

New Castle Town Beach, New Castle

BEACH WATER QUALITY REPORT SUMMER 2005



January 2006



BACKGROUND

The New Hampshire Department of Environmental Services (NHDES) has operated its Public Beach Inspection Program, or Beach Program, for over twenty years. Coastal beach monitoring began in 1989 and has continued through the present. NHDES recognizes the threat to public health at public beaches and continues to monitor public beaches throughout the state for the presence of pathogenic organisms. Coastal beaches are monitored for the presence of the fecal bacteria *Enterococci*. These fecal bacteria are present in the intestines of warm-blooded animals including humans. Fecal bacteria, when present in high concentrations and ingested, can commonly cause gastrointestinal illnesses such as nausea, vomiting and diarrhea. They are also known as indicator organisms, meaning their presence in water may indicate the presence of other potentially pathogenic organisms.

In October of 2000, the United States Environmental Protection Agency (EPA) signed into law the Beaches Environmental Assessment and Coastal Health (BEACH) Act. The BEACH Act is an amendment to the Clean Water Act that authorizes the EPA to award grants to eligible states. The purpose of the BEACH Act is to reduce the risk of disease to users of the nation's recreational waters. BEACH Act grants provide support for development and implementation of monitoring and notification programs that help protect the public from exposure to pathogenic microorganisms in coastal recreation waters.

NHDES received grant funding in 2002 to develop and implement a beach monitoring and notification program consistent with EPA's performance criteria requirements published in the *National Beach Guidance and Required Performance Criteria for Grants* document (www.epa.gov/waterscience/beaches/grants). NHDES has successfully met all requirements and continues to expand the monitoring and notification program. In 2002, only nine coastal beaches were monitored, while in 2003 and 2004, 15 and 16 beaches, respectively, were monitored on a routine basis. There were 15 beaches sampled again in 2005, as the Star Island Beach was not sampled. In 2004, volunteers sampled the beach, but circumstances did not allow for this cooperative effort in 2005.

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Beach Description

New Castle Town Beach is a soft sand beach. Its total length is 840 feet. The beach is frequently used by residents and vacationers for various recreational activities. There are two access points to the beach area from the town park and from a nearby parking lot (Figure 1). The beach is only one attraction at New Castle Common. A large picnic and playground area are present and attract families and group outings to the area. Lifeguards are not present and sanitary facilities are available during the summer.

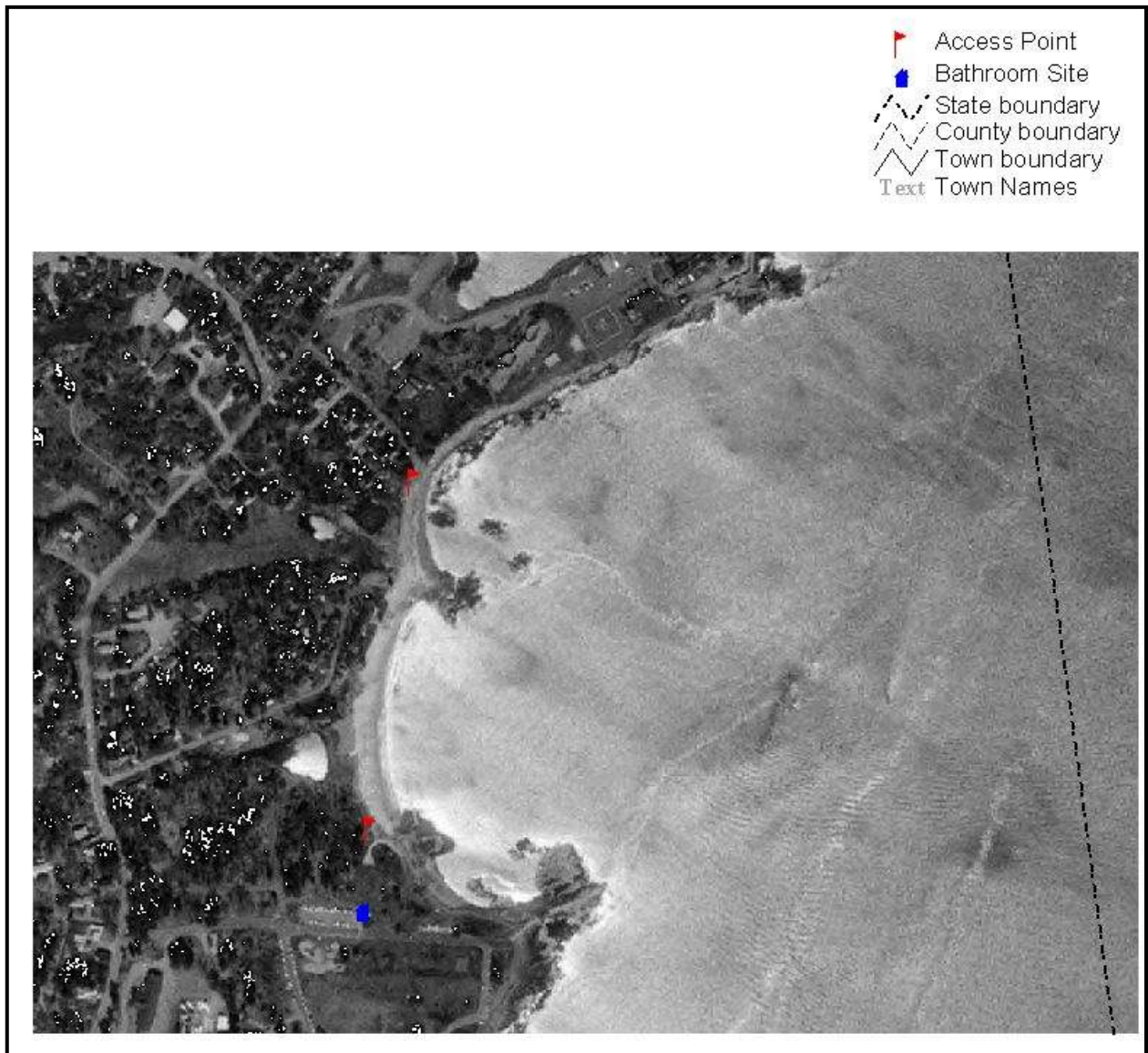


Figure 1. New Castle Town Beach Access Points and Restroom Facilities

Waterfowl have been observed at the beach, although infrequently and generally few in number. The most commonly seen waterfowl are gulls and cormorants. There are restrictions for dogs on the beach.

Below is a brief description of the sampling stations at New Castle Town Beach, New Castle. All stations are accessed via the New Castle Common off Route 1B. These stations are pictured in Figure 2.

Table 1. Station Descriptions

Description	Latitude	Longitude
Left sample station: located in front of a wood clapboard house near the north end of the beach.	43° 4' 3.9517"	-70° 42' 47.7898"
Center sample station: located between a gulley and a brown house with a chimney and sun room.	43° 4' 1.2368"	-70° 42' 48.2041"
Right sample station: located in front of the first pine tree on the left as you enter the beach area from the park.	43° 3' 59.4561"	-70° 42' 47.9113"
Pipe sample: located just across a berm from New Castle Town Beach. It can be accessed from New Castle Town Beach or from Ocean Drive off of Route 1B.	43° 4' 7.838"	-70° 42' 46.3721"

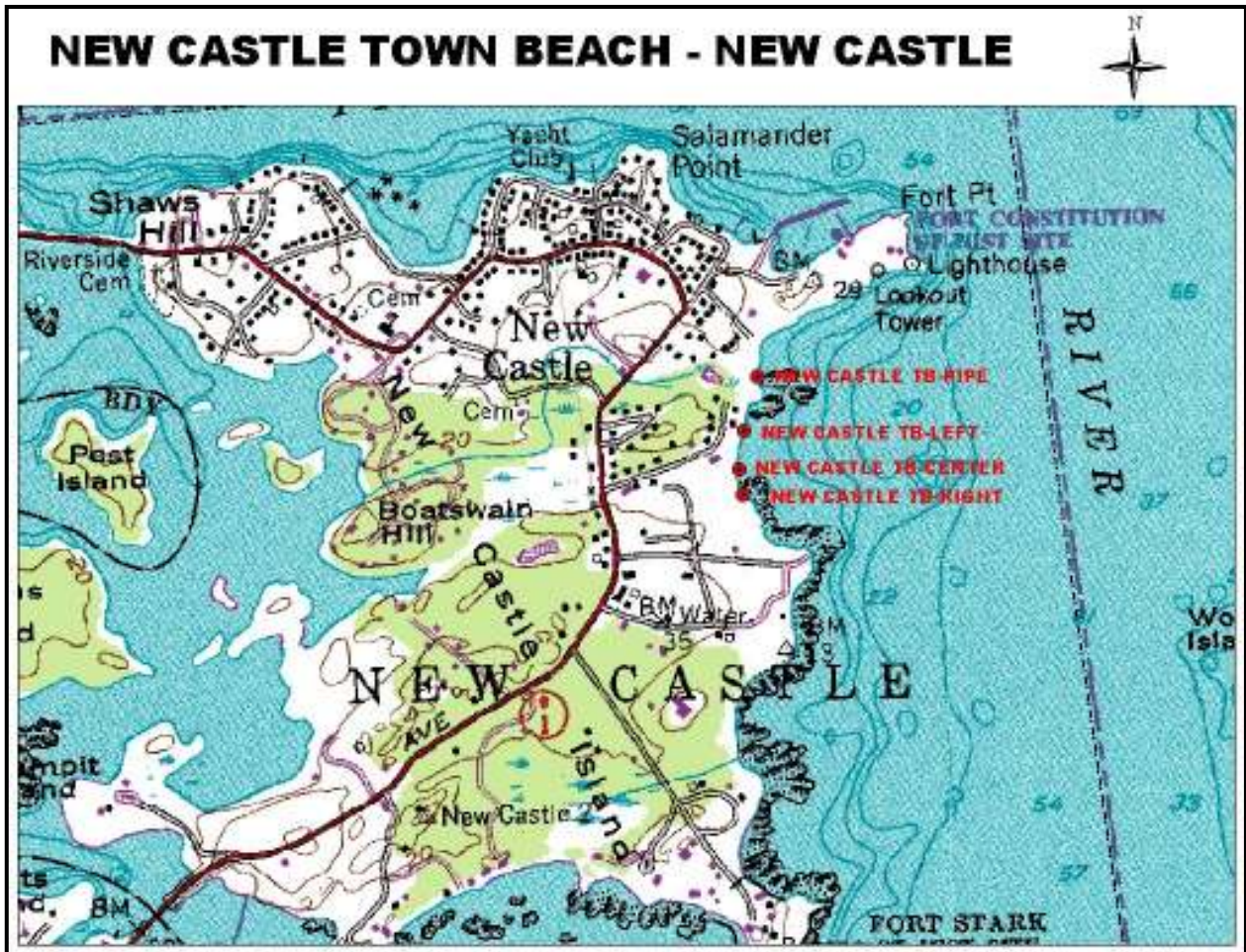


Figure 2. Map of New Castle Beach

Tier Status and Sampling Frequency

The Beach Program developed a risk-based beach evaluation process and tiered monitoring approach and implemented this approach during the 2003 beach season. Beach evaluations are conducted annually to determine potential health threats to the public. Evaluations are based on several criteria in three main categories: beach history, microbial pathogen sources, and beach use. Based on these criteria, beaches are assigned either a Tier I or Tier II status. Tier I are high priority beaches that have an increased potential to affect public health while Tier II are low priority beaches that have less potential to affect public health. Beach sample frequency is based on the Tier statuses; Tier I beaches are sampled weekly and Tier II beaches are sampled every other week.

New Castle Town Beach was categorized as a Tier I beach based on the Beach Program's Risk-Based Evaluation ranking system. This ranking indicates that the beach is frequently used by the public but there are potential pollution sources present that may negatively affect public health. The New Castle Town Beach Tier I ranking has not changed since the ranking system was implemented.

Water Quality

Beaches are monitored to ensure compliance with State Water Quality Standards. Marine waters are analyzed for the presence of the fecal bacteria Enterococci. Enterococci are known as indicator organisms, meaning their presence may indicate the presence of pathogenic bacteria. The state standard for Enterococci at public beaches is 104 counts/100 mL in one sample, or a geometric mean of 35 counts/100 mL in three samples collected over sixty days. Standard exceedances require the issuance and posting of a beach advisory. Beach advisories remain in effect until subsequent beach sampling indicates safe water quality conditions.

The number of samples collected at each beach is determined by the beach length. Beaches less than 100 feet in length are sampled at left and right locations 1/3 of the distance from either end of the beach. Beaches greater than 100 feet in length are bracketed into thirds and sampled at left, center and right locations. Routine sample collection may be enhanced by sampling known or suspected pollution sources to the beach area. Also, storm event sampling may be conducted at beaches where wet-weather events are expected to affect beach water quality.

The 2005 sampling season began June 1st. June was warmer and wetter than normal, while July and August were warmer and drier than normal. The sampling season encompassed 96 days, of which precipitation was recorded on 35 days (based on Seabrook WWTF recorded precipitation). Eleven beach days (normal beach hours are considered 9:00 a.m. to 5:00 p.m.) were directly affected by precipitation. New Castle Town Beach was sampled once per week from June 1st through Labor Day. Samples were collected at three beach stations and also at a pipe that discharges outside of the beach area (Figure 2). There were a total of 14 routine inspections performed and 42 beach samples and 3 pipe samples collected in 2005.

Table 2 includes the Enterococci data from each sampling event in 2005 while Figure 3 compares Enterococci levels with the state standards for coastal public beaches. Overall, the Enterococci levels were low and no advisories were issued for New Castle Town Beach in 2005, however, bacteria levels exceeded the state standard at the right station on June 22, 2005 (Figure 3). Beach Program personnel post beach advisories once bacteria levels exceed the state standard at two sample locations on the same day, or if they exceed the state standard at one sample location by greater than 70 counts/100 mL. Enterococci levels did not exceed the state standard at two sample stations nor did they exceed the state standard by greater than 70 counts/100 mL.

Each station reflected slightly elevated sample results on June 22, 2005. There is little evidence to explain why the elevated levels occurred. One possible explanation may be elevated turbidity near the shoreline, which was noted on the inspection form for that date and others during the summer. Data suggest that the right station is often more turbid than the rest of the beach area. Children tend to congregate and play in the water at the right side of the beach. Bathing activities may stir up the sediments where bacteria persist. When disturbed, the bacteria can be released into the water column. A rain event previous to the June 22 sample event may have washed bacteria into the beach area from the surrounding watershed.

Table 2. New Castle Town Beach Enterococci Data 2005

Sample Date	Station Name	Results (counts per 100 mL)
06/02/2005	Left	10
	Center	10
	Right	10
06/06/2005	Left	10
	Center	10
	Right	10
06/15/2005	Left	5
	Center	10
	Right	30
06/22/2005	Left	80
	Center	70
	Right	120
06/27/2005	Left	10
	Center	5
	Right	10
07/07/2005	Left	10
	Center	10
	Right	30
07/12/2005	Left	10
	Center	10
	Right	10
07/18/2005	Left	10
	Center	10
	Right	5
07/27/2005	Left	10
	Center	40
	Right	10
08/02/2005	Left	10
	Center	10
	Right	20
08/08/2005	Left	10
	Center	10
	Right	20
08/17/2005	Left	20
	Center	10
	Right	10
08/23/2005	Left	10
	Center	5
	Right	10
08/29/2005	Left	10
	Center	60
	Right	20

Table 3 includes Enterococci data from samples collected at a pipe that discharges to a small area beyond the north end of New Castle Town Beach. A system of wetlands drains Little Harbor and traverses the island from West to East, culminating in a small pond. The pipe is the discharge from this pond. Figure 4 depicts the pipe Enterococci data for the 2005 beach season. Samples were collected only when sufficient flow for clean sample collection occurred. Otherwise, flow was too low for sample collection or the pipe was closed.

Table 3. New Castle Town Beach Pipe Enterococci Data 2005

Sample Date	Results (counts per 100 mL)
05/05/2005	10
05/05/2005 (duplicate)	10
06/02/2005	40

Figure 3 depicts New Castle Town Beach Enterococci data relative to the state standard for coastal beaches.

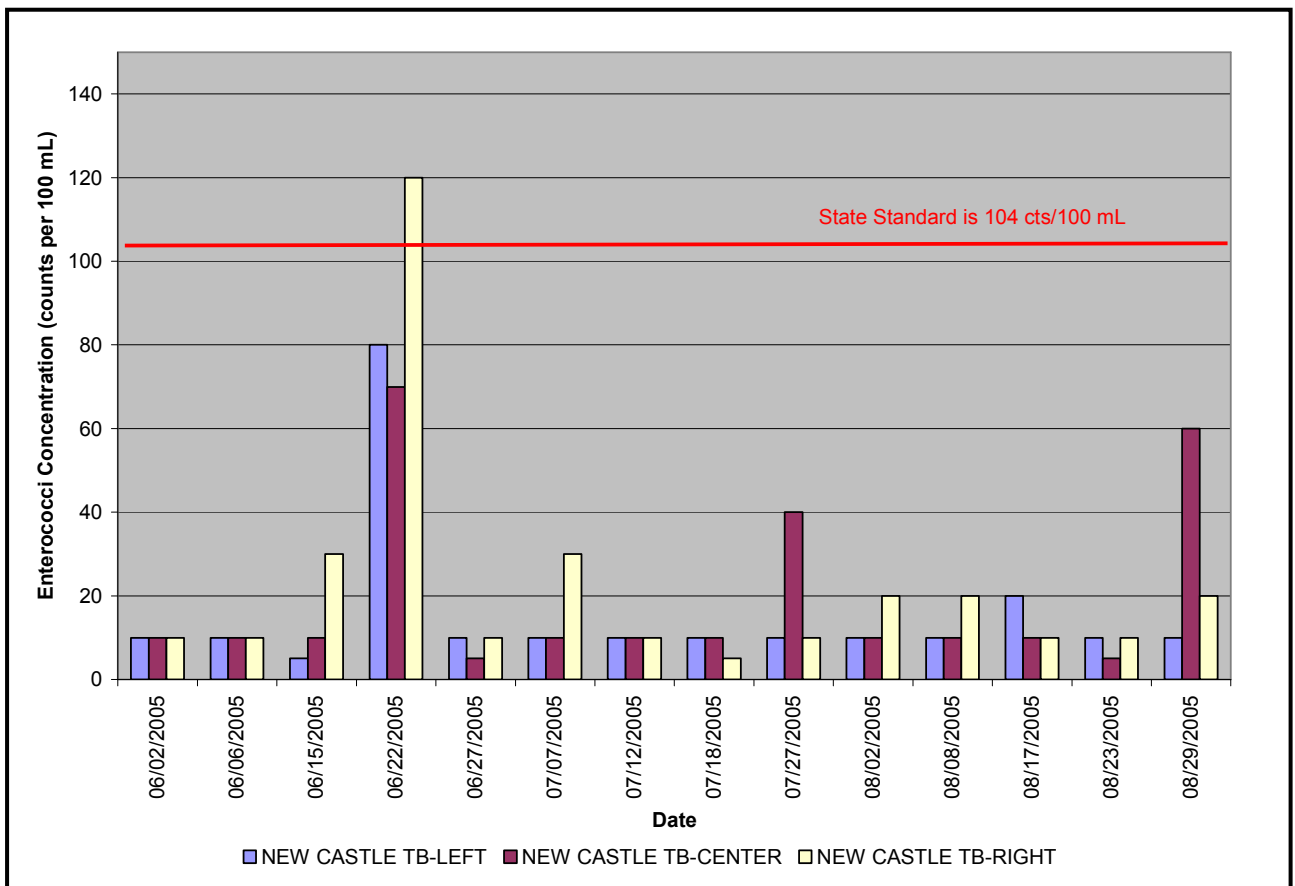


Figure 3. New Castle Town Beach Enterococci Data 2005

Figure 4 depicts the Enterococci data collected from a pipe discharging beyond the left end of the beach area.

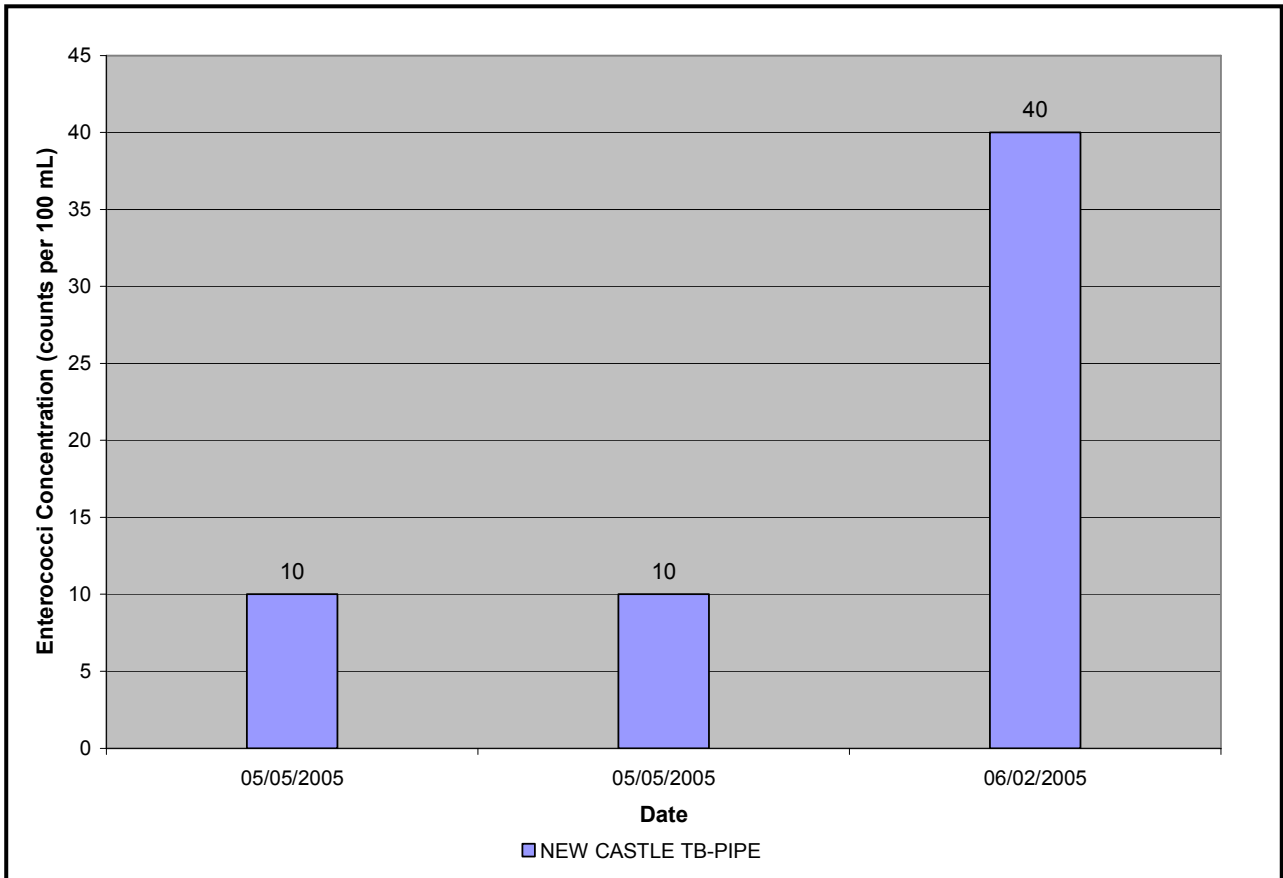


Figure 4. New Castle Pipe Enterococci Data 2005

Areas of Concern

Bull Toad Pond located at New Castle Common is scheduled to undergo restoration activities. Several groups are involved in the project, including New Hampshire Coastal Program, the Town of New Castle and New Castle Conservation Commission. The pond is located west of the New Castle Town Beach area and during high water, the pond drains between the right and center station of the beach. The town began a project to remove invasive plants at the site. More removal and control is anticipated in the future.

Bacteria levels at the pipe were much lower this year than in the previous two beach sampling seasons. However, sampling only occurred on two days due to high tides obstructing access to the pipe, low flow from the pipe or closure of the pipe.

Thoughts for the Future

- The Town of New Castle, local businesses, or school groups should consider joining NHDES' Adopt-a-Beach Program. The program would consist of beach clean-ups and water quality monitoring. DES would conduct training sessions and participate in education and outreach activities for the community. If you are interested, please contact Sara Sumner at 603-271-8803 or ssumner@des.state.nh.us.
- A study to document the amounts of bacteria in the sand at New Castle Town Beach might be warranted. Studies in other areas of the country have shown concentrated populations of bacteria in the onshore sand near the water line (also called the swash zone – see Special Topic for more information). Initiating a project at the beach could prove whether or not bacteria proliferates in the sand and contributes to high results. If the town is interested in pursuing a scientific study, the Beach Program has funds available to support such an activity. Please contact Sara Sumner to discuss your options, (603) 271-8803 or ssumner@des.state.nh.us.

Appendix A

Special Topic 2005

Health Threats from Beach Sand: Why You Should be Concerned

As beach managers, one question we are often faced with is: What are the sources of *Escherichia coli* (*E. coli*) plaguing my beach and how must I evaluate management and remedial efforts to prevent further contamination?

E. coli bacteria are natural components of the intestines of warm-blooded animals, including humans. *E. coli* are indicator bacteria, meaning their presence often indicates the presence of other pathogenic organisms (bacteria, viruses, protozoa). Sources of *E. coli* to beach areas include: waterfowl (ducks, geese, gulls, etc.), domestic animals (dogs, cats), agriculture, faulty septic systems, storm water, and sewer overflows. Recently, research efforts have focused on the presence of *E. coli* and other pathogenic organisms in beach sand.



These studies have shown that beach sand can harbor significant levels of bacteria. Various researchers have focused research activities on bacteria in underlying lake sediment, in pore water, in the swash zone, in onshore beach sand (not in direct contact with water), and in near-shore surface waters. A recent study at four Canadian beaches found significant amounts of *E. coli* in pore water at public beaches. Pore or interstitial water inhabits the spaces between sand particles and can be observed in holes when one digs into the sand. Although the study did not find that the pore water significantly affected beach water quality, it does suggest that beach sand is a source of bacteria at beaches. Another study in Ohio found high concentrations of *E. coli* in the swash zone that were attributed to beach sand. The swash zone is the area along the shore that is constantly washed by waves or tides.

It is evident that bacteria are surviving in beach sand but we can only speculate on the potential sources of bacteria to the sand. Waterfowl, wild or domestic animals often defecate on beaches. Bacteria from their feces can contaminate beach sand and beach water. Rainfall can cause bacteria or other harmful organisms to infiltrate directly into the beach sand, as well as transport them directly to beach waters. Contaminated groundwater from septic systems may contribute to bacteria measured in beach sand. Beach goers themselves may contribute by leaving trash on the beach, dirty diapers, or food scraps. Beach sand bacteria populations survive longer than in the water column due to less predation, decreased exposure to UV radiation, and warmer temperatures.

This discussion yields concern about public health issues relating to beach sand as well as beach waters. Children often dig holes or trenches in the sand and are in frequent contact with pore water. Young children are often found playing in swash zone waters. It is important that the public be informed of the potential risks associated with beach sand, but also realizes that not all beaches harbor elevated concentrations of bacteria. If a large number of waterfowl are evident, or if a storm drain outfall is present, consider the fact that both the beach sand and water may

contain pollutants that can create public health related illnesses. It is important to evaluate the area and use your best judgment when recreating at a public beach. Make sure that the beach is regularly monitored and check for advisories that may be posted at a public beach. Never swim at areas that may compromise public health or safety.