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Hamilton Public Health Services 2020 Beach Monitoring Report

Background

This is an annual update regarding Hamilton Public Health Services' (PHS) recreational water quality monitoring at Hamilton's public beaches. The Ontario Public Health Standards (OPHS) specify the public health programs and services Boards of Health must deliver. Program and topic-specific protocols under the OPHS further define the minimum responsibilities every Board of Health in Ontario is accountable to provide. To assist in the prevention and reduction of water-borne illness and injury related to recreational water use at a public beach, Boards of Health are directed by the Recreational Water Protocol (2019) and the Operational Approaches for Recreational Water Guideline (2018). Both documents guide the delivery of the local Beach Water Quality Monitoring Program in Hamilton.

In 2020 Hamilton PHS conducted routine beach surveillance at seven public beaches in Hamilton. A public beach is "any public bathing area owned and operated by a municipality where the public has access and there is reason to believe that there is recreational use of the water" (MOHLTC, 2019). The seven monitored beaches in Hamilton were Beach Boulevard, Van Wagner's and Confederation Park Beaches along Lake Ontario; Binbrook, Christie and Valens Conservation Area beaches, and Pier 4 Park Beach in Hamilton Harbour. Bayfront Park Beach remained closed to users due to a history of poor water quality. Routine beach inspections are conducted before the swimming season begins and throughout the summer, to monitor the safety of the public swimming areas and to establish strategies for the management of health hazards.

Beach Water Quality Monitoring

Hamilton PHS monitors the safety of public beaches by collecting and testing the beach water for *E. coli* bacteria during the swimming season, typically between the Victoria Day long weekend in May and the Labour Day long weekend in September. However, the season was shortened by approximately five weeks in 2020 due to the COVID-19 pandemic and the closure of public beaches under Ontario's Declaration of Emergency. Beach water quality monitoring did not begin until the week preceding June 19, 2020 when public beaches were permitted to reopen. Water quality monitoring continued at all beaches in Hamilton until the last week of August 2020. Beach water quality is monitored for both *E. coli* bacteria and blue-green algae blooms.

E. coli

E. coli are naturally found in the intestines of humans and warm-blooded animals. High numbers of *E. coli* in the water indicates the presence of faecal contamination and the potential presence of other harmful microorganisms such as *Cryptosporidium*, *Giardia*, *Shigella*, norovirus and *E. coli* O157:H7 (CDC, 2017). These organisms have the potential to cause a variety of infections including

gastrointestinal, skin, ear, respiratory, eye, neurologic and wound infections (CDC, 2017). The maximum acceptable concentration of *E. coli* at a beach is 200 *E. coli* colony-forming units (CFUs) per 100 ml of water (MOHLTC, 2018). *E. coli* concentrations above this level could represent an increased risk of infection to swimmers.

The Operational Approaches for Recreational Water Guideline (2018) states that a minimum of five samples must be collected at each beach and the geometric mean of *E. coli* concentrations must be used to assess recreational water quality and guide public health action. When the geometric mean (GM) of *E. coli* concentrations is above 200 CFUs per 100 ml of water, warning signs are posted at the affected beach to advise potential users that the water may pose a health risk and the beach is deemed as unsafe for swimming. The beach will also be posted as unsafe for swimming if any single point sample taken has a test result above 400 CFUs per 100 ml of water (MOHLTC, 2018). In addition to posting warning signs at the affected beaches, 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 levels of sunlight (Miller and Russell, 2017). 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 through ingestion and/or inhalation while swimming. Short-term exposure can cause skin irritation, rash, vomiting and fever while long-term exposure (mostly through drinking contaminated water) can lead to tumour formation with microcystin-LR being a possible human carcinogen (Miller and Russell, 2017).

Hamilton PHS monitors public beaches for the presence of microcystin toxins throughout the swimming season. The Health Canada Guidelines for Canadian Recreational Water Quality (2012) recommends the microcystin concentration in recreational water should be less than 20 parts per billion (ppb). When potential toxin-producing cyanobacterial blooms are observed at a public beach, Hamilton PHS uses Abraxis™ test strips to measure the concentration of microcystin toxins in the water. When elevated concentrations of microcystins are detected, the beach is closed, and a swimming advisory is issued. Hamilton PHS issues a media release and posts closure signs at the affected beach. The City of Hamilton's Beach Water Quality website and the Safe Water Information Line's outgoing phone message are also updated. PHS does not routinely monitor for *E. coli* bacteria when a beach has been closed due to microcystin toxins.

2020 Beach Water Quality Monitoring Results

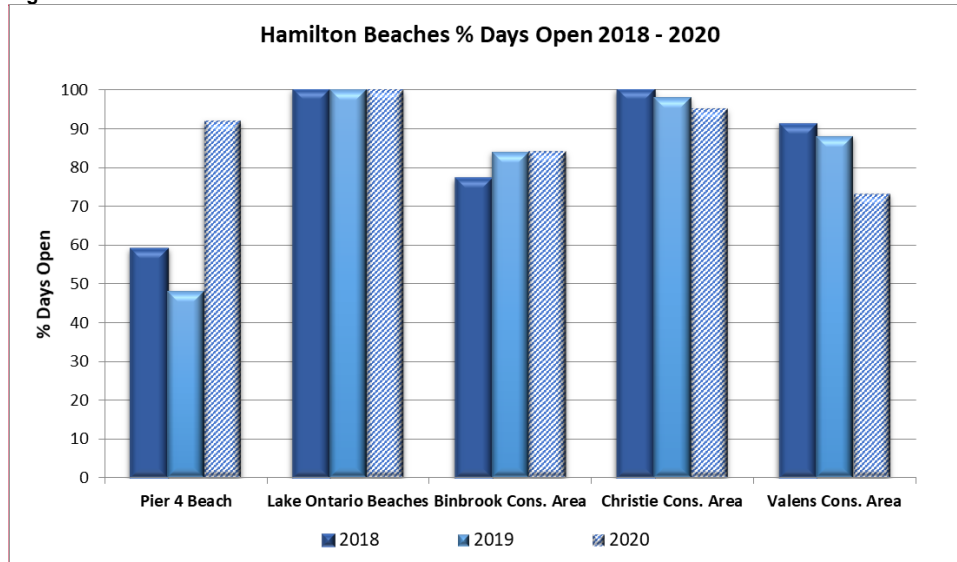
The 2020 beach monitoring program took place over an approximately 10-week period beginning Friday, June 19th and ending the last week of August. Table 1 on the following page summarizes the data for the 2020 swimming season at each public beach. The far-right column indicates the total percentage of days the beach was open for swimming. In Hamilton Harbour, Pier 4 Beach's water quality was acceptable for swimming 92% of the time. Lake Ontario beaches were open for 100% of

the season in 2020, while Binbrook, Christie and Valens Conservation Area Beaches were open 84%, 95% and 73% respectively.

Table 1: 2020 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</i>						
Pier 4 Beach*	73	6	0	6	67	92%
<i>Lake Ontario Beaches</i>						
Beach Boulevard	73	0	0	0	73	100%
Van Wagner's	73	0	0	0	73	100%
Confederation Park	73	0	0	0	73	100%
<i>Conservation Area Beaches</i>						
Binbrook Conservation	73	12	0	12	61	84%
Christie Conservation	73	4	0	4	69	95%
Valens Conservation	73	20	0	20	53	73%

Fig. 1.



Commented [MN1]: This is indicating that Pier 4 Beach was open in 2019 but it wasn't due to water levels. This chart might confuse others. If bga was present the data would show that it was closed for the season. We might want to clarify in the chart in the event someone doesn't read the body of the report

Pier 4 Park Beach

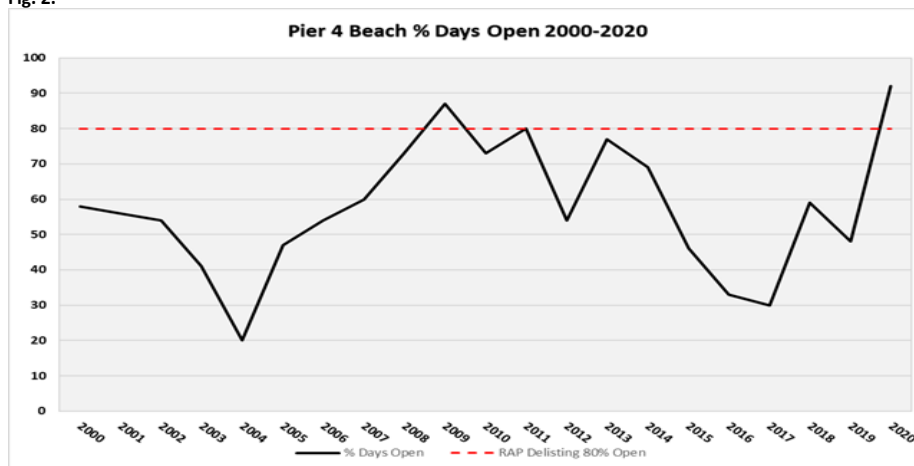
Pier 4 Park Beach was open for 92% of the season in 2020 and was posted as unsafe for swimming 6 out of the 73 days in the monitoring season. This is a significant achievement for the water quality at Pier 4 Beach, increasing from 48% days open in 2019 and 59% open in 2018. (Fig. 1).

Contributing to a much higher percentage of days open in 2020 was the absence of blue-green algae (BGA) from Pier 4 Beach. With no visible algal blooms in 2020, the beach was not once closed due to BGA. For the past several seasons, the main reason for a lengthy beach closure at Pier 4 has been due to BGA. The data from the previous year in 2019 helps show how impactful BGA is on the length of the swimming season. The beach was not posted due to unsafe levels of *E. coli* and remained open 100% of the time until BGA arrived at Pier 4 beach in early August. The beach was then closed and stayed closed for the remainder of the 2019 season, being open for swimming only 48% of the season.

Ongoing efforts to control the waterfowl population around the beach, coupled with the continuation of efforts to improve water quality - such as increased beach grooming and maintenance - has also impacted the increase in percentage of days open at Pier 4 beach.

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 to identify the challenges in the harbour and how they may be addressed. One criterion that needs to be satisfied before the Hamilton Harbour can be delisted from the AOC List, is that harbour beaches must be open for swimming 80% of the time during the swimming season. Fig. 2 below illustrates the percentage of days open at Pier 4 beach from the years 2000-2020 related to the 80% criterion.

Fig. 2.



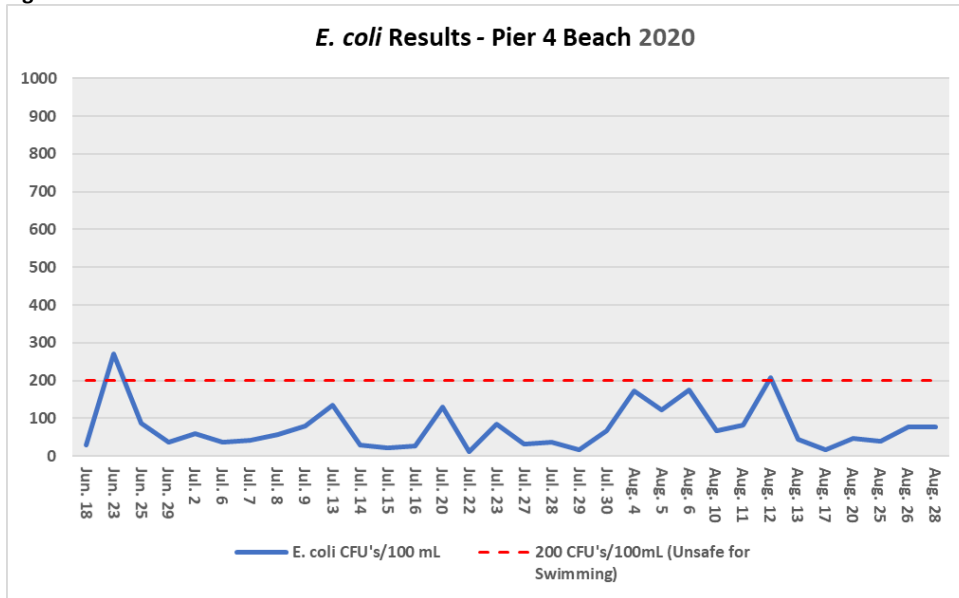
Pier 4 Beach reached a record low of only 20% days open in 2004 which prompted additional research on the issue of bacteriological water quality at Pier 4 Beach and the introduction of bird

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exclusion measures in 2005. After the introduction of bird exclusion measures the water quality increased each year and percentages of days open continued to increase until a peak of 87% days open was reached in 2009. Bird exclusion measures have continued to effectively evolve, and over the last several years, bacteriological levels have continued to decrease. However, BGA has resulted in lengthy closures of the beach and has significantly decreased the percentage of days open. In 2016, an increase in the threshold used for posting beaches as unsafe for swimming went from 100 to 200 CFU's. Although this contributed to an overall increase in percentage of days open, the bacteriological quality and E. coli geometric means have continued to improve. Consistently good water quality coupled with the absence of BGA resulted in the highest percentage of days open to date – 92%. As seen in Fig. 3 below water quality was consistently below the threshold of 200 CFU's per 100 mL in 2020.

Fig. 3.



Increased Efforts to Control Waterfowl Population

Research has shown that high levels of bacteria are introduced to the water by waterfowl faecal droppings. These droppings can contaminate the beach water directly or indirectly through storm water runoff and beach sand. At Pier 4 Beach several measures designed to deter the waterfowl population from using the beach as suitable habitat have been put into place. These measures include the installation of a buoy line and habitat modification including the planting of shrubs around the perimeter of the beach. In 2018-19, strobe lighting was also used to discourage waterfowl migration to the beach area at night. Because of these efforts, City of Hamilton Parks North reported fewer geese or faecal matter on the beach after installation of these deterrents.

The wildlife management contractor for the City of Hamilton also reported a decrease in the number of waterfowl population seen near Pier 4 Park Beach.

Lake Ontario Beaches

Lake Ontario beaches were open 100% of the season in 2020 (Fig. 1). The water quality at Beach Boulevard, Van Wagner’s and Confederation Park Beaches is historically excellent, with beaches consistently open 100% of the time during each swimming season. Swimming advisories are rare at Lake Ontario beaches and when they do occur, they are of very short duration, usually lasting only one or two days. Additionally, *E. coli* concentrations are consistently very low, often reported at the minimum reporting level of < 10 *E. coli* CFUs per 100 mL of water. As Public Health Ontario’s minimum reporting level is < 10 *E. coli* CFUs per 100 mL of water, the actual geometric means may be even lower than what is listed below. Lake Ontario also does not typically have water quality problems related to BGA, allowing for a consistent and lengthy swimming season.

Due to the historically excellent water quality results at Lake Ontario beaches, Hamilton Public Health Services reduced the sampling frequency to once monthly in 2020, as per the Ontario Ministry of Health and Long-Term Care’s Recreational Water Protocol (2019) which states “sampling frequency may be reduced to once per month where historical data of the geometric mean and environmental surveys indicate water quality was consistently within the water quality threshold for the previous bathing season and confirmed through the pre-season sampling results”.

Each beach along Lake Ontario was sampled four times during the 2020 season. The geometric means of *E. coli* concentrations are listed in the table below and they were always well below the threshold.

Table 2 – Lake Ontario *E. coli* CFU’s / 100 mL of Water - 2020

Date Sampled	Beach Blvd.	Van Wagner’s Beach	Confederation Park Beach
June 18, 2021	17	16	10
June 23, 2021	14	17	12
July 21, 2021	11	11	10
Aug. 18, 2021	10	10	21

Hamilton Public Health services will resume beach water quality monitoring in 2021 immediately following the Victoria Day long weekend (subject to provincial restrictions due to the COVID-19 pandemic) and continuing to the Labour Day long weekend in September.

References

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