



Hamilton Public Health Services 2017 Beach Monitoring Report

This is an annual update regarding Hamilton Public Health Services (PHS) recreational water quality monitoring at Hamilton's public beaches and the activities undertaken by stakeholders to improve the water quality at these beaches.

Background

The Ontario Public Health Standards (OPHS) specify the public health programs and services Boards of Health must provide. Program and topic-specific protocols under the OPHS further define the minimum responsibilities every Board of Health is accountable to provide. The Recreational Water Protocol (2016) and the Beach Management Guidance Document (2014) direct Boards of Health on the delivery of local public health programs to assist in the prevention and reduction of water-borne illness and injury related to recreational water use at a public beach. A public beach is a public bathing area owned/operated by a municipality where the general public has access and there is reason to believe that there is recreational use of the water.

During the 2017 swimming season Hamilton PHS conducted routine beach surveillance at three beaches along Lake Ontario and three conservation area beaches. PHS also monitored water quality at two beaches in Hamilton Harbour; however they both remained closed to users. Pier 4 Park Beach was closed due to high water levels and was used as a temporary boat launch by a local boating club. Bayfront Park Beach was closed to users in 2016, and remained closed to users in 2017 due to history of poor water quality. PHS resumed water quality monitoring at Bayfront Beach in 2017 to assist in the evaluation of the effectiveness of various strategies that were implemented to improve the water quality at the beach.

Inspections are conducted before the swimming season begins, and at least once per week during the season to monitor the safety of the public bathing areas and establish strategies for the management of health hazards.

Water Quality Monitoring

PHS monitors the safety of public beaches by collecting and testing the beach water for *E. coli* at least once per week during the swimming season, which typically begins after Victoria Day in May and ends on Labour Day in September. *E. coli* are naturally found in the intestines of humans and warm-blooded animals. High numbers of *E. coli* in the water at public beaches indicate the presence of faecal contamination and the potential presence of other harmful microorganisms in the water. The recreational water quality guideline in Ontario is 100 *E. coli* Colony Forming Units (CFU's) per 100 ml of water. *E. coli* concentrations at or above this level could represent an increased risk of infection to swimmers.

The Beach Management Guidance Document (2014) states that a minimum of five samples must be collected at each beach and the geometric mean (GM) of *E. coli* concentrations must be used to assess recreational water quality and guide public health action. When the GM of *E. coli* concentrations are at or above 100 CFU's per 100 ml of water, warning signs are posted at the affected beach to advise potential bathers that the water may pose a health risk and the beach is deemed as unsafe for swimming. Additionally, PHS updates the City of Hamilton's Beach Water Quality Website www.hamilton.ca/beaches and the Safe Water Information Line outgoing phone message (905-546-2189) to reflect the current beach water quality status.

Cyanobacteria (Blue-Green Algae)

Cyanobacteria or blue-green algae (BGA) are microorganisms which occur naturally in aquatic environments and flourish in warmer, slow-moving or still waters with high nutrient levels and sufficient sunlight. Some cyanobacteria produce microcystin toxins which are the most commonly produced toxin of the cyanobacterial toxins. Microcystin toxins are tasteless, colourless and odourless and are toxic to both humans and animals. Typical exposure routes are through skin contact or ingestion/inhalation while swimming.

PHS monitors public beaches for the presence of microcystin toxins throughout the swimming season. The Canadian Recreational Water Guideline for microcystin concentrations in recreational water is 20 parts per billion (ppb). When potential toxin-producing BGA blooms are observed at a public beach PHS uses Abraxis™ test strips to measure the concentration of microcystin toxins in the water samples. When high concentrations of microcystin toxins are measured, the beach is closed and a swimming advisory is issued. PHS posts beach closure signs and issues a media release. The City of Hamilton's Beach Water Quality website (www.hamilton.ca/beaches) and the Safe Water Information Line (905-546-2189) are also updated.

2017 Beach Monitoring Results

The 2017 public beach monitoring program took place over a 15-week period, beginning the week of May 22 and ending the week of September 4. The following table on page 3 summarizes the data for the 2017 swimming season at eight public beaches in Hamilton. Although Bayfront and Pier 4 Beaches were monitored in 2017, the beaches were closed to users.

Lake Ontario beaches were open 92% to 98% of the time. Binbrook, Christie and Valens Conservation Areas Beaches were open 84%, 98% and 79% respectively. Although Bayfront Beach and Pier 4 Beach were closed to public use for the swimming season due to different reasons, the water quality was very poor; Bayfront Beach water quality was acceptable 27% of the time and Pier 4 Beach water quality was acceptable 30% of the time (Table 1).

Hamilton Harbour Beaches

Hamilton Harbour Beach Management Group meets at least twice per year to share research and discuss issues, projects and activities being done in and around Hamilton Harbour to improve the recreational water quality at the harbour beaches. Members of the group include staff from Hamilton Public Health Services, Hamilton Harbour Remedial Action Plan (RAP), Environment and

Table 1: 2017 Beach Monitoring Program Summary

Name of Beach	Total # of Days in Bathing Season	# of Days Beach Posted due to <i>E. coli</i>	# of Days Beach Closed due to BGA	Total # of Days Beach Closed	Total # of Days Beach Open	% of Days Beach Open
<i>Hamilton Harbour Beaches</i>						
Bayfront Beach*	105	22	55	77	28	27%
Pier 4 Beach*	105	18	55	73	32	30%
<i>Lake Ontario Beaches</i>						
Beach Boulevard	105	2	0	2	103	98%
Van Wagner's	105	8	0	8	97	92%
Confederation Park	105	6	0	6	99	94%
<i>Conservation Area Beaches</i>						
Binbrook Conservation	105	13	4	17	88	84%
Christie Conservation	105	2	0	2	103	98%
Valens Conservation	105	22	0	22	83	79%

*Bayfront and Pier 4 Beaches were closed to users in 2017

The percentage of days that public beaches are open during the swimming season is an indicator of the recreational quality of the water at Hamilton's public beaches. Hamilton Harbour remains on the Great Lakes Areas of Concern (AOC) List. As a result, stakeholders have developed a Remedial Action Plan (RAP) for Hamilton Harbour in order to identify the challenges in the harbour and how they may be addressed. One criterion that needs to be satisfied in order to remove Hamilton Harbour from the AOC List is that harbour beaches must be open for swimming 80% of the time.

Bayfront Beach

The OPHS require Public Health Units to determine the suitability of a public beach for public recreational use. Due to a history of poor water quality at Bayfront Beach, PHS advised Hamilton Public Works that Bayfront Beach is not a suitable recreational area and that Bayfront Beach should be closed in 2016 until action is taken to improve the water quality. Bayfront Beach was closed for the 2016 season and Hamilton PHS did not monitor the water quality. In 2016-17 a water quality study took place by the City of Hamilton Public Works Department and the Hamilton Waterfront Trust in order to assess the historical water quality data for Bayfront Beach and provide potential fixes and use options. Activities undertaken in 2017 to improve the water quality at Bayfront Beach

included increased waterfowl surveillance and harassment and habitat modification. PHS resumed water quality monitoring in 2017 to assess the effectiveness of efforts to improve the water quality. Water quality was monitored four days per week for *E. coli* concentrations and microcystin toxins. Bayfront Beach water quality was acceptable 27% of the time during the 2017 season (Fig. 1), a slight increase from 22% in 2015.

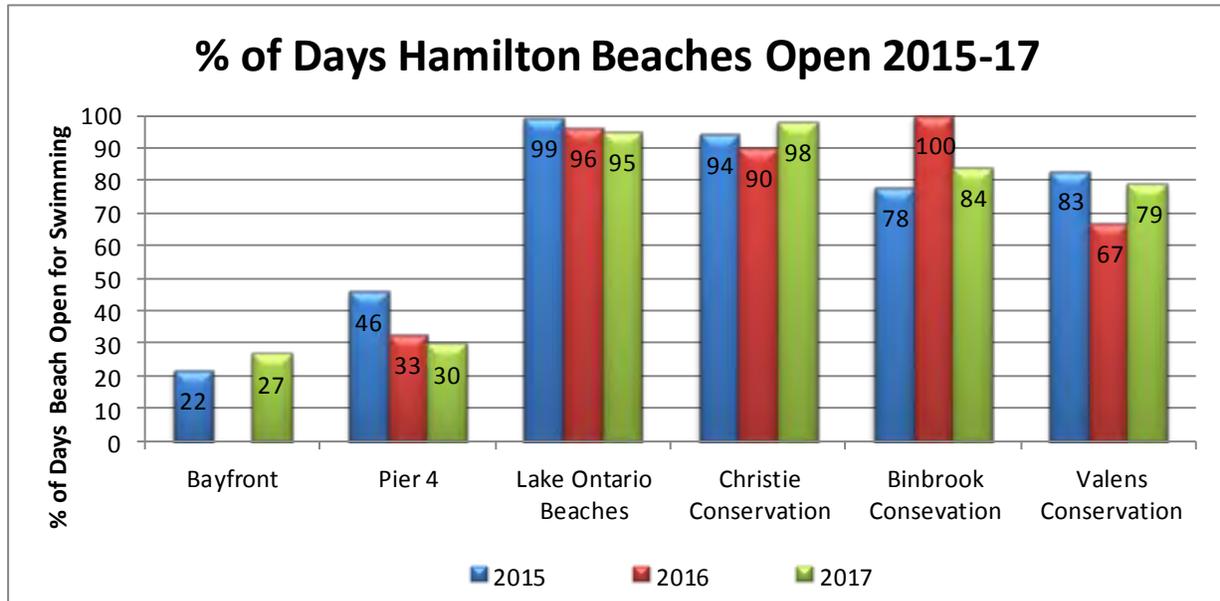


Fig. 1: Percentage of Days Hamilton Beaches Open 2015-17

High levels of *E. coli* concentrations have been an ongoing concern at Bayfront Beach and the water quality continues to remain very distant from meeting the Remedial Action Plan (RAP) delisting criteria of 80% open (Fig. 2).

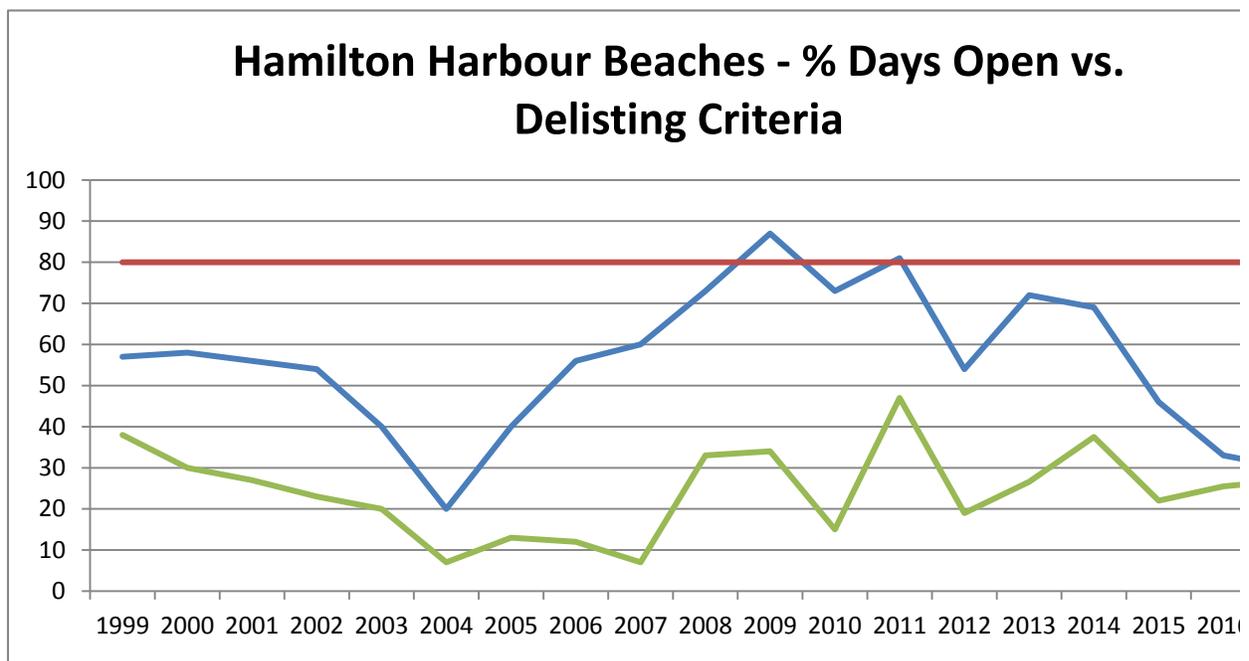


Fig. 2: Hamilton Harbour Beaches - Percentage Days Open vs. Delisting Criteria

Research has shown that high levels of bacteria are introduced to the water by waterfowl faecal droppings. Droppings can contaminate the water directly and indirectly through storm water runoff and beach sand. Bayfront Beach *E. coli* concentrations reached or exceeded 1000 CFU's per 100 mL of water several times during the 2017 season (Fig. 3). These events occurred in late May, on June 21, July 17 and in late August 2017. On several of these occasions the *E. coli* concentrations were safe for swimming on the days immediately prior to and after sudden spikes in *E. coli* concentrations. The high *E. coli* concentrations in late May were also observed at Pier 4 Beach and may have been caused by rainfall events, Combined Sewer Overflow (CSO) events and/or high water levels in Hamilton Harbour. However, the spikes in *E. coli* concentrations that happened later in the swimming season do not appear to be related to rainfall events, CSO events, or other environmental variables. This might indicate that the source of the *E. coli* at Bayfront Beach is localized near Bayfront Beach. When *E. coli* concentrations fluctuate drastically within very short time periods, risk to human health is greater due to the 24hour delay between collecting a water sample and receiving lab test results. If Bayfront Beach had not been closed for the 2017 season, beach users could have been placed at a significant risk of being exposed to pathogenic microorganisms.

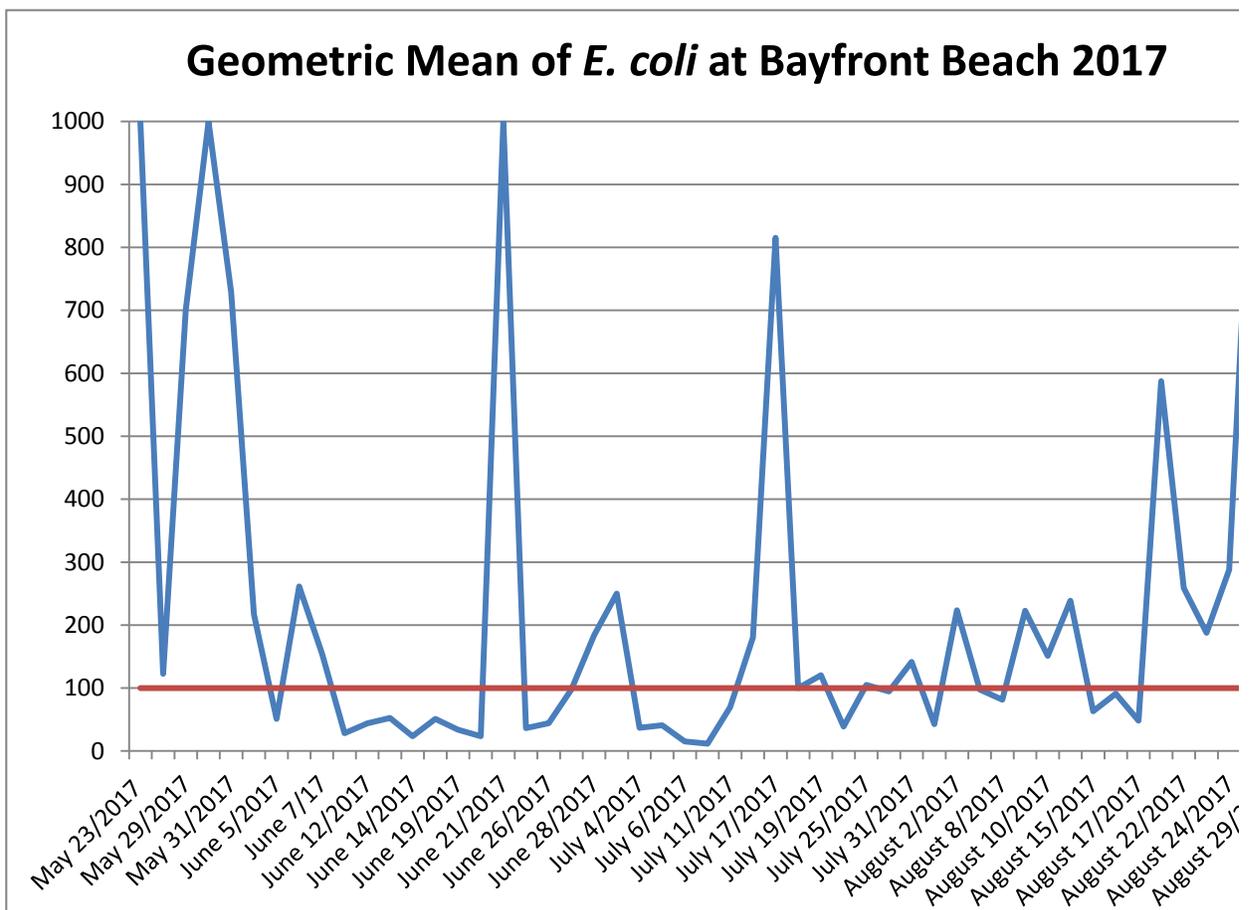


Fig. 3: Geometric Mean of *E. coli* at Bayfront Beach 2017

On July 12, 2017 microcystin concentrations from cyanobacteria were detected and exceeded warning levels at Bayfront Beach and the Bayfront Park Boat Launch. Public Health Services issued a media release to inform the public and stakeholders of the presence of microcystin toxins and beach closure signs were posted at the sites. The microcystin toxin-producing cyanobacteria were

present in the harbour for the remainder of the swimming season, and would have accounted for a 52% closure of the beach over the 2017 season.

Microcystin toxins have become a predominant reason for beach closures in Hamilton Harbour due to their tendency to remain well established in the harbour after they are detected. PHS continued to monitor for *E. coli* concentrations during cyanobacterial blooms. Data shows that had cyanobacteria not been present Bayfront Beach water quality would have been unsafe for swimming 50% of the time due to high *E. coli* levels. In 2017, Bayfront Beach water quality was unsafe 73% of the swimming season, with microcystins accounting for 32% of the swimming season when water quality did not meet the recreational water guidelines. Poor water quality due to cyanobacteria has been increasing over recent years and when coupled with high levels of *E. coli* bacteria, Bayfront Beach water quality is unsafe for swimming for the majority of swimming seasons. Despite activities undertaken to improve the water quality at Bayfront Beach in 2017, Hamilton Public Health Services cannot recommend that Bayfront Beach is suitable for public recreational.

Pier 4 Park Beach

Pier 4 Park Beach was closed to users during the 2017 season due to high water levels and was used as a temporary boat launch facility for a local boat club. Although the beach was closed to users, Public Health Services continued to monitor water quality. Pier 4 Park Beach has experienced a steady decrease in percentage of days open for swimming during the 2015-17 swimming seasons (Fig. 1). The percentage of days open at Pier 4 beach dropped to 30% in 2017 from 46% days open in 2015, and 33% days open in 2016. Pier 4 Park Beach also continues to remain very distant from meeting the Remedial Action Plan (RAP) delisting criteria of 80% (Fig. 2).

E. coli concentrations peaked in late May at Pier 4 Beach reaching 1000 CFU's per 100 mL of water on May 29, 2017. Unlike Bayfront Beach however, *E. coli* concentrations at Pier 4 Beach did not reach such levels again for the remainder of the swimming season (Fig. 4).

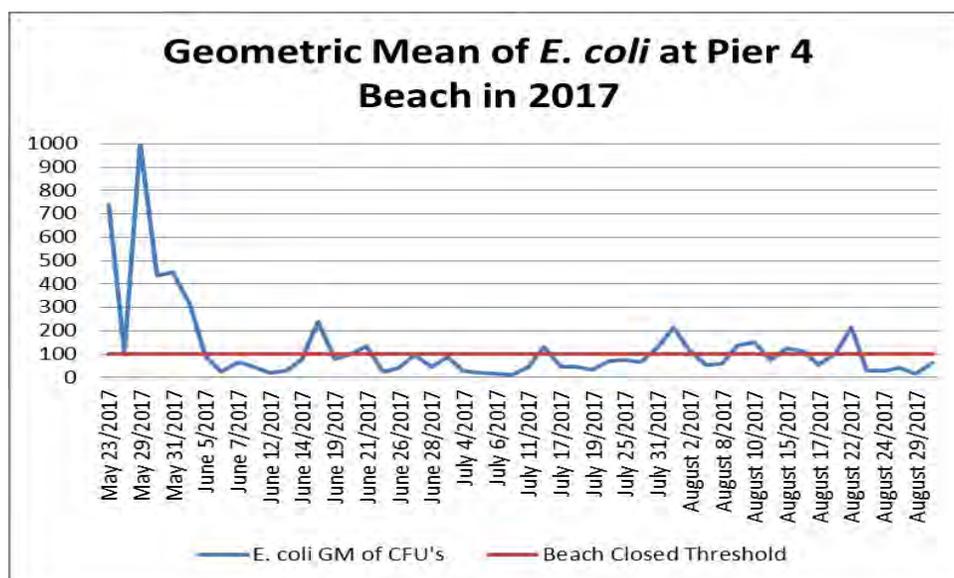


Fig. 4: Geometric Mean of *E. coli* at Pier 4 Beach in 2017

Microcystin concentrations from cyanobacteria were detected and exceeded warning levels at Pier 4 Park Beach on July 12, 2017 and were present in the harbour for the remainder of the season. Microcystin toxins alone would have closed the beach 52% of the season. A prolonged closure due to microcystin toxins would have been the predominant reason for closure at Pier 4 Park Beach, had it been open in 2017; contributing to the lowest percentage of days open yet at 30%. Pier 4 Park Beach experienced a record high water level in 2017 making planned activities to improve the water quality very challenging, as very little beach area remained. Pier 4 Park Beach would have been open to users for 67% of the season despite the high water levels, if microcystin producing cyanobacteria were not present. Hamilton Public Health Services will continue to monitor Pier 4 Park beach in 2018 as interventions to improve the water quality at this beach continue. PHS will likely recommend closure of Pier 4 Beach (similar to Bayfront Beach) for the 2019 swimming season if a significant improvement in water quality does not occur during the 2018 monitoring season.

Changes to the Ministry of Health and Long-Term Care (MOHLTC) Recreational Water Protocol 2018

In January 2018 the MOHLTC released a revised Recreational Water Protocol under the Ontario Public Health Standards, titled Operational Approaches for Recreational Water Guideline 2018. There is one noteworthy change in this new document that has the potential to affect the number of days that the water quality at public beaches will meet the MOHLTC beach water quality criteria. The MOHLTC has increased the water quality criteria from a geometric mean of less than or equal to (\leq) 100 *E. coli* Colony Forming Units (CFUs) to \leq 200 *E.coli* CFUs, or when the *E. coli* concentration in a single water sample is \leq 400 *E. coli* CFUs.

PHS staff reviewed 2017 beach monitoring data for Bayfront Beach to assess the effect this change would have had on the 2017 monitoring report for Bayfront Beach. Applying the 2018 water quality criteria to the 2017 lab test results at Bayfront Beach indicates the water quality at Bayfront Beach would have met the water quality criteria for *E. coli* 10% more often in 2017. A 10% increase in meeting the new water quality criteria is a poor result when the acceptable amount of *E. coli* in recreational water has been increased 100%. With the occurrence of BGA in Hamilton Harbour, the water quality at Bayfront Beach in 2017 would have met the new 2018 water quality criteria only 5% more often.