BEACH MANAGEMENT PROTOCOL

Preamble

The Ontario Public Health Standards (OPHS) are published by the Minister of Health and Long-Term Care under the authority of the Health Protection and Promotion Act (HPPA) to specify the mandatory health programs and services provided by boards of health. Protocols are program and topic specific documents which provide direction on how boards of health must operationalize specific requirement(s) identified within the OPHS. They are an important mechanism by which greater standardization is achieved in the province-wide implementation of public health programs.

Protocols identify the minimum expectations for public health programs and services. Boards of health have the authority to develop programs and services in excess of minimum requirements where required to address local needs. Boards of health are accountable for implementing the standards including those protocols that are incorporated into the standards.

Purpose

The purpose of this protocol is to prevent or reduce the burden of water-borne illness and injury related to recreational water use at public beaches, and to assist boards of health in the delivery of local, comprehensive public beach management programs, which include, but are not limited to:

- Surveillance and inspection, including pre-season assessment and routine public beach surveillance;
- Management and response, including response to complaints and adverse events at public beaches and communication strategies for the public and stakeholders; and
- Reporting of Safe Water Program data elements to the Ministry of Health and Long-Term Care (MOHLTC) related to recreational water use at public beaches.

It should be noted that the requirements of public beaches outlined in this protocol also pertain to waterfront areas used for aquatic activities at recreational camps. Public beaches within provincial parks are generally the responsibility of the Ministry of Natural Resources; however, this is done in consultation with the board of health. The board of health is not responsible for routine monitoring of private residential beaches.

Recreational water quality is influenced by various environmental and built factors, including rainfall, wave action, water and ambient air temperatures, waterfowl, industrial waste discharges, storm water outflows, septic system discharges, and agricultural run-off.

This protocol replaces the *Beach Management Protocol, January 1998.*

Reference to the Standards

The table below identifies the OPHS standard and requirements to which this protocol relates.

Standard	Requirement
Safe Water	Requirement #1: The board of health shall report Safe Water Program data elements in accordance with the proposed *Drinking Water Protocol, 2008* (or as current); the proposed *Recreational Water Protocol, 2008* (or as current); and the proposed *Beach Management Protocol, 2008* (or as current). Requirement #3: The board of health shall conduct surveillance of public beaches and public beach water illnesses of public health importance, their associated risk factors, and emerging trends in accordance with the proposed *Beach Management Protocol, 2008* (or as current). Requirement #10: The board of health shall ensure that the medical officer of health or designate is available on a 24/7 basis to receive reports of and respond to: • Water-related adverse events, such as reports of adverse drinking water on drinking-water systems governed under the Health Protection and Promotion Act or the Safe Drinking Water Act; • Reports of water-borne illnesses or outbreaks; • Water-related issues arising from floods, fires, power outages, or other situations that may affect water safety; and • Water-related issues relating to recreational water use including public beaches in accordance with the Health Protection and Promotion Act*;* the proposed *Drinking Water Protocol, 2008* (or as current); the proposed *Infectious Diseases Protocol, 2008* (or as current); the proposed *Public Health Emergency Preparedness Protocol, 2008* (or as current); the proposed *Beach Management Protocol, 2008* (or as current); and the proposed *Recreational Water Protocol, 2008* (or as current). Requirement #13: The board of health shall reduce risks of public beach use by implementing a beach management program in accordance with the proposed *Beach Management Protocol, 2008* (or as current).

Operational Roles and Responsibilities

1) Surveillance and inspection

Pre-season assessment

a) The board of health shall conduct a pre-season assessment of all public beaches each year. This assessment shall include:

i) Inventory of public beaches
- Development and maintenance of an inventory of public beaches in its jurisdiction; and
- Review of the inventory of public beaches before the commencement of the season to confirm the number and location of the beaches that require monitoring as per this protocol. The board of health may also monitor any other public bathing area, except provincial parks, to which the public has access, and where there is reason to believe that recreational use of the water may result in waterborne illness or injury.

ii) Historical and epidemiological data
- Collection and analysis of historical, environmental, and epidemiological data to assess conditions that may have adverse health effects for the public using public beaches; and
- Analysis of previous years' data on public beach water conditions and bacterial quality (geometric mean results) to identify factors that can be used to predict influences on water quality. Heavy rain, storm sewer outfalls, or wave action have been shown to have an adverse effect on bacterial water quality at many public beaches. This analysis can assist in developing risk management approaches and communication strategies on a site-by-site basis.

iii) Environmental survey
- Carry out an environmental survey of the public beach prior to the commencement of regular testing of the water quality. The purpose of conducting the survey is to identify possible pollution sources and their potential impact on the quality of the water to determine the safety of the water for public recreational use. As part of the environmental survey, the board of health shall:
  - Verify existing sources of pollution at the public beach, such as storm water outfalls, and identify other sources that may not have been identified in previous seasons;
  - Work with municipalities and other surrounding landowners, wherever possible, to reduce or eliminate sources of pollution, such as garbage, litter, and manure piles; and
  - Collect water samples as deemed necessary from areas such as storm water outfalls, which may influence water quality at the bathing area.

Routine public beach surveillance

b) The board of health shall conduct routine beach surveillance of all public beaches, including but not limited to, the following components:

i) Ensure the collection of recreational water samples on a weekly basis, at minimum, to assess ongoing water quality conditions at public beaches in accordance with this protocol.

ii) Conduct a minimum of one set of five samples per week from each public beach beginning prior to and continuing over the course of the bathing season.

iii) Consider the following additional factors with respect to the frequency and timing of water sampling:
- More frequent sampling is recommended for public beaches that are affected by intermittent contamination sources.
- Routine samples should be collected at regular times, ideally when bacterial density is expected to be highest.
- Where historical data and environmental surveys indicate that water quality has been consistently within the limits of the provincial water quality standards for recreational use, routine surveillance may be reduced to once per month.

iv) Collect water samples and any subsequent re-samples for routine surveillance from fixed locations at the public beach that are representative of the majority of the bathing area. Fixed sampling locations will support consistency for analyzing trends in water quality.

v) Prepare a detailed layout of the public beach area, including but not limited to:
- All possible sources of pollution and the distances to the bathing area;
- The bathing area with shallow and deep sections indicated; and,
- Numbered sampling point locations and the order of samples to be collected.

vi) Record sampling conditions at the public beach on a weekly basis based on information contained in the Routine Beach Surveillance Field Data Report provided in Appendix Three, Attachment One.

vii) Use the following guideline to establish the number of sampling sites for extensive public beach areas:

Length of beach	Number of sampling sites
1000 metres or less	5 sites
1 kilometre or more	1 site per 200 metres

viii) Implement additional environmental surveys during the course of the bathing season if:
- Subsequent bacterial testing of the water demonstrates a significant, unexpected deterioration in water quality;
- Historical and epidemiological evidence points to the public beach as a possible factor in the prevalence or incidence of an illness that may be water-borne; or
- There are reports or evidence of chemical, manure, or sewage spills that may affect public beach water quality.

Water sampling methodology

c) The board of health shall:

i) Confirm sampling arrangements with the regional public health laboratory prior to commencement of routine sampling, including, but not limited to:
- Transportation of samples;
- Supply of bottles;
- Identification of samples submitted (i.e., as being associated with an environmental survey or with routine public beach surveillance in order that the appropriate laboratory procedures can be utilized);
- Reporting systems; and
- Other special sampling arrangements as required.

ii) Make local arrangements for chemical analysis of water samples through a licensed government or private laboratory, as required. This type of sampling is not normally collected for routine monitoring, but may be required for investigating spills or other suspected sources of pollution.

iii) Collect samples in a manner that is representative of the water that is being tested and in such a manner as to prevent contamination. This shall include:
- Holding the sample bottle near the base and filling to the fill line with a fluid motion, then replacing the cap immediately. The sample bottle may be held by hand or by a sampling rod when filling;
- Removing caps only at the time of sampling and protecting the sample from contamination until the cap is replaced on the bottle;

- Where possible, obtaining samples for bacteriological analysis at approximately 15 to 30 cm below the water surface, at a point where the depth of water is 1 to 1.5 metres; and
- When the depth of water is less than 1 metre, obtaining samples as far off shore as possible, but within the swimming area.

Sample preservation and transport to laboratory

d) The board of health shall store all samples in refrigerated coolers or coolers stocked with ice after they are collected, for delivery to the nearest regional public health laboratory within 24 hours of collection or as otherwise directed by the laboratory.

Bacteriological analysis

e) The board of health shall:
   i) Review the bacterial test results, as calculated using the daily geometric mean, along with other environmental factors of the particular public beach, to determine the appropriate course of action. Calculation of geometric mean is outlined in Appendix Three, Attachment Two.
   ii) Consider signage posting when the daily geometric mean of the samples for a public beach exceeds the Ontario Ministry of the Environment Guideline for Recreational Water Quality.

2) Management and response

Response to complaints and adverse events

a) The board of health shall establish an on-call system for responding on a 24 hour, 7-day availability to reports of illness or injury related to recreational water use of public beaches.

b) For all complaints related to recreational water use at public beaches received by the board of health, the board of health shall undertake a preliminary assessment to determine the level of potential impact within 24 hours. Complaints that have the potential for immediate public health consequences require immediate action on the part of board of health staff.

c) The board of health shall take immediate action to address any hazardous condition observed during the course of its pre-season assessment or routine beach surveillance of public beaches.

d) The board of health shall establish local operating procedures for responding to and reporting potentially hazardous spills and other adverse events at public beaches in accordance with the procedures outlined in Appendix Three, Attachment Three.

e) Routine recreational water sampling in public beaches at provincial parks is the responsibility of the Ministry of Natural Resources. The board of health shall, upon request, provide advice and consultation to local Ministry of Natural Resources staff with respect to recreational water use at provincial beaches in accordance with this protocol.

f) The board of health shall take enforcement action under the HPPA where such action may be warranted to reduce the risk of illness or injury to the public using a public beach.

Communication and education

g) The board of health shall establish communication strategies with partner agencies to provide timely and clear information to the public regarding the potential risks associated

with the use of public beaches. Communications strategies may include, but are not limited to:

i) Posting of signage regarding the status of recreational water quality at public beach locations;
ii) Posting information on the board of health website;
iii) Disseminating written materials;
iv) Issuing media releases to the local newspaper, radio station, or other local media; and
v) Informing local stakeholders and elected officials.

h) Where there is evidence that recreational beach water is potentially dangerous to the health of bathers, the board of health shall ensure that notices are displayed in prominent locations at the public beach indicating the nature of the risk. Considerations with respect to sign posting shall include:
   i) The evidence to support the posting of signs may be based on bacteriological analysis, assessment of historical environmental and epidemiological data, or the physical quality of the water.
   ii) Posting involves placing one or more signs at conspicuous locations along the affected public beach or shoreline. The notices (signs) should be clear, concise, and recommend a course of action to the public based on the specific risk.
   iii) The international icons for safe or unsafe swimming should also be incorporated into the signs.
   iv) The posting and removal of signs at public beaches is generally carried out by the owner/operator under the recommendation of the board of health.
   v) The signs should be left in place for as long as deemed necessary and promptly removed when the adverse condition no longer exists. The duration of beach posting should take into account any available evidence and historical data related to the beach in question. Posting should continue until surveillance of the water quality demonstrates that the risk to bathers is at a level considered by the board of health to be acceptable. Where beach water contamination follows a heavy rainfall, notices of beach postings may be removed when previous experience suggests that sufficient time has elapsed for water quality to have recovered.
   vi) Where historical data show that the bacterial counts consistently either exceed or fluctuate above the limits set for recreational use, the beach may be permanently posted. Monthly sampling to provide background data may be continued at the discretion of the board of health. After any remedial work is completed that may affect water quality, regular weekly sampling should resume to re-assessing the posting requirement.

i) The board of health shall ensure the availability of educational material and/or information to owners/operators regarding the health and safety-related operational procedures applicable to public beaches.

3) Reporting

a) The board of health shall utilize an information management system to record public beach monitoring data and provide such information as required by the MOHLTC.

Appendix One: Glossary

Adverse condition: A situation that may be potentially harmful to the health of users of the beach.

Advisory: A precautionary notice that informs members of the public about specific risks to health and safety to allow them to take measures to protect themselves.

Bathing season: A bathing season generally begins the first week of June and ends the first weekend of September.

Beach grooming: The act of removing garbage and other debris from sand along a beach front using mechanical means, such as a tractor fitted with a rake-like device to dislodge and remove such garbage and debris.

Closure: To cause restriction or elimination of public access to a beach or specific beach areas where a significant risk to health and safety has been identified. Board of health staff will direct owner/operators of beaches to post signage and erect barriers and barricades at appropriate locations to reduce the risk of public exposure to the health hazard.

Environmental survey: An environmental survey of a beach area is a site investigation where observations are made to identify environmental and built factors that may influence recreational water quality.

Geometric mean calculation: For the purposes of this protocol, the geometric mean is a calculation used to estimate bacterial levels of *E. coli* in recreational water. This averaging method is used to reduce the biasing effect of a single high reading. A single high reading may indicate an accident whose cause should be investigated, but a simple arithmetic average incorporating this reading gives an unrealistic estimate of average conditions.

Posting: Posting of a beach means to cause the placement of signs that inform the public about potential risks to health and safety based on an assessment of those risks. The owner/operator of the beach will be primarily responsible for posting and removing the signs as conditions warrant.

Public beach: A beach area owned and/or operated by a municipality, which:

- The general public has direct access to;
- Allows supervised aquatics programs or is staffed by lifeguards; and
- Meets the requirements of the sampling protocol for sampling sites.

Appendix Two: References

1. Water Management, Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy, Queen's Printer for Ontario, July 1994. Reprinted, February 1999. The document is available on the Ministry of Environment's website at: http://www.ene.gov.on.ca/envision/gp/3303e.htm

Appendix Three: Attachments

- Attachment One: Public Beach — Routine Beach Surveillance Field Data Report
- Attachment Two: Public Beach — Calculation of Geometric Mean
- Attachment Three: Operating Procedures for Responding to Adverse Events at Public Beaches

Attachment One: Public Beach — Routine Beach Surveillance Field Data Report

Health Agency: **Date:** **Time:**

Beach Name: **Location**

(A) Bacteriological Counts		
Number	***E. coli***	**Other (Specify)**

B)	**Meteorological Conditions**	**E)**	**Geometric Mean [ ]**
	1) Water Temperature (Celsius) At sampling depth: [ ]	**F)**	**Posted:** Yes [ ] No [ ]
	2) Rainfall: During Sampling: Light [ ]Medium [ ] Heavy [ ] None [ ]	**G)**	**Wave Action** Medium [ ] High [ ]
	3) Rainfall: Within 48 Hours of Sampling Light [ ] Medium [ ] Heavy [ ] None [ ]	**H)**	**pH:**
	4) Wind Direction: Toward Shore [ ] Away from Shore [ ] Parallel to Shore [ ] No Wind [ ]	**I)**	**Water Clarity (Turbidity)** <100cm [ ] >100cm [ ]
	5) Sunlight Bright [ ] Intermediate [ ] Dull [ ]	**J)**	**Other Influences (Specify)**
C)	**Bather Density** Light [ ] Medium [ ] Heavy [ ] No Bathers [ ]		
D)	**Waterfowl** Affected Sampling Sites [ ] Size of Flock(s) [ ] Duration of Stay [ ] None [ ]		

Attachment Two: Public Beach — Calculation of Geometric Mean

Assessment of the bacterial quality of drinking water or recreational water requires more than a single reading. Because of the uneven distribution of bacteria through a liquid medium, there is no reason to expect that the count of microorganisms in a single "grab sample" represents the average concentration in a lake or well. Indeed, an occasional sample may be far above (or below) the average.

Accordingly, to get an accurate estimate of the quality of recreational water, the results of a number of samples must be combined in such a way that an occasional unrepresentative sample will not unduly influence the average. For this reason, publications setting bacterial standards for water quality usually require either that a large proportion of the readings, say 90 to 95%, fall below a certain maximum permissible value, or that the geometric mean of all the samples fall below such a maximum. Ontario's proposed *Beach Management Protocol, 2008* (or as current) uses the latter approach.

The geometric mean, rather than the arithmetic average, is used in these calculations because it reduces the biasing effect of a single high reading. For instance, the arithmetic average of four counts of 10,000, 10,000, 10,000 and 1,000,000 is 257,500, while the geometric mean is about 31,600. In such a case, the single high reading may indicate an accident whose cause should be investigated, but a simple arithmetic average incorporating this reading gives an unrealistic estimate of average conditions.

The formula for the geometric mean G_x is:

$$G_x = {}^x1{}^x2{}^x3.....{}^xn;$$

that is, the geometric mean of n readings is the n th root of their product.

This calculation, a cumbersome one in arithmetic terms, can be simplified considerably by means of logarithms (logs), as described below.

Calculating the Geometric Mean

The logarithm of the geometric mean is:

$$\log G_x = \frac{\log x1 + \log x2 + \log x3 + ... + \log xn}{n}$$

that is, to find the log of the geometric mean of a set of readings, add up the logs of all the readings and divide by the number of readings. The geometric mean will then be the antilog of log G_x.

For this calculation, a calculator with logarithmic capability should be used.

It should be noted that the daily geometric mean provides historical data by indicating the water quality at the time of sampling, rather than the present water quality.

Adapted from notes by B. L. Miranda, Water Resources Branch, Ministry of the Environment.

Attachment Three: Operating Procedures for Responding to Adverse Events at Public Beaches

In addition to recreational water quality exceeding the provincial standard for bacteria, other conditions may occur that render public beaches unsafe or unsuitable for use by the public. Examples of adverse events are listed below, with possible options for response. The board of health shall carry out a risk assessment based on available information and physical observations in recommending actions.

Notification systems should be established with local public works, parks and recreation, the Ministry of the Environment, and conservation authorities to respond to and manage adverse events in a timely manner and to coordinate communication with the public.

a) Chemical, oil, manure, sewage spill, etc.

The public beach should be "Closed" until determined to be safe for public use. Closure, as defined in this protocol, would be carried out by the beach owner/operator (i.e., municipality) based on the recommendation of board of health staff. An order under section 13 of the Health Protection and Promotion Act (HPPA) may be necessary.

Board of health staff should collaborate with the local office of the Ministry of Environment and conservation authority, where applicable, to investigate and develop an action plan to resolve the issue and assess other environmental impacts. Re-opening of the public beach would require appropriate testing for the spilled materials or residues.

b) Waste water treatment plant bypass (unintentional or controlled)

The public beach should be "Posted" or "Closed" if there is sufficient evidence that the bypass or overflow may have adversely affected the bacterial quality of the beach. Considerations should include:

- Proximity of the bypass or overflow to the beach;
- Volume, dilution, and level of treatment of effluent (secondary or tertiary bypass);
- Circumstances of the release (e.g., heavy rain event, plant failure, overload); and
- Location of the outflow in relation to the beach, time of year, etc.

The preliminary assessment can be based on telephone communications with the owner/operator. Board of health staff should collaborate with the local public works department, local office of the Ministry of Environment, and conservation authority, where applicable, to investigate and develop an action plan to resolve the issue and assess other environmental impacts. Further assessment may require a site visit by board of health staff. Water sampling may be warranted to verify the bacterial quality of the recreational water.

c) Blue green algae bloom (confirmed by visual observation or laboratory test)

The public beach should be "Closed" until a full assessment can determine the safety of its use. The Ministry of Environment, the Ministry of Natural Resources, the conservation authority, and the local municipality would be involved in investigating and managing the adverse event. Blue green algae is a natural phenomenon and may persist for the entire bathing season.

d) Heavy algae growth or accumulation

The public beach should be "Posted" if the growth of plant life at the swimming area could cause entanglement or could prevent the ability to see someone in distress. If the problem is extreme, then closure could be considered by the beach owner depending on the location and extent of the dead and decaying accumulated algae. The mere presence of the material is not considered a

health hazard, but an assessment may be needed to determine if it is in sufficient quantity and in a location that may directly affect the safety of swimmers. Heavy accumulation of dead and decaying algae (usually with associated odours) typically deters beach use.

e) Fish or other wildlife die-off at the beach

The public beach should be "Posted" as unsuitable for swimming or wading. The Ministry of Natural Resources should be notified for any action it deems necessary. The Ministry of the Environment, the Ministry of Natural Resources, the conservation authority, and the local municipality would be involved in investigating and managing the clean-up operation. Communication with the public via the media is recommended.

f) Visible debris, metal or sharp objects in the water, etc.

The public beach should be "Posted" or "Closed" depending on the extent and the risk to users of the debris. The beach owner/operator should be contacted to have the material removed from the beach area before the postings are removed.

g) Exceedance of bacterial recreational water standard

The public beach should be "Posted" if water sample test results exceed the provincial standard for bacterial water quality and an assessment of other environmental factors support such action.

h) Other situations

Other situations may arise at public beaches that may require an assessment by board of health staff and subsequent "Posting" or "Closure" under the authority of the HPPA.