RHODE ISLAND DEPARTMENT OF HEALTH

BEACHES ENVIRONMETNAL ASSESSMENT
AND COASTAL HEALTH PROGRAM

2017 RHODE ISLAND BEACH AND RECREATIONAL WATER QUALITY REPORT

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Rhode Island Department of Health
Division of Environmental Health
3 Capitol Hill, Room 201
Providence, RI 02908

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Prepared By:

Sherry Poucher
Beaches Environmental Assessment and Coastal Health Program
Rhode Island Department of Health
3 Capitol Hill, Room 203
Providence, RI 02908
www.Health.ri.gov/beaches

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1.0 Executive Summary

The Rhode Island Department of Health (RIDOH) is responsible for the licensing and regulation of bathing beach facilities in the State of Rhode Island, including both fresh and saltwater beaches. Funding for the Beach Program is provided by the United States Environmental Protection Agency (USEPA) through the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000, an amendment to the Federal Water Pollution Control Act (also known as the Clean Water Act) of 1972. These funds support primary programmatic activities including: sanitary surveys, development and implementation of a risk-based monitoring plan, bacteriological testing at marine beaches, and a public notification system.

During the 2017 Beach Season (from May 30th through August 31st) approximately 1,586 samples were collected by RIDOH from 69 licensed saltwater beaches (Appendix A). Samples were analyzed for *Enterococcus* bacteria using the IDEXX Enterolert Method (EPA Method 1600).

The 2017 bathing season exhibited an increase in both saltwater beach closure events and closure days compared to the 2016 season. The total of 28 closure events resulting in 73 beach closure days in 2017 represents a reversal relative to 2016 when there were an historically low number (twelve) of closure events spread over 23 closure days. The total volume of rainfall was similar in the 2017 and 2016 Beach Season (8.8 and 9.2 inches, respectively). There were seven significant rainfall instances (greater than one-half inch in a 24-hour period) each year. Notably, conditions in 2014 and 2007 also had similar low rainfall, with 6.8 and 8.2 inches of rain, including seven and six significant rain events, respectively. During these years there were 43 and 36 closure events.

Currently, RIDOH does not conduct surface water monitoring at freshwater bathing beaches. To ensure public safety, freshwater beach managers are responsible for sampling and following RIDOH approved regulations and monitoring recommendations.

1.0 PROGRAM STANDARDS

1.1 Mission

The mission of the RIDOH is to prevent disease and to protect and promote the health and safety of the people of Rhode Island. Within RIDOH, the Beach Program works to protect the public from illness associated with swimming in contaminated bathing waters. The Beach Program furthers this mission through continuous monitoring during the bathing season and by assisting beach owners and managers with finding and eliminating sources of contamination.

1.2 History

RIDOH began monitoring beaches in the summer of 1995. Prior to 1995, the Rhode Island Department of Environmental Management (RIDEM) was responsible for monitoring recreational waters.

In 1999, development of a comprehensive beach-monitoring program began under a USEPA Environmental Monitoring for Public Access and Community Tracking (EMPACT) Grant titled Bacterial Water Quality Monitoring at Upper Narragansett Bay Bathing Beaches. This grant enabled RIDOH to establish a public notification system including a website, telephone hotline, and beach signage system. RIDOH evaluated conditions in Upper Narragansett Bay, which has long been impacted by urban runoff, point source discharges, and combined sewer overflows (CSOs).

The EMPACT Program provided RIDOH with the resources to sample 23 stations in the Upper Narragansett Bay during wet and dry weather. The study concluded that additional sampling was necessary at the licensed Upper Bay beaches to adequately protect the public. In addition, due to identified contamination sources and analytical results, the areas north of Conimicut Point in Warwick and Nayatt Point in Barrington were deemed unsuitable to serve as licensed facilities.

In 2000, Congress enacted the Beaches Environmental Assessment and Coastal Health (BEACH) Act, an amendment to the Federal Water Pollution Control Act. The BEACH Act authorizes USEPA to distribute grants to eligible states, territories, and tribes to reduce the risk of disease and illness in the nation's bathing waters. State objectives under this program were published by USEPA in June 2002. The National Beach Guidance and Required Performance Criteria for Grants document promulgated by USEPA further organizes several requirements of the BEACH Act, including: a tiered categorization of beaches according to risk, identification and mitigation of pollution sources, a risk communication plan, and specific beach monitoring information.

Since 2000, USEPA has provided RIDOH with over $3.2 million in beach grants to manage Rhode Island's Beach Program. These grants have provided RIDOH with the resources to monitor Rhode Island's licensed bathing beaches, identify sources (point and non-point) of contamination, and work with Rhode Island's municipalities to eliminate those sources of contamination and improve coastal water quality in Rhode Island.

1.3 Enacted Legislation

Per R23-21-RF(A)(1.4) within the General Laws of Rhode Island as amended January 2002, a "bathing beach" is defined as a natural area or tract of land that is used in connection with swimming and/or bathing in any waters of the state provided:

a) It is open to the public by permit and/or payment of a fee; or

b) It is maintained as a private club or association requiring membership fees or dues; or

c) It is maintained with or without charge for the recreation of groups of ten (10) or more children.

Please Note: Due to identified and unidentified sources of contamination RIDOH recommends only swimming at licensed bathing beach facilities.

Per R23-21-RF(B)(13) within the General Laws of Rhode Island as amended January 2002, licensing of recreational facilities requires facilities to have electrical service; refuse storage and disposal; sewage disposal facilities; adequate toilets, showers, or lavatories with hot and cold running water; a drinkable water supply; and the water adjacent to a bathing beach must meet bacteriological standards. Specific requirements are dependent on the number of users. Reference to these requirements can be found within the Rules and Regulations for Licensing of Recreation Facilities within the General Laws of Rhode Island (Appendix B).

Per R23-22.5 Drowning Prevention and Lifesaving

Beach Rules and Regulations Promulgated in Accordance with Chapter 3343 of the Public Health Laws of 1954

1. All individuals employed as lifeguards after June 30, 1954 at bathing areas within the State of Rhode Island shall hold an active state lifeguard certification card as issued by the Division of Parks and Recreation, within RIDEM. Lifeguards holding surf cards may be employed at either surf or non-surf bathing areas. Lifeguards holding non-surf cards shall be employed only at non-surf bathing areas. All certification cards are active during the season of their employment and until the following June 30 unless suspended or revoked by the Division of Parks and Recreation.

2. All bathing areas shall provide lifeguard equipment and personnel according to the requirements of the Division of Parks and Recreation and shall provide such equipment and personnel whenever the facilities of the area are open for business.

3. All lifesaving equipment shall be maintained in good operating condition ready for immediate use.

4. All bathing areas shall post conspicuously the hours of duty of lifeguard personnel.

5. A telephone for emergency calls shall be readily accessible from every bathing area. Numbers of police, fire, and rescue units of the area shall be posted conspicuously beside the telephone.

6. No power boats shall be allowed within any bathing and swimming area. The management of each bathing area shall maintain his area free from driftwood and other objects which may cause injury.

7. No bathing area shall operate on any given day unless a state certified lifeguard is present during all hours which the facilities are being used.

8. During periods of severe surf, undertow and other emergency conditions the Recreational Safety Inspectors of the Division of Parks and Recreation shall have the authority to close any and all bathing areas whenever such action is deemed necessary in the interest of public safety. Whenever a bathing area has been closed because of the aforesaid conditions, lifeguards shall be retained on the beach to caution prospective bathers against entering the water.

9. The bathing season shall, for each year, last from May 30th until 6:00 PM of each Labor Day unless the Division of Parks and Recreation gives notice to the contrary.

1.4 Standards

Recreational water quality standards for Rhode Island saltwater bathing waters are under review, but currently apply a single sample standard of 60 *Enterococcus* (measured in most probable number [MPN]) per 100 milliliters (ml) of water. An additional standard, a geometric mean of 30 *Enterococcus* (MPN), is applied as a running average standard.

The analytical method for monitoring for conformance with the standards utilizes the IDEXX Enterolert© 1600, a USEPA-approved method to enumerate *Enterococcus*. Enterolert© provides a range of *Enterococcus* counts from less than 10 to greater than 24,192 MPN/100ml. The principal imitation of IDEXX Enterolert© is that it takes more than 24 hours from sample reception at the laboratory to reporting of analytical result. In other words, there is over a full day delay from when the sample is collected to when the results are received. Decisions to close and/or re-open a beach are generally made in the late afternoon on the day after sample collection. This translates to risk for beach-goers who may be exposed to contaminated water that will not be identified until the next day. In addition, the delay may result in beaches remaining closed for more than a full day after they may have become safe for swimming.

RIDOH is continuously reviewing promising new methods that would better meet the intent of standards to protect public health without unnecessary restrictions of use, including new analytical methods and predictive modeling (see Section 4).

The current single sample standard is used as a trigger to consider the recommendation for a beach closure. Actual closure recommendations involve additional considerations (e.g., environmental conditions and weather predictions) that determine the likelihood that adverse water quality would persist.

2.0 NATIONAL BEACH GUIDANCE AND REQUIRED PERFORMANCE CRITERIA FOR GRANTS, 2014 ED.

USEPA has developed 11 performance criteria for the implementation of monitoring, assessment and notification programs. To be eligible for a grant to implement a monitoring and notification program the state, tribal, or local government's program must be consistent with these performance criteria. These performance criteria are based on and incorporate other requirements of the BEACH Act as well. The 11 performance criteria listed below are quoted directly from the National Beach Guidance and Required Performance Criteria for Grants, 2014 Ed (US EPA 2014)

Performance Criterion 1: Risk-based Beach Evaluation and Classification Process

Performance criterion 1 requires a state or tribe to develop a risk-based beach evaluation and classification process and apply the process to its coastal recreation waters. The process must describe the factors used in the state's or tribe's evaluation and classification process and explain how the state's or tribe's coastal recreation waters are ranked as a result of the process. That process must result in a list of specific coastal recreation waters adjacent to beaches or similar points of access used by the public.

Performance Criterion 2: Tiered Monitoring Plan

Performance criterion 2 requires a state or tribe to develop a tiered monitoring plan. The plan must adequately address the frequency and location of monitoring and the assessment of coastal recreation waters on the basis of the periods of recreational use of the waters, the nature and extent of use during certain periods, the proximity of the waters to known point and nonpoint sources of pollution, and any effect of storm events on the waters. EPA has added three new considerations to the basis for developing the tiered monitoring plan.

Performance Criterion 3: Methods and Assessment Procedures

Performance criterion 3 requires a state or tribe to develop detailed assessment methods and procedures. States and tribes must adequately address and submit to EPA methods for detecting levels of pathogens and pathogen indicators that are harmful to human health in coastal recreation areas. States and tribes must also provide documentation to support the validity of methods other than those that EPA validated or approved. Finally, states and tribes must identify and submit to EPA assessment procedures for identifying short-term increases in pathogens and pathogen indicators that are harmful to human health in coastal recreation areas.

Performance Criterion 4: Monitoring Report Submission

Performance criterion 4 requires states and tribes to develop a mechanism to collect and report monitoring data in timely reports. States and tribes must report their monitoring data to the

public in a timely manner, including posting on a website. They must report their monitoring data to EPA at least annually or at a frequency required by the EPA Administrator. EPA encourages states to coordinate closely with local governments to ensure that monitoring information is submitted consistently. Reported data must be consistent with the list of required data elements

Performance Criterion 5: Delegation of Monitoring Responsibilities

Performance criterion 5 requires a state to document any delegation of monitoring responsibilities that might have been made to local governments. If monitoring responsibilities are delegated to local governments, the state grant recipient must describe the process by which the state may delegate to local governments responsibility for implementing the monitoring program.

Performance Criterion 6: Public Notification and Risk Communication Plan

Performance criterion 6 requires that a state or tribe develop a public notification and risk communication plan. The plan must describe the state's or tribe's public notification efforts and measures to inform the public of the potential risks associated with water contact activities in the coastal recreation waters that do not meet applicable Water Quality Standards (WQS).

The state or tribe must adequately identify measures to promptly communicate the occurrence, nature, location, pollutants involved, and extent of any exceedance or likelihood of exceedance of applicable WQS for pathogens and pathogen indicators. The state or tribe must identify how it will promptly communicate that information to EPA. States are responsible for identifying how they will promptly communicate the failure to meet applicable standards to a designated official of the local government in the area adjoining the coastal recreation waters with water quality problems.

A state or tribal government program must describe procedures for posting signs at beaches or similar points of access, or taking functionally equivalent communication measures that are sufficient to give notice to the public that the coastal recreation waters are not meeting or are not expected to meet applicable WQS for pathogens and pathogen indicators.

Performance Criterion 7: Actions to Notify the Public

Performance criterion 7 requires that a state or tribe give notice to the public when coastal recreation waters are not meeting or are not expected to meet applicable WQS for pathogens and pathogen indicators.

A state or tribe must post signs at beaches or similar points of access, or provide functionally equivalent communication measures that are sufficient to give notice to the public that the coastal recreation waters are not meeting or are not expected to meet applicable WQS for pathogens and pathogen indicators.

Performance Criterion 8: Notification Report Submission

Performance criterion 8 requires that states and tribes compile their notification data into timely reports. States and tribes must report to EPA the actions they have taken to notify the public when WQS are exceeded.

Performance Criterion 9: Delegation of Notification Responsibilities

Performance criterion 9 requires that states describe any notification responsibility they have delegated or intend to delegate to local governments. The state must describe the process by which the state may delegate to local governments responsibility for implementing the notification program.

Performance Criterion 10: Adoption of New or Revised WQS and Identification and Use of a Beach Notification Threshold

Performance criterion 10 is a new criterion, intended to focus on adoption of new or revised WQS as required by CWA section 303(i)(1)(B) and identification and use of an appropriate beach notification threshold. These requirements apply to states and tribes receiving grants under CWA section 406(b), and they will be implemented through conditions included in the grants.

Performance Criterion 11: Public Evaluation of Program

Performance criterion 11 requires that states and tribes provide the public with an opportunity to review the program through public notice and provide an opportunity to comment. This is not a one-time requirement; public input must be sought whenever a state or tribe makes significant changes to its beach program. If a state or tribe significantly changes its List of Beaches, beach ranking, or other elements of its monitoring and notification program, the public must have an opportunity to review the changes before implementation. Further, states and tribes should consult with the applicable EPA Region prior to making significant program changes.

The public evaluation can be accomplished through notice and public comment, meetings, forums, or workshops. For example, when classifying and ranking beaches, it is beneficial to gather input from members of the community regarding the recreational waters they would like monitored. Annual public or community meetings, surveys of the users at the beach, local newspaper articles, or other sources can provide insight into public opinion about the beach, including why the beach is or is not used (e.g., for sunning, running, swimming, or surfing); perceptions of water quality and health problems; and whether beach users desire a monitoring and notification program (if none exists) or how satisfied they are with the current program.

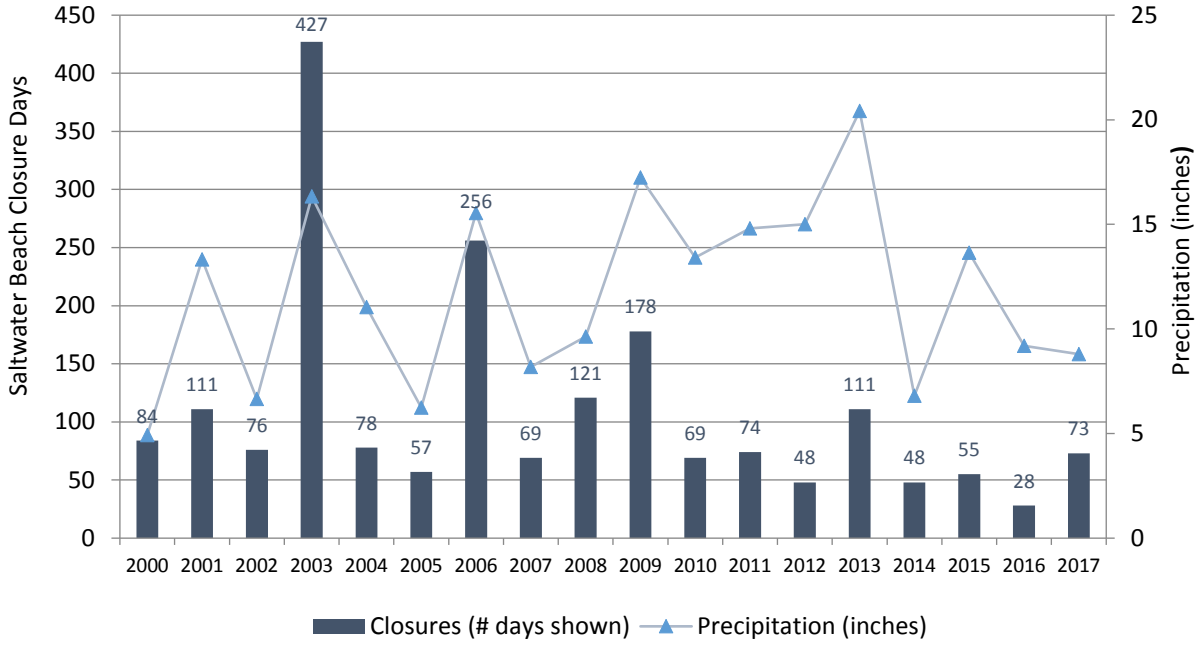
3.0 2017 DATA SUMMARY

During the 2017 bathing season the number of saltwater beach closure events and closure days increased compared to the 2016 season. Closure events are defined as each occasion when a closure recommendation occurs (on a per-beach basis). Closure days are the accumulation of all of the days when beaches were closed or remained closed (also on a per-beach basis), due to unsafe water quality conditions. In 2017 there were 28 closure events that included a total of 73

beach closure days. In 2016 there were 12 closure events spread over 23 closure days. Historically, closures have been correlated with precipitation. Both thee 2017 and 2016 Beach Seasons were characterized by low rainfall, with total precipitation somewhat lower during 2017 (8.8 inches) relative to 2016 (9.2 inches). There were seven instances of significant rainfall (greater than one-half inch in a 24-hour period) in both 2016 and 2017. Notably, conditions in 2014 and 2007 also had similar low rainfall, 6.8 and 8.2 inches, (relative to the eighteen-year seasonal average of 11.7 inches), and included seven and six significant rain events, respectively. During these years there were 43 and 36 closure events, both higher than in 2016 and 2017.

The annual closure days from 2000 through 2017, along with seasonal rainfall are shown in Figure 1, and are tabulated in Appendix B - Closure Evaluation Spreadsheet.

Figure 1. Rhode Island Saltwater Beach Closure Days and Precipitation 2000-2017



It appears that we may be in a sustaining period of less beach closures and less association of water quality with rain. Since 2009, the influence of rainfall on the magnitude of beach closures appears to have diminished. This may be a beneficial change associated with the installation of major stormwater management infrastructure to optimize treatment at the state's largest treatment sewage treatment plant. This facility, located on Narragansett Bay at Fields Point in Providence, dramatically reduced overflow of untreated wastewater during wet weather events, beginning in October 2008. The number of beach closure days per inch of rain decreased from a mean of 13.0 for the period from 2000 through 2008 to 5.7 for the period from 2009 through 2017. While this difference is statistically significant (T test, p=0.0074), it must be emphasized that the composition of the data, particularly because it includes all licensed saltwater beaches in the state, leaves much room for uncertainty with respect to trends. A comparison of single

years with similar low levels of precipitation from each period, 2007 and 2017, shows that closure days were nearly identical (73 and 69), while 2016 had the least number of closure days on record (23).

Table 1 show the distribution of 2017 beach closure days across nine Rhode Island towns. More than half (56%) of all closure days occurred in Warwick. However, 31 of the 40 closure days in Warwick were associated with three extended closure events (Table 2), partially due to delays in re-sampling to clear the beaches for reopening.

Table 1. Percentage of Saltwater Beach Closure Days by City/Town.

2017 Beach Closures by Town			
% Closures	**Town**	**Closure Days**	**Beaches**
1.37%	Bristol	1	Bristol Town Beach
6.85%	Barrington	5	Barrington Town Beach
6.85%	Middletown	5	Peabody's Beach, Third Beach
10.96%	Newport	8	Spouting Rock, Hazard's Beach, King Park
6.85%	North Kingstown	5	Saunderstown Yacht Club, Plum Beach
2.74%	Portsmouth	2	Sandy Point Beach
8.22%	Warren	6	Warren Town Beach
56.16%	Warwick	41	Conimicut Point Beach, Goddard Memorial State Park, Oakland Beach

While both closure days and closure events are important metrics, the number of closure events may be a more reliable metric to characterize water quality and health risks because beaches remain closed for a variety of reasons (e.g., sampling logistics). Figures 2a and 2b compare relative beach closure days and closure events per town, respectively. Where closure events are presented in Figure 2b, Warwick is less dominant than it was for closure days. It is of note that ten of the thirteen beaches had only one or two closure events during 2017. Kings Park in Newport and Warren Town Beach had three closures, and Oakland Beach in Warwick had five. Each 2017 closure event is detailed in Table 2.

Figure 2. Bathing Season. 2a. Closure Days and Closure Events.

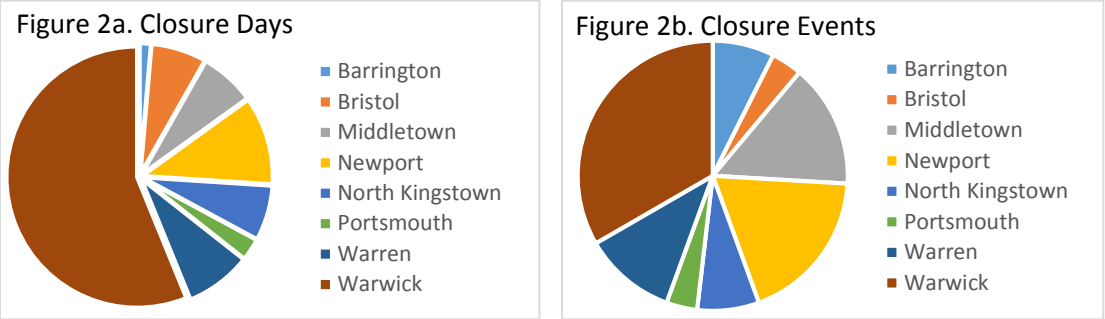


Table 2: 2017 Saltwater Beach Closures

2017 Saltwater Beach Closure Summary Table by Town				
Closure Date	**Re-Open Date**	**Beach Name**	**Town**	**Closure Days**
5/31/2017	6/1/2017	Third Beach	Middletown	1
5/31/2017	6/1/2017	Peabody's Beach	Middletown	1
6/9/2017	6/10/2017	Goddard Memorial State Park	East Greenwich	1
6/16/2017	6/26/2017	Conimicut Point Beach	Warwick	10
6/19/2017	6/21/2017	City Park Beach	Warwick	2
6/23/2017	7/7/2017	Oakland Beach	Warwick	14
6/25/2017	6/27/2017	King Park Swim Area	Newport	2
6/25/2017	6/27/2017	Warren Town Beach	Warren	2
6/28/2017	6/30/2017	Spouting Rock Beach	Newport	2
7/13/2017	7/17/2017	Saunderstown Yacht Club	North Kingstown	4
7/13/2017	7/14/2017	Oakland Beach	Warwick	1
7/17/2017	7/18/2017	Bristol Town Beach	Bristol	1
7/25/2017	7/26/2017	Barrington Town Beach	Barrington	1
7/25/2017	7/27/2017	Third Beach	Middletown	1
7/25/2017	7/27/2017	Peabody's Beach	Middletown	2
7/25/2017	7/27/2017	Warren Town Beach	Warren	2
7/25/2017	8/1/2017	Oakland Beach	Warwick	7
7/25/2017	7/27/2017	Conimicut Point Beach	Warwick	2
7/26/2017	7/28/2017	Hazard's Beach	Newport	2
7/26/2017	7/27/2017	Plum Beach	North Kingstown	1
7/26/2017	7/28/2017	Sandy Point Beach	Portsmouth	2
8/8/2017	8/10/2017	Warren Town Beach	Warren	2
8/9/2017	8/10/2017	King Park Swim Area	Newport	1
8/16/2017	8/18/2017	Oakland Beach	Warwick	2
8/22/2017	8/24/2017	Oakland Beach	Warwick	2
8/25/2017	8/29/2017	Barrington Town Beach	Barrington	4
8/31/2017	9/1/2017	King Park Swim Area	Newport	1
		Total		**73**

Detailed information regarding 2017 beach closures can be found in Appendix C - 2017 Coastal Beaches Action Summary. The Beach Program tracks meteorological data including tidal and lunar cycles at eleven weather stations throughout the state. This information is included in

Appendix D - 2017 Meteorological Data. This data tracks precipitation, air/water temperatures and wind direction/speed.

4.0 PROJECTS

4.1 Rapid Testing Project

Working to reduce analysis and notification turnaround times, the RIDOH Beach Program secured funding in 2015 from the USEPA Healthy Communities Grant Program to investigate a rapid testing method (EPA Method 1609) for surface water monitoring.

The project, "*Building Large-Scale Capacity for the Rapid Detection of Bacterial Contamination in Coastal Waters*" was undertaken to test a method that has shown promise for reducing laboratory analysis time to approximately four hours of delivery to the laboratory. Reducing the analysis time from 24 hours could result in two significant improvements to the problems described in Section 1.4, above. First, obtaining sample results on the same day as sample collection would dramatically reduce the amount of time that swimmers and beach bathers would be in contact with contaminated water prior to notification. Second, the ability to re-open beaches on the same day as sampling would increase the number of days that beaches would be open after conditions improve.

Objectives for this study were two-fold: 1) To build capacity to quantify fecal indicator bacteria, *Enterococcus,* in beach water samples using quantitative Polymerase Chain Reaction (qPCR) with a method published by USEPA in 2013; and 2) To test the method for applicability within Southeast New England Coastal Watersheds (SNEP). The method under study uses techniques to amplify and quantify specific genetic sequences as a means to estimate *Enterococcus* concentrations. The metrics used to characterize applicability of the method for the SNEP target area including three principal factors: reliability of results, logistic complexity and costs. Notifying the public as soon as possible to limit exposure to enteric pathogens is the over-arching goal.

The project design for the study emphasized a collaborative approach, including national experts, RIDOH laboratory staff, beach managers and private laboratories within SNEP. After attending training with experts at the Southern California Coastal Water Research Project (SCCWRP) in Costa Mesa, RIDOH staff installed equipment in a designated laboratory space, completed proficiency exercises and developed QA/QC protocols. They also conducted in-house training to expand capabilities amongst staff.

During 2016, the first year of testing, two very different Rhode Island beaches were tested using both qPCR and IDEXX methods. Both breaches represented sites within SNEP that experience adverse water quality. Easton's Beach in Newport has high-energy, open ocean conditions and Bristol Town Beach represents relatively calm bay waters. Result from the two methods were compared using the respective standards recommended by U.S EPA. Unfortunately, the two analytical methods produced disparate results; more than half of the samples that yielded results

above the IDEXX standard did not exceed the qPCR standard. In 2017, two additional beaches with water quality impairment were tested, Oakland Beach and Conimicut Point in Warwick. Again, the qPCR results were not reliably comparable with IDEXX. Given this outcome, and that the comparability and agreement between results was a key measure for reliability, we determined that qPCR was not suitable for any of the study beaches.

As a final phase of the research effort, an additional study addressed the potential reasons for disparities between the two analysis methods. The study involved tests to see whether different species of *Enterococcus* which are commonly found in beach waters might be quantified differently by the two methods. Another EPA-approved method, membrane filtration with MEI agar, was included as a third method to provide additional insight. Results showed that IDEXX most reliably recovered expected concentrations of *Enterococcus* for both species, but was generally similar to membrane filtration. qpCR yielded unexpectedly high concentrations when the spike included E. faecium, but were similar to IDEXX and membrane filtration for samples spiked with *E. faecalis.* This demonstrated a bias in qPCR that cannot be mitigated in routine analysis. An additional bias with qPCR analysis is that it does not distinguish between live and dead cells. Given that ratios of live:dead cells are not constant, the method carries an inherent uncertainty as an indicator of pathogen risks.

The study also concluded that there are substantial logistical hurdles for conducting qPCR testing when compared with the IDEXX method. Specifically, qPCR requires supplemental training and expertise of laboratory staff and more active processing time than the IDEXX method, as well as the dedication of more dedicated laboratory space for equipment. Some of these factors as well as higher throughput costs, would only be mitigated or held to acceptable levels if samples were processed in bulk. Practically speaking, only beaches with high use and high motivation to mitigate risk might consider qPCR as a viable option, and only if results could be considered reliable.

Other analytical methods such as digital qPCR are advancing and show promise, and new enzyme mediated assays are under development. Considering that these methods also intend to reduce turn-around-time while minimizing logistical and economic constraints, RIDOH will not recommend using qPCR for beach monitoring. However, even the up-and-coming analytical methods have turn-around-times of at least several hours. Predictive modeling based on environmental monitoring variables represent another alternative, wherein management actions could be prompted as adverse conditions occur.

Nonetheless, this work has expanded qPCR capabilities at the RIDOH laboratory, opening the door to other applications. In particular, qPCR can be used for enumeration and for targeting pathogenic strains of *Vibrio*, as well as for rabies confirmation and for various microbial source tracking functions. Having completed initial training and analysis of over 400 samples for this study, it is expected that additional applications would require little if any further training.

Statistical analyses for this project were conducted through contract support provided by the John Snow Institute (JSI). JSI reports are included as an appendix in this document.

4.2 Urban Initiative

During the hot summer months, many Rhode Islanders use recreational beaches as sanctuaries to escape the heat. Populations most in need are those living in Rhode Island's urban core, where buildings and pavement heat retention elevates temperatures through the "heat island effect". These populations are also some of the most at risk in the state for water-borne illness as social and economic restraints interfere with access to cleaner, more costly water bodies. Southern Rhode Island waterbodies may also not be accessible to at-risk communities due to restrictions in public transportation. Working to create clean, healthy, and safe recreational outlets for at-risk communities is an integral part of the BEACH Program's mission.

In 1999, under the EMPACT Program, Bacterial Water Quality Monitoring at Upper Narragansett Bay Bathing Beaches deemed areas north of Conimicut Point in Warwick and Nayatt Point in Barrington unsuitable for licensing. The Urban Initiative was launched in the summer of 2010 with the primary goal of identifying areas in the upper Narragansett Bay that are utilized for recreation and determine if such areas are safe for swimming. First, Beach Program personnel located coastal water access areas in Warwick, Cranston, Barrington, and East Providence that were utilized or appeared to be utilized by bathers. Next, access points were delimited, water samples were collected and submitted for laboratory analysis of *Enterococcus*, and water quality evaluations were conducted.

Program staff investigated various unlicensed public access points to assess the possibility of restoring access/use to communities that currently have impaired beaches. Field's Point and Bold Point in Providence and Rose Larissa Memorial Park and Sabin Point Park in East Providence were determined to be the highest-priority public access points. In 2010, the Urban Initiative included water quality sampling, property surveys, and stakeholder meetings for each of the priority public access points of concern.

2017 marks the Urban Beach Initiative's seventh season. Since the start of this project, monitoring locations and schedules have been adjusted to potential bather population as well as municipal interest in opening a recreational outlet. For instance, monitoring commenced at Stillhouse Cove in Cranston during 2014.

For 2017 the following locations were monitored for bacterial contamination:

- Bold Point, Providence
- Field's Point, Providence
- Rose Larissa Park, East Providence
- Sabin's Point, East Providence
- Stillhouse Cove, Cranston

4.2.1 Urban Initiative Monitoring Results

Water samples were collected from four public access points to assess water quality and potential bathing beach conditions. The analytical results of the Urban Initiative are included in

Appendix E**.** Concentrations of *Enterococcus* exceeding the acceptable bathing beach standard of 60 MPN/mL were identified at each access point. Table 3 summarizes results for each location for both 2016 and 2017. Conditions generally exceeded standards at a similar rate (approximately 25%) across stations and years. It is important to take into account that variability is expected, given that monitoring is random with respect to environmental conditions. Results are also similar to other previous years, beginning in 2011. Water quality conditions are expected to be relatively persistent (lasting longer than 24 hours) in these locations in upper Narragansett Bay, relative to lower Bay and open ocean locations that have higher flushing rates. Given this assumption, if these beaches were opened for recreational use, the number of closure days would be greater than 25% of the season and frequent monitoring would be required.

Table 3: 2016 and 2017 Urban Access Point Results Exceeding Acceptable Standards

	Sample Exceedance Rate			
Beach Name	**2016**	**N***	**2017**	**N***
Bold Point, Providence	27%	68	25%	16
Field's Point, Providence	25%	12	18%	22
Rose Larissa Park, East Providence	24%	66	35%	81
Sabin's Point, East Providence	27%	22	30%	30
Stillhouse Cove, Cranston	9%	11	25%	16

*Total number of samples

Additional questions regarding these urban beaches are being addressed by statistical analysis conducted by JSI. RIDOH BEACH Program worked with JSI to conduct data analysis on the six-year data set from 2011 to 2016. The analysis was ongoing during 2017 and focuses on three key questions:

1. Are the urban beaches in upper Narragansett Bay getting cleaner over time?
2. How do upper bay licensed beach locations compare to the urban beaches identified for study and potential licensing in terms of water quality?
3. Do rainfall and tide relate to water quality?

Collaboration with Save the Bay is an integral part of the Urban Beach Initiative. The Narragansett Baykeeper along with fellow staff assist with staffing and training of water quality monitors as well as grant guidance and application support for remediation work at the beaches. RIDOH will continue to work closely with Save the Bay into the 2018 beach season as we continue to examine water quality in upper Narragansett Bay.

4.3 Beach Season Kick-Off Meeting

Each year the Beach Program holds a topic-based meeting for beach owners/managers, cities/towns, state agencies, laboratories, and any interested stakeholders. Meetings include guest speakers knowledgeable in the applicable topic as well as federal representatives to answer questions and concerns. In 2017, the Beach Season Kick-off Meeting centered on predictive

modeling and included a presentation by Dr. Michael Cyterski from U.S. EPA's Athens, Georgia office. Dr. Cyterski is one of the developers of the EPA "Virtual Beach" software designed to assist in the derivation of statistical models that can be used to apply real-time environmental monitoring information (e.g., weather and tides) to estimate *Enterococcus* concentrations. The goal is to develop a predictive capacity that would allow closures at or before the time when water quality presents risks.

The 2017 Kick-Off Meeting was held on May 10, 2017 at the Jamestown Library. Along with this year's meeting focus on predictive modeling, status of the rapid detection project was also discussed. Sherry Poucher presented these findings, including a presentation of the 2016 results from Easton's Beach and Bristol Town Beach. Concerns regarding the reliability of the rapid detection method, as well as logistical constrains were discussed. Plans to continue the work with samples from Warwick beaches and Easton's Beach were presented. Ms. Poucher also summarized the 2016 season, describing the record low closures. She also summarized progress in the Urban Beaches Project. A copy of the 2017 Beach Season Kick-Off Meeting invitation and Agenda can be found in Appendix F.

4.4 Publication of the 2009 RI Beach Sand Study

In 2009 the BEACH Program investigated bacterial contamination in sand at 10 coastal beaches throughout Rhode Island. Eight of the 10 locations have known sources of contamination and close due to high bacteria levels on a regular basis. Sand and water samples were collected along with data on wind speed, direction, wave intensity, and precipitation.

The study manuscript (Parris et al., 2016) was published in the April 8th, 2016 issue of the Journal of Environmental Health (JEH). The study reported statistically significant gradients in *Enterococcus* concentrations among tidal zones, with dry (supra-tidal, or above high tide mark) sand having the highest level, followed by wet (intra-tidal, or below high tide mark) and underwater sand. There were two beaches without a statistically significant gradient (Easton's Beach and Conimicut Point), for these beaches, mean levels were uniformly high in all three zones. Beaches with higher wave action had significantly lower *Enterococcus* count levels in wet and underwater sand compared to beaches with lower wave action.

4.5 Adoption of USEPA Beach Action Value (BAV)

The bacteria threshold, also known as the Beach Action Value (BAV), was reduced from 104 colony forming units (cfu) of *Enterococcus* per 100 milliliters of water to 60 cfu/100mL in 2015 in response to EPA guidance (US EPA 2014). It is important to note that comparison with the BAV benchmark is only one of several factors, including degree of exceedance, that the Beach Program uses to determine the closure and re-opening of a beach. Other factors include weather and hydrography which drive the duration of a potential adverse exposure condition, as well as site history. After consideration for these additional factors, a sample result that exceeds the BAV may trigger either a closure or additional sampling.

EPA's decision to revise the BAV downward was based on a revised definition of water-borne disease. Under the new construct, a fever is no longer required for a person to be considered ill from swimming. The new definition included anyone who experiences diarrhea, vomiting, nausea, and/or a fever.

While EPA has changed the symptoms that qualify as illness, the target limit to restrict the number of illnesses remains at no more than 32 per 1,000 primary recreators. Epidemiological data previously correlated this limit with an *Enterococcus* count of 104 cfu per 100 mL of water. With the new illness definition, the BAV dropped to 60 cfu per 100 mL of water. EPA makes the following statement for states and tribes regarding adoption of the revised BAV:

> *States and tribes must identify a beach notification threshold. This threshold does not need to be adopted into a state's or tribe's WQS. In the 2012 RWQC EPA suggests use of a specific value, the Beach Action Value (BAV), which is the 75th percentile value of the water quality distributions for the CWA section 304(a) recommended criteria (i.e., the 75th percentile values for 32 NGI per 1,000 recreators or 36 NGI per 1,000 recreators for one of the two indicator-method combinations (Enterococci or E. coli by culture) or qPCR (on a site-specific basis and with the appropriate analyses (see section 4.4.2.3)) as the threshold value for determining whether to take a beach notification action. EPA selected the 75th percentile value because it corresponds to the percentile of the SSM values many states currently use as beach notification thresholds.*

The RI Beach Program has adopted the new BAV of 60 cfu/100mL. The BAV will continue to be one of several factors that influence the closure and subsequent re-opening of a beach with respect to health risks.

Table 4 USEPA Beach Action Values

Indicator	Estimated Illness Rate (NGI) 36/1000 Primary Contact Recreators BAV (Units/100mL)		Estimated Illness Rate (NGI) 32/1000 Primary Contact Recreators BAV (Units/100mL)
Enterococcus: Culturable (fresh and marine)[a]	70 cfu	OR	60 cfu
E. Coli: Culturable (fresh)[b]	235 cfu	OR	190 cfu
Enterococcus spp. qPCR (fresh and marine)[c]	1000 cce	OR	640 cfu

a *Enterococcus* measured using EPA Method 1600 (USEPA 2009a), or another equivalent method that measures culturable *Enterococci*.
b *E. coli* measured using EPA Method 1603 (USEPA 2009b), or any other equivalent method that measures culturable *E. coli.*
c EPA *Enterococcus* spp. Method 1611 for qPCR (USEPA 2012a).

5.0 2018 PROJECTED ACTIVITIES

5.1 Monitoring Program

Beach interns will conduct sampling at coastal beaches from Memorial Day through Labor Day. Approximately 1600 samples will be collected, submitted, and analyzed for *Enterococcus* during the summer season.

5.2 Illness Tracking

The BEACH Program will work with the Division of Infectious Disease and Epidemiology to research and develop standard operating procedures for tracking and responding to water-borne disease and illness.

5.3 Data Submission

The BEACH Program will prepare both notification and monitoring data for submission to EPA's Environmental Exchange Network Services Center. Verification of the submittals, and updates and corrections in historic data will be accomplished using EPA's new Verification Tool, and with assistance from EPA contract staff.

5.4 Reporting

Annual Season Report

Reporting of previous year's data will be prepared and submitted to EPA Region 1 as required. The Season Report will include analysis and descriptions of data collected and trends affecting the beaches and water quality of Rhode Island.

5.5 Outreach

2018 Beach Season Kickoff

The Beach Program will hold a one-day meeting for beach owners, managers, and interested stakeholders to kick-off the summer season. Each year is a unique theme with presenters and take-home materials on the day's topic. The annual kick-off meeting also provides an opportunity for beaches to ask questions, sign up for summer training and events hosted by RIDOH and to network with other beaches and state officials.

"Beach Program at Your Beach"

Beach Program at your Beach is a summer education and outreach event hosted by the BEACH Program. Two sampling interns spend Fridays from Memorial Day through Labor Day setting up a table event for beaches and summer camps interested in learning about water quality and healthy beaches. Events with larger groups of children will have an Enviroscape presentation, Beach Bingo, Beach Trivia, and Scavenger hunts. Facility staff supervises all summer camp events.

Beaches are notified of this opportunity at the annual Kick-off meeting and through their annual facility packets. 2017 will be the sixth year for "Beach Program at your Beach".

5.6 Risk Assessment

Sanitary Surveys and Modeling

The Beach Program will conduct Sanitary Surveys to identify potential sources of contamination, risks to public health, and environmental impairments leading to the evaluation and classification of saltwater beaches. RIDOH will utilize EPAs 2013 Marine Beach Sanitary Survey User Manual (US EPA 2013) to perform these assessments. Beach Program staff will work with any beach manager who expresses interest in applying qPCR or a modelling tool such as Virtual Beach to enhance the ability to predict and close and open their beach, reducing the contribution of standard EDEXX results that require a 24-hour turn-around time from sample collection to reported results.

Rank Beaches by Tier

Step four of the Risk-based Beach Evaluation and Classification Process is to rank beaches by tiers. Using information and data gathered from beach evaluations and sanitary surveys the BEACH Program will evaluate the current tier classification and determine if changes in the tier rank are needed, and if so, make the appropriate changes.

5.7 Investigate qPCR

The Beach Program will finalize a report describing the progression of the qPCR research program and its findings. The report will include separate statistical analyses for the 2016 and 2017 data. At this point, it is expected that the report will recommend not adopting qPCR as a standard method for the Rhode Island Beach Program. Reliability, logistics and costs will all be factors contributing to this decision. Regardless, the qPCR project developed the state's capacity to train and analyze qPCR samples and the laboratory expects to continue to work with qPCR for other purposes (e.g., for Vibrio analysis and source identification through use of specific genetic markers that can discriminate between different host pathways for Enterococcus). Training of laboratory personnel from private laboratories and/or other government agencies in New England will remain an open option.

5.8 Beaches Environmental Assessment Plan

Over the next three to five years, the Beach Program will work to develop an environmental assessment plan for Rhode Island Coastal beaches. This plan will refresh beach specific information/data such as sources of contamination, stormwater improvement projects, review water quality, and public access. This plan may include the following:

- Site-specific comprehensive assessments for coastal beaches
- Host-specific qPCR validation studies

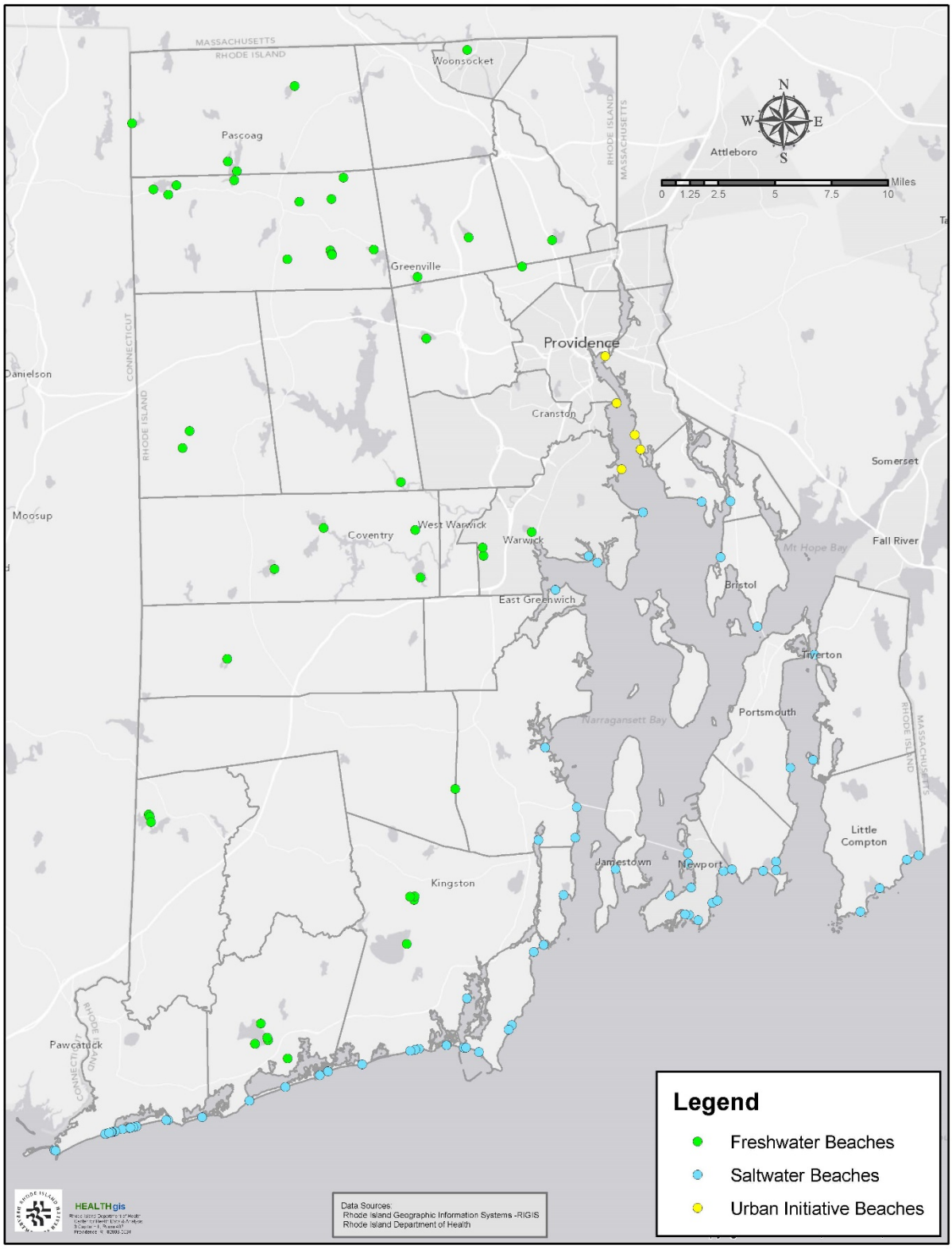
- Sanitary surveys using USEPA's new template and survey guidance recommended in the 2014 Beaches Environmental Assessment and Coastal Health Act Guidance Document
- Data collection to better characterize temporal and spatial variability
- Use of forensic dogs to identify sources and pathways of contamination
- Identification and characterization of the nature and extent of groundwater seepage
- Develop predictive models in areas with known sources of contamination that pose the greatest risk to public health.
- Work with beach owners and managers including cities and towns to conduct health assessments of the beach facility.
- Hold stakeholder workshops, sampler training, etc.

5.9 New Recreational Water Quality Criteria Standards

The BEACH Program will work to assist the Rhode Island Department of Environmental Management (RIDEM) with the gathering, reviewing, and reporting of state-wide water quality data to meeting recreational water quality standards (RWQS) in Rhode Island. The BEACH Program will also make available all beach water quality monitoring and notification data collected by RIDOH to assist RIDEM in meeting RWQS.

APPENDIX A

Map of Rhode Island Licensed and Urban Beaches


MASSACHUSETTS
RHODE ISLAND
Woonsocket
Pascoag
Attleboro
N
W
E
S
0 1.25 2.5 5 7.5 10
Miles
Greenville
Providence
Danielson
CONNECTICUT
RHODE ISLAND
Cranston
Somerset
Moosup
Coventry
West Warwick
Warwick
Mt Hope Bay
Fall River
Bristol
East Greenwich
Tiverton
Narragansett Bay
Portsmouth
Little Compton
Jamestown
Newport
Kingston
Pawcatuck
Legend
Freshwater Beaches
Saltwater Beaches
Urban Initiative Beaches
Data Sources:
Rhode Island Geographic Information Systems -RIGIS
Rhode Island Department of Health
HEALTHgis

APPENDIX B
Closure Evaluation Spreadsheet 2000-2016

Rhode Island Department of Health Beach Monitoring Program

Closure Evaluation Spreadsheet

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Number of Monitored Freshwater Beaches	51	51	49	51	47	50	53	49	50	50	42	42	35	46	46	46	46	46
Number of Monitored Saltwater Beaches	31	31	70	72	71	69	69	69	74	68	72	70	76	69	69	69	69	69
Total Number of Monitored Beaches	82	82	119	123	118	119	122	118	124	118	114	112	111	115	115	115	115	115
Sample Count* (RIDOH - EPA Funded Sampling Only)	515	976	1,779	2,567	2,701	3,211	2,769	1,718	1,655	1,770	1,988	2,678	1,680	1,604	1,747	2,025	1,718	1,586
Rainfall Total (Memorial Day - Labor Day)	4.93	13.32	6.65	16.34	11.04	6.24	15.54	8.18	9.64	17.24	13.42	14.8	15.00	20.42	6.80	13.65	9.21	8.80
Significant Rain Events (>0.5" in 24-hr)	4	7	6	12	9	4	7	6	6	13	11	9	5	13	7	8	7	7
Closure Events	13	26	27	67	41	30	91	43	52	89	56	37	34	41	36	41	12	23
Closure Days	103	144	103	503	122	65	351	95	161	230	148	74	54	119	52	61	27	78

* Sample count estimates do not include approximately 1,000 samples submitted by Beach Operators on an annual basis, which are reviewed by RIDOH.

Notes: Significant Rain Events Calculated from Warwick RI - Central location of state.

For up to the minute information, visit us online at www.health.ri.gov/beaches or via our hotline at 401-222-2751.

APPENDIX C
2016 Beach Action Summary

Beach Actions

Beach ID	Beach Name	Activity Type	Action Start Date	Action Stop Date	No. of Days Under Beach Action	Action Reason	Action Indicator	Action Source
RI162580	Conimicut Point Beach	CLOSURE	6 /16/2017 : :	6 /26/2017 : :	10	ELEV_BACT	ENTERO	STORM
RI162580	Conimicut Point Beach	CLOSURE	7 /25/2017 : :	7 /27/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI205142	Plum Beach	CLOSURE	7 /26/2017 : :	7 /27/2017 : :	1	ELEV_BACT	ENTERO	STORM
RI245197	Barrington Town Beach	CLOSURE	7 /25/2017 : :	7 /26/2017 : :	1	ELEV_BACT	ENTERO	STORM
RI245197	Barrington Town Beach	CLOSURE	8 /25/2017 : :	8 /29/2017 : :	4	ELEV_BACT	ENTERO	UNKNOWN
RI276487	Peabody's Beach	CLOSURE	5 /31/2017 : :	6 /1 /2017 : :	1	ELEV_BACT	ENTERO	STORM
RI276487	Peabody's Beach	CLOSURE	7 /25/2017 : :	7 /27/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI327519	Oakland Beach	CLOSURE	6 /23/2017 : :	7 /7 /2017 : :	14	ELEV_BACT	ENTERO	UNKNOWN
RI327519	Oakland Beach	CLOSURE	7 /13/2017 : :	7 /14/2017 : :	1	ELEV_BACT	ENTERO	STORM
RI327519	Oakland Beach	CLOSURE	7 /25/2017 : :	8 /1 /2017 : :	7	ELEV_BACT	ENTERO	STORM
RI327519	Oakland Beach	CLOSURE	8 /22/2017 : :	8 /24/2017 : :	2	ELEV_BACT	ENTERO	UNKNOWN
RI327519	Oakland Beach	CLOSURE	8 /16/2017 : :	8 /18/2017 : :	2	ELEV_BACT	ENTERO	UNKNOWN
RI397836	Warren Town Beach	CLOSURE	8 /8 /2017 : :	8 /10/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI397836	Warren Town Beach	CLOSURE	6 /25/2017 : :	6 /27/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI397836	Warren Town Beach	CLOSURE	7 /25/2017 : :	7 /27/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI469483	Hazards Beach	CLOSURE	7 /26/2017 : :	7 /28/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI596700	City Park Beach	CLOSURE	6 /19/2017 : :	6 /21/2017 : :	2	ELEV_BACT	ENTERO	STORM

Beach ID	Beach Name	Activity Type	Action Start Date	Action Stop Date	No. of Days Under Beach Action	Action Reason	Action Indicator	Action Source
RI627966	Bristol Town Beach	CLOSURE	7/17/2017 : :	7/18/2017 : :	1	SEWAGE	PREEMPT	SEWER_LINE
RI695386	Sandy Point Beach	CLOSURE	7/26/2017 : :	7/28/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI706698	King Park Beach	CLOSURE	8/9/2017 : :	8/10/2017 : :	1	ELEV_BACT	ENTERO	STORM
RI706698	King Park Beach	CLOSURE	6/25/2017 : :	6/27/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI706698	King Park Beach	CLOSURE	8/31/2017 : :	9/1/2017 : :	1	ELEV_BACT	ENTERO	STORM
RI810609	Goddard Memorial State Parl	CLOSURE	6/9/2017 : :	6/10/2017 : :	1	ELEV_BACT	ENTERO	UNKNOWN
RI840021	Third Beach	CLOSURE	7/25/2017 : :	7/27/2017 : :	2	ELEV_BACT	ENTERO	STORM
RI840021	Third Beach	CLOSURE	5/31/2017 : :	6/1/2017 : :	1	ELEV_BACT	ENTERO	STORM
RI901282	Saunderstown Yacht Club	CLOSURE	7/13/2017 : :	7/17/2017 : :	4	ELEV_BACT	ENTERO	STORM
RI954025	Spouting Rock Beach	CLOSURE	6/28/2017 : :	6/30/2017 : :	2	ELEV_BACT	ENTERO	UNKNOWN

APPENDIX D
2016 Meteorological Data

Available on Request

APPENDIX E
2016 Urban Beach Results

Date/Time	Sample Station	Sample ID	Sample Result (cce)
5/30/2017 11:00	Rose Larissa-North	RI501547-01	171
5/30/2017 11:00	Rose Larissa-Center	RI501547-02	281
5/30/2017 11:00	Rose Larissa-South	RI501547-03	158
5/30/2017 11:15	Sabin Point-Center	RI215063-01	146
5/30/2017 11:15	Sabin Point-Center	RI215063-02	120
6/1/2017 10:15	Rose Larissa-Center	RI501547-02	10
6/1/2017 10:15	Rose Larissa-South	RI501547-03	63
6/1/2017 10:20	Rose Larissa-North	RI501547-01	10
6/1/2017 10:40	Sabin Point-Center	RI215063-01	10
6/1/2017 10:45	Sabin Point-Center	RI215063-02	31
6/5/2017 10:50	Rose Larissa-North	RI501547-01	10
6/5/2017 10:50	Rose Larissa-Center	RI501547-02	10
6/5/2017 10:50	Rose Larissa-South	RI501547-03	20
6/5/2017 11:15	Sabin Point-Center	RI215063-01	10
6/6/2017 7:50	Stillhouse Cove-Center	RIBMPSHC-01	262
6/6/2017 7:50	Stillhouse Cove-Center	RIBMPSHC-01	10
6/6/2017 8:30	Fields Point-Center	RI834445-01	161
6/6/2017 8:30	Fields Point-Center	RI834445-01	10
6/7/2017 10:40	Rose Larissa-North	RI501547-01	20
6/7/2017 10:45	Rose Larissa-Center	RI501547-02	63
6/7/2017 10:45	Rose Larissa-South	RI501547-03	75
6/7/2017 11:00	Sabin Point-Center	RI215063-01	41
6/7/2017 11:00	Sabin Point-Center	RI215063-02	62
6/12/2017 10:45	Rose Larissa-North	RI501547-01	30
6/12/2017 10:45	Rose Larissa-Center	RI501547-02	10
6/12/2017 10:45	Rose Larissa-South	RI501547-03	20
6/12/2017 11:10	Sabin Point-Center	RI215063-01	31
6/13/2017 10:05	Stillhouse Cove-Center	RIBMPSHC-01	85
6/13/2017 10:05	Stillhouse Cove-Center	RIBMPSHC-01	10
6/13/2017 10:20	Fields Point-Center	RI834445-01	10
6/13/2017 10:20	Fields Point-Center	RI834445-01	10
6/15/2017 10:50	Rose Larissa-North	RI501547-01	10
6/15/2017 10:50	Rose Larissa-Center	RI501547-02	10
6/15/2017 10:50	Rose Larissa-South	RI501547-03	10
6/15/2017 11:05	Sabin Point-Center	RI215063-01	10
6/20/2017 8:57	Fields Point-Center	RI834445-01	10
6/20/2017 8:57	Fields Point-Center	RI834445-01	10
6/20/2017 10:15	Rose Larissa-North	RI501547-01	31
6/20/2017 10:15	Rose Larissa-Center	RI501547-02	30
6/20/2017 10:15	Rose Larissa-South	RI501547-03	31
6/20/2017 10:45	Sabin Point-Center	RI215063-01	174

Date/Time	Sample Station	Sample ID	Sample Result (cce)
6/20/2017 10:45	Sabin Point-Center	RI215063-01	174
6/22/2017 11:00	Rose Larissa-North	RI501547-01	20
6/22/2017 11:00	Rose Larissa-Center	RI501547-02	20
6/22/2017 11:00	Rose Larissa-South	RI501547-03	41
6/22/2017 11:15	Sabin Point-Center	RI215063-01	10
6/26/2017 10:30	Rose Larissa-North	RI501547-01	131
6/26/2017 10:30	Rose Larissa-Center	RI501547-02	441
6/26/2017 10:30	Rose Larissa-South	RI501547-03	404
6/26/2017 11:00	Sabin Point-Center	RI215063-01	20
6/27/2017 10:40	Bold Point-Center	RI683850-01	51
6/27/2017 10:42	Bold Point-Center	RI683850-01	10
6/28/2017 10:15	Rose Larissa-South	RI501547-03	10
6/28/2017 10:20	Rose Larissa-North	RI501547-01	41
6/28/2017 10:20	Rose Larissa-Center	RI501547-02	86
6/28/2017 10:45	Sabin Point-Center	RI215063-01	10
7/6/2017 9:47	Fields Point-Center	RI834445-01	10
7/6/2017 9:47	Fields Point-Center	RI834445-01	10
7/6/2017 10:07	Bold Point-Center	RI683850-01	10
7/6/2017 10:08	Bold Point-Center	RI683850-01	10
7/6/2017 10:20	Rose Larissa-North	RI501547-01	10
7/6/2017 10:20	Rose Larissa-Center	RI501547-02	84
7/6/2017 10:20	Rose Larissa-South	RI501547-03	10
7/6/2017 10:45	Sabin Point-Center	RI215063-01	20
7/10/2017 9:35	Fields Point-Center	RI834445-01	256
7/10/2017 9:35	Fields Point-Center	RI834445-01	315
7/11/2017 10:45	Rose Larissa-North	RI501547-01	379
7/11/2017 10:45	Rose Larissa-Center	RI501547-02	529
7/11/2017 10:45	Rose Larissa-South	RI501547-03	216
7/11/2017 11:15	Sabin Point-Center	RI215063-01	17300
7/13/2017 10:50	Rose Larissa-North	RI501547-01	84
7/13/2017 10:50	Rose Larissa-Center	RI501547-02	61
7/13/2017 10:50	Rose Larissa-South	RI501547-03	41
7/13/2017 11:00	Sabin Point-Center	RI215063-01	41
7/17/2017 8:33	Fields Point-Center	RI834445-01	20
7/17/2017 8:33	Fields Point-Center	RI834445-01	10
7/17/2017 8:49	Stillhouse Cove-Center	RIBMPSHC-01	10
7/17/2017 8:49	Stillhouse Cove-Center	RIBMPSHC-01	10
7/17/2017 9:09	Bold Point-Center	RI683850-01	10
7/17/2017 9:09	Bold Point-Center	RI683850-01	10
7/18/2017 11:00	Rose Larissa-North	RI501547-01	10
7/18/2017 11:00	Rose Larissa-South	RI501547-03	10
7/18/2017 11:15	Sabin Point-Center	RI215063-01	20

Date/Time	Sample Station	Sample ID	Sample Result (cce)
7/20/2017 10:45	Rose Larissa-North	RI501547-01	10
7/20/2017 10:45	Rose Larissa-Center	RI501547-02	10
7/20/2017 10:45	Rose Larissa-South	RI501547-03	31
7/20/2017 11:00	Sabin Point-Center	RI215063-01	10
7/24/2017 10:45	Rose Larissa-North	RI501547-01	19900
7/24/2017 10:45	Rose Larissa-Center	RI501547-02	24200
7/24/2017 10:45	Rose Larissa-South	RI501547-03	24200
7/24/2017 11:15	Sabin Point-Center	RI215063-01	24200
7/25/2017 9:26	Stillhouse Cove-Center	RIBMPSHC-01	262
7/25/2017 9:26	Stillhouse Cove-Center	RIBMPSHC-01	204
7/25/2017 9:37	Fields Point-Center	RI834445-01	142
7/25/2017 9:37	Fields Point-Center	RI834445-01	52
7/25/2017 9:55	Bold Point-Center	RI683850-01	512
7/25/2017 9:55	Bold Point-Center	RI683850-01	383
7/26/2017 11:15	Rose Larissa-North	RI501547-01	110
7/26/2017 11:15	Rose Larissa-Center	RI501547-02	291
7/26/2017 11:15	Rose Larissa-South	RI501547-03	63
7/26/2017 11:20	Sabin Point-Center	RI215063-01	10
7/31/2017 10:30	Rose Larissa-North	RI501547-01	10
7/31/2017 10:30	Rose Larissa-Center	RI501547-02	10
7/31/2017 10:30	Rose Larissa-South	RI501547-03	10
7/31/2017 11:00	Sabin Point-Center	RI215063-01	10
8/1/2017 9:25	Stillhouse Cove-Center	RIBMPSHC-01	10
8/1/2017 9:25	Stillhouse Cove-Center	RIBMPSHC-01	10
8/1/2017 9:39	Fields Point-Center	RI834445-01	10
8/1/2017 9:39	Fields Point-Center	RI834445-01	10
8/1/2017 9:58	Bold Point-Center	RI683850-01	41
8/1/2017 9:58	Bold Point-Center	RI683850-01	52
8/3/2017 11:15	Rose Larissa-Center	RI501547-02	10
8/3/2017 11:15	Rose Larissa-South	RI501547-03	10
8/3/2017 11:20	Rose Larissa-North	RI501547-01	10
8/3/2017 11:30	Sabin Point-Center	RI215063-01	20
8/7/2017 9:21	Stillhouse Cove-Center	RIBMPSHC-01	20
8/7/2017 9:21	Stillhouse Cove-Center	RIBMPSHC-01	10
8/7/2017 9:41	Fields Point-Center	RI834445-01	41
8/7/2017 9:41	Fields Point-Center	RI834445-01	51
8/7/2017 10:02	Bold Point-Center	RI683850-01	20
8/7/2017 10:02	Bold Point-Center	RI683850-01	10
8/7/2017 11:10	Rose Larissa-South	RI501547-03	20
8/7/2017 11:15	Rose Larissa-Center	RI501547-02	10
8/7/2017 11:20	Rose Larissa-North	RI501547-01	10
8/7/2017 11:30	Sabin Point-Center	RI215063-01	10

Date/Time	Sample Station	Sample ID	Sample Result (cce)
8/9/2017 10:30	Rose Larissa-North	RI501547-01	754
8/9/2017 10:30	Rose Larissa-Center	RI501547-02	1100
8/9/2017 10:30	Rose Larissa-South	RI501547-03	414
8/9/2017 10:50	Sabin Point-Center	RI215063-01	327
8/15/2017 8:51	Fields Point-Center	RI834445-01	10
8/15/2017 8:51	Fields Point-Center	RI834445-01	10
8/15/2017 9:02	Stillhouse Cove-Center	RIBMPSHC-01	10
8/15/2017 9:02	Stillhouse Cove-Center	RIBMPSHC-01	10
8/15/2017 9:28	Bold Point-Center	RI683850-01	10
8/15/2017 9:28	Bold Point-Center	RI683850-01	10
8/15/2017 11:00	Rose Larissa-South	RI501547-03	10
8/15/2017 11:05	Rose Larissa-Center	RI501547-02	10
8/15/2017 11:10	Rose Larissa-North	RI501547-01	10
8/15/2017 11:20	Sabin Point-Center	RI215063-01	10
8/17/2017 10:30	Rose Larissa-North	RI501547-01	20
8/17/2017 10:30	Rose Larissa-Center	RI501547-02	30
8/17/2017 10:30	Rose Larissa-South	RI501547-03	10
8/17/2017 11:00	Sabin Point-Center	RI215063-01	20
8/22/2017 11:00	Rose Larissa-North	RI501547-01	10
8/22/2017 11:00	Rose Larissa-Center	RI501547-02	10
8/22/2017 11:00	Rose Larissa-South	RI501547-03	10
8/22/2017 11:15	Sabin Point-Center	RI215063-01	160
8/24/2017 11:00	Rose Larissa-North	RI501547-01	336
8/24/2017 11:00	Rose Larissa-Center	RI501547-02	512
8/24/2017 11:00	Rose Larissa-South	RI501547-03	341
8/24/2017 11:15	Sabin Point-Center	RI215063-01	459
8/28/2017 9:05	Fields Point-Center	RI834445-01	10
8/28/2017 9:05	Fields Point-Center	RI834445-01	10
8/28/2017 9:14	Stillhouse Cove-Center	RIBMPSHC-01	10
8/28/2017 9:14	Stillhouse Cove-Center	RIBMPSHC-01	20
8/28/2017 11:10	Rose Larissa-North	RI501547-01	10
8/28/2017 11:10	Rose Larissa-Center	RI501547-02	10
8/28/2017 11:10	Rose Larissa-South	RI501547-03	10
8/28/2017 11:25	Sabin Point-Center	RI215063-01	10
8/30/2017 11:00	Rose Larissa-North	RI501547-01	10
8/30/2017 11:00	Rose Larissa-Center	RI501547-02	10
8/30/2017 11:00	Rose Larissa-South	RI501547-03	10
8/30/2017 11:15	Sabin Point-Center	RI215063-01	10

APPENDIX F
Kick-Off Meeting Invitation

RHODE ISLAND DEPARTMENT OF HEALTH 2017 BEACH SEASON KICK-OFF

THE RIDOH BEACH PROGRAM HAS AN IINTERESTING PROGRAM PLANNED FOR OUR 2017 KICK-OFF MEETING. PLEASE COME TO JOIN FELLOW BEACH OWNERS AND MANAGERS, VOLUNTEER ORGANIZATIONS, AND STATE/FEDERAL PERSONNEL INVOLVED IN RHODE ISLAND'S BEACHES.

ON THE AGENDA:

- GUEST SPEAKER DR. MIKE CYTERSKI FROM EPA ATHENS, GEORGIA HE WILL DEMONSTRATION VIRTUAL BEACH SOFTWARE, SHOWCASING THE POTENTIAL TO PROCESS HISTORIC SITE SPECIFIC DATA AND SURVEY INFORMATION TO GENERATE PREDICTIVE MODELS.
- OVERVIEW OF OUR 2017 INITIATIVE TO UPDATE BEACH SURVEYS.
- UPDATE ON THE 2016-2017 RAPID TESTING PROJECT
- OPTIONAL AFTERNOON WORKSHOP TO TRY YOUR HAND AT VIRTUAL BEACH- YOU MAY WANT TO BRING A LAPTOP.

WHERE: JAMESTOWN PHILOMENIAN LIBRARY
26 NORTH ROAD
JAMESTOWN, RI

WHEN: MAY 10, 2016 AT 10:00 A.M.

PLEASE RSVP[1] TO Sherry Poucher
PHONE: 401-222-7727
EMAIL: SHERRY.POUCHER@HEALTH.RI.GOV BY MAY 5, 2016

[1] But do come even if you don't rsvp.