PARSONS CREEK WATERSHED
WATER QUALITY REPORT

NOVEMBER 2016

PREPARED FOR

Town of Rye
10 Central Road
Rye, NH 03862

PREPARED BY

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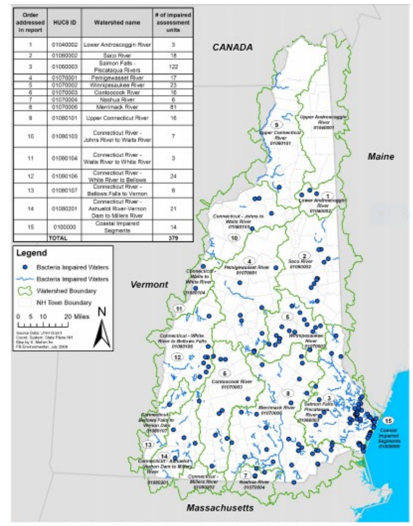
TRACKING FECAL CONTAMINATION

Current Tools and Challenges



Order addressed in report	HUC8 ID	Watershed name	# of impaired assessment units
1	01040002	Lower Androscoggin River	3
2	01060002	Saco River	18
3	01060003	Salmon Falls - Piscataqua Rivers	122
4	01070001	Pemigewasset River	17
5	01070002	Winnipesaukee River	23
6	01070003	Contoocook River	16
7	01070004	Nashua River	6
8	01070006	Merrimack River	81
9	01080101	Upper Connecticut River	16
10	01080103	Connecticut River - Johns River to Waits River	7
11	01080104	Connecticut River - Waits River to White River	3
12	01080106	Connecticut River - White River to Bellows	24
13	01080107	Connecticut River - Bellows Falls to Vernon	8
14	01080201	Connecticut River - Ashuelot River-Vernon Dam to Millers River	21
15	0100000	Coastal Impaired Segments	14
	TOTAL		379

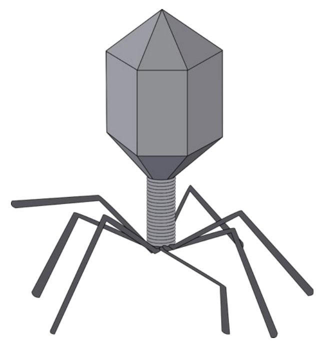
Figure 1-1: Map of Bacteria Impaired Waters in New Hampshire, by HUC 8 Watershed.

STATEWIDE FECAL CONTAMINATION ISSUE

Surface waters near developed areas are impacted by fecal contamination from polluted stormwater runoff, malfunctioning septic systems, pet, livestock, and wildlife waste, leaky sewer lines, and other aging infrastructure on residential, municipal, and commercial properties. The State of New Hampshire lists over 300 river and estuarine segments as impaired for fecal indicator bacteria (FIB). These impaired waterbodies are particularly concentrated in the populated Seacoast Region. This fecal contamination generates a significant threat to water quality, public health, and the local economy.

TRACKING FECAL SOURCES IS DIFFICULT

Monitoring, tracking, and managing pathogens in fecal matter is extremely difficult, particularly when fecal indicators (e.g., *E.coli,* Enterococci, or fecal coliform) are also highly variable to track and measure. Fecal indicator bacteria (FIB) are used to detect fecal contamination and the pathogens associated with fecal matter in surface waters. Previous studies of beaches impacted by point sources of sewage discharge found a significant correlation between FIB and the probability of gastrointestinal (GI) illness in swimmers. However, there are some limitations to using FIB to track pathogens in fecal matter. Bacteria and viral pathogens react differently in the natural environment, so that external factors (temperature, sunlight, proliferation, etc.) may influence the concentration of FIB, but not the viral pathogens of interest for protecting public health. In addition, laboratory analysis of FIB can be highly variable due to the biological nature of the bacteria. For instance, laboratory and field duplicates can vary up to 200% or more, particularly at lower concentrations. As such, bacteria results should not be interpreted as absolute numbers, but as a rough estimate of concentration. New indicators are currently being tested (e.g., male-specific coliphage) that help address these issues, but until then current FIB must be interpreted with some caution when determining its actual threat to public health.



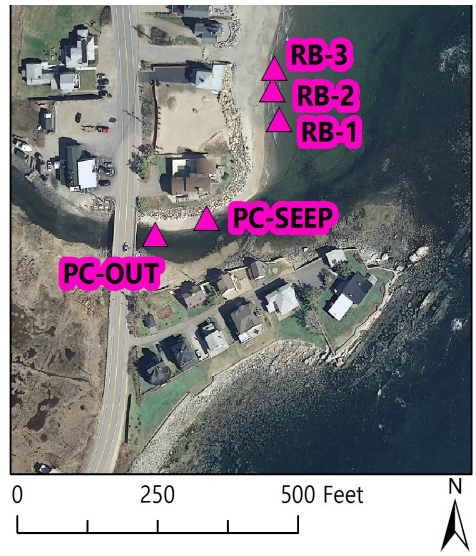
BEACH SAMPLING

Wallis Beach, Rye, NH

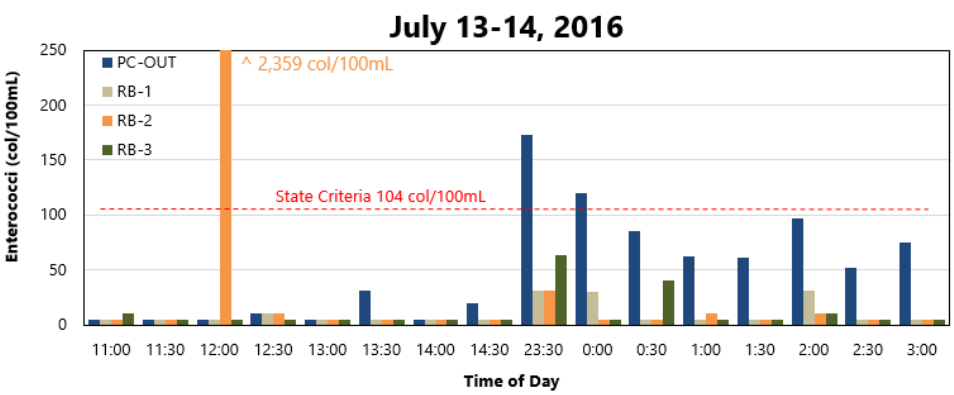
2016 OVERNIGHT BEACH SEEP SAMPLING

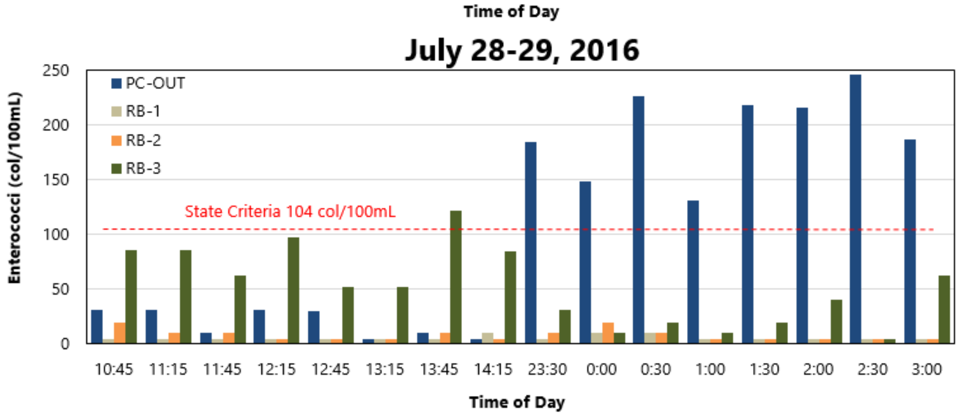
Since overnight beach seep sampling in 2014 and 2015 showed elevated concentrations of fecal indicator bacteria (Enterococci) and canine detection in 2013 and 2015 showed human waste as a likely source of contamination to the beach outlet area, three seeps (RB-1, RB-2, RB-3) near the beach access point north of the Parsons Creek outlet were sampled for Enterococci over 24 hours at low tide on July 13-14, 2016 (*n* = 16) and July 28-29, 2016 (*n* = 16). A seep (PC-SEEP) along the north bank of the outlet was also sampled once during the day and twice at night on July 28 -29, but showed contamination levels below State criterion (similar to 2015).

Similar to 2015 overnight sampling, Enterococci measured at Parsons Creek outlet (PC -OUT) were elevated at night, exceeding State criterion for single samples during both 2016 surveys. These seemingly higher counts at night may be a reflection of bacteria die-off from UV ray exposure during the day. The beach seeps were more variable with no discernable pattern in bacteria concentrations, which is similar to results in previous years. However, RB-2 has shown a significant spike in bacteria concentrations around mid-day in both 2015 and 2016, possibly a pulse of contaminated groundwater from nearby human activities. In addition, RB-3 during the July 28-29 survey showed daytime bacteria concentrations consistently elevated above nighttime concentrations, which may suggest human or non-human fecal contamination at that location. Refer to Appendix A for data.



Overnight beach seep sampling revealed possible fecal contamination, particularly at RB-2 (mid-day spike) and RB-3 (consistently elevated daytime concentrations); however, the high data variability across years makes it difficult to draw significant conclusions about fecal sources at the beach.





FB Environmental staff collecting a beach seep sample at night. Photo credit: FBE.

WATERSHED SAMPLING

Parsons Creek, Rye, NH

2016 WATERSHED SAMPLING

Twelve watershed sites were sampled for Enterococci six times at low tide during wet and dry weather conditions from May to October 2016. These sites were sampled at primary locations throughout the watershed to re-investigate potential “hotspots” of fecal contamination compared to those found during previous bracket sampling efforts from 2008-2010. Three new sites were added in 2016 (PC10, PC11, and WIL-CUL) to better account for spatial gaps in the monitoring program. A back-up site (BCH26A) was sampled in instances of no flow conditions at the twelve main sites. The major source of fecal contamination stemmed from the northern portion of the watershed (BCH08, PC08, PC07 on the eastern branch and ACPS005-U35 on the western branch) and seemed to dilute or be attenuated downstream as Parson Creek flows through the marsh. PC08 is of particular concern with measured bacteria concentrations more than 24,200 col/100mL on 8/11/2016. One site (WIL-CUL) that drains a man-made pond in the Highland Ave neighborhood also showed elevated counts, but was only sampled once due to no flow conditions. Refer to Appendix A for data.

Similar to 2015, the upper east branch of Parsons Creek showed multiple locations (BCH08, PC07, PC08) where individual samples and geometric means exceeded State criteria. Septic systems near or contributing to the area around these sites should be inspected for proper functioning to rule out human fecal contamination as a primary

Looking downstream of confluence with BCH08, PC08, and PC07. Photo Credit: FBE.

WET/DRY WEATHER ANALYSIS

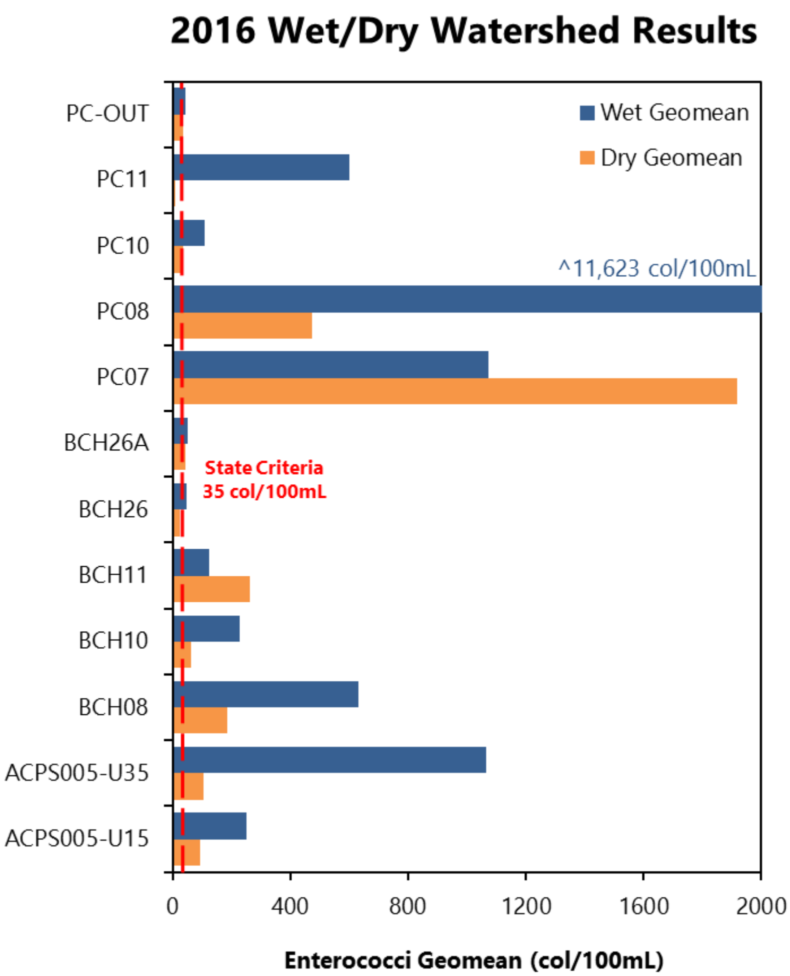
Parsons Creek Watershed and Beaches

2016 WET/DRY WEATHER ANALYSIS

Similar to historical patterns, wet weather in 2016 generated higher counts of fecal indicator bacteria (Enterococci) in surface waters compared to dry weather conditions, suggesting that the sources of fecal contamination are coming off the landscape as surface runoff (i.e., stormwater). However, during significant rain events (several inches), the water table may rise and intercept leachfields, which flush out to nearby waterbodies. BCH11 and PC07 were exceptions this year as dry weather conditions tended to generate higher counts, suggesting that groundwater (e.g., malfunctioning septic systems) may be contributing to fecal contamination to those areas.

Historically and in 2016, fecal indicator bacteria (Enterococci) have exceeded State criteria during both wet and dry weather conditions, suggesting that both stormwater runoff and groundwater are significant sources of contamination to Parsons Creek and the beach. The low-lying topography and high groundwater table in the watershed make leachfields susceptible to malfunction, which is likely the primary source of fecal contamination in the watershed and at the beaches.

Eroded banks at Parsons Creek outlet after major storm event in 2015. Photo Credit: FBE.



Drought conditions in 2016 prevented mobilization of potential fecal sources. Photo Credit: FBE.

SUMMARY

Snapshot of Results

Overall, the Town of Rye, the NHDES Beaches Program, the NHDES Watershed Assistance Section, the NH Shellfish Program, FB Environmental Associates, the Jackson Laboratory, and Environmental Canine Services have done a considerable amount of work to track sources of fecal contamination in the Parsons Creek watershed and along the beach. This work has generated a long-term dataset for analysis and interpretation for determining next steps in dealing with this issue. A summary of results is provided below.

Beach Results

⇒ Elevated fecal indicator bacteria concentrations continue to be measured at the beach, but no discernable pattern in these high counts were found and the majority of samples collected had counts within acceptable limits for State water quality criteria.

⇒ An unusual mid-day spike in Enterococci at RB-2 (seen in 2015 and 2016) may be a pulse of groundwater contamination from nearby human activities. Historical canine investigations show that there is human fecal contamination at the outlet and along the beach.

Watershed Results

⇒ Elevated fecal indicator bacteria concentrations continue to be measured throughout the watershed, particularly in the upstream headwater areas. Although microbial DNA analyses conducted during dry weather on 8/9/2016 found only canine biomarkers at PC10, drought conditions likely prevented mobilization of human waste sources. Historical canine investigations show that human fecal contamination is a diffuse problem throughout the watershed due to the area's low-lying topography and high groundwater table that likely intercept leachfields on a regular basis. Even if a high water table is not the issue, sandy soils would allow for fast percolation rates of contaminated leachfield water to groundwater and ultimately surface waters without adequate treatment of pathogens.

Wet/Dry Weather Analysis

⇒ Historically and in 2016, fecal contamination was elevated during both wet and dry weather conditions, suggesting that both stormwater runoff and groundwater are significant sources of contamination to Parsons Creek and the beach.

TAKE HOME

The low-lying topography and high groundwater table in the Parsons Creek watershed make septic system leachfields susceptible to malfunction, which is likely the primary source of fecal contamination in the watershed and at the beaches.

NEXT STEPS

Recommendations and Priorities

Address groundwater sources of fecal contamination

⇒ Update the septic system database on a regular basis.

⇒ Conduct septic system surveys in priority neighborhoods near hotspot sites or where septic system history is largely unavailable. Target areas upstream of PC07.

⇒ Continue to enforce the septic system health regulation that requires pump-outs every 3 years.

⇒ Evaluate individual properties for septic system functioning near hotspots.

⇒ Consider feasibility study of engineered solutions for septic systems in the watershed.

⇒ Consider groundwater study of homes near beach seeps at the outlet to determine proper septic system functioning.

Address surface runoff sources of fecal contamination

⇒ Continue to locate candidate sites for BMP implementation to address stormwater runoff.

⇒ Continue to secure funding that implements these candidate BMP sites.

⇒ Continue to track and monitor existing BMP conditions and fix or improve sites as necessary.

⇒ Add canine waste disposal stations near walking trails.

Enhance public outreach program

⇒ Continue to distribute educational materials and reports to the public via the Town's website.

⇒ Educate homeowners on proper disposal of pet waste and maintenance of septic systems.

⇒ Continue regular meetings with the Parsons Creek Water Quality Committee.

Continue and/or expand monitoring program

⇒ Continue water quality sampling throughout the Parsons Creek watershed under varying weather conditions to track changes in fecal indicator bacteria over time.

⇒ Measure co-indicators along with fecal indicator bacteria to better pinpoint human sources of fecal contamination. Co-indicators include optical brighteners and inorganic nutrients present in human wastewater.

⇒ Conduct storm sampling before, during, and after a major rain event to characterize mobilization of fecal sources by site.

⇒ Expand duration of sampling to include a seasonal analysis of spring, summer, and fall.

APPENDIX A

2016 Beach Data

Site ID	Date	Time	Salinity (ppt)	Enterococci (col/100mL)	Weather
PC-OUT	7/13/2016	11:10	30	<10	DRY
PC-OUT	7/13/2016	11:40	27	<10	DRY
PC-OUT	7/13/2016	12:10	27	<10	DRY
PC-OUT	7/13/2016	12:43	26	10	DRY
PC-OUT	7/13/2016	13:11	26	<10	DRY
PC-OUT	7/13/2016	13:44	26	31	DRY
PC-OUT	7/13/2016	14:18	25	<10	DRY
PC-OUT	7/13/2016	14:42	25	20	DRY
PC-OUT	7/13/2016	23:32	30	*173*	DRY
PC-OUT	7/14/2016	00:00	30	*120*	DRY
PC-OUT	7/14/2016	00:31	30	85	DRY
PC-OUT	7/14/2016	01:01	29	62	DRY
PC-OUT	7/14/2016	01:30	30	61	DRY
PC-OUT	7/14/2016	02:00	30	97	DRY
PC-OUT	7/14/2016	02:30	30	52	DRY
PC-OUT	7/14/2016	03:00	30	75	DRY
PC-OUT	7/28/2016	10:50	30	31	DRY
PC-OUT	7/28/2016	11:18	28	31	DRY
PC-OUT	7/28/2016	11:49	27	10	DRY
PC-OUT	7/28/2016	12:18	27	31	DRY
PC-OUT	7/28/2016	12:46	29	30	DRY
PC-OUT	7/28/2016	13:18	28	<10	DRY
PC-OUT	7/28/2016	13:49	28	10	DRY
PC-OUT	7/28/2016	14:18	30	<10	DRY
PC-OUT	7/28/2016	23:31	30	*185*	WET
PC-OUT	7/29/2016	00:04	29	*148*	WET
PC-OUT	7/29/2016	00:31	30	*226*	WET
PC-OUT	7/29/2016	01:00	30	*131*	WET
PC-OUT	7/29/2016	01:32	30	*218*	WET
PC-OUT	7/29/2016	02:01	30	*216*	WET
PC-OUT	7/29/2016	02:31	30	*246*	WET
PC-OUT	7/29/2016	03:00	30	*187*	WET
PC-SEEP	7/28/2016	14:24	23	<10	DRY
PC-SEEP	7/29/2016	00:00	28	86	WET
PC-SEEP	7/29/2016	03:05	26	41	WET
RB-1	7/13/2016	11:15	29	<10	DRY
RB-1	7/13/2016	11:49	30	<10	DRY
RB-1	7/13/2016	12:16	30	<10	DRY
RB-1	7/13/2016	12:49	28	10	DRY

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Site ID	Date	Time	Salinity (ppt)	Enterococci (col/100mL)	Weather
RB-1	7/13/2016	13:17	29	<10	DRY
RB-1	7/13/2016	13:50	28	<10	DRY
RB-1	7/13/2016	14:22	26	<10	DRY
RB-1	7/13/2016	14:48	29	<10	DRY
RB-1	7/13/2016	23:36	30	31	DRY
RB-1	7/14/2016	00:03	29	30	DRY
RB-1	7/14/2016	00:35	30	<10	DRY
RB-1	7/14/2016	01:05	30	<10	DRY
RB-1	7/14/2016	01:38	30	<10	DRY
RB-1	7/14/2016	02:04	31	31	DRY
RB-1	7/14/2016	02:34	30	<10	DRY
RB-1	7/14/2016	03:04	32	<10	DRY
RB-1	7/28/2016	10:55	27	<10	DRY
RB-1	7/28/2016	11:24	28	<10	DRY
RB-1	7/28/2016	11:55	27	<10	DRY
RB-1	7/28/2016	12:24	27	<10	DRY
RB-1	7/28/2016	12:51	28	<10	DRY
RB-1	7/28/2016	13:23	27	<10	DRY
RB-1	7/28/2016	13:54	29	<10	DRY
RB-1	7/28/2016	14:33	27	10	DRY
RB-1	7/28/2016	23:38	29	<10	WET
RB-1	7/29/2016	00:09	30	10	WET
RB-1	7/29/2016	00:35	30	10	WET
RB-1	7/29/2016	01:05	29	<10	WET
RB-1	7/29/2016	01:36	30	<10	WET
RB-1	7/29/2016	02:07	30	<10	WET
RB-1	7/29/2016	02:35	30	<10	WET
RB-1	7/29/2016	03:10	30	<10	WET
RB-2	7/13/2016	11:21	30	<10	DRY
RB-2	7/13/2016	11:54	31	<10	DRY
RB-2	7/13/2016	12:24	30	*2,359*	DRY
RB-2	7/13/2016	12:54	29	10	DRY
RB-2	7/13/2016	13:23	29	<10	DRY
RB-2	7/13/2016	13:55	28	<10	DRY
RB-2	7/13/2016	14:27	27	<10	DRY
RB-2	7/13/2016	15:00	29	<10	DRY
RB-2	7/13/2016	23:41	30	31	DRY
RB-2	7/14/2016	00:08	31	<10	DRY
RB-2	7/14/2016	00:41	31	<10	DRY

APPENDIX A

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Site ID	Date	Time	Salinity (ppt)	Enterococci (col/100mL)	Weather
RB-2	7/14/2016	01:10	30	10	DRY
RB-2	7/14/2016	01:41	31	<10	DRY
RB-2	7/14/2016	02:07	31	10	DRY
RB-2	7/14/2016	02:38	31	<10	DRY
RB-2	7/14/2016	03:08	31	<10	DRY
RB-2	7/28/2016	11:02	28	20	DRY
RB-2	7/28/2016	11:31	28	10	DRY
RB-2	7/28/2016	12:04	27	10	DRY
RB-2	7/28/2016	12:30	28	<10	DRY
RB-2	7/28/2016	12:57	28	<10	DRY
RB-2	7/28/2016	13:32	28	<10	DRY
RB-2	7/28/2016	14:02	30	10	DRY
RB-2	7/28/2016	14:40	30	<10	DRY
RB-2	7/28/2016	23:45	29	10	WET
RB-2	7/29/2016	00:13	30	20	WET
RB-2	7/29/2016	00:39	30	10	WET
RB-2	7/29/2016	01:08	30	<10	WET
RB-2	7/29/2016	01:39	30	<10	WET
RB-2	7/29/2016	02:10	30	<10	WET
RB-2	7/29/2016	02:37	30	<10	WET
RB-2	7/29/2016	03:12	30	<10	WET
RB-3	7/13/2016	11:28	31	10	DRY
RB-3	7/13/2016	12:00	31	<10	DRY
RB-3	7/13/2016	12:35	30	<10	DRY
RB-3	7/13/2016	13:01	30	<10	DRY
RB-3	7/13/2016	13:28	30	<10	DRY
RB-3	7/13/2016	14:06	30	<10	DRY
RB-3	7/13/2016	14:33	30	<10	DRY
RB-3	7/13/2016	15:09	30	<10	DRY
RB-3	7/13/2016	23:46	30	63	DRY
RB-3	7/14/2016	00:14	30	<10	DRY
RB-3	7/14/2016	00:46	31	41	DRY
RB-3	7/14/2016	01:15	31	<10	DRY
RB-3	7/14/2016	01:44	31	<10	DRY
RB-3	7/14/2016	02:10	31	10	DRY
RB-3	7/14/2016	02:42	32	<10	DRY
RB-3	7/14/2016	03:12	32	<10	DRY
RB-3	7/28/2016	11:08	27	86	DRY
RB-3	7/28/2016	11:40	27	86	DRY

APPENDIX A

2016 Beach Data

Site ID	Date	Time	Salinity (ppt)	Enterococci (col/100mL)	Weather
RB-3	7/28/2016	12:09	27	63	DRY
RB-3	7/28/2016	12:35	27	98	DRY
RB-3	7/28/2016	13:05	31	52	DRY
RB-3	7/28/2016	13:41	28	52	DRY
RB-3	7/28/2016	14:07	30	***122***	DRY
RB-3	7/28/2016	14:45	30	85	DRY
RB-3	7/28/2016	23:50	30	31	WET
RB-3	7/29/2016	00:20	30	10	WET
RB-3	7/29/2016	00:44	30	20	WET
RB-3	7/29/2016	01:12	30	10	WET
RB-3	7/29/2016	01:43	30	20	WET
RB-3	7/29/2016	02:13	30	41	WET
RB-3	7/29/2016	02:41	30	<10	WET
RB-3	7/29/2016	03:16	30	63	WET

Bold and italicized red text indicates exceedance of the State criterion for individual Enterococci samples (104 col/100mL).

2016 Watershed Data

Site ID	Date	Time	Water Temp. (°C)	DO (%)	DO (ppm)	Salinity (ppt)	Enterococci (col/100mL)	Weather
ACPS005-U15	6/15/2016	14:22	20.4	95.6	8.6	0.0	10	DRY
ACPS005-U15	7/11/2016	10:08	17.8	81.5	7.8	0.0	*148*	WET
ACPS005-U15	8/9/2016	09:48	21.6	84.0	7.5	16.0	*120*	DRY
ACPS005-U15	8/11/2016	10:52	26.8	111.1	8.5	10.7	98	WET
ACPS005-U15	8/23/2016	08:05	17.2	60.2	5.4	15.0	*1,076*	WET
ACPS005-U15	9/30/2016	07:09	13.0	35.5	3.8	35.0	*677*	DRY
ACPS005-U35	6/15/2016	14:08	17.4	3.7	0.4	0.0	85	DRY
ACPS005-U35	7/11/2016	10:00	17.8	13.6	1.3	0.0	*11,199*	WET
ACPS005-U35	8/9/2016	09:25	18.6	1.5	0.1	0.0	*221*	DRY
ACPS005-U35	8/11/2016	10:31	20.5	4.0	0.4	0.2	96	WET
ACPS005-U35	8/23/2016	07:50	18.3	4.3	0.4	2.0	*1,124*	WET
ACPS005-U35	9/30/2016	07:25	12.9	4.1	0.4	13.0	62	DRY
BCH08	6/15/2016	15:46	30.6	106.9	8.0	5.0	62	DRY
BCH08	7/11/2016	12:15	24.6	91.8	7.7	17.0	*2,316*	WET
BCH08	8/9/2016	12:08	24.9	0.7	0.1	21.0	*1,334*	DRY
BCH08	8/11/2016	12:26	30.1	89.0	7.5	15.4	84	WET
BCH08	8/23/2016	10:20	22.3	88.0	6.3	25.0	*1,281*	WET
BCH08	9/30/2016	06:20	14.6	11.7	1.1	34.0	75	DRY
BCH10	6/15/2016	16:08	17.8	74.6	7.1	1.0	61	DRY
BCH10	7/11/2016	12:52	17.1	76.7	7.5	2.0	*148*	WET
BCH10	8/23/2016	11:00	16.1	70.0	6.9	3.0	*355*	WET
BCH11	6/15/2016	15:38	24.9	106.0	8.9	15.0	*130*	DRY
BCH11	7/11/2016	11:55	21.5	21.9	1.9	22.0	*108*	WET
BCH11	8/9/2016	11:49	23.3	1.9	0.2	26.0	*738*	DRY
BCH11	8/11/2016	12:14	25.5	5.5	0.3	26.5	30	WET
BCH11	8/23/2016	10:05	19.5	14.8	1.4	27.0	*571*	WET
BCH11	9/30/2016	06:06	14.7	12.8	1.3	36.0	*187*	DRY
BCH26	6/15/2016	15:13	26.6	203.1	16.2	15.0	20	DRY
BCH26	7/11/2016	11:25	21.9	66.7	5.9	25.0	52	WET
BCH26	8/9/2016	10:24	22.6	84.9	7.4	33.0	<10	DRY
BCH26	8/11/2016	11:15	25.5	117.0	8.1	28.9	10	WET
BCH26	8/23/2016	08:45	16.8	41.8	3.4	25.0	*175*	WET
BCH26	9/30/2016	05:45	13.6	48.5	5.1	36.0	*161*	DRY
BCH26A	7/11/2016	11:15	18.2	53.3	5.0	24.0	63	WET
BCH26A	8/11/2016	11:45	23.0	23.6	1.8	22.9	20	WET
BCH26A	8/23/2016	08:55	18.3	40.6	3.4	30.0	98	WET
BCH26A	9/30/2016	05:37	15.1	56.7	5.8	36.0	41	DRY
BCH26B	8/9/2016	10:34	23.0	104.8	9.1	11.0	<10	DRY
PC07	6/15/2016	15:57	28.3	156.8	12.3	5.0	*2,050*	DRY

APPENDIX A

2016 Watershed Data

Site ID	Date	Time	Water Temp. (°C)	DO (%)	DO (ppm)	Salinity (ppt)	Enterococci (col/100mL)	Weather
PC07	7/11/2016	12:35	25.7	216.4	17.8	16.0	*12,997*	WET
PC07	8/9/2016	12:25	26.1	36.7	2.8	25.0	*15,531*	DRY
PC07	8/11/2016	12:45	31.3	93.2	6.4	12.4	*1,270*	WET
PC07	8/23/2016	10:35	21.5	78.4	6.2	26.0	75	WET
PC07	9/30/2016	06:26	13.5	22.0	2.3	35.0	*221*	DRY
PC08	6/15/2016	15:53	27.2	41.1	3.2	14.0	*12,033*	DRY
PC08	7/11/2016	12:28	24.7	85.1	7.1	22.0	*11,199*	WET
PC08	8/9/2016	12:35	23.1	34.0	2.9	27.0	20	DRY
PC08	8/11/2016	12:37	24.5	15.6	1.3	27.0	*24,200*	WET
PC08	8/23/2016	10:45	23.6	52.2	4.1	27.0	*5,794*	WET
PC08	9/30/2016	06:32	13.3	9.4	1.0	35.0	*443*	DRY
PC10	6/15/2016	15:28	28.8	289.0	22.1	14.0	51	DRY
PC10	7/11/2016	11:37	22.5	85.2	7.5	25.0	*323*	WET
PC10	8/9/2016	11:26	24.5	202.7	17.1	30.0	<10	DRY
PC10	8/11/2016	12:00	27.9	165.1	10.9	28.4	20	WET
PC10	8/23/2016	09:50	18.8	63.0	4.8	30.0	*187*	WET
PC10	9/30/2016	05:55	13.6	28.6	3.0	37.0	*169*	DRY
PC11	6/15/2016	14:47	21.3	53.0	4.7	0.0	10	DRY
PC11	7/11/2016	10:22	17.9	65.3	6.2	0.0	*355*	WET
PC11	8/23/2016	08:25	16.2	59.8	5.8	4.0	*1,014*	WET
PC-OUT	6/15/2016	13:33	22.4	113.9	9.9	22.0	10	DRY
PC-OUT	7/11/2016	11:00	20.3	89.7	8.1	27.0	63	WET
PC-OUT	8/9/2016	10:52	22.1	124.4	11.0	27.0	20	DRY
PC-OUT	8/11/2016	11:28	24.2	101.5	7.2	28.3	20	WET
PC-OUT	8/23/2016	09:30	17.4	64.0	5.1	30.0	63	WET
PC-OUT	9/30/2016	05:24	13.8	65.7	6.9	40.0	*195*	DRY
WIL-CUL	6/15/2016	13:53	15.1	67.1	6.7	0.0	*1,600*	DRY

Bold and italicized red text indicates exceedance of the State criterion for individual Enterococci samples (104 col/100mL).

APPENDIX B

Summary of Methods

SAMPLING PROTOCOL

Sampling was performed as documented in the *NHDES Generic Beach Program Quality Assurance Project Plan* dated April 3, 2012, RFA # 06193, Section B2.0. Samples were collected in labeled whirlpak bags and stored on ice in a cooler for transport to Nelson Analytical Laboratory in Kennebunk, ME for analysis of Enterococci. Water quality parameters (DO, temperature, salinity, and specific conductivity) were collected in the field using calibrated instruments: YSI PrODO, YSI 85, and refractometer. Seeps were sampled using sterile syringes.

WET/DRY WEATHER CLASSIFICATION

Wet weather was determined as: >0.1” of precipitation in the prior 24 hours; or >0.25” in the prior 48 hours; or >2.0” in the prior 96 hours. Conditions were considered dry weather when precipitation was <0.1” for each day within 72 hours.

STATISTICAL METHODS

A Mann-Kendall trend analysis was performed for sites with at least 10 years of data. The Mann-Kendall Trend Test is a non-parametric statistical test that determines if the central value (median) of a dataset has changed over time. A non-parametric test is appropriate here because it does not make assumptions about the normality or variability of the dataset; variation seen year-to-year or within seasons will not influence the results of non-parametric analysis the way that parametric tests can be influenced. ANOVA was performed for wet/dry weather analysis.