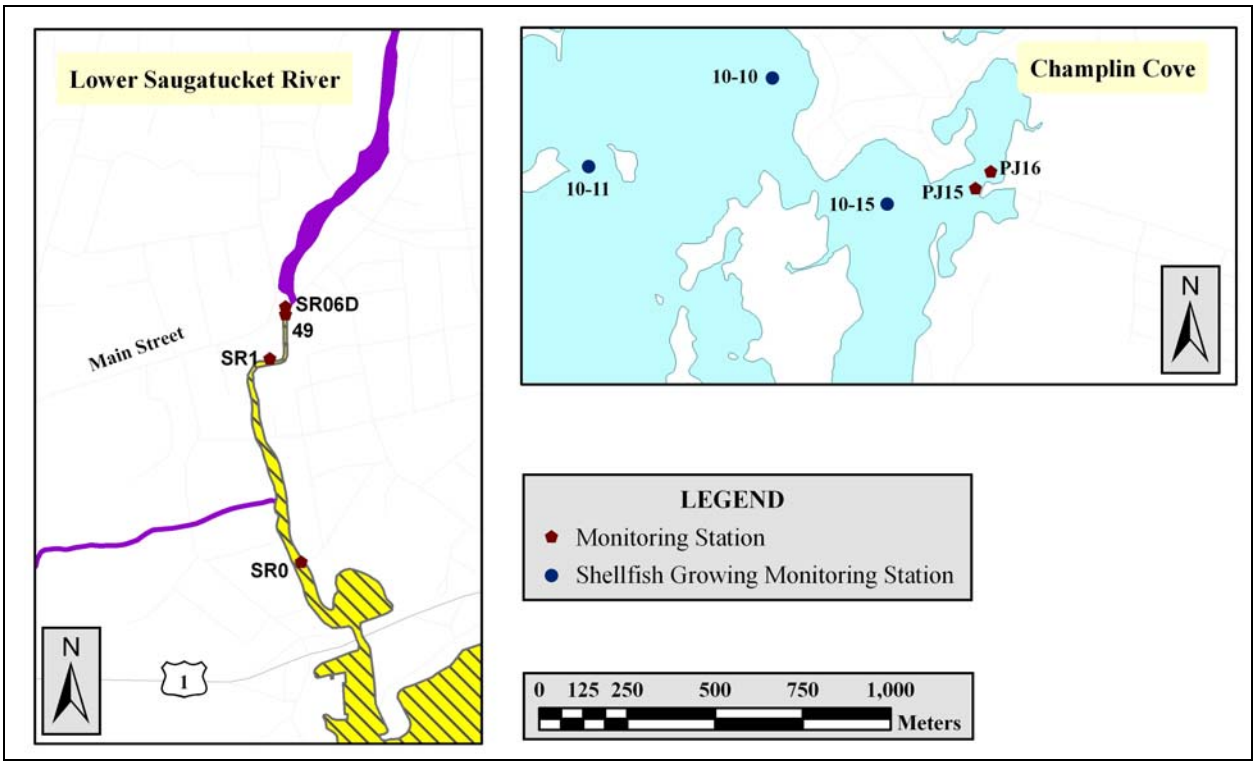

Figure 3.2 – Other Instream Monitoring Stations

3.2 Evaluation of Instream Water Quality Data

Shellfish Program data collected in Point Judith Pond and Potter Pond were also evaluated for tidal, seasonal, and weather (i.e. rainfall) related impacts. In general, data collected from 1984 through 2006 were analyzed because the data from the most recent thirty samples did not provide an adequate cross section for these conditions. Data from 2002 through 2006 are included in Appendix A.

Weather Condition

The geometric mean and 90th percentile values were noticeably higher in wet weather than in dry weather. When using the historical data set, there were three violations of the geometric mean criterion and five violations of the 90th percentile criterion in wet weather. In dry weather there were no geometric mean violations and only two 90th percentile violations. For this analysis, wet weather was considered to be within seven days of a rain event of 0.5 inches or more as measured at the Westerly, Rhode Island airport.

In addition to the historical data set, it was also possible to evaluate the last thirty samples for weather condition. It became apparent during this analysis that it would be more appropriate to define wet weather as four days following a rain event of 0.25 inches to be consistent with the Saugatucket River TMDL, as the Saugatucket River is the largest source of contamination to the pond.

The water quality violations were the same when looking at either the entire data set or at the most recent thirty samples. Violations were confined to stations in upper Point Judith Pond, closest to the Saugatucket River outlet. The river is a major contributor of stormwater to the ponds. See Appendix A for wet and dry weather data statistics.

Tidal Analysis

During dry weather, ebb tide and low tide show the most violations of water quality standards. Violations are primarily located in the upper pond, indicating the importance of fecal coliform loadings from the Saugatucket River. Flood tide and high tide bring an influx of seawater, diluting fecal concentrations for these tidal conditions. During wet weather, it does not appear that tides substantially impact fecal coliform concentrations as samples taken during all tides show a similar number and severity of violations. See Appendix A for tidal geometric mean and 90^{th} percentile values.

Seasonal Analysis

Seasonal influences on the shellfishing stations were apparent for the historical data set. Samples taken during the warmer weather in and around the summer months generally exhibited the higher fecal coliform concentrations during both wet and dry weather. This is probably caused in part by increased water temperatures and reduced bacteria die off. In addition, more people use the ponds during the summer months as well as additional pets brought to the area by visitors. Wildlife are also more active during the summer months. See Appendix A for tidal geometric mean and 90^{th} percentile values.

3.3 Pollution Sources

Saugatucket River

RIDEM completed its bacteria TMDL for the freshwater Saugatucket River in 2003. The study area for this TMDL also included Mitchell Brook, Rocky Brook and its tributaries, and Indian Run, all tributaries to the Saugatucket River. The TMDL identified untreated stormwater runoff from impervious surfaces such as roads and streets, and from residential and commercial land as major contributors to impaired water quality, requiring a watershed-wide approach to address stormwater-related problems.

RIDEM conducted bacteria monitoring as part of its TMDL study. Station SR-06 was located at the Main Street Bridge in Wakefield at the boundary between the freshwater and saltwater portions of the river, downstream of the Main Street Dam. According to results from the Saugatucket River TMDL, water at the northernmost point of the saltwater region of the river has a weighted geometric mean fecal coliform concentration of 833 fc/100mL, in violation of the Class SB, 50 fc/100 mL standard. A 94 percent reduction is required to meet target goals. The TMDL recommended structural and non-structural BMPs for this area, including more frequent street sweeping, storm sewer maintenance, and a pet ordinance. A structural pigeon deterrent was originally recommended below Main Street Bridge to discourage pigeon roosting beneath the bridge (RIDEM, 2003). Upon further investigation, it was determined that pigeons are not a problem at this location. It was not possible to determine the wet weather impact of localized

sources downstream of the Neighborhood Guild because upstream impoundment masks the impact of freshwater sources.

Direct Stormwater Discharge and Other Sources

Every twelve years, the RIDEM Shellfish Program conducts comprehensive shoreline surveys to identify and quantify actual and potential pollution sources, which may directly or indirectly affect a growing area and, as a result, render shellfish harvested from that area as unsafe for human consumption. RIDEM documents any evidence of human waste contamination and takes samples from all creeks, streams, ground water seeps, and discharging pipes and/or culverts. Annual analysis of the data is used to determine whether water quality within the growing area meets water quality standards and complies with NSSP requirements. Identified sources considered as potential threats to the sanitary conditions of waters open to shellfish harvesting are revisited and if found flowing, resampled either annually or triennially.

The most recent Point Judith Pond twelve-year shoreline survey was conducted over a two-month period from May through June in 2002. Data from this survey were used to identify potential and actual bacteria sources to Point Judith Pond and Potter Pond. A total of seventy sources were identified. Fifty of the seventy sources were actively flowing at the time of the shoreline survey. These sources were all sampled. Figure 3.3 shows all locations.

Included within the seventy sources are twenty-five stormwater sources and twenty-six freshwater streams draining into the ponds. The remaining sources are other sources of potential fecal coliform contamination to the ponds, including groundwater seeps, stormwater swales, cove outlets, etc (RIDEM 2006b).

In 2005 and 2006, RIDEM performed additional sampling in the Point Judith area on those sources flowing into those sections listed on the 2006 303(d) list. This included all sources within the impaired areas of the study area, including lower Saugatucket River, upper Point Judith Pond, and Champlin Cove. All sources in these areas were revisited, with samples taken at all discharging sources. In addition, RIDEM conducted a shoreline survey for the saltwater Saugatucket River from the Main Street Dam to Point Judith Pond. These sources have been added to the information collected during the 2002 Point Judith Pond and Potter Pond Shoreline Survey. The 2006 sampling is included in Attachment A.

Both the 2002 Shoreline Survey and the 2005-2006 TMDL source sampling were skewed towards dry weather conditions. While the sampling may have occurred within days of a wet weather event, the actual sampling occurred while it was not actively raining.

The following contains a discussion of the known actual and potential sources identified in the impaired sections of the study area. Appendix C contains all shoreline survey results for the Point Judith Pond and Potter Pond Growing Area.

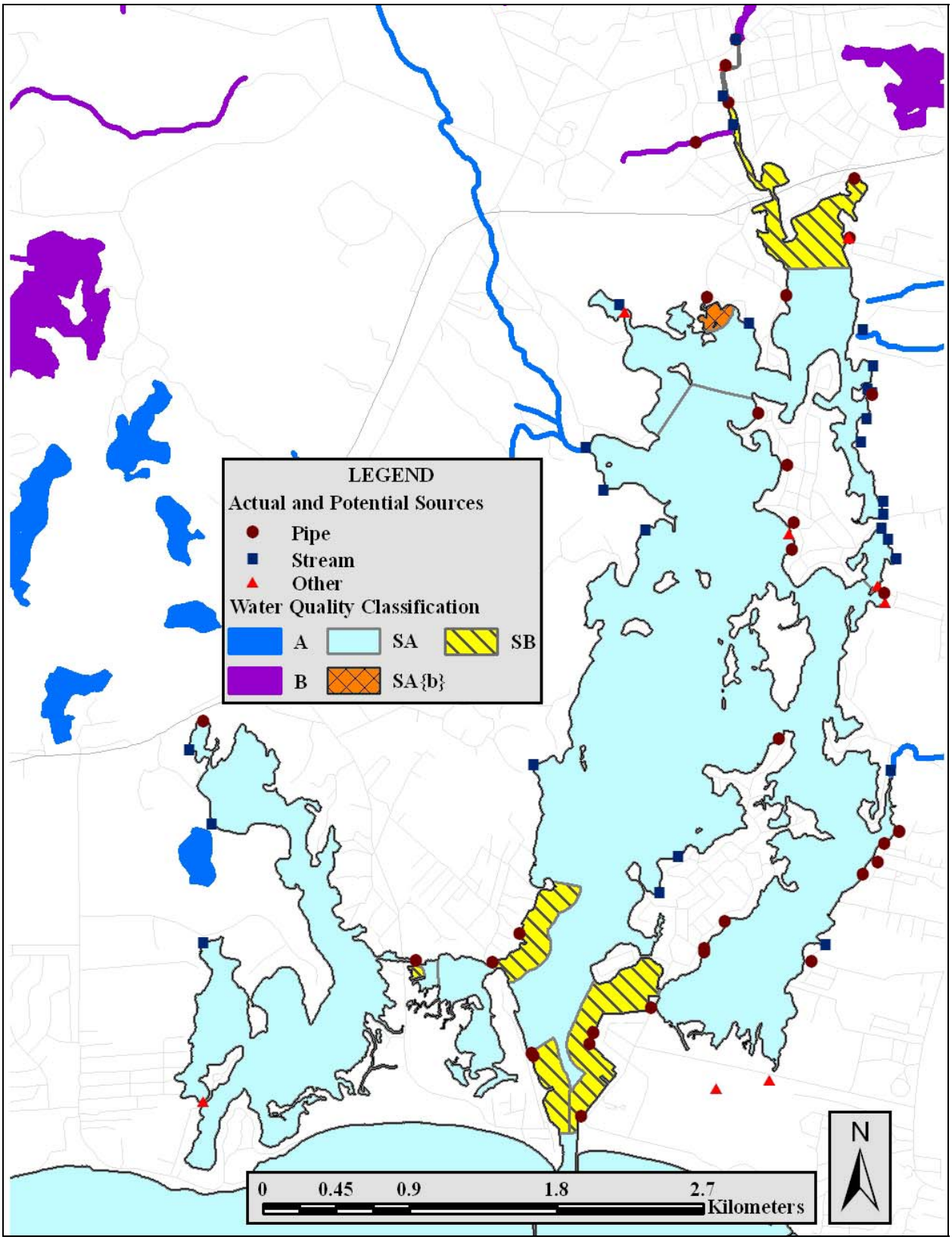

Figure 3.3 – Shoreline Survey Sources

Lower Saugatucket River
In the Lower Saugatucket River, RIDEM has identified three storm drains and one stormwater swale between the Main Street Dam and the Mews Tavern parking lot, labeled as sources 45 through 48. One of the storm drains was found to discharge during dry weather conditions. Samples ranged from 9 fc/100 mL to 460 fc/100 mL, both measured at source 46. The remaining two pipes and one swale do not discharge during dry weather. Due to the relatively low results, the sources between the Main Street Dam and the Mews are not expected to be substantial contributors of contaminants to the river.

There are six sources between the Mews Tavern and the Saugatucket River's outlet to Point Judith Pond. A groundwater seep (source 75) just downstream from the Mews had low concentrations. Source 78 is a pipe that drains Johnson Place, an adjacent street. While it was not flowing during dry weather, excessive sedimentation at its discharge indicates that it receives significant amount of wet weather flow. Field visits and discussions with neighbors indicate that this storm drain was reconstructed recently to address flooding issues along Johnson Place. A small stream identified as source 44 and located just north of the Silver Lake Avenue Bridge had fecal coliform concentrations of 4600 fc/100 mL, though it had a minimal flow and there was no stream-channel evidence indicating larger flows. It appears to drain a small wetland. A pipe (Source 43) discharges during dry weather near the Silver Lake Avenue Bridge. Fecal coliform results have been low, with a maximum concentration of 150 fc/100 mL. Source 77 is an intermittent stream that appears to enter the Saugatucket River just south of Silver Lake Avenue. This stream flows through a small cattle farm before passing through a culvert (source 71) under Pond Street. Livestock at the farm have been observed in close proximity to the water. RIDEM sampled the stream's outlet to the Saugatucket River, which resulted in a fecal coliform concentration of 430 fc/100 mL measured at source 77. Though this value is not exceedingly high, given observations of cattle in the ponded area, this stream is considered a potential substantial contributor of pathogens.

Mouth of Saugatucket River and Upper Point Judith Pond
Three sources were identified in the vicinity of the mouth of the Saugatucket River, two pipes and a small emu farm. One pipe (source 52) is very large with substantial flow discharging from it during wet and dry weather. Although it runs under Route 1, the highway does not drain into this pipe. The pipe appears to drain either Silver Lake or a large wetland complex to the north of Route 1. The source was sampled twice, with results differing between 3 fc/100 mL and 93 fc/100 mL. The pipe's substantial flow and diameter merit periodic sampling even though the sampled results have been low.

A second pipe (source 65) was visited on two days and was not flowing either time. The emu farm is identified as source 66 and is a potential source of contamination, mainly due to its close proximity to the edge of Point Judith Pond. Several emus have been observed in the pen.

Twelve streams and two pipes discharge into the upper reaches of Point Judith Pond. Two pipes (sources 35 and 42) were found and observed to have no flow during dry weather and are not expected to impact Point Judith Pond. All the streams were sampled both during the 2002 Shoreline Survey and during the 2005-2006 TMDL program study. Results varied from 2 fc/100 mL to 1100 fc/100 mL at sources 32 and 50 respectively. The majority of the streams enter

Long Cove along the Narragansett side of the pond. Some residential development and a seasonal campground are present in the vicinity of the streams; specifically the streams identified as sources 50 and 51, located in the vicinity of the Long Cove Road, and the Sunnybrook Farm Road and Wandsworth Street neighborhoods in Narragansett. Results from these streams were as high as 1100 fc/100 mL at source 50. While they are not expected to be substantial contributors of pollution due to their small flows, they should be investigated, especially under wet weather conditions when their flow would be expected to increase substantially. The remaining sources are unlikely to cause a large impact on Point Judith Pond.

Several streams drain into upper Point Judith Pond from the South Kingstown side on the west. While results are as high as 930 fc/100 mL (source 36) with trickle flow for a stream entering just outside Billington Cove, these streams drain areas of minimal development and are not expected to be significant sources of pollution. Streams should still be investigated under wet weather conditions due expected increased flows.

Billington Cove

A single source to Billington Cove has been identified. A pipe identified as source 53, which drains a salt marsh, was sampled twice, once in 2002 and again in 2005. Both samples produced results of 240 fc/100 mL. As the source drains a salt marsh, which borders an area with little development, it is unlikely that human impacts are causing bacteria contamination. This source does not appear to be a substantial contributor of pollution to the pond, nor a controllable source

Champlin Cove

In lower Champlin Cove, RIDEM has identified a storm drain (source 28) that drains the lower portion of the Briggs Farm neighborhood. This outfall is currently equipped with a Vortechs swirl separator to help with sediment removal. In addition, two seeps were identified as sources 5 and 27, only one of which was flowing during dry weather (source 27). Two samples from the flowing seep produced results of 9 fc/100 mL and 240 fc/100 mL. As the source had little flow and relatively low fecal coliform results, this source is not expected to be a major contributor of contamination.

Three streams discharge into upper Champlin Cove. The streams flow through a wetland area prior to entering the pond. Source 6 had fecal coliform numbers of 240 fc/100 mL as measured in both 2002 and 2006. Its flow, 3.0 cubic feet per second in 2002, was one of the larger flows into Point Judith Pond, resulting in one of the highest loads that year. Sources 7 and 8 had little to no flow when measured in 2002 and results of 93 and 43 fc/100 mL as measured in 2006. Since source 7 has not shown elevated fecal coliform levels during sampling events, it was concluded that Sunset Farm was not a significant source to this stream. However, the potential exists that it could under certain high groundwater and/or wet weather conditions. Source 8 is not expected to be substantial contributors of bacteria to the pond.

Sunset Farm, which borders Champlin Cover to the east, contributes to both sources 6 and 7. Although a stream originating in Sunset Farm does not have a direct channel to Point Judith Pond, it may have a direct hydrologic connection at intermittent times during periods of high groundwater and/or extremely wet weather conditions. During these times, runoff flows overland through a wetlands complex before being collected in the stream that discharges as

source 6. Meanwhile, a small stream crosses the Briggs Farm development, which picks up stormwater from the development during rainfall events, eventually discharging to Point Judith Pond through the same source 6. Therefore source 6 represents runoff from both the Briggs Farm neighborhood and a portion of Sunset Farm during certain conditions. Due to the flow and fecal coliform numbers, as well as the direct source of stormwater from the neighborhood, this source is expected to be a substantial contributor of stormwater contamination to Champlin Cove.

RIDEM has concluded that the main source of fecal coliform to source 6 originates from the stream branch that bisects the Briggs Farm development. This stream collects stormwater from impervious areas of the neighborhood which runs into the stream even during small storm events, while runoff from the Sunset Farm branch is generated only during extremely wet times and must flow overland rather than through a defined channel.

Wastewater Disposal

Sources of domestic wastes that may convey fecal coliform bacteria to Point Judith Pond include dry wells, cesspools, and Onsite Wastewater Treatment Systems (OWTS). The method of transport of pollutants is normally through the groundwater, either to the pond itself or to a tributary that ultimately drains to Point Judith Pond. Although less common, fecal coliform bacteria can also be transported via surface seepage or by illegal pipes.

In the Point Judith Pond watershed, many houses relying on OWTS for sewage disposal were originally constructed as summer cottages that have since been converted to year-round residences. Many of these OWTS were installed prior to the promulgation of state construction standards in 1969 or the implementation of more rigorous standards in the early 1980s. Before the adoption of state regulations and standards, commercial and domestic wastewater was discharged through a variety of methods ranging from improvised systems to dry wells and cesspools. These older systems are frequently sited on undersized lots, lack adequately sized leach fields, are in direct contact with the groundwater table, or are used at levels which exceed the original design capacity. In addition, many seasonally used residences have OWTS, which are overloaded and must be frequently pumped out due to continuous and heavy use during the summer months. As a result, these systems do not adequately treat sewage nor meet current state standards. According to the Salt Pond Region Special Area Management Plan (SAMP) (1999), failing and sub-standard OWTS and resultant contaminated runoff are the principal sources of bacterial contamination to the Salt Ponds Region (CRMC, 1999).

Many small vacant lots have “grandfathered” rights and may be buildable even though they do not meet current zoning standards. These lots are located in areas that are already densely developed, and many have problem soils or inadequate room for drainfields. In 1998, Lucht et. al. estimated that twenty percent of all vacant lots in the South Kingstown portion of the watershed alone are substandard.

Sewers in South Kingstown are generally limited to the Wakefield area at the northern boundary of Point Judith Pond. There is limited development along the western shore of Point Judith Pond, all of which is served by on-site systems, including the development along the Potter Pond

Channel. Numerous houses and businesses are present along the channel, which has been listed as impaired on the 2006 303(d) List. All areas surrounding Potter Pond are unsewered.

Sewer availability is varied in Narragansett. Numerous neighborhoods throughout the watershed such as Galilee, Sand Hill Cove Road, Durkin Drive, Palm Beach Road, Briggs Farm, and Wandsworth Road are fully sewered. It is Narragansett town policy to require all residents located within a sewered area to connect to the sewer system and abandon any on-site systems within one year. Harbour Island and Great Island do not have municipal sewers.

South Kingstown enacted a town-wide wastewater management district in 1999, which requires OWTS-owners to inspect OWTS systems to ensure their maintenance and to replace cesspools. Cesspools discovered via the inspection program are to be upgraded within 5 years of the date of the First Maintenance Inspection or within 12 months of the sale of a property, whichever comes first. South Kingstown zoning also contains more stringent setbacks from natural features than the current state requirements. The goal of the program is to decrease the amount of ground and surface water contamination from OWTS that do not function properly. Almost 50 percent of the unsewered, residentially zoned land under two acres in South Kingstown has constraints relative to the proper functioning of OWTS. In 1990, according to the Facilities Element of the Comprehensive Plan sixty percent of South Kingstown residents relied on OWTS. The percentage of OWTS users relative to sewer users will continue to increase due to a limited town-wide sewer expansion plan and the location of potentially developable land outside sewer-service areas. In 2000, South Kingstown estimated that there were 5,973 OWTS. Based on a record of which houses were constructed prior to 1970, approximately 2,360 systems or 39.5 percent predate OWTS regulations, although some of these of systems have been upgraded over the years.

South Kingstown sent RIDEM partial results of the inspection program as of June 2007. Results were limited to the approximate boundaries of the Point Judith Pond West sub-watershed. The majority of systems, 1250, passed inspection with only thirty-two failures. In addition, 210 cesspools were found; seventeen of these failed inspection (South Kingstown, 2007). Properties abutting the saltwater Saugatucket River have sewers available.

Narragansett has an approved onsite wastewater management plan (OWMP) but does not have an onsite wastewater management district. A zoning ordinance sets more stringent standards than the state regulations for septic system siting. In 1992, Narragansett adopted an ordinance that requires every owner of an OWTS to have their system pumped at least once every four years. Proof of pumping in the form of a receipt from an OWTS pumping company must be forwarded to the town engineering office.

Other Bacteria Sources

Animals

Other bacteria sources to Point Judith Pond include waterfowl, wildlife, farm animals, and domestic pets. Waterfowl are known to gather along the shore and in the waters of the ponds.

The RIDEM Division of Fish and Wildlife conducts annual waterfowl counts in Point Judith Pond and Potter Pond. These aerial, one-day snapshots are conducted in January when the

largest number of waterfowl species is present in the ponds. The number of waterfowl is expected to drop in spring and summer when only the resident waterfowl are present in the Ponds. Data taken over 8 days from the last seven years shows a wide range in the number of waterfowl present. In Point Judith Pond, the number ranged from 151 to 500 waterfowl with an average count of 325 waterfowl. In Potter Pond, the number ranged from 50 to 439 waterfowl with an average count of 184 waterfowl. The most prevalent species were American Black Duck and Canada Goose. Other waterfowl species prevalent during the surveys included Bufflehead, Mallard, Merganser, Mute Swan, and Red-Breasted Merganser (Osenkowski, 2007). While Point Judith Pond is generally not considered a concentrator of waterfowl populations (including Canada Geese) as compared with other waterbodies in the state, the pond is a major molting area for swan in August (Osenkowski, 2008). Waterfowl may contribute to elevated bacteria concentrations and possibly water quality violations within the pond.

Two farms are situated adjacent to Point Judith Pond. Sunset Farm, located on Point Judith Road in Narragansett is within the Champlin Cove subwatershed. The farm's 200 acres are home to on average 70 beef cattle, 3 horses, 70 pigs and 200 chickens a year. These animals do not have direct access to Point Judith Pond. There are however, intermittent streams that lead from both an on-site compost pile and a small pond at the rear of the site to Point Judith Pond. These streams flow during rain events and meander through several wetlands prior to discharging into Champlin Cove (per comments received from the Southern RI Conservation District on behalf of the Town of Narragansett). The second farm, a small emu farm with four emus, is located on the western side of Gull Road adjacent to the Upper Pond. The emus are in a pen and do not have direct access to Point Judith Pond. No streams were found in the immediate vicinity of either farm that could convey feces to the pond.

A third farm is located along Pond Street in Wakefield, adjacent to the tidal Saugatucket River and has a small stream that flows through the property during wet weather. Livestock has been observed in close proximity to this ponded stream, which ultimately flows to the Saugatucket River.

Given considerable residential areas (approximately 8,400 acres) draining to the ponds, pet waste is expected to be a significant source of bacteria carried in stormwater. One gram of dog waste contains 23 million fecal coliform bacteria, almost twice as much as human waste (Pacific Shellfish Institute, 2006). Additionally, over 13,000 acres of forests and brushlands are present in the watershed. This undeveloped land is home to wildlife, which is also expected to be a source of bacteria to the ponds, especially where drainage structures intercept runoff from these areas and provide direct delivery to the pond.

Boats

On August 18, 1998, EPA designated Rhode Island's marine waters as a *Federal No Discharge* Area. Boats with installed toilets must have an operable Coast Guard approved marine sanitation device (MSD) designed to hold sewage for pump-out or for discharge in the ocean beyond the three-mile limit. Eleven recreational boat marinas are located in Point Judith Pond and two are located in the Potter Pond connector channel. Two of the thirteen marinas contain pump-out facilities to provide sewage disposal for larger vessels moored within the ponds. Most areas immediately surrounding the recreational boat marinas located in Class SB waters are

permanently closed to shellfishing. One marina is in Class SA{b} waters. Two marinas in the northern portion of Point Judith Pond are located in impaired waters.

Individual Non-stormwater RIPDES Permits
The Rhode Island Pollution Discharge Elimination System Program (RIPDES) is responsible for permitting industrial and municipal waste discharges to all Rhode Island waters. The RIPDES Program has three permitted industrial permits for Growing Area 10, all located at the Port of Galilee in Class SB waters. The permitted dischargers are related to fish transport flumes that are used to transport fish from boats to packaging plants. These activities do not normally contain high bacteria levels and they are located within an area that meets water quality standards. There are no municipal waste discharges to Point Judith Pond waters.

3.4 Natural Background Conditions

Natural background concentrations are those that would exist in the area in the absence of human-induced sources. The natural background concentrations could not be resolved independently for this TMDL.

3.5 Water Quality Impairments

Consistent with the current prohibited and conditionally approved shellfish harvesting restrictions established by Rhode Island's Shellfish Program, data analyses for this TMDL found that the highest bacteria concentrations can be seen in the northern portions of Point Judith Pond nearest the Saugatucket River. The tidal portions of the Saugatucket River and the upper reaches of Point Judith Pond exceed water quality standards. While most segments of Point Judith Pond furthest downstream of the Saugatucket River meet water quality standards, Champlin Cove consistently violates water quality standards.

4.0 TMDL ANALYSIS

As described in EPA guidelines, a TMDL identifies the pollutant loading that a waterbody can assimilate per unit of time without violating water quality standards (40 C.F.R. 130.2). The TMDL is often defined as the sum of loads allocated to point sources (i.e. waste load allocation, WLA), loads allotted to nonpoint sources, including natural background sources (i.e. load allocation, LA), and a margin of safety (MOS). The loadings are required to be expressed as mass per time, toxicity, or other appropriate measures (40 C.F.R. 130.2[I]).

4.1 Establishing the Numeric Water Quality Target

Margin of Safety (MOS)

The TMDL must contain a margin of safety (MOS) to account for uncertainty in the analysis. The use of an explicit margin of safety provides a conservative estimate of reductions needed. An explicit margin of safety equal to an additional five percent of the calculated percent reduction was assumed to conservatively account for possible uncertainties in the analysis. Examination of Table 4.2 reveals that with this 5% MOS is applied, waterbody ID RI0010043E-06B (Mouth of the Saugatucket River) would need over 100% reduction in fecal coliform bacteria concentrations to meet water quality criteria and support designated uses. However, RIDEM believes that pollution reductions between 90 to 100 percent should be adequate to achieve water quality standards; RIDEM will conduct follow-up monitoring to assess compliance with water quality standards

Seasonal Variation/Critical Conditions

Water quality data shows that while fecal coliform violations in the ponds occur in all seasons, bacteria levels are at their highest during the summer months and directly following wet weather events. This allocations and reductions in this TMDL plan are protective because data from critical conditions is adequately represented.

Numeric Water Quality Targets

The numeric water quality targets will be set to the applicable water quality criteria or standard for each segment of Point Judith Pond and Potter Pond. Segment boundaries and water quality standards are described in Section 1.1. In some areas, a waterbody segment with higher allowable limits of fecal coliform bacteria discharges to a waterbody with more stringent criteria. In these places, the numeric water quality target must be the more strict criteria at the station nearest the boundary with the higher water quality standard. Targets are set such that Point Judith Pond can meet designated uses.

4.2 Establishing the Allowable Loading (TMDL)

EPA guidelines specify that a TMDL identify the pollutant loading that a waterbody can assimilate per unit time without violating water quality standards, with loads expressed as mass per time, toxicity, or any other appropriate measure (40 CFR§130.2). In this TMDL, the allowable load or loading capacity is expressed as concentrations set equal to the applicable water quality standard. Concentration is considered to apply daily because daily values are used

to calculate the geometric means and percent variability. The allowable daily load is the criterion concentration multiplied by the flow in the receiving water. For the purposes of implementation and the reasons expressed below, it is recommended that the concentration and percent reduction bacteria TMDL targets be used.

- Expressing bacteria TMDL reductions in terms of concentration provides a direct link between existing water quality and the numeric water quality criteria.
- Using concentration to set TMDL reductions is more relevant and consistent with water quality standards, which apply for a range of flow and environmental conditions.
- Expressing bacteria TMDL reductions as daily loads can be more confusing to the public and can be more difficult to interpret since they are dependent on flow conditions.

Extensive field surveys, water quality monitoring, and a review of aerial and topographic maps were used to establish the link between pollutant sources and instream concentrations. As a first step in determining allowable loads and percent reductions, RIDEM separated the surface waters in the study area into segments based on waterbody identification numbers. Table 4.1 lists the stations grouped in each segment. Figure 3.1 and Figure 3.2 show the locations of the shellfish program and other stations. Station data and descriptions may be found in Appendices A and B.

Table 4.1 – Stations within Each Pond Segment

Waterbody ID	Waterbody Description	Stations Used to Characterize Water Quality Conditions
RI0010045R-05C	Saugatucket River	SR-06D; 49; SR-1, 0
RI0010043E-06B	Mouth of the Saugatucket River	GA10-1
RI0010043E-06C	Upper Point Judith Pond	GA10-2, 3, 5, 7[1]
RI0010043E-06D	Billington Cove	[2]
RI0010043E-06A	Middle and Lower Point Judith Pond	GA10-10, 11, 12, 15, 16, 16a, 17
RI0010043E-06K	Point Judith Pond, Champlin Cove	PJ-15, 16
RI0010043E-06E	Point Judith, Bluff Hill Cove	GA10-19
RI0010043E-06G	Point Judith, Snug Harbor	GA10-20
RI0010043E-06F	Point Judith Pond Breachway	GA10-21
9999	Harbor of Refuge	GA10-22
RI0010043E-06H	Potter Pond Channel	GA10-23
RI0010043E-05	Potter Pond	GA10-24, 27, 28, 29, 30, 31

[1] Station GA10-7 is on the line between waterbody ID RI0010043E-06A and RI0010043E-06C. It has been placed in the latter for assessment purposes.
[2] Billington Cove has no in-stream stations located within the waterbody. Waterbody segment RI0010043E-06C was used to evaluate water quality conditions.

The reduction goal for each segment was determined by comparing current fecal coliform concentrations to the applicable water quality targets (geometric mean and 90th percentile values). The percent reductions required to reach each portion of the target were then calculated. The higher percent reduction resulting from evaluation of the shellfish data against both the geometric mean and 90th percentile criteria was used to set each segment's necessary reduction. The geometric mean values were calculated using the GEOMEAN function in Microsoft Excel while 90th percentile values were calculated using the PERCENTILE function.

4.3 Required Reductions

EPA guidance requires that load allocations be assigned to either point (wasteload) or nonpoint (load) sources. As is the case for most bacteria impairments, insufficient data existed to accurately differentiate between point (stormwater discharges regulated under RIPDES stormwater permitting program) and nonpoint sources of bacteria. Therefore, as recommended by EPA Region 1, all bacteria source reductions for this TMDL are combined into the wasteload allocation.

However in implementing this TMDL both point and nonpoint controls will be necessary to meet the plan's water quality targets. To guide TMDL implementation, RIDEM evaluated the Point Judith watershed land use and pollution source data. The required fecal coliform reductions for the Saugatucket River, Point Judith Pond, and Champlin Cove are presented in Table 4.2. They are calculated from observed concentrations at instream shellfish, TMDL, and/or Salt Pond Coalition stations. These values were then compared to the applicable portion of the water quality standard. The station having the largest violation relative to the state's fecal coliform standard was used to calculate the percent reduction for the segment containing that station and is shown in bold in Table 4.2. The required reduction for each segment is the higher of the two reductions (geometric mean versus 90^{th} percentile value).

For the Class SB waters in the vicinity of station GA10-1, the water quality standard for the station was set to the Class SA standards in order to ensure water quality at station GA10-2 was maintained. As shown in Table 4.2, the required percent reductions are highest for the northern reaches of Point Judith Pond and the lower Saugatucket River.

Table 4.2 – Geometric Means and 90th Percentile Values[1]

Station	Segment ID	Location	WQ Class	Geometric Mean (fc/100 mL)		Percentile (fc/100 mL)		Percent Reduction
				Target	2002-2006	Target	2002-2006	
SR06-D	RI0010045R-05C	Saugatucket River	SB	50	**581.7***	400	**4000**	(91.4%)[5] **96.4%**
49		Saugatucket River	SB	50	**112.4**	400	**887**	
SR-1		Saugatucket River	SB	50	**334.2**	400	**1600**	
SR-0		Saugatucket River	SB	50	**290.1**	400	**1328**	
GA10-1	RI0010043E-06B	Point Judith Pond	SB[2]	14	**93.9**	49	**1100***	(95.5%)[5] **>100%**
GA10-2	RI0010043E-06C	Point Judith Pond	SA	14	**63.9**	49	**507**	(90.3%)[5] **95.3%**
GA10-3		Point Judith Pond	SA	14	**32.3**	49	**309**	
GA10-5		Point Judith Pond	SA	14	**19.4**	49	**240**	
GA10-7[3]		Point Judith Pond	SA	14	12.8	49	**240**	
GA10-5	RI0010043E-06D	Billington Cove	SA{b}	14		49		(90.3%)[4,5] **95.3%**
GA10-10	RI0010043E-06A	Point Judith Pond	SA	14	6.5	49	43	N/A
GA10-11		Point Judith Pond	SA	14	6.5	49	48	
GA10-12		Point Judith Pond	SA	14	5.9	49	25	
GA10-15		Point Judith Pond	SA	14	5.9	49	25	
GA10-16		Point Judith Pond	SA	14	5.1	49	25	
GA10-16a		Point Judith Pond	SA	14	7.9	49	43	
GA10-17		Point Judith Pond	SA	14	5.4	49	25	
PJ-15	RI0010043E-06K	Champlin Cove	SA	14	**22.2**	49	**130***	(62.3%)[5] **67.3%**
PJ-16		Champlin Cove	SA	14	**18.0**	49	**130***	
GA10-19	RI0010043E-06E	Point Judith Pond	SB	50	6.5	400	25	N/A
GA10-20	RI0010043E-06G	Point Judith Pond	SB	50	4.6	400	25	N/A
GA10-21	RI0010043E-06F	Point Judith Pond	SB	50	6.4	400	25	N/A
GA10-22	9999	Harbor of Refuge	SA	14	3.3	49	10	N/A
GA10-23	RI0010043E-06H	Potter Channel	SA	14	6.0	49	23	N/A
GA10-24	RI0010043E-05	Potter Pond	SA	14	4.0	49	16	N/A
GA10-27		Potter Pond	SA	14	3.7	49	16	
GA10-28		Potter Pond	SA	14	3.7	49	12	
GA10-29		Potter Pond	SA	14	3.0	49	8	
GA10-30		Potter Pond	SA	14	4.1	49	23	
GA10-31		Potter Pond	SA	14	5.0	49	23	

[1] Results denoted with a * show that data for that station was used to set the reduction for the segment. [2] This station is located on the Class SA line and needs to meet Class SA standards.

[3] Station GA10-7 is on the line between waterbody ID RI0010043E-06A and RI0010043E-06C. It has been placed in the latter for assessment purposes.

[4] Waterbody ID RI0010043E-06D, Billington Cove has no in-stream stations associated with it, however since it is entirely surrounded by waterbody RI0010043E-06C, reductions have been set equal for both segments. Station GA10-5 is the closest instream station.

[5] An additional margin of safety of 5% has been added to these segments. The actual percent reduction is shown in parentheses. The modified percent reduction is shown in bold.

4.4 Strengths and Weaknesses in the Analytical Approach

Strengths

- The TMDL incorporates the findings of several studies and utilizes data collected over several years. In addition, extensive knowledge of land use and potential bacteria sources in the watershed was available.
- The area has been sampled by a number of programs. The Rhode Island Shellfish Program samples the area six times a year and conducts routine shoreline surveys, including a twelve-year shoreline survey in 2002 and a three-year shoreline survey in 2005. The Salt Ponds Coalition conduct summer sampling in areas that are not sampled by the Rhode Island Shellfish Program.
- The TMDL endpoints presented in the load allocation sections allow water quality standards to be met at all times.
- The phased approach allows an emphasis on mitigation strategies rather than on modeling and more complex monitoring issues to keep the focus on abating sources.

Weaknesses

- The relative significance of identified outfalls during wet weather is not fully known because shoreline surveys were completed during dry weather.
- Studies were not conducted to identify specific forms of fecal contamination from wildlife and/or humans. It is difficult to separate pollution caused by human sources such as failed OWTS systems from natural causes.

5.0 IMPLEMENTATION

Eliminating the bacterial impairments of Point Judith Pond and its watershed requires a reduction in both wet and dry weather inputs. Several segments of Point Judith Pond violate water quality standards. High bacteria concentrations originate from within the Point Judith Pond watershed and for the upper pond can be traced to the Saugatucket River.

Harvesting shellfish is prohibited in the northern reaches of Point Judith Pond, Champlin Cove, as well as the Potter Pond channel. With the exception of Potter Pond Channel, bacteria concentrations at these locations are consistently high with bacteria concentrations violating standards both historically and more recently during nearly all weather conditions. The stations with the lowest bacteria concentrations are located furthest from the Saugatucket River indicating that bacteria sources from within the watershed cause the impairments.

Recommended implementation activities for Point Judith Pond are detailed in the following sections. Implementation activities focus on stormwater and wastewater management. During wet weather, stormwater contains high bacteria concentrations that lead to violations in water quality standards. Achieving standards requires that both the amount of stormwater and the bacteria concentrations in that stormwater reaching Point Judith Pond are reduced. Wastewater management activities include continuing the extension of sewer lines, connecting homes to the sewer system, adopting wastewater management ordinances in areas without sewers to ensure that septic systems are properly maintained and operated, and ensuring that boaters fully utilize pump-out facilities. Other recommendations include minimizing fecal contamination from domestic animals, farm animals, waterfowl, and wildlife.

5.1 Stormwater from Municipal Separate Storm Sewer Systems

Phase II – Six Minimum Measures

While other wet weather sources of bacteria exist, the volume of stormwater generated by impervious areas within the basin suggests that it is the major source of wet weather impairments. Significant stormwater is generated in highly developed areas located primarily in the Saugatucket River watershed, such as downtown Wakefield.

The Town of South Kingstown, the Town of Narragansett, and the Rhode Island Department of Transportation (RIDOT) operate small Municipal Separate Storm Sewer Systems (MS4s) that discharge to the surface waters of Point Judith Pond and its tributaries. These entities have applied for and obtained coverage under the RIPDES General Permit and have developed and submitted the required Storm Water Management Program Plans (SWMPPs). The plans contain implementation schedules that include interim milestones, frequency of activities, and reporting of results. The SWMPPs describe BMPs for six minimum measures and include measurable goals and schedules for each measure:

- A public education and outreach program to inform the public about the impacts of stormwater on surface water bodies.
- A public involvement/participation program.
- An illicit discharge detection and elimination program.

- A construction site stormwater runoff control program for sites disturbing 1 or more acres.
- A post construction stormwater runoff control program for new development and redevelopment sites disturbing 1 or more acres.
- A municipal pollution prevention/good housekeeping operation and maintenance program.

RIDEM encourages cooperation between operators of regulated MS4s (including RIDOT) in developing and implementing the six minimum measures and in determining suitable locations for the construction of Best Management Practices. Communities affected by the Phase II program are encouraged to cooperate on any portion of, or an entire minimum measure when developing and implementing their stormwater programs.

Post-Construction Provisions
Post-construction stormwater management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly affect receiving waterbodies. To meet the requirements of the Phase II minimum control measure relating to Post Construction Runoff Control, the operator of a regulated small MS4 will need to at a minimum:

- Develop and implement strategies, which include a combination of structural and/or nonstructural BMPs.
- Develop an ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls to the extent allowable under State or local law.
- Ensure adequate long-term operation and maintenance of controls.
- Develop and implement strategies to reduce runoff volumes.
- Determine appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

Required Amendments to Phase II Stormwater Management Program Plans
Part IV.D of the General Permit states that the operator must address the TMDL provisions in the SWMPP if a TMDL has been approved for any waterbody into which stormwater discharges from the MS4 contribute directly or indirectly the pollutants(s) of concern (Part II.C3). Upon approval of this TMDL, the RIDOT, South Kingstown, and Narragansett will be required to submit SWMPP amendments addressing the TMDL provisions within one hundred and eighty (180) days of the date of written notice from RIDEM (Rule 31 (f)(8)(iii)). More detail is provided below.

The SWMPPs must be revised to describe the six minimum measures and other additional controls that have been or will be implemented to address the TMDL provisions, including those discussed below. The MS4 operators must provide measurable goals for the development and/or implementation of the six minimum measures and for additional structural and non-structural BMPs that will be necessary to address the stormwater control provisions identified in this TMDL. Requirements include an implementation schedule, which must contain all major milestone deadlines, including start and finish calendar dates, estimated costs, proposed or actual funding sources, and anticipated improvement(s) to water quality. These requirements apply to any operators of MS4s contributing stormwater to specifically identified outfalls, regardless of

outfall ownership. If structural BMPs are not recommended, the operator must evaluate whether the six minimum measures alone (including any revisions to ordinances) are sufficient to meet the TMDL plans specified pollutant reduction targets. The revised SWMPP must specifically address the following:

1. Determine the land areas contributing to the discharges identified in TMDL using sub-watershed boundaries as determined from USGS topographic maps or other appropriate means.
2. Address all contributing areas and the impacts identified by the Department.
3. Assess the six minimum control measure BMPs and additional controls currently being implemented or that will be implemented in the SWMPP to address the TMDL provisions and Pollutants of Concern (POCs) and describe the rationale for the selection of controls including the location of the discharge(s), receiving waters, water quality classification, shellfish growing waters, and other relevant information.
4. Identify and provide tabular description of the discharges identified in the TMDL including:
    a. Location of discharge (latitude/longitude and street or other landmark.
    b. Size and type of conveyance (e.g. 15" diameter concrete pipe).
    c. Existing discharge data (flow data and water quality monitoring data).
    d. Impairment of concern and any suspected sources(s).
    e. Interconnections with other MS4s within the system.
    f. TMDL provisions specific to the discharge.
    g. BMP(s) that have or will be implemented to address TMDL provisions.
    h. Schedule for construction of structural BMPs including those for which a Scope of Work is to be prepared, as described below.

Post-Construction Provisions

Among the six minimum measures described earlier is the requirement for operators to establish post construction stormwater runoff control programs for new land development and redevelopment sites disturbing one or more acres. It is imperative that land development and re-development projects utilize best management practices if Point Judith Pond is to be successfully restored. To ensure consistency with the goals and recommendations of the TMDL, the revised SWMPP must also address revisions to the local ordinances to ensure that:

- New land development projects to employ stormwater controls to prevent any net increase in bacteria pollution to the waterbodies in the Saugatucket River and Point Judith Pond watersheds.
- Redevelopment projects to employ stormwater controls to reduce bacteria pollution to the waterbodies in the Saugatucket River and Point Judith Pond watersheds to the maximum extent feasible.

Site Specific Structural BMP Requirements

Since this TMDL has determined that structural BMPs are necessary, all operators of MS4s identified below must prepare and submit a Scope of Work describing the process and the rationale that will be used to select BMPs and measurable goals to ensure that the TMDL provisions will be met. The Scope of Work must be accompanied with a schedule prioritizing outfalls for the construction of structural stormwater BMPs. A targeted approach to construction

of stormwater retrofit best management practices (BMPs) at state and locally owned stormwater outfalls is recommended.

Specific Outfalls or Discharges
For those operators for which specific outfalls or discharges are identified in the TMDL, the Scope of Work must:

1. Describe the tasks necessary to design and construct BMPs that reduce bacteria loads and stormwater volumes to the maximum extent feasible including:
    a. Delineation of the drainage or catchment area.
    b. Determination of interconnections within the system and the approximate percentage of contributing area served by each operator's drainage system, as well as a description of efforts to cooperate with owners of the interconnected system.
    c. Completion of catchment area feasibility analyses to determine drainage flow patterns (surface runoff and pipe connectivity), groundwater recharge potentials(s), upland and end-of-pipe locations suitable for siting BMPs throughout the catchment area, appropriate structural BMPs that address bacteria, any environmental (severe slopes, soils, infiltration rates, depth to groundwater, wetlands or other sensitive resources, bedrock) and other siting (e.g. utilities, water supply wells, etc.) constraints, permitting requirements or restrictions, potential costs, preliminary and final engineering requirements.
2. Establish a schedule to identify and assess all remaining discharges not identified in the TMDL (owned by the operator) contributing to the impaired waters addressed by the TMDL, to delineate the drainage or catchment areas to these discharges, and as needed to address water quality impairments, to design and construct structural BMPS. To determine the prioritization for BMP construction, the assessment of identified discharges shall determine the relative contribution of bacteria, taking into consideration pollutant loads (i.e. concentrations and flows) as indicated by drainage area, pipe size, land use, known hot spots and/or sampling data.

MS4-Specific Requirements

In addition to end-of pipe BMPs, either on the surface or underground, all MS4s should examine Low Impact Development (LID) techniques and upland attenuation options that may be feasible for identified areas. LID is discussed in Section 5.6.

South Kingstown
The Saugatucket River TMDL identified numerous outfalls that should be prioritized for BMP construction. The Town should begin work on these drainage systems to reduce/treat stormwater discharges to the river. The following stormwater drainage systems/outfalls are located in South Kingstown:

- Outfall off Greenwood Drive
- Stormwater swale on Kingstown Road below Rocky Brook Reservoir (RIDOT owned outfall)
- Outfall at Kingstown Road at Kingston Pizza (formerly Anton's Deli) (RIDOT owned outfall)
- Outfall at Railroad Street (RIDOT owned outfall)
- Outfall at Route 108, School Street and Indian Run Road (RIDOT owned outfall)

- Outfall at Church Street and Columbia Street

As noted previously, TMDL provisions apply to any MS4 operators contributing stormwater to the identified outfall regardless of outfall ownership.

Narragansett
Narragansett should focus its efforts on the Briggs Farm and Wandsworth Road neighborhoods. In addition, Narragansett should take proactive steps to ensure that water quality in the areas surrounding Harbor Island and Great Island does not decline.

The stream labeled as Source 6 which receives runoff from the upper portions of the Briggs Farm neighborhood has been identified as a source of contamination to Champlin Cove. The drainage system contributing to this stream should be evaluated for possible BMP construction. Due to extensive wetlands in the area of the stream outfall and lack of a defined pipe, end-of-pipe BMP's are not an option. Narragansett should examine LID options and surface BMP's such as infiltration swales to reduce and/or treat stormwater runoff before it enters the stream.

A pipe identified as Source 65 at the end of Wandsworth Road has been identified as a source of contamination to the pond. This outfall receives stormwater runoff from a portion of the Wandsworth Road neighborhood and discharges directly to Point Judith Pond. Narragansett should evaluate the contributing area for possible BMP's. There is an adjacent parking area, which could be suitable for BMP installation.

Harbor Island and Great Island have numerous outfalls discharging to the waters of Point Judith Pond. Due to the densely developed nature of the islands, problem prevention methods, including LID techniques should be taken to reduce stormwater discharges to the pond.

RIDOT
The Saugatucket River TMDL identified numerous outfalls that should be prioritized for BMP construction. RIDOT should begin work on these drainage systems to reduce stormwater discharges to the river. The following stormwater drainage systems/outfalls are located in South Kingstown:

- Stormwater swale on Kingstown Road below Rocky Brook Reservoir
- Outfall at Kingstown Road at Kingston Pizza (formerly Anton's Deli)
- Outfall at Railroad Street
- Outfall at Route 108, School Street and Indian Run Road

5.2 Stormwater from Industrial Activities

Stormwater discharges from facilities that discharge "stormwater associated with industrial activity" are regulated under the statewide general RIPDES permit prescribed in Chapter 46-12, 42-17.1 and 42-35 of the General Laws of the State of Rhode Island. As mentioned previously, stormwater is a major source contributing to the bacteria and bacteria-related impairments to Point Judith Pond. Stormwater from industrial activities may be discharged to these waters directly or via MS4s and may contain bacteria concentrations that contribute to the impairments.

In accordance with Part I.B.3.j of the RIPDES Multi-Sector General Permit (MSGP), permittees are required to demonstrate that the stormwater discharges are consistent with the TMDL once the TMDL has been approved. Permittees will have 90 days from written notification by RIDEM to submit this documentation including revised SWPPPs to RIDEM.

The owner/operators of facilities currently authorized to discharge to Point Judith Pond are listed below:

- Lockwoods Marina (formerly Kenport Marina)
- Point Judith Marina, LLC
- Stone Cove Marina
- Silver Springs Marine, Inc.
- Ram Point Marina, Inc.

RIDEM is aware that there may be additional facilities that have regulated industrial activities and point source discharges that require authorization under the RIPDES MSGP. RIDEM will continue to work to ensure that all facilities that are required to apply for a multi-sector general permit have done so.

The SWPPP must identify the potential sources of pollution, including specifically the TMDL pollutant of concern (bacteria), which may reasonably be expected to affect the quality of stormwater discharges from the facility; and describe and ensure implementation of practices, which the permittee will use to reduce bacteria in stormwater discharges from the facility. The SWPPP must address all areas of the facility and describe existing and/or proposed BMPs that will be used and at minimum must include the following:

- Frequent sweeping of roads, parking lots and other impervious areas
- Effective management (storage and disposal) of solid waste and trash
- Regular inspection and cleaning of catch basins and other stormwater BMPs
- Other pollution prevention and stormwater BMPs as appropriate

Where structural BMPs are necessary, as stated in Part IV.F.7 of the permit, selection of BMPs should take into consideration:

1. The quantity and nature of the pollutants, and their potential to impact the water quality of receiving waters.
2. Opportunities to combine the dual purposes of water quality protection and local flood control benefits (including physical impacts of high flows on streams - e.g., bank erosion, impairment of aquatic habitat, etc.).
3. Opportunities to offset the impact of impervious areas of the facility on ground water recharge and base flows in local streams.

For existing facilities, the SWPPP must include a schedule specifying when each control will be implemented. Facilities that are not currently authorized will be required to demonstrate compliance with these requirements prior to authorization.

5.3 Wastewater Management

Inadequately treated wastewater from substandard and failed OWTS adds bacteria to waterbodies, contributing to water quality impairments. These sources can be mitigated through sewer extensions and tie-ins and, for those areas where sewers are not and will not be available, through replacement of sub-standard and/or failed systems. When extending new sewer lines, both Narragansett (Section 78-248. Use of public sewers required) and South Kingstown (Article II. Wastewater Management, Division 9. On-Site Wastewater Management Ordinance) require that all properties with access connect to the sewer line in a defined period of time with some exceptions.

A properly designed and operating OWTS does prevent bacterial pollution from impacting the surrounding surface and ground waters. Consistent with the Rhode Island's Coastal Nonpoint Pollution Control Program (1995), RIDEM recommends that communities adopt ordinances for those areas where sewers are not planned to establish enforceable mechanisms to ensure that existing OWTS are properly operated and maintained. As part of the wastewater management planning efforts, communities should keep detailed records of which properties are not connected to the municipal sewer system, identify sub-standard systems, and adopt a schedule for replacement of those systems.

As described in the Pollution Sources sections, South Kingstown enacted a wastewater management district in 1999. Cesspools and substandard OWTS in the Point Judith Pond watershed should be replaced by an onsite wastewater system which conforms with current state and local standards within 12 months after the sale of a property or within five years of the date of the First Maintenance (Baseline) Inspection, whichever date comes first. Failing cesspools and septic systems must be replaced immediately. Inspection results are discussed in the Pollution Source section.

The Wakamo Beach Cottages have been identified as a possible source of bacteria to the Potter Pond channel. This property contains at least fifty cottages and travel trailers. The property owner is currently locating and inspecting the wastewater disposal systems on the property. South Kingstown requested that the owner submit a remediation plan for the property. In April 2008, the town's conservation committee reviewed the submitted remediation plan and requested a number of revisions, including that the owner include the entire property in the plan.

Narragansett has an approved onsite wastewater management plan (OWMP) but does not have an onsite wastewater management district. In 1992, Narragansett adopted an ordinance that requires every OWTS owner to have their system pumped at least once every four years. Proof of pumping in the form of a receipt from an OWTS pumping company must be forwarded to the town engineering office. Residents that fail to provide proof of pumping face a summons to court, suspension and possible termination of wastewater service, and fines. Narragansett should adopt a policy governing substandard OWTS and cesspool replacement within a reasonable time frame. To provide more comprehensive protection of groundwater, the Town should work to enact a wastewater management district.

Statewide, cesspools that are failed are required to be replaced under the current onsite wastewater treatment regulations. In addition, new septic system rules effective January 1, 2008

will require the replacement of cesspools that serve commercial facilities or multifamily dwellings. The Rhode Island Cesspool Act of 2007 will take effect on June 1, 2008 and will require by January 1, 2013 the replacement of cesspools located within 200 feet of all shoreline features bordering tidal areas, such as Point Judith Pond and Potter Pond, within 200 feet of all public wells, and within 200 feet of a water body with an intake for a drinking water supply. Cesspools located in communities with comparable or more stringent replacement requirements are exempt from the new state law (RIDEM, 2007). Since, as mentioned previously, South Kingstown requires the replacement of all cesspools in town, the new law will only require a cesspool phase-out within 200 feet of shoreline features in the Narragansett portion of the watershed.

5.4 Waterfowl, Wildlife, and Domestic Pets

Past TMDL studies have shown that waterfowl, wildlife, and domestic pets contribute significantly to elevated bacteria concentrations in surface water. Pet waste left to decay on the sidewalk, or on grass near the street, may be washed into storm sewers by rain or melting snow and cause water quality impairments (MADEP, 2007).

Stormwater Phase II requirements include an educational program to inform the public about the impact of stormwater. Point Judith Pond communities' education and outreach programs should highlight the importance of picking up after pets and not feeding birds. Pet wastes should be disposed of away from Point Judith Pond and any stormwater system that discharges to the pond. South Kingstown and Narragansett should work with volunteers from the towns to map locations where pet waste is a significant and a 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 pet waste on water quality. This may include installing signage, providing pet waste receptacles or pet waste digester systems in high-use areas, and targeting educational and outreach programs in problem areas (RIDEM, 2006c). South Kingstown should continue the practice of providing pet waste bags and trash receptacles at Marina Park, and add pet waste bag receptacles at the Village Green in Peace Dale and other high use areas.

Towns and residents can take several measures to minimize bird-related impacts. They can allow tall, coarse vegetation to grow in areas along the shores of the Ponds 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 (RIDEM, 2004b). Fish and Wildlife Regulations, Part XIV Section 14.13 (2006) prohibits feeding wild waterfowl at any time in the state of Rhode Island (http://www.dem.ri.gov/pubs/regs/regs/fishwild/hunt0607.pdf). Educational programs should emphasize that feeding waterfowl, such as ducks, geese, and swans, contributes to water quality impairments in Point Judith Pond and can harm human health and the environment. Towns should ensure that mention of this regulation is included in their SWMPPs (RIDEM, 2006c).

In response to the dramatic rise in the population of non-native swans in the northeast, as of 2006, swans are no longer protected under federal wildlife regulations. The RIDEM Division of Fish and Wildlife has developed a management plan to control the state's swan population, which includes the routine monitoring of swan populations (a summer aerial survey to identify

swan nests and a fall productivity survey) as well as working to actively reduce the state's swan population from the currently estimated population of 1,000 to 300. Fish and Wildlife works with local municipalities to achieve this population goal and has initiated swan population control efforts in South County.

5.5 Farms

Several small farms are located in the Point Judith Pond watershed. A farm adjacent to Pond Street in South Kingstown allows cows to graze in the ponded area of an intermittent stream that discharges to the Saugatucket River. Their direct contact with the stream allows fecal coliform bacteria to enter the stream and ultimately end up in Point Judith Pond. Permanent fencing should be installed to prohibit cattle access to the wetland areas and thus, eliminate this intermittent discharge of bacteria to the pond.

The emu farm on the western side of Gull Road adjacent to the Upper Pond is a potential source of contamination to the ponds. Although the emus are in a pen and do not have direct access to Point Judith Pond, bacteria contamination can result as stormwater flows along the ground surface through the pen and into the pond. A natural vegetation buffer should be created between the emu pen and Point Judith Pond to allow vegetative uptake and/or filtering of runoff draining off the penned area. In addition, animal droppings should be cleaned up regularly and disposed of away from Point Judith Pond (RIDEM, 2002a).

Since the potential exists for Sunset Farm to contribute to elevated bacteria concentrations, it is recommended that Sunset Farm employ appropriate manure management practices to control runoff from manure piles on-site. Additionally, fencing should be installed to limit livestock access to the pond at the rear of the farm.

5.6 Marine Pump-out Facilities

Point Judith Pond is home to thirteen recreational boating marinas as well as the commercial fishing port of Galilee (RIDEM, 2002b). EPA has designated Rhode Island marine waters as a *Federal No Discharge Area*. Two pump-out facilities are available throughout the areas of Point Judith Pond and Potter Pond. In 2006, 9500 gallons of sewage was dumped at the Bellvue Yacht Center and 8687 gallons was dumped at the Ram Point Marina. Point View Marina has recently received a grant for a pump-out facility. These pump-out facilities should be maintained and operated to maximize boat usage.

RIDEM oversees the operation and maintenance of the pump-out infrastructure by participating in the Clean Vessel Act (CVA) program which provides money for the construction, repair, and replacement of pump-out facilities and by coordinating outreach and education programs. RIDEM encourages all marinas with boats having Marine Sanitation Devices (MSDs) to have pump-out facilities available. RIDEM also recommends the installation of restroom facilities at all marinas and boat ramps if none are currently available.

CRMC should make marine pump-out facilities a mandatory maintenance item as a condition of minimum standard for operation of a marine facility.

Enforcing Rhode Island's No Discharge designation is required by the Clean Water Act. State laws 46-1-2-39, 46-12-40, and 46-12-41 give authority to local harbormasters, local police, Coast Guard, and RIDEM conservation officers and employees to enforce *No Discharge* laws. Boarding boats and inspecting marine sanitation devices (MSD) by all empowered agencies are needed in Point Judith Pond as a follow-up to the last ten years of outreach and education. All agencies should develop a policy regarding the boarding of boats to inspect compliance with *No Discharge*.

5.7 Future Development

The Point Judith Pond watershed contains both areas with minimal development and areas that are highly developed. When possible, communities should continue to preserve open space. In addition, as described previously, municipal ordinances must be reviewed and revised to make sure that future development projects do not add to water quality problems and that redevelopment projects reduce contributions to the water quality problems in the freshwater and estuarine portions of the Saugatucket River, Point Judith Pond, and Potter Pond.

LID techniques should be used wherever possible, as currently utilized heavily in Puget Sound (http://www.psat.wa.gov/Programs/LID.htm). A 2007 Rhode Island law requires RIDEM and CRMC to update the Rhode Island Stormwater Design and Installations Manual by June 1, 2008. Per the statute, the manual should require that future development maintain pre-development groundwater recharge and infiltration on site to the maximum extent practicable, demonstrate that post-construction stormwater runoff is controlled, and that post-development peak discharge rates do not exceed pre-development peak discharge rates, and use low impact-design techniques as the primary method of stormwater control to the maximum extent practicable (Rhode Island, 2007).

5.8 Summary

RIDEM will continue to work with RIDOT, CRMC, and the local municipalities to identify funding sources and evaluate locations and designs for stormwater control BMPs throughout the watershed. Table 5.1 summarizes the recommended implementation activities.

Table 5.1 – Implementation Measures Summary

Abatement Measure	Jurisdiction / Location	Notes
Stormwater Phase II Minimum Measures	RIDOT Narragansett South Kingstown	Revised plans submitted to RIDEM as required.
Upper Briggs Farm Neighborhood Wandsworth St. Neighborhood	Narragansett	Identify and design suitable stormwater BMP's (include LID).
Harbor Island and Great Island	Narragansett	Develop LID BMPs to prevent future pollution problems.
Saugatucket River TMDL Recommendations	RIDOT South Kingstown	Implement recommendations of the Saugatucket River TMDL. Identify and design suitable stormwater BMP's (include LID).

Abatement Measure	Jurisdiction / Location	Notes
Future Development and Redevelopment	Narragansett South Kingstown	Local Ordinances should institute stormwater volume reduction/treatment requirements for new development and redevelopment of commercial and industrial properties.
Wastewater Treatment	Narragansett South Kingstown	Sewer extensions and mandatory tie-in should continue. Ordinances should be adopted or continue to be enforced in areas without sewers to ensure properly operating OWTS.
Educational Programs	Narragansett South Kingstown	Do not feed birds, clean up pet waste, plant buffers along the water, etc.
Small Farms	Narragansett South Kingstown	Livestock should be denied direct access to wetlands / waterways that discharge into the Saugatucket River and Point Judith Pond. Manure disposal plans and vegetated buffers should be developed where needed.
No Discharge - Optimize use of Point Judith Pond pump-out facilities	Marina Operators Local Harbormasters	Increase public awareness of No Discharge requirements and available facilities
No Discharge - Require mandatory maintenance of pump-out facilities as a condition of marina operation	CRMC	
No Discharge - Develop and implement policies for inspecting boats to ensure compliance with No Discharge	Local Harbormasters Local Police Coast Guard RIDEM	
No Discharge - Participate in CVA Program to maintain infrastructure	RIDEM Marina Owners	
Wakamo Beach Cottages	Wakamo Beach Cottages, South Kingstown	Submit a remediation plan for the property

6.0 PUBLIC PARTICIPATION

DEM held a public meeting December 5, 2007 where the TMDL plan was presented to stakeholders and the general public. The public meeting began the public comment period, which ended on January 11, 2008. During the public comment period, DEM received numerous comments. The DEM response to these comments is Appendix D of this reportt.

7.0 FOLLOW-UP MONITORING

This is a phased TMDL. Additional monitoring is required to ensure that water quality objectives are met as remedial actions are accomplished. Monitoring by RIDEM will be the principle method of obtaining the data necessary to track water quality conditions in the watershed. Also, as proposed BMPs are installed in the watershed, post construction influent and effluent sampling will be required to assess the effectiveness of the selected technology.

The RIDEM Shellfish Program will continue to sample Point Judith Pond and Potter Pond for fecal coliform six times a year as well as complete shoreline surveys of the ponds in accordance with NSSP protocol. This will help RIDEM to continually monitor fecal levels in the ponds while identifying possible new sources and evaluating the effectiveness of installed BMP's. In addition, the Saugatucket River will be monitored to determine the ongoing impact on Point Judith Pond.

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APPENDIX A SHELLFISH STATION LOCATIONS AND DATA

Shellfish Station Locations

ID	Location
GA10-1	At Can Buoy #25 off Ram Pt.
GA10-2	Mid-channel on a line due west of Long Bar Pt.
GA10-3	At Can Buoy #21 off Short Pt.
GA10-5	The intersection of a line from the northern extremity of Cummock I. to the southwest tip of Short Pt., and a line from Nun Buoy #18 to the point of land jutting out south from the eastern tip of Congdon Cove.
GA10-7	Approximately 50 yards east of Buttonwoods Pt.
GA10-10	Midway across the mouth of Wheatfield Cove.
GA10-11	Midway between the northern tips of Gardner I. and Beach I.
GA10-12	In Turner Cove, midway between Reel Pt. and Turner Pt.
GA10-15	Just west and north of the entrance to Champlin Cove.
GA10-16	Just west of Locke Pt.
GA10-16a	Located midway between Great Island and Salty Acres at the intersection of a line from Ram Head to stream culvert under Escape Rd., and a line from the house with red roof to the north end of Great Island Bridge.
GA10-17	At Nun Buoy #8 off Beef I.
GA10-19	Under the Great Island Bridge
GA10-20	At Can Buoy #3 just south of Snug Harbor.
GA10-21	At Nun Buoy #2 off State Pier.
GA10-22	Approximately 100 yards south of DEM building at Sand Hill Cove beach.
GA10-23	At the entrance to Potter Pond.
GA10-24	At a point south of Champlin Cove and directly east of the wreck midway across the Pond.
GA10-27	Approximately 50 yards west of Whalebone Pt.
GA10-28	Just south of Meadow Pt.
GA10-29	At the approximate center of Sugar Cove.
GA10-30	A point in Sugar Cove on a line directly west of the westernmost point of Gardner I., midway between the island and the shore at Matunuck.
GA10-31	Midway in Seaweed Cove opposite the stone gazebo.

Shellfish Station Data

Date	Rain (in)	Days Since	Tide	Station Fecal Counts (fc/100 mL)											
				GA 10-1	GA 10-2	GA 10-3	GA 10-5	GA 10-7	GA 10-10	GA 10-11	GA 10-12	GA 10-15	GA 10-16	GA 10-16a	GA 10-17
01/10/02	0.60	3	L	43											
04/04/02	1.11	3	L	150	43	43	2	2	4	2	2				
05/06/02	0.85	3	L	240	9	9	4	4	4	2	4	2	2	2	2
06/11/02	1.30	4	H	240	93	23	93	9	4	4	9	9	9	4	23
08/27/02	0.65	7	F	75	43	2	3	2	7	4	43	2	2	93	23
10/29/02	4.63	2	F	240	11000	2400	43	240	43	240	240	93	93	43	93
12/18/02	1.26	4	E		93	43	9	4	2	2	2	4	4	4	4
03/26/03	0.75	5	L	7	15	2	2	2	4	2	2	2	2	2	2
04/28/03	1.04	1	E	43	43	230	9	7	4	2	2	3	4	2	7
06/10/03	0.50	2	L	93	240	150	93	75	4	4	7	2	4	4	43
07/25/03	0.64	1	L									3	2	4	2
08/13/03	2.54	5	H	2400	230	230	43	9	9	9	2	9	7	9	2
10/09/03	0.12	5	E	93	7	75	9	4	2	4	2	4	3	4	2
12/17/03	1.75	3	F	240	75	75	7	15	15	4	11	23	2	11	3
03/24/04	0.50	3	H	2	2	4	2	2	2	4	2	2	2	4	2
07/07/04	1.10	4	F	2	9	9	4	2	4	4	4	2	43	21	2
08/17/04	1.75	1	H	93	430	240	93	240	9	43	15	15	4	21	9
09/21/04	2.30	3	L	1100	460	210	240	120	14	9	3	15	4	43	4
10/18/04	0.90	2	F	43	240	15	15	15	43	7	15	23	20	2	7
11/19/04	0.34	6	F	43	21	4	4	4	7	3	7	4	2	9	4
03/30/05	2.18	1	H	93	93	150	75	93	15	15	7	2	15	2	4
04/26/05	0.81	2	F	93	4	4	9	4	2	2	2	2	2	2	2
06/20/05	0.30	4	E	1100	240	43	9	15	4	3	7	4	4	43	2
08/16/05	0.33	2	E	430	930	930	750	430	43	460	39	93	43	15	15
09/22/05	2.82	6	F	43	9	4	4	4	2	4	4	2	2	7	4
11/14/05	0.90	4	E	460	43	43	93	15	7	4	2	7	4	4	9
03/09/06	0.48	7	L	9	2	2	2	2	2	2	3	4	2	23	4
04/28/06	0.51	5	E	2	4	2	4	9	7	2	2	2	2	2	2
06/13/06	0.60	3	H	93	240	39	93	23	4	4	7	9	4	9	4
07/26/06	0.40	5	E	430	43	9	7	9	2	15	4	4	2	9	9
09/21/06	0.98	2	E	1500	4600	930	4600	23	43	93	23	15	23	15	4
11/15/06	0.38	2	L	230	230	20	240	240	43	15	15	43	23	43	43
Count				30	30	30	30	30	30	30	30	30	30	30	30
Geometric Mean				93.9	63.9	32.3	19.4	12.8	6.5	6.5	5.9	5.9	5.1	7.9	5.4
Percentile				1100	507	309	240	240	43	48	24.6	25	25	43	25

All Samples were analyzed using MPN. Rain was recorded at Westerly, Rhode Island.

Shellfish Station Data (continued)

Date	Rain (in)	Days Since	Tide	Station Fecal Counts (fc/100 mL)										
				GA 10-19	GA 10-20	GA 10-21	GA 10-22	GA 10-23	GA 10-24	GA 10-27	GA 10-28	GA 10-29	GA 10-30	GA 10-31
01/10/02	0.60	3	L											
04/04/02	1.11	3	L		9			2	2	2	2	2	2	2
05/06/02	0.85	3	L	2	4	4	4	2	2	2	2	2	2	2
06/11/02	1.30	4	H	2	4	4	4	14	2	15	9	2	9	9
08/27/02	0.65	7	F	43	7	75	4	43	3	23	43	4	2	2
10/29/02	4.63	2	F	9	43	23	2	9	2	4	2	2	2	2
12/18/02	1.26	4	E	4	2	23	2	4	2	2	2	2	2	4
03/26/03	0.75	5	L	2	2	4	2	2	2	2	2	2	2	2
04/28/03	1.04	1	E	4	2	2	2	3	4	2	2	2	2	2
06/10/03	0.50	2	L	23	43	9	2	15	15	2	2	7	23	23
07/25/03	0.64	1	L	9		23	23							
08/13/03	2.54	5	H	9	4	9	2	2	23	23	43	4	4	4
10/09/03	0.12	5	E	3	9	2	2	7	4	2	2	2	2	4
12/17/03	1.75	3	F	2	7	2	2	2	2	4	2	2	9	2
03/24/04	0.50	3	H	2	2	4	2	4	2	2	2	2	2	2
07/07/04	1.10	4	F	4	2	4	4	4	2	2	9	3	6	93
08/17/04	1.75	1	H	9	4	4	2	4	21	9	4	2	93	21
09/21/04	2.30	3	L	15	4	4	2	15	20	4	4	21	23	43
10/18/04	0.90	2	F	2	9	4	2	23	15	23	4	2	9	4
11/19/04	0.34	6	F	15	2	23	2	2	2	2	2	2	2	2
03/30/05	2.18	1	H	23	2	4	3	2	2	2	2	2	2	2
04/26/05	0.81	2	F	3	2	2	2	4	2	2	4	2	2	2
06/20/05	0.30	4	E	4	2	2	4	9	2	2	2	4	2	9
08/16/05	0.33	2	E	93	39	43	15	9	9	7	9	15	23	15
09/22/05	2.82	6	F	43	2	4	2	9	4	4	4	2	3	4
11/14/05	0.90	4	E	4	4	23	9	4	2	2	4	2	2	2
03/09/06	0.48	7	L	2	4	15	2	4	4	2	2	2	2	2
04/28/06	0.51	5	E	2	2	2	2	2	4	4	2	2	2	2
06/13/06	0.60	3	H	9	2	2	2	4	9	4	3	2	43	9
07/26/06	0.40	5	E	3	2	2	2	9	2	4	2	2	2	23
09/21/06	0.98	2	E	15	23	2	2	150	15	9	43	43	3	23
11/15/06	0.38	2	L	23	9	93	460	23	4	2	2	7	2	4
	Count			30	30	30	30	30	30	30	30	30	30	30
	Geometric Mean			6.5	4.6	6.4	3.3	6.0	4.0	3.7	3.7	3.0	4.1	5.0
	Percentile			25	24.6	25	9.6	23	15.5	15.8	12.4	7.8	23	23

All Samples were analyzed using MPN. Rain was recorded at Westerly, Rhode Island.

Wet and Dry Data

Wet Weather

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	20	111.1	524
10-2	20	111.7	1297
10-3	20	63.5	930
10-5	20	36.9	291
10-7	20	21.0	240
10-10	20	8.5	43
10-11	20	8.4	108
10-12	20	7.0	25
10-15	20	7.9	48
10-16	20	7.2	43
10-16A	20	7.1	43
10-17	20	6.6	43
10-19	20	6.8	23
10-20	20	5.7	39
10-21	20	6.5	25
10-22	20	4.0	16
10-23	20	6.5	23
10-24	20	4.3	16
10-27	20	3.6	10
10-28	20	3.5	9
10-29	20	3.4	16
10-30	20	5.5	25
10-31	20	5.8	25

Dry Weather

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	10	67.1	1230
10-2	10	20.9	231
10-3	10	8.4	90
10-5	10	5.3	12
10-7	10	4.7	10
10-10	10	3.9	7
10-11	10	3.8	10
10-12	10	4.2	11
10-15	10	3.3	5
10-16	10	2.5	4
10-16A	10	9.7	48
10-17	10	3.7	10
10-19	10	6.1	43
10-20	10	3.0	7
10-21	10	6.0	28
10-22	10	2.3	4
10-23	10	5.2	12
10-24	10	3.5	6
10-27	10	4.0	23
10-28	10	4.0	43
10-29	10	2.5	4
10-30	10	2.2	3
10-31	10	3.7	10

Tidal Data

High Tide

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	6	98.7	1320
10-2	6	86.2	335
10-3	6	55.7	235
10-5	6	41.6	93
10-7	6	20.9	167
10-10	6	5.8	12
10-11	6	8.5	29
10-12	6	5.5	12
10-15	6	5.9	12
10-16	6	5.6	12
10-16A	6	6.2	15
10-17	6	4.9	16
10-19	6	6.4	16
10-20	6	2.8	4
10-21	6	4.1	7
10-22	6	2.4	4
10-23	6	3.9	9
10-24	6	5.7	22
10-27	6	6.1	19
10-28	6	5.1	26
10-29	6	2.2	3
10-30	6	9.1	68
10-31	6	5.5	15

Ebb Tide

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	8	180.4	1220
10-2	9	84.2	1664
10-3	9	65.2	930
10-5	9	33.9	1520
10-7	9	14.0	104
10-10	9	6.1	43
10-11	9	8.6	166
10-12	9	4.5	26
10-15	9	6.3	31
10-16	9	5.3	27
10-16A	9	6.6	21
10-17	9	4.7	10
10-19	9	5.7	31
10-20	9	4.7	26
10-21	9	4.8	27
10-22	9	3.2	10
10-23	9	7.5	37
10-24	9	3.7	10
10-27	9	3.2	7
10-28	9	3.6	16
10-29	9	3.8	21
10-30	9	2.7	7
10-31	9	5.9	23

Low Tide

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	8	83.2	498
10-2	7	43.5	328
10-3	7	19.2	174
10-5	7	15.0	240
10-7	7	13.2	168
10-10	7	6.1	26
10-11	7	3.7	11
10-12	7	4.0	10
10-15	7	4.8	26
10-16	7	3.5	12
10-16A	7	8.3	43
10-17	7	5.9	43
10-19	7	6.6	23
10-20	7	6.4	23
10-21	7	10.9	51
10-22	7	6.8	198
10-23	7	5.6	18
10-24	7	4.5	17
10-27	7	2.2	3
10-28	7	2.2	3
10-29	7	4.0	13
10-30	7	4.0	23
10-31	7	4.9	31

Flood Tide

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	8	53.2	240
10-2	8	52.5	3468
10-3	8	15.4	773
10-5	8	7.3	23
10-7	8	7.8	83
10-10	8	8.3	43
10-11	8	6.3	77
10-12	8	11.8	102
10-15	8	6.5	44
10-16	8	6.3	58
10-16A	8	11.1	58
10-17	8	6.4	44
10-19	8	7.7	43
10-20	8	4.8	19
10-21	8	7.5	39
10-22	8	2.4	4
10-23	8	6.9	29
10-24	8	3.0	7
10-27	8	4.8	23
10-28	8	4.6	19
10-29	8	2.3	3
10-30	8	3.5	9
10-31	8	3.8	31

Seasonal Data

Winter

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	2	19.7	40
10-2	1	2.0	2
10-3	1	2.0	2
10-5	1	2.0	2
10-7	1	2.0	2
10-10	1	2.0	2
10-11	1	2.0	2
10-12	1	3.0	3
10-15	1	4.0	4
10-16	1	2.0	2
10-16A	1	23.0	23
10-17	1	4.0	4
10-19	1	2.0	2
10-20	1	4.0	4
10-21	1	15.0	15
10-22	1	2.0	2
10-23	1	4.0	4
10-24	1	4.0	4
10-27	1	2.0	2
10-28	1	2.0	2
10-29	1	2.0	2
10-30	1	2.0	2
10-31	1	2.0	2

Spring

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	12	55.5	240
10-2	12	31.5	240
10-3	12	20.3	150
10-5	12	11.5	93
10-7	12	8.6	70
10-10	12	4.2	7
10-11	12	3.1	4
10-12	12	3.6	7
10-15	11	2.9	9
10-16	11	3.5	9
10-16A	11	3.7	9
10-17	11	4.2	23
10-19	11	4.2	23
10-20	12	3.3	9
10-21	11	3.1	4
10-22	11	2.5	4
10-23	12	3.9	14
10-24	12	3.0	9
10-27	12	2.7	4
10-28	12	2.5	4
10-29	12	2.4	4
10-30	12	3.6	22
10-31	12	3.6	9

Summer

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	8	237.8	1770
10-2	8	206.0	2031
10-3	8	79.7	930
10-5	8	63.9	1905
10-7	8	23.5	297
10-10	8	10.2	43
10-11	8	20.9	203
10-12	8	9.3	40
10-15	9	8.0	31
10-16	9	7.0	43
10-16A	9	17.2	53
10-17	9	5.3	17
10-19	9	12.6	53
10-20	8	6.0	28
10-21	9	8.2	49
10-22	9	3.8	17
10-23	8	11.2	75
10-24	8	7.9	22
10-27	8	7.5	23
10-28	8	10.9	43
10-29	8	6.3	28
10-30	8	7.8	44
10-31	8	16.4	58

Fall

Station	# of Samples	Geomean (fc/100 mL)	90th Pctile (fc/100 mL)
10-1	8	120.7	306
10-2	9	85.4	2392
10-3	9	36.7	540
10-5	9	17.2	122
10-7	9	15.4	240
10-10	9	9.2	43
10-11	9	7.0	60
10-12	9	8.0	60
10-15	9	10.7	53
10-16	9	6.3	37
10-16A	9	8.2	43
10-17	9	7.7	53
10-19	9	6.7	27
10-20	9	5.8	16
10-21	9	10.6	37
10-22	9	4.3	99
10-23	9	6.4	23
10-24	9	3.2	6
10-27	9	3.3	8
10-28	9	2.5	4
10-29	9	2.3	3
10-30	9	2.9	9
10-31	9	2.9	4

APPENDIX B OTHER INSTREAM MONITORING LOCATIONS AND DATA

Other Monitoring Locations

Station	Name	Location	Organization
SR06-D	Saugatucket River	Main Street Dam, downstream of dam	Salt Ponds Coalition (SPC)
49	Saugatucket River	Main Street Bridge	RIDEM TMDL RIDEM Shellfish
SR-1	Saugatucket River	Saugatucket River behind Mews	Salt Ponds Coalition (SPC)
SR-0	Saugatucket River	Saugatucket River, 6 Edgewater Road	Salt Ponds Coalition (SPC)
PJ-15	Champlin Cove	Briggs Farm	Salt Ponds Coalition (SPC)
PJ-16	Champlin Cove	Champlin Cove	Salt Ponds Coalition (SPC)

Other Monitoring Data

Date	Organization	Station Fecal Counts (fc/100 mL)					
		Lower Saugatucket River				Champlin Cove	
		SR06-D	49	SR-1	SR-0	PJ-15	PJ-16
06/06/00	Salt Pond Coalition			1600	920	920	540
06/22/00	Salt Pond Coalition			540	130	13	0[1]
07/05/00	Salt Pond Coalition			350	350	130	49
07/05/00	RIDEM TMDL	650				0[1]	0[1]
07/19/00	Salt Pond Coalition			540	130		
07/25/00	RIDEM TMDL	940					
08/02/00	Salt Pond Coalition			350			49
08/16/06	Salt Pond Coalition			170	110	140	1600
08/21/00	RIDEM TMDL	20					
08/23/00	Salt Pond Coalition			130	350	5	79
08/24/00	RIDEM TMDL	200					
09/06/00	Salt Pond Coalition			350	1600		
09/14/00	RIDEM TMDL	170					
09/15/00	RIDEM TMDL	3100					
09/15/00	RIDEM TMDL	8000					
09/16/00	RIDEM TMDL	4100					
09/16/00	RIDEM TMDL	1100					
09/17/00	RIDEM TMDL	540					
09/18/00	RIDEM TMDL	260					
10/17/00	RIDEM TMDL	230					
06/06/01	Salt Pond Coalition			79	70	8	7
06/20/01	Salt Pond Coalition			540	920	8	33
07/11/01	Salt Pond Coalition			140	170	7	0[1]
07/18/01	Salt Pond Coalition			240	540	33	

Date	Organization	Station Fecal Counts (fc/100 mL)					
		Lower Saugatucket River				Champlin Cove	
		SR06-D	49	SR-1	SR-0	PJ-15	PJ-16
08/01/01	Salt Pond Coalition			1600	170	5	2
08/15/01	Salt Pond Coalition				540		
08/29/01	Salt Pond Coalition				240	49	7
05/20/02	RIDEM Shellfish		1100				
05/28/02	Salt Pond Coalition				170	4	79
06/11/02	Salt Pond Coalition				220	70	13
06/25/02	Salt Pond Coalition			920	350	8	130
07/09/02	Salt Pond Coalition				240	8	8
07/23/02	Salt Pond Coalition				540	13	8
08/06/02	Salt Pond Coalition				920		
08/20/02	Salt Pond Coalition				62	1	2
09/03/02	Salt Pond Coalition				220	49	46
05/28/03	Salt Pond Coalition			1600	1600	49	130
06/11/03	Salt Pond Coalition			240	49		
06/25/03	Salt Pond Coalition			350	240	14	8
07/09/03	Salt Pond Coalition			350	79	49	41
07/23/03	Salt Pond Coalition			1600	1600	33	22
08/06/03	Salt Pond Coalition			350	1600	33	33
08/20/03	Salt Pond Coalition			130	540	8	33
09/02/03	Salt Pond Coalition			1600	920	240	170
05/25/04	Salt Pond Coalition				130	17	33
06/08/04	Salt Pond Coalition			130	540	79	33
06/22/04	Salt Pond Coalition			540	920	49	7
07/06/04	Salt Pond Coalition			240	920	33	70
07/20/04	Salt Pond Coalition			350	79	13	13
08/03/04	Salt Pond Coalition			1600	540	17	68
08/17/04	Salt Pond Coalition			540	350	7	5
08/31/04	Salt Pond Coalition			1600	1600	14	23
05/10/05	Salt Pond Coalition			540	540	17	17
05/24/05	Salt Pond Coalition			240	350	110	130
06/07/05	Salt Pond Coalition			110	240	79	17
06/21/05	Salt Pond Coalition			350	130	11	33
07/05/05	Salt Pond Coalition			350	170	13	2
07/19/05	Salt Pond Coalition			540	240	33	33
08/02/05	Salt Pond Coalition			540	130	7	5
08/16/05	Salt Pond Coalition			170	220	33	21
08/30/05	Salt Pond Coalition			920	1600	170	110

Date	Organization	Station Fecal Counts (fc/100 mL)					
		Lower Saugatucket River				Champlin Cove	
		SR06-D	49	SR-1	SR-0	PJ-15	PJ-16
12/28/05	RIDEM TMDL		390				
01/27/06	RIDEM TMDL		4				
05/16/06	Salt Pond Coalition			110	70	540	540
05/30/06	Salt Pond Coalition			240	49	26	33
06/13/06	Salt Pond Coalition			33	130	79	22
06/27/06	Salt Pond Coalition			920	540	46	49
07/11/06	Salt Pond Coalition			79	240	130	46
07/25/06	Salt Pond Coalition			79	130	13	22
08/08/06	Salt Pond Coalition			110	79	23	23
08/22/06	Salt Pond Coalition			70	170	8	11
09/18/06	RIDEM TMDL		93				
	Number of Samples	12	4	46	55	51	51
	Geometric Mean	581.7	112.4	334.2	290.1	22.2	18.0
	90th Percentile	4000	887	1600	1328	130	130

[1]Salt Pond Coalition reported as 0.01. This value was used when calculating the geometric mean and 90th percentile values

APPENDIX C SHORELINE SURVEY INFORMATION

RI010045R-05C: Lower Saugatucket River

Src ID	Description / Location	Latitude	Longitude	Source Type	2002 Flow (cf/sec)	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
47	12" RCP stormdrain outfall- west side of Main St bridge	41.4370	-71.5016	Pipe	trickle	**150**	NF		**230**			
48	24" RCP stormdrain outfall- east side of Main St bridge, SK	41.4370	-71.5016	Pipe	-	NF	NF					**240**
46	24" Flared end RCP outfall- Mew's Tavern, SK	41.4356	-71.5023	Pipe	trickle	**460**	9		**240**			
45	20" wide stormwater swale- Mew's Tavern, SK	41.4356	-71.5024	Other	-	NF	NF		NF			
75	Groundwater seep, 30 yards downstream of Mews Tavern	41.4353	-71.5027	Other	trickle					3		
78	18" RCP outfall- drains Johnson Place, SK	41.4351	-71.5027	Pipe	-				NF			
44	Stream approx. 200-ft north of Silver Lake Ave bridge, SK	41.4339	-71.5025	Stream	trickle	**43**				**4600**		
43	24" Flared end RCP outfall-Silver Spring bridge, SK	41.4335	-71.5021	Pipe	-	NF	**150**		**93**			
71	36" RCP outfall- beneath Pond Street, SK	41.4313	-71.5045	Pipe	unknown			9				NF
77	Stream outlet from cattle farm, wetland , SK	41.4323	-71.5018	Stream	unknown							**430**

Src ID	Description / Location	Latitude	Longitude	Source Type	2002 Flow (cf/sec)	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
49	Saugatucket River-under Main St bridge, SK	41.4370	-71.5016	Stream	120.12	**1100**	**390**	**4**				**93**
49(a)	Saugatucket River-top of Main St dam, SK	41.4370	-71.5016	Stream	unknown			9	**2400**			
49(b)	Saugatucket River-downstream of Main St bridge, SK	41.4370	-71.5016	Stream	unknown			3				
72	Saugatucket River behind Mews	41.4354	-71.5027	Stream	unknown				**2400**	**240**		**150**
76	300 yds downstream from Mews, 30 yds from riprap outfall	41.4351	-71.5027	Stream	unknown					**43**		
74	Saugatucket River-under Silver Lake Ave bridge	41.4336	-71.5023	Stream	unknown		**23**		**11000**	**43**		**230**
73	Saugatucket River, 6 Edgewater Road	41.4305	-71.5010	Stream	unknown				**4600**			**43**

RI0010043E-06B: Mouth of the Saugatucket River

Src ID	Description / Location	Latitude	Longitude	Source Type	2002 Flow (cf/sec)	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
52	36" RCP outfall-Route 1 to Upper Pond, SK	41.4293	-71.4929	Pipe	0.98	**93**		3				
65	12" RCP outfall w/ rip-rap-Gull Rd., Narr.	41.4260	-71.4932	Pipe	-	NF		CNA			NF	
66	Emu farm-6 emus-Gull Rd, Narr.	41.4260	-71.4933	Other	-	NF		CNA			NF	

RI0010043E-06C: Upper Point Judith Pond

Src ID	Description / Location	Latitude	Longitude	Source Type	2002 Flow (cf/sec)	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
29	Stream entering Long Cove, Narr	41.4107	-71.4908	Stream	1.60	**90**					**240**	
30	Stream entering Long Cove, Narr	41.4114	-71.4908	Stream	0.23	**40**					**460**	
31	Stream entering Long Cove, Narr	41.4147	-71.4924	Stream	0.09	**90**					**460**	
32	Stream entering Long Cove, Narr	41.4160	-71.4920	Stream	0.26	2					**150**	
33	Stream entering Long Cove, Narr	41.4176	-71.4919	Stream	0.81	9					**430**	
34	Stream entering Long Cove, Narr	41.4174	-71.4916	Stream	3.35	9					**39**	
35	12" corr. metal pipe outfall-west side of Short Point, SK	41.4173	-71.4916	Pipe	-	NF	CNA				NF	
36	Stream entering Billington Cove, SK	41.4213	-71.5006	Stream	trickle	**460**	CNA				**930**	
37	Stream entering Congdon Cove, SK	41.4223	-71.5101	Stream	0.53	**150**		3				**23**
38	Congdon Cove outlet, SK	41.4219	-71.5097	Other	1.41	7		CNA				4
39	Smelt Brook, SK	41.4144	-71.5126	Stream	1.40	**23**						**150**
40	Stream entering Smelt Brook Cove, SK	41.4120	-71.5113	Stream	0.01	**23**						**23**
42	4" PVC Pipe-west side of Upper Pond, SK	41.4228	-71.4979	Pipe	-	NF	CNA				NF	
50	Stream entering east side of Upper Pond, Narr	41.4209	-71.4923	Stream	1.91	**23**		CNA			**1100**	
51	Stream entering Long Cove, Narr	41.4189	-71.4915	Stream	0.98	9		CNA			**430**	

RI0010043E-06D: Billington Cove

Src ID	Description / Location	Latitude	Longitude	Source Type	2002 Flow (cf/sec)	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
53	12" CPP draining salt marsh-Billington Cove Marina, SK	41.4227	-71.5037	Pipe	0.08	**240**	**240**					

RI0010043E-06H: Potter Pond Channel

Src ID	Description / Location	Latitude	Longitude	Source Type	2002 Flow (cf/sec)	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
55	24" RCP draining salt marsh to connector channel east of Succotash Rd, SK	41.3859	-71.5250	Pipe	0.86	**93**	4					

RI0010043E-06K: Champlin Cove

Src ID	Description / Location	Latitude	Longitude	Source Type	2002 Flow (cf/sec)	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
5	12" Seepage Channel- Brigg's Farm Beach, Narr	41.4067	-71.4912	Other	-	NF	NF					
6	Stream entering Champlin Cove, Narr	41.4082	-71.4898	Stream	2.98	**240**	CNA				**240**	
7	Stream entering Champlin Cove, Narr	41.4093	-71.4904	Stream	0.11	**43**	CNA				**93**	
8	Stream entering Champlin Cove, Narr	41.4099	-71.4909	Stream	-	4	CNA				**43**	
27	6" Swale/Seep-Champlin Cove south, Narr	41.4058	-71.4906	Other	trickle	**240**	9					
28	12" RCP outfall-Champlin Cove south, Narr	41.4063	-71.4907	Pipe	-	NF	NF					

[1] *NF: No Flow present*
[2] *CNA: Could Not Access the location*
Numbers shown in bold exceed the applicable criterion.

APPENDIX D RESPONSE TO COMMENTS

The following comments were received by RIDEM during the public comment period for the draft Point Judith Pond TMDL document. The complete text of all comments received is on file in the Office of Water Resources at RIDEM.

TOWN OF NARRAGANSETT

Comments on the Point Judith Pond Waters Fecal Coliform TMDL From the Southern RI Conservation District On Behalf of the Town of Narragansett

Alicia Lehrer, Manager of the Southern RI Conservation District attended the public meeting on the draft fecal coliform TMDL for Point Judith Pond Waters on December 5, 2007 in Narragansett.

Alicia, on behalf of the Town of Narragansett, developed proposals for Narragansett Bay Water Quality Restoration (NBWQR) and NRCS Environmental Quality Incentives Program (EQIP) Funding in 2006 to make improvements on Sunset Farm. Below is some information collected during the development of those proposals that may be of interest for the TMDL. The NBWQR proposal was not funded because it was to be matched by EQIP funds and at the last minute, the Narragansett Land Trust, owner of the Sunset Farm property, decided that they needed to rethink activities on the farm prior to accepting funds to make changes.

Sunset Farm, located at 505 Point Judith Road in Narragansett, discharges both directly and indirectly to Champlin Cove on Point Judith Pond near the Briggs Farm outfall. The farm's 200 acres are owned by the Town of Narragansett's Land Trust and operated by farmer Jeff Farrell. Sunset Farm, on average, is home to 70 beef cattle, 3 horses, 70 pigs and 200 chickens a year. The animals generate manure which yields about 500 cubic yards of compost per year. The compost is piled, stored and used on-site by the farmer (see Figure 1). There is also a small pond on the property that provides water supply to the animals (see Figure 2). Currently, animals are watered in areas separated from the pond but they are not fenced out of the pond. There are also intermittent streams that lead from both the compost pile and the pond to Point Judith Pond (see Figure 3). The stream flows only during rain events and meanders through several wetlands prior to discharging into Champlin Cove. Eugene Pepper, from RIDEM's Division of Agriculture mapped the stream channel as shown in Figure 3 using the Department's GeoTracker GPS unit on September 13, 2006. Figure 3 shows a discontinuity in the stream channel. Rather than this being the actual case, the break is due to difficulty in accessing the channel due to fencing on the property and dense vegetation, thereby making the GPS data impossible to collect at that location.

RIDEM Response:
The draft TMDL document states that the farm did not appear to be a direct contributor to bacteria concentrations in the pond. This conclusion was based on several factors including the separation between Champlin Cove and the farm along with belief that elevated bacteria concentrations were more likely due to a channelized stream that transverses an adjacent

neighborhood. After reviewing the materials provided by the Town, the results of a shoreline survey completed by RIDEM in 2002, and discussing the matter with RIDEM's Division of Agriculture, OWR acknowledges that Sunset Farm may have a ***direct*** hydrologic connection to the pond, at least intermittently during periods of high groundwater and/or extremely wet weather conditions. Eugene Pepper, a Principal Planner with the Division of Agriculture at DEM, stated that although the stream originating at Sunset Farm has no direct channel through the wetlands complex that separates Sunset Farm from Champlin Cove, it is possible that runoff flows overland through the wetlands complex before being collected in the stream that discharges as RIDEM source 6. Meanwhile, a small stream crosses the Briggs Farm development, which picks up stormwater from the development during rainfall events, eventually discharging to Point Judith Pond through the source 6. Therefore source 6 represents runoff from both the Briggs Farm neighborhood and a portion of Sunset Farm during certain conditions.

Based upon this information, OWR staff has concluded that the main source of fecal coliform to source 6 originates from the stream branch that bisects the Briggs Farm development. This stream collects stormwater from impervious areas of the neighborhood which runs into the stream even during small storm events, while runoff from the Sunset Farm branch is generated only during extremely wet times and must flow overland rather than through a defined channel.

While the farm represents a potential source of bacteria to the pond, based upon available information, we do not believe it to be a significant source.

RIDEM source 7 also discharges into Champlin Cove. This stream was identified by DEM in 2002 as originating on the farm. Since source 7 has not shown elevated fecal coliform levels during sampling events, it was concluded that Sunset Farm was not a significant source to this stream. However it is acknowledged that the potential exists that it could under certain high groundwater and/or wet weather conditions.

Since the potential exists for Sunset Farm to contribute to elevated bacteria concentrations, it is recommended that Sunset Farm employ appropriate manure management practices to control runoff from manure pipes on-site. Additionally, fencing should be installed to limit livestock access to the pond at the rear of the farm. The TMDL will be modified accordingly to address the above changes.

TOWN OF SOUTH KINGSTOWN

The Town of South Kingstown has carefully reviewed the draft TMDL for pathogen impairments for Point Judith Pond waters, as prepared by the RI Department of Environmental Management (RIDEM). South Kingstown continues to be a strong advocate for environmental protection in the community. Our commitment to the environment is clearly demonstrated by the Town's open space protection program, innovative on-site wastewater management program, and award winning Regional wastewater treatment plant, to name a few. Although the Town wishes to work jointly with RIDMEM in protecting and enhancing environmental quality in our

community, we have several questions and concerns relative to the Point Judith Pond proposed TMDL for response by RIDEM.

Source of Pollutants
The RIDEM "Total Maximum Daily Load Analysis for Point Judith Pond Waters- Pathogen/ Bacteria Impairments" technical paper identifies the Saugatucket River and "untreated stormwater runoff from impervious surfaces such as roads and streets, and from residential and commercial land, as major contributors to impaired water quality..." *(Page 26, Section 3.3, paragraph 2).* However, this statement is not correct, as stormwater runoff is the conveyance mechanism for pollutants, not the source. As detailed in the RIDEM technical paper and public hearing power point presentation, the pollutant source of fecal coliform appears to be primarily from human waste, domestic pets, waterfowl/ wildlife and farm animals.

Be advised that all non-sewered properties in South Kingstown are subject to the Town's on-site wastewater management ordinance to ensure that the property's on-site wastewater disposal system is operating properly. Further, since municipal sewers service most properties along the lower reaches of the Saugatucket River, it would appear that the fecal coliform pollutants in the study area are due to non-human sources.

RIDEM Response:
RIDEM agrees that stormwater runoff serves to convey pollutants from a variety of sources and is not in a strict sense "the source" of pollutants. Construction of impervious surfaces and drainage systems serve to enhance the delivery of pollutants conveyed by stormwater and exacerbate the impact on waterbodies. Pursuant to the Federal Clean Water Act and the Federal NPDES Regulations, the owner of the outfall is response for the pollutants discharged from the outfall.

Relative to comments expressed in the last paragraph, RIDEM acknowledges the Town's on-site wastewater management ordinance in the TMDL. With respect to the potential for human sources in the lower reaches of the Saugatucket River, as documented in the TMDL, our investigations found no evidence of either pump station or septic system failures along the lower river. In addition, the town's illicit discharge detection program, required under the RIPDES Phase II program, will provide another check on the presence and/or absence of human sources to the storm sewer network.

Quantifying Each Source of Pollutant
Quantifying the percent of fecal coliform from each source is paramount in order to calculate and assess the effectiveness of the proposed implementation strategy. As such, the Town requests that RIDEM determine each fecal pollutant loading per source at each stormwater outfall designated for treatment, prior to final promulgation of the TMDL. In addition, an overall fecal loading per source for the impaired water body down gradient of stormwater outfalls needs to be determined by RIDEM prior to final promulgation of the TMDL. In addition, due to limited financial resources available to all governmental bodies, RIDEM needs to conduct a cost benefit analysis to evaluate properly the effectiveness of proposed strategies and the cost associated with these remedies.

RIDEM Response:
The sources of bacteria to Point Judith Pond are varied, intermittent, and unpredictable. As such, it is not feasible to accurately quantify loadings from each source nor is it necessary for the development and implementation of an appropriate mitigation strategy. The TMDL identifies all actual and potential sources/inputs and outlines the recommended abatement measures to address identified sources. In general these measures can be divided into those that directly reduce contamination of stormwater (proper pet waste disposal etc.) and those that treat/reduce the quantity of stormwater discharged. RIDEM believes that phased implementation of mitigation measures, resolving the largest sources/inputs first - especially since reduction or removal of the pollution sources would be expected to have an immediate and positive effect on water quality, is the most appropriate use of public resources. The TMDL has prioritized stormwater outfalls for water quality improvements based upon either wet weather monitoring results and/or size of outfalls (used as a proxy representing relative pollutant loads). Towns and/or RIDOT, as the responsible parties, may choose to further refine this prioritization based upon more site-specific information including the determination of each outfalls' hydraulic load. These parties would also be expected to evaluate cost versus benefits when studying the design feasibility of and selecting the appropriate stormwater BMP option.

Implementation Strategies
The Town questions the amount of fecal reduction that will be achieved based upon implementation strategies. The Town believes that research clearly indicates waterfowl and wildlife populations down gradient of targeted stormwater outfalls contribute significant quantities of fecal pollutants to the impaired water body, which must be addressed. As such, the Town opposes the reduction strategies as drafted, which limit the recommended applicable needed action to only public education for waterfowl fecal reductions.

In accordance with the Clean Water Act (CWA), the US Environmental Protection Agency (EPA) gives States, territories and tribes complete discretion on how pollutant caps for a given TMDL should be allocated among sources. RIDEM has elected to require MS4 operators (Towns and the RI Department of Transportation (RIDOT)) to construct stormwater outfall treatment improvements, while not addressing waterfowl and wildlife pollutants that are not carried through stormwater systems, but are the result of indigenous waterfowl and wildlife living on and around the water body.

RIDEM Response:
RIDEM is not aware of the research that the Town is citing that "clearly indicates waterfowl and wildlife populations down gradient of targeted stormwater outfalls contribute significant quantities of fecal pollutants…" The TMDL targets outfalls in the Briggs Farm and Wandsworth Road neighborhoods in Narragansett, and the various outfalls owned by RIDOT and the Town of South Kingstown identified in the Saugatucket River TMDL as contributing to impairments in the Saugatucket River and its tributaries, along with Point Judith Pond.

RIDEM acknowledges that waterfowl may contribute to elevated bacteria concentrations and possibly water quality violations within the pond. As documented in the TMDL document, the

sources of bacteria contributing to water quality violations in the pond are many, varied, intermittent, and unpredictable. Data available to RIDEM indicate that fecal coliform concentrations in the upper pond are significantly higher during and immediately after wet weather than dry weather and are generally higher during ebb tide versus high tide conditions, pointing to land-based and stormwater sources of fecal coliform. Wet weather monitoring conducted in support of the Saugatucket River Fecal Coliform TMDL, reported significantly elevated concentrations of fecal coliform in-stream following rain storms (in violation of water quality standards) and very high bacteria concentrations discharged from various outfalls in the watershed. For example, the geometric mean fecal coliform concentration in the water flowing directly from the stormwater outfall located at the intersection of Kingstown Road, School Street, and Indian Run Road (known as the School Street outfall) was 8,367 fc/100ml, with a peak concentration of 14,000 fc/100ml. In conclusion, while waterfowl may contribute to elevated bacteria levels, clearly, stormwater is the most significant input of bacteria to the pond.

It is our understanding from recent conversations with RIDEM Division of Fish and Wildlife (RI F&W) personnel that waterfowl populations are generally higher during the winter months when resident populations are joined by migrating populations. It is noted that RIDEM monitoring results find that fecal coliform concentrations in Pt. Judith Pond are generally lower in the winter months than in the summer months. Furthermore, Point Judith Pond is not considered a concentrator of waterfowl populations (including Canada Geese) as compared with other waterbodies in the state. The pond is however a major molting area for swan in August (Jay Osenkowski, personal communication). In response to the dramatic rise in the population of these non-native birds in the northeast, as of 2006, swans are no longer protected under federal wildlife regulations. RI F& W has developed a management plan to control the state's swan population, which includes the routine monitoring of swan populations (a summer aerial survey to identify swan nests and a fall productivity survey) as well as working to actively reduce the state's swan population from the currently estimated population of 1,000 to 300. Where feasible, RI F& W works to achieve this population goal and has initiated swan population control efforts in the South County area. Therefore, the TMDL has been modified to include control of the swan population as one of the mitigation measures.

It is incorrect to say that RIDEM has *elected* to require MS4 operators to construct stormwater treatment structures and that RIDEM has complete discretion on how pollutant caps can be allocated between the sources. Pollutant reductions must be established in a manner that results in compliance with water quality standards. EPA will not approve a TMDL unless they determine that compliance with water quality standards will be achieved. Furthermore, federal and state regulations governing stormwater discharges as point sources clearly stipulate that ultimate responsibility for the quality of the discharged stormwater lies with the owner/operator. So while the sources contributing to the stormwater conveyance system may be diffuse and considered nonpoint sources of pollution, the owner/operator of the outfall is ultimately responsible for the quality of the stormwater discharged from the outfall regardless of its original source. The TMDL specifically states that regardless of outfall ownership, any MS4 operators that are significant contributors of stormwater to the TMDL-targeted outfalls are responsible for taking appropriate action to mitigate the impact of stormwater on water quality.

Equal Reductions for Each Source
Given the fact that waterfowl and wildlife contribute significant quantities of fecal coliform down gradient of stormwater outfalls, the Town objects to the draft TMDL source reduction strategy and requests RIDEM to promulgate a fecal coliform TMDL for Point Judith Pond that requires equal reductions among sources (i.e.: equal reductions for all or equal loadings from each). The TMDL as drafted does not adequately address wildlife and waterfowl fecal contributions to the impaired water body down gradient of stormwater outfalls. For example, as the trustee for natural resources, RIDEM needs to implement a comprehensive wildlife management program to address the source of fecal coliform in order to achieve an equal reduction based on loadings directly resulting from wildlife pollutant contributions to the pond.

RIDEM Response:
See the above responses.

Baseline Background Pathogen Levels
Wildlife and waterfowl have always inhabited the Point Judith Pond and Saugatucket River watershed basin with an associated contribution of fecal coliform. RIDEM needs to quantify the level of fecal coliform contribution to the impaired water body associated with wildlife and waterfowl that has always been present within the watershed. In other words, is the proposed 97% fecal coliform reduction greater than fecal coliform levels attributed to the natural order that have always existed in the watershed?

As such, Section 3.4 Natural Background Conditions of RIDEM's "Total Maximum Daily Load Analysis for Point Judith Pond Waters- Pathogen/ Bacteria Impairments" technical paper inadequately addresses this issue, which appears to be a significant contribution of fecal coliform to the impaired water. The Town requests that RIDEM quantity this pollutant contribution prior to promulgating the proposed TMDL.

RIDEM Response:
Presumably the comment refers to the 95.5% reduction (which is the largest of any reduction called for in the document) at station GA-1 at the head of the pond, since the TMDL does not specify a 97% reduction anywhere. This reduction is based upon the 30 most recently completed sampling surveys. A close inspection of the data finds that the TMDL targets are driven by the reductions needed to meet the 90^{th} percentile portion of the fecal coliform standard for SA waters. In determining the necessary reductions, RIDEM utilizes the highest reduction calculated for either the geometric mean or 90^{th} percentile portion of the standard from all stations within the waterbody segment. This ensures that the TMDL is protective of all portions of the waterbody under critical – as required by US EPA. In this case, it is the data collected during wet weather conditions that influence the necessary reductions. As stated previously, RIDEM acknowledges that waterfowl may contribute to water quality violations, however, the water quality data suggest that it is more likely the large amount of stormwater generated during rainfall events and discharged untreated into the upstream watershed and directly into the pond that are causing the impairment. This calculation is necessary to meet EPA TMDL requirements.

A review of annual statistics of water quality data collected over the last ten years reveals a trend of increasing fecal coliform concentrations (both geometric means and 90th percentile values) in the upper reaches of Point Judith Pond. Typically the highest values are associated with wet weather conditions. As stated elsewhere in this response document, sources of bacteria in stormwater are varied and regardless of whether the source is human or animal, the impact of these sources is exacerbated by stormwater drainage systems, which deliver untreated stormwater into the state's surface waters. If it can be demonstrated that direct sources can be controlled such that the stormwater conveyed from drainage systems does not result in violations of water quality standards, actions could be limited to only those that control direct sources. RIDEM recognizes that a multifaceted approach is required, but given the amount of impervious area served by stormwater drainage systems, reductions in the quantity of stormwater discharged and treatment to improve the quality of stormwater discharged will be necessary to restore the pond.

State of Rhode Island Reimbursable Costs

The Town believes that the costs associated with compliance of the proposed TMDL are reimbursable by the State. The implementation actions imposed by RIDEM are a 'state mandate' subject to reimbursement under RI General Laws §45-13-6 through §45-13-10. Pursuant to RIGL §45-13-7, *state mandated costs* include costs to a municipality resulting from any state-initiated regulation or policy (i.e. the TMDL) adopted by a state department (RIDEM) "that requires a local government to establish, expand, or modify its activities in a way as to necessitate additional expenditures from local government revenue sources *where the expenditures are not otherwise reimbursed in whole*."

The Clean Water Act does not mandate Water Quality Standards (WQS) for non-point sources but gives RIDEM complete discretion in setting the pollutant caps. 40CFR131.12 "Antidegradation Policy" states in pertinent part:

"(a) The State shall develop and adopt a statewide antidegradation policy and identify the methods for implementing such policy pursuant to this subpart [of the Act]. The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following: (1) Existing in-stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. (2) Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected…."

The Act does not set forth specific reduction levels, which the State must match or exceed with its WQS. In fact, the CWA provides no federal authority for requiring non-point sources to reduce pollutant loadings. Furthermore, the TMDL's required by the CWA are simply a source of information for a given water body, which includes a selection of management measures or implementation efforts that need to be applied to achieve the specific load reduction necessary to protect the existing uses of a water body.

RIGL §45-13-7 specifically addresses state regulations and policies that are intended to achieve compliance with federal statutes or regulations. The section requires "Where the federal statute

or regulation ... is discretionary, the state ... action shall be considered a state mandate for the purposes of RIGL §45-13-7 - §45-13-10.

In light of the above, we request that prior to adoption, RIDEM address the issue of mandated costs associated with implementation of the proposed TMDLs.

Your attention to the Town's concerns regarding the draft TMDL for fecal coliform for Point Judith Pond Waters is appreciated. Please do not hesitate to contact me directly should you have any additional questions relative to this matter.

RIDEM Response:
The TMDL program is a state-administered program but not a state-initiated program. The federal Clean Water Act (and implementing regulations found in 40 CFR Part 130.7) requires that once a waterbody has been identified as impaired (i.e. polluted) that a schedule be established for development of a TMDL to address that impairment (as found in the state's 303(d) list). Federal regulations further require that TMDLs establish the pollutant reductions necessary to attain water quality standards and that the "allowable load" be allocated amongst the identified point and nonpoint sources of pollution. As you have noted, TMDLs are not in themselves enforceable or self-implementing. State and federal regulations however require that point source permits (NPDES or RIPDES) be modified to address relevant TMDL findings. More specifically relating to stormwater, 40 CFR Part 122 states that NPDES permit holders (i.e. Town of South Kingstown and other MS4 operators), "comply with any more stringent effluent limitations in your permit, including permit requirements that modify, or are in addition to, the minimum control measures based on an approved total maximum daily load (TMDL) or equivalent analysis . . . that determines such limitations are needed to protect water quality" (paragraph 122.34 (e)(1)).

In response to other points raised, Water Quality Standards apply to all waters of the state regardless of pollution sources impacting these waters. The following paragraph from 40 CFR 130.0 (b) describes water quality planning and management requirements, including the definition of Water Quality Standards.
"(b) Water quality standards (WQS) are the State's goals for individual water bodies and provide the legal basis for control decisions under the Act. Water quality monitoring activities provide the chemical, physical and biological data needed to determine the present quality of a State's waters and to identify the sources of pollutants in those waters."

The antidegradation language referenced in the comment appears out of context and does not apply in this case since the antidegradation provisions apply to waterbodies that meet water quality standards, which is not the case with either the tidal Saugatucket River or impaired waters of Point Judith Pond.

For the reasons stated above, it is RIDEM's position that the TMDL recommendations do not represent a "state mandate for the purposes of RIGL §45-13-7 - §45-13-10." However, that is not to say that monetary considerations are not a concern to RIDEM. Wherever feasible, RIDEM provides technical and/or financial assistance to municipalities and others responsible for implementation of TMDL recommendations. The agency has worked very closely with the

governor's office and state legislature to ensure that state bond funds are available to assist with the costs of implementing TMDLs. In addition to the Narragansett Bay and Watershed Restoration Bond Funds, RIDEM makes federal 319 Nonpoint Source Grants available for nonpoint source pollution abatement activities, with priority points given to projects that address TMDL recommendations. RIDEM also administers the Clean Vessel Act grant program, which provides funds to marinas and others to purchase and repair marine sanitation device pump-out facilities. As was done on the Dale Carlia Stormwater Attenuation Project (where RIDEM applied for and received a federal 104(b)3 grant for the Town of South Kingstown which required no local match), RIDEM also works to get other federal grants to assist municipalities and others in implementing TMDL recommendations. Finally, the Office of Water Resources continues to work with the RIDEM Division of Agriculture to assist farmers with addressing TMDL recommendations and in obtaining funds to develop agriculture management plans and install/construct best management practices.

RHODE ISLAND DEPARTMENT OF TRANSPORTATION

This letter constitutes RIDOT's written comments regarding the Point Judith Pond Waters TMDL report. RIDOT has reviewed the report, attended the December 5, 2007 Public Meeting, and offers the following:

RIDOT, RIDEM, and the URI Cooperative Extension have entered into a multi-year agreement for URI to provide stormwater public education and outreach support and materials to participating MS4s. Public education regarding illicit discharges, pet waste, feeding of waterfowl, motor vehicle repair/maintenance waste, etc. are all anticipated to be addressed through this Agreement. The RIDEM RIPDES Program has a copy of this agreement, or it may be found on RIDOT's Stormwater webpage at http://www.dot.ri.gov/programs/enviro/index.html within the 2007 Revised SWMPP Attachments.

RIDOT will continue to work with the Office of Water Resources and interconnected MS4s in both the Storm Water Retrofit Program and the Storm Water Management Program. RIDOT will also implement each of the 6 Phase II Minimum Measures within the Point Judith Pond Waters TMDL area, to the maximum extent practicable, and will report on progress in the RIPDES Annual Report. An amended SWMPP will be submitted after the acceptance and finalization of the TMDL.

Should you have any questions regarding this matter, please contact Ms. Allison LeBlanc within the Natural Resources Unit at 222-2023, Extension 4097. Thank you.

Additional Technical Comments (no response necessary):

- Page 10, Section 1.1, 2nd Paragraph: Last sentence should read 'This study area is shown in Figure 1.1.'
- Page 16, table 2.2: The total area unit of the sub-watersheds (left-most column) should be km^2 (instead of (km)).
- Page 24, 1st paragraph: "Samples are collected…(see Appendix A)." The reference should be to Appendix B.

- Page 24, 3rd paragraph: Salt Pond Coalition Data and RIDEM TMDL data should reference Appendix B.
- Page 25, 4th paragraph: typo in first sentence…"…most recent thirsty samples."
- Page 30, *Wastewater Disposal*: Reference the TMDL water (Point Judith Pond, etc…) instead of "Growing Area" to be consistent with rest of report.
- Page 43, *Narragansett* recommendations: "The stream labeled as Source 8…" On page 30, the report states that sources 7 & 8 are not expected to be substantial contributors of bacteria to the pond. Should the reference be to Source 6?

RIDEM Response:
The above comments were addressed by making minor revisions as requested by RIDOT.

Page 11, Figure 1.2: The same Water Quality Classification legend formatting should be used in each of the figures (SB and SA{b} are different in 1.2 than 1.1, 3.1, and 3.3).

RIDEM Response:
The legends have been modified to be consistent throughout all the figures.

Page 11, Section 1.2: "The pollutant of concern…by Rhode Island as an indicator…". The State Agency (DEM &/or DOH…) that determined fecal coliform as an appropriate parameter should be inserted.

RIDEM Response:
RIDEM is the Rhode Island authorized agency to promulgate water quality standards. RIDEM uses input from other relevant agencies (i.e. HEALTH). The relevant federal and/or state agency determines the indicator based on use.

Page 19, Section 2.3: The last (3) sentences reiterate the first (3).

RIDEM Response:
The last three sentences of Section 2.3 have been removed.

Page 27, Figure 3.3: Include source IDs (make map whole page to increase legibility)

RIDEM Response:
The map was increased in size. Source Ids are not necessary here.

Pages 28-30: Include source numbers for all sources mentioned.

RIDEM Response:
Source numbers were included in the narrative.

Page 29, 2nd paragraph: Emu farm as potential source of contamination… on page 32 (3rd paragraph), the TMDL states that the emus are in a pen with no direct access and no stream conveyance. The significance of the emu farm is unclear.

RIDEM Response:
Please see Page 47: "Although the emus are in a pen and do not have direct access to Point Judith Pond, bacteria contamination can result as stormwater flows along the ground surface through the pen and into the pond."

Page 32, *Other Bacteria Sources*: The significance of the potential animal sources, boat discharges, or industrial discharges are not stated as they are for stormwater discharges and wastewater disposal.

RIDEM Response:
Animal and boat sources are present in all areas of the pond and are especially difficult to quantify their impacts, as sources are intermittent in nature. As mentioned in the TMDL, the individual RIPDES permits (non-stormwater) are all located in a non-impaired area and consist of activities that do not normally contain high bacteria loads.

Page 35, 2nd paragraph: "Table 4.1 lists… Figure 3.1 shows the location of segments and stations." Figure 3.1 does not show the waterbody segments, and the station identifiers do not match those listed in Table 4.1. That the Shellfish Growing Area Monitoring Stations were specifically used should also be mentioned (and reference Appendix A for location description).

RIDEM Response:
The last sentence of paragraph 2 has been revised as follows: Figure 3.1 and Figure 3.2 show the locations of the shellfish program and other stations. Station data and descriptions may be found in Appendices A and B. Waterbody segments are shown in Figure 1.2.

STEVE WINNETT, EPA (VIA EMAIL)

Here is our review of the draft TMDL for pathogens in Pt. Judith Pond waters. Thank you for the opportunity to comment on it. Our comments center on two major issues within the TMDL, the TMDL allocations for Billington Cove and Potter Pond Channel. We also have comments about the margin of safety.

Billington Cove

Although this water body (Judith Pond waters in the vicinity of Billington Cove Marina, RI0010043E-06D) is one of the six for which this TMDL is written, there is no TMDL allocation given for it, although it is stated in the TMDL document that it is impaired. It does not appear in Table 4.2, which contains the TMDL percent reductions. It also does not appear in Table 4.1, which identifies the stations within each segment used to establish the allowable loading. In fact, its situation is never resolved. Is this an oversight?

We point this out because, based on the TMDL document, there doesn't appear to be any doubt that the segment is impaired, and it is included in the area at the northern end of Point Judith Pond that is closed for shellfish harvesting as recently as 2007. The data for shellfish monitoring station GA10-5, the closest to Billington Cove, clearly exhibits exceedances for both geometric means and 90th percentile values compared to the criteria for class SA{b} (19.4 and 240, respectively, compared to targets of 14 and 49). In addition, on page 29, the TMDL references a trickle flow to the cove of 930 fc/100ml, and a single source whose two samples had fecal counts of 240 fc/100ml. The results for this segment are also identical to one of those used to set the allocation for segment 06C.

Please explain.

RIDEM Response:

Waterbody segment is impaired based on the factors listed. A row will be added in Table 4.1 showing that station GA10-5 has been used to evaluate water quality conditions in the segment. Another row will be added to Table 4.2 to show appropriate reductions for the segment. The reduction will be set equal to the adjacent segment, waterbody ID RI0010043E-06C, Upper Point Judith Pond.

Potter Pond Channel

There seem to be conflicting statements in the TMDL document as to whether or not this water body (RI0010043E-06H) is impaired:

There is a zero (0) reduction given for the waterbody in Table 4.2, which would seem to indicate that it is meeting standards.

The Abstract states that impairments are present in the channel connecting Potter Pond to Point Judith Pond, and other statements in the document mirror that point, as do the maps (Fig 1.2, for example) which show impaired water bodies. The channel is included in the 2007 shellfish closure area. We assume the water body includes the area to the east of the narrow channel where the water body opens out and contains a small class SB area (included in the impaired area, marked by cross hatches)? Presumably, the TMDL would include all impaired areas.

[EPA notes that while the data for shellfish monitoring station GA10-23, located within the narrow part of Potter Pond Channel, does not exhibit exceedances in Table 3.1, the water body seems to include portions of the larger area to the east of the narrow part of the channel, which is shown to be part of the impaired area. It might be inferred from the map that GA10-23 would

not necessarily be a good indicator of the water quality in that part of the impaired water body, for example out beyond the small class SB area and west of the line that demarcates the eastern end of the impaired area.]

On page 22, last paragraph, the document states that "…Stations located in the lower half of Point Judith Pond as well as Potter Pond Channel meet water quality standards. Although GA10-23, the station in Potter Pond Channel, met water quality standards during this time period, the area remains closed and listed as impaired; given past water quality fluctuations observed at this station, additional data are needed to confirm that water quality conditions have in fact improved."

On page 33, last paragraph, the document states that "…both Champlin Cove and the Potter Pond Channel also exceed water quality standards."

EPA suggests that in light of the above, it is premature to assume that the station GA10-23 data adequately represent water quality in the segment and to set a N/A reduction for this segment (Table 4.2). If additional data are needed to show water quality has improved beyond the segment's implied impaired state, EPA suggests RI DEM either keep the segment in Category 5 of the integrated list until such data are available, at which point RI DEM may request the segment be delisted, or RI DEM may request Category 3 status when it submits its 2008 integrated report. Category 3 recognizes that there are insufficient available data and/or information to make a use support determination.

RIDEM Response:
RIDEM acknowledges that the information on Potter Pond Channel presented in the TMDL is somewhat confusing. The 2006 303(d) list identified the waterbody segment (RI0010043E-06H) as impaired for fecal coliform criteria applicable to Class SA waterbodies. The segment was originally listed as impaired for fecal coliform in 1996, since data collected at shellfish monitoring station GA10-23, located mid-channel, was not meeting Class SA fecal coliform criteria. Specifically, the area met the geometric mean fecal coliform criteria, however, did not meet the variability portion of the shellfishing criteria when evaluating the 30 most recent sampling points taken from 1991 through 1995 (consistent with the NSSP-approved Shellfish Monitoring Program's data evaluation protocol). An analysis of the most recent 30 data points collected by RIDEM's Shellfish Monitoring Program from 2003 through 2007 at station GA10-23, shows that the waterbody segment no longer violates Class SA fecal coliform criteria. Upon further consideration of this recent Potter Pond Channel data, RIDEM is proposing to delist this waterbody segment on the 2008 303(d) list.

Relative to whether station GA 10-23 adequately represents water quality in the segment – given the waterbody segment's relatively small area and strong tidal flushing of the channel and adjoining areas, we do not concur with EPA's suggestion. Table 4.2 has been modified to show a reduction of N/A for the Potter Pond Channel per EPA's suggestion.

The impairment in Potter Pond Channel is based on station GA10-23 as it is the closest in-stream station to the waterbody.

Page 22 will remain unchanged as it is correct.

On page 33, last paragraph, the document has been changed to the following: "While most segments of Point Judith Pond furthest downstream of the Saugatucket River meet water quality standards, Champlin Cove consistently violates water quality standards."

Margin of Safety

On p. 34, Margin of Safety, the three elements of the implicit MOS appear to be somewhat questionable. Please remember that the MOS is supposed to confer an extra measure of protection beyond what the data say is necessary to meet standards. Citing the use of recent data as MOS in the calculation of the TMDL only implies protection equated to the current impaired situation, not beyond it. Likewise, greater use of wet weather vs. dry weather data in TMDL development as MOS only implies protection equal to the loading reductions for wet weather, not beyond it.

As far as we know, bacterial decay is relatively insignificant, especially with regard to the loadings in the first two days of a storm event, and its use in the MOS would not offer additional protection during that time.

We suggest the use of an explicit MOS, such as an additional 5-10% increase in the required load reduction beyond what the data indicate are necessary, which would be simple and effective as a MOS.

RIDEM Response:

RIDEM has removed all references to an implicit margin of safety, instead adding an explicit MOS of 5% to all required percent reductions to each waterbody segment. Table 4.2 shows both the actual percent reductions required based on data evaluated in the TMDL as well as the modified reductions incorporating the 5% margin of safety.

Examination of Table 4.2 reveals that with this 5% MOS applied, waterbody ID RI0010043E-06B (Mouth of the Saugatucket River) would need over 100% reduction in fecal coliform bacteria concentrations to meet water quality criteria and support designated uses. RIDEM believes that pollution reductions between 90 to 100 percent should be adequate to achieve water quality standards. RIDEM will conduct follow-up monitoring to assess compliance with water quality standards.

Revisions to the TMDL Document:

- Identification of Sunset Farm as a potential contributor of fecal coliform along with recommendations for implementation of BMPs
- Identified swans as potential source of fecal coliform along with recommendations for implementation
- Modified the document to reflect that RIDEM is moving to delist waterbody ID RI0010043E-06H, Potter Pond Channel due to an analysis of recent data for the segment. References to the segment as well as data pertaining specifically to station GA10-23 have been removed from all tables and narratives, except to state that Potter Pond Channel is being delisted.
- Adjusted the Margin of Safety throughout the document. All references to an implicit MOS were removed and an explicit 5% Margin of Safety was added to all waterbody segments requiring a reduction.
- Changed Industrial Waste Discharges to Individual Non-stormwater RIPDES Permits.
- Fixed a number of minor things from RIDOT's comments.
- Adjusted abstract to show "Required percent reductions range from 62.6% to 91.4%", changed from 94.5%.
- Adjusted values in Table 4.2 for waterbody IDs RI0010043E-06C and RI0010045R-05C.
- Page 35 before table 4.1, redid sentence: Figure 3.1 and Figure 3.2 show the locations of the shellfish program and other stations. Station data and descriptions may be found in Appendices A and B.
- Page 19, Section 2.3: The last (3) sentences reiterate the first (3). The last three sentences of Section 2.3 have been removed.
- Page 28 through 30, added source numbers in the write-up.
- Added a line and footnote in both Tables 4.1 and 4.2 addressing Billington Cove segment
- Inserted new Figures 1.2, 2.1, and 3.2.

ATTACHMENT A POINT JUDITH POND SOURCE SAMPLING
DECEMBER 28, 2005 THROUGH SEPTEMBER 18, 2006

In 2002, a twelve-year shoreline survey was conducted for the entire shoreline of Point Judith Pond and Potter Pond. Numerous actual and potential sources of bacteria contamination were identified. In order to obtain more recent data, follow-up shoreline survey sampling was conducted over the course of six days between December 28, 2005 and September 18, 2006. The shoreline and sources targeted were those located in the impaired tidal areas of Point Judith Pond, including in the upper reaches of the pond, a small segment in the channel to Potter Pond, and the lower Saugatucket River. Sources in upper Point Judith Pond and Potter Pond were identified during the 2002 shoreline survey. During this most recent survey, a small segment of shoreline was walked in the lower Saugatucket River, from the Main Street Dam to the Route 1 overpass. Four sources were identified in this segment. The additional sampling also helped to analyze the impacts of seasonal changes as well as precipitation on fecal coliform counts.

RI0010045R-05C - Lower Saugatucket River

The lower Saugatucket River from the Main Street Dam in Wakefield to the Route 1 overpass has been classified by DEM as a Class SB waterbody. DEM has listed this segment as impaired on its 303(d) list. It is directly downstream of the freshwater Saugatucket River. A TMDL plan for the freshwater Saugatucket River was approved by EPA in July of 2003. Sample results from the lower Saugatucket River have been divided into two categories, those taken in-stream and those that are actual or potential sources of bacteria to the Saugatucket River, such as stormwater pipes or streams.

Nine sources outlet into the lower Saugatucket, including six stormwater sources. Twelve samples were taken from eight of the sources during both wet and dry weather. Results vary between sources, from a low of 3 fc/100mL to a high of 4600 fc/100mL. Source 74 had the highest bacteria concentration at 4600 fc/100mL. This small, shallow stream with trickle flow was sampled close to the stagnant marsh where the stream originates. Source 77 was sampled downstream of a small cattle farm. Source 77 does not have a defined outlet into the Saugatucket River. The sample was taken as close as possible to the expected outlet where a wetland area is located. Manure practices at the farm should be investigated since the cattle have been observed to be close to the stream.

Src ID	Description / Location	Results (fc/100mL)						
		May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
43	Flared end RCP outfall-Silver Spring bridge, SK	NF	**150**		**93**			
45	Stormwater swale- Mew's Tavern, SK	NF	NF		NF			
46	Flared end RCP outfall- Mew's Tavern, SK	**460**	9		**240**			
47	RCP stormdrain outfall- west side of Main St bridge	**150**	NF		**230**			
48	RCP stormdrain outfall- east side of Main St bridge, SK	NF	NF					**240**
71	RCP outfall- beneath Pond Street, SK			9				NF
74	Small stream upstream of Silver Lake Road					**4600**		
75	Groundwater seep, 30 yards downstream of Mews Tavern					3		
77	Stream outlet from cattle farm, wetland							**430**

In-stream sampling in the lower Saugatucket River varied extensively between different sampling events. During the 2002 shoreline survey, two in-stream sampling stations were established, one at the Main Street bridge (source 49) and one at the Silver Lake Avenue bridge (source 44). During the Saugatucket River TMDL study in 2002, Source 49 was broken into two separate stations, one above the Main Street dam and one downstream of the Main Street bridge. These stations, identified in the 2002 TMDL study as SR06U and SR06D respectively, are shown as 49(a) and 49(b) below. In the Saugatucket River TMDL, final weighted geometric means at Main Street were 183 fc/100mL (60 fc/100mL for dry weather and 265 fc/100mL for wet weather) at station 49(a), and 833 fc/100mL (357 fc/100mL for dry weather and 1151 fc/100mL for wet weather) at station 49(b). Eightieth percentiles for the two locations were 1000 fc/100mL and 4100 fc/100mL respectively.

Follow-up sampling was conducted at numerous in-stream locations, three locations in the vicinity of Main Street in Wakefield and four additional locations for the remainder of the lower Saugatucket River. Results varied extensively between sampling days. Samples taken on June 20, 2006 were elevated, ranging from 2400 fc/100mL to 11,000 fc/100mL. A rainfall event of 0.47 inches fell that day, preceded by 0.13 inches of rain the day before. June was a very wet month, with 5.79 inches of rain falling above normal (based on the Providence National Weather Service sampling station). The large amount of rain over the course of June likely resulted in the elevated readings.

Src ID	Description / Location	Results (fc/100mL)						
		May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
49	Saugatucket River-under Main St bridge, SK	1100	390	4				93
49(a)	Saugatucket River-top of Main St dam, SK			9	2400			
49(b)	Saugatucket River-downstream of Main St bridge, SK			3				
72	Saugatucket River behind Mews				2400	240		150
76	300 yds downstream from Mews, 30 yds from riprap					43		
44	Stream approx. 200-ft north of Silver Lake Ave bridge, SK	43	23		11000	43		230
73	Saugatucket River, 6 Edgewater Road				4600			43

RI0010043E-06B - Mouth of Saugatucket

Three sources are located in RI0010043E-06B, an impaired SB waterbody. These sources are located south of the Route 1 overpass and north of Can Buoy 33. Sources include two outfall pipes and an Emu farm along the shore. Source 52 had a substantial flow rate both times it was sampled; follow-up sampling was conducted on January 27, 2006, one day after 0.37 inches of rain fell, and four days after 0.74 inches fell. Although noticeable rain fell in the region, sample results were low at 3 fc/100mL, even less than 93 fc/100mL measured from the 2002 survey. Since the source flows during all weather conditions, it is expected that the pipe drains a wetland area located on the northern side of Route 1, however this has not been confirmed. The remaining two sources were not discharging during the two times DEM tried to sample them, however weather was dry with less than 0.05 inches of rain falling over the previous five days prior to September 5, 2006. These sources do not seem to be directly causing the impairment to this segment.

Src ID	Description / Location	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
52	RCP outfall-Route 1 to Upper Pond, SK	**93**		3				
65	RCP outfall w/ rip-rap-Gull Rd., Narr.	NF		CNA			NF	
66	Emu farm-6 emus-Gull Rd, Narr.	NF		CNA			NF	

RI0010043E-06C - Upper Point Judith Pond

The largest number of potential and actual sources to Point Judith Pond are located in the region known as Upper Point Judith Pond. The region is an impaired Class SA waterbody. This portion of the pond includes areas south of Can Buoy 33 such as The Narrows, Long Cove, Congdon Cove, Smelt Brook Cove, as well as other areas of the upper pond. Fifteen sources have been identified in this area, including two pipes. The remaining identified sources are small streams. Of the two pipes, neither was flowing during the 2002 shoreline survey or the follow-up date; all sources with the exception of sources 37 through 40 were collected on September 5, 2006. Weather before this sampling event was dry, with a total of only 0.05 inches of rain falling in the five days previous. Sources 37 through 40 were sampled on September 18, 2006, before which approximately one-inch of rain fell over a two-day period from September 14 through September 15. Fecal coliform concentrations from the streams varied from 4 fc/100mL to 1100 fc/100mL. These results are somewhat higher than other sources. The highest source sample is 1100 fc/100mL, which is not uncommon for streams draining wetlands.

Src ID	Description / Location	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
29	Stream entering Long Cove, Narr	**90**					**240**	
30	Stream entering Long Cove, Narr	**40**					**460**	
31	Stream entering Long Cove, Narr	**90**					**460**	
32	Stream entering Long Cove, Narr	2					**150**	
33	Stream entering Long Cove, Narr	9					**430**	
34	Stream entering Long Cove, Narr	9					**39**	
35	Corrugated metal pipe outfall-west side of Short Point, SK	NF	CNA				NF	
36	Stream entering Billington Cove, SK	**460**	CNA				**930**	
37	Stream entering Congdon Cove, SK	**150**		3				**23**
38	Congdon Cove outlet, SK	7		CNA				4
39	Smelt Brook, SK	**23**						**150**
40	Stream entering Smelt Brook Cove, SK	**23**						**23**
42	PVC Pipe-west side of Upper Pond, SK	NF	CNA				NF	
50	Stream entering east side of Upper Pond, Narr	**23**		CNA			**1100**	
51	Stream entering Long Cove, Narr	9		CNA			**430**	

RI0010043E-06D - Billington Cove

A single source is present in the vicinity of Billington Cove Marina in Billington Cove, listed as impaired for water quality class SA{b}. This pipe drains a salt marsh area adjacent to the marina. Fecal coliform concentrations were 240 fc/100mL during the 2002 shoreline survey and

the most recent follow-up. The follow-up sample for Source 53 was taken on December 28, 2005. Approximately one-half inch of rain fell from December 25 through December 26 and could explain why the fecal reading is somewhat elevated though not exceptionally high.

Src ID	Description / Location	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
53	CPP draining salt marsh-Billington Cove Marina, SK	**240**	**240**					

RI0010043E-06H - Potter Pond Channel

A single source is present in the channel connecting Potter Pond to Point Judith Pond. This channel is the only connection between the two ponds. It is narrow and bordered by houses and small summer cottages along both sides. The channel is classified as an SA waterbody. The single RCP pipe drains a salt marsh north of the channel. Results from both sampling periods were fairly low, especially the reading from the most recent sampling day of 4 fc/100mL. The follow-up sample for Source 55 was taken on December 28, 2005. Approximately one-half inch of rain fell from a two-day period December 25 through December 26.

Src ID	Description / Location	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
55	RCP draining salt marsh to connector channel east of Succotash Rd, SK	**93**	4					

RI0010043E-06K - Champlin Cove

The sources located in RI0010043E-06K discharge into Champlin Cove in Narragansett. Champlin Cove is classified as a Class SA waterbody. There is one pipe that conveys stormwater directly to the cove; all other sources are streams and seepage channels. Results were generally low (below 240 fc/100mL) from both the 2002 shoreline survey and from follow-up sampling taken in 2005 and 2006. Two sources identified in the 2002 shoreline survey were not flowing during either sampling event. Follow-up sampling of sources 6, 7, and 8 was conducted on September 5, 2006. Weather before this sampling event was dry, with a total of only 0.05 inches of rain falling in the five days previous. The remaining sources were sampled on December 28, 2005, before which approximately one-half inch of rain fell from a two-day period December 25 through December 26.

Src ID	Description / Location	Results (fc/100mL) May-Jun 2002	12/28 2005	1/27 2006	6/20 2006	8/18 2006	9/5 2006	9/18 2006
5	Seepage Channel- Brigg's Farm Beach, Narr	NF	NF					
6	Stream entering Champlin Cove, Narr	**240**	CNA				**240**	
7	Stream entering Champlin Cove, Narr	**43**	CNA				**93**	
8	Stream entering Champlin Cove, Narr	4	CNA				**43**	
27	Swale/Seep-Champlin Cove south, Narr	**240**	9					
28	RCP outfall-Champlin Cove south, Narr	NF	NF					