Supervised Beach Water Quality Monitoring Protocol Summer 2024

Beach Management

The Municipality's supervised outdoor swim (beaches) program is offered as a public service during the summer months of every year. The program runs annually from July 1 through August 31. This service, offered at 19 locations throughout HRM in 2024 (see Appendix A), is highly valued by our residents, and is one of the signature recreational services provided to residents during summer months. Public services offered in natural environments can only be offered when an adequate measure of public safety can be assured. Both freshwater and marine aquatic environments pose potential risks to human health and safety, due to the possibility of contact with various chemicals or biological materials, and physical hazards.

The primary hazard posed by water quality is the potential for contact with microorganisms associated with fecal contamination. An emerging hazard to beach water quality in the HRM is harmful algal blooms and mats (cyanobacteria), and the potential for these blooms and mats to produce toxins harmful to humans and other animals. The best way to manage these risks is through the effective operation of a water quality monitoring program, including the use of risk awareness measures, appropriate guidelines and standards for collection, handling, analysis, and reporting. The Municipality's program is operated in partnership with contracted laboratory services, provided in 2024 by Bureau Veritas Laboratories (BV Labs).

Beach Operation

Swimming and using the water at HRM's supervised beaches are encouraged for the public except in the following circumstances:

- The geometric mean (geomean) of five test results for a given beach is above the acceptable concentration for the appropriate indicator bacteria
- There has been a significant rainfall event
- Beach personnel suspect water quality concerns
- Visual observation of algal blooms or mats

Staff responses to circumstances triggering beach closures are described starting on page 3 of this protocol.

Due to different indicator limits for fecal bacteria and cyanobacteria, the protocols guiding beach openings, closures, and advisories are different for each, as reflected in the details presented below.

2024 is the seventh year the municipality has a planned response to cyanobacteria, with 2024 being the first year using the updated response protocol outlined below. The Municipality's response is to use a risk-based approach based on species identification and toxin testing due to multiple factors such as uncertainty in appearance, toxicity, number and location of blooms or mats, and current laboratory limitations. Water sample handling guidelines are similar for fecal bacteria and cyanobacteria testing practices and are addressed below.

Water Quality Results

The municipality's beach water quality monitoring protocol conforms to Health Canada's Guidelines for Canadian Recreational Water Quality. The most recent edition of these guidelines was published in 2023.

Per these guidelines, Halifax uses *E. coli* as indicator of water quality for freshwater beaches, and enterococci as the indicator of water quality for marine and brackish beaches. Kinap Beach is a supervised brackish beach and is managed based on enterococci results. All other supervised beaches are exclusively managed based on *E. coli* results.

Municipal Response to Water Quality Results

Lab results from weekly sampling are received by the Water Quality Coordinator, Water Resources Specialist, and Aquatic Specialist. For supervised beaches, where bacteriological results exceed guideline limits, beaches will be closed, and Beach Supervisors will arrange to retest the affected beach as soon as possible and follow the steps outlined in *Table 1*.

Table 1: Action Items for Bacteria Exceedances & Algae Blooms at Supervised Beaches

Step	Action	Person(s) Responsible
1	Laboratory contact to notify Manager of Aquatic & Inclusion Services	Aquatic Specialist or Beach Supervisor on Office duty
2	Notify lifeguard(s) on affected beach(es)	Beach Staff
3	Place appropriate signage at site	Lifeguard(s) on site
4	Notify Public Affairs Office to publish PSA Email: mediarelations@halifax.ca	Water Resources Specialist
5	Remain at the beach where the advisory has been issued for at least 7 days for public relations	Lifeguard(s) on site
6	Direct all media questions to the Public Affairs Office for redirection to Water Resources Specialist or designate. Staff to maintain "no comment" unless otherwise directed.	All staff
7	Notify NSECC: 1) Primary Contact - Environmental Health Consultant, Rodney Lahey, 902.565.9881, rodney.lahey@novascotia.ca; if Rodney is unavailable, contact Manager of Environmental Health Programs, Colin Poirier, 902.943.9842, colin.poirier@novascotia.ca 2) NS Inspection, Compliance & Enforcement Division, Central Region (Bedford Office) a. 902-424-7773 or Bedford.Office@novascotia.ca (M - F 08:30-16:30); or b. Environmental Emergencies Hotline: 1-800-565-1633 between 16:30 and 08:30 M-F and weekends	Water Resources Specialist

Fecal Bacteria Overview

Fecal bacteria are a large group of bacteria that originate in the lower digestive tracts of warm-blooded animals. Many of these bacteria are pathogenic and may cause disease in people. *Escherichia coli* (*E. coli*) are coliform bacteria, and are used as an indicator of the presence of all fecal bacteria in recreational waters, in part because of its persistence in the environment, its origin in the intestinal tract, and the relative accessibility of standardized lab analysis.

The health risk associated with primary contact with elevated concentrations of fecal bacteria (represented by the measured concentration of *E. coli*) include diarrhea, skin rashes, ear pain, cough or congestion, and eye pain. In more serious cases, symptoms may include urinary tract infections, respiratory illness, and bloodstream infections.

Swimming is encouraged as long as key water quality indicators remain below acceptable limits. HRM beach program staff collect, handle, and deliver water samples and associated documentation to the analytical lab. In 2024 this is BV Labs. BV Labs is responsible for confirming documentation and analytical procedures, conducting analytical procedures, and reporting analytical results to HRM staff. HRM and BV Labs' staff responsibilities are described separately in the section below.

Water Quality – Sample Collection, Handling, Delivery & Documentation

Sample collection is the process of obtaining uncompromised water samples across the supervised beach area. Samples are collected across the entire length of the beach, at knee-depth. Five samples are collected weekly at each beach.

Each sample is assigned a unique label, A through E, representing their relative location across the beach profile. From the perspective of a lifeguard standing on the beach facing the water, station A is on the far left, station E is on the far right, and stations B-D are at equidistant intervals between stations A and E.

When sampling, the open bottle should be submerged below the water surface with the open end facing downwards, turning the bottle upright to fill it at a depth of roughly 30cm (1ft). Sample collectors should wear sterile gloves, and take care to avoid contaminating the sample by touching the mouth of the bottle with their hand or another surface. Human skin naturally harbors several varieties of microorganisms, including bacteria, even when freshly washed. If a hand touches the inside of the bottle or the inside of the bottle lid, skin these bacteria could be transferred to the water sample, potentially causing false-positive test results. False-positive results may lead to unnecessary beach advisories, further testing requirements, and unnecessary expense.

HRM's beach program conforms to water quality standards set in the Guidelines for Canadian Recreational Water Quality (Health Canada, 2023).[1] HRM's protocol has been developed in consultation with Nova Scotia Environment & Climate Change (NSECC), including Environmental Health, the division representing the interests of the district Medical Officer of Health.

In 2024, Halifax has supervised beaches in both freshwater and brackish environments. When results are received from the analytical lab, the geometric mean (geomean), an average of all

[1] recreational-water-quality-guidelines-indicators-fecal-contamination.pdf (canada.ca)

samples, will be calculated from the five sample results. Acceptable bacteria thresholds for fresh water and brackish beaches are presented in *Table 2*. Based on Health Canada's most recent guidance for recreational water quality, *E. coli* thresholds have been reduced from 2023.[2]

Table 2: Beach Monitoring Indicators and Maximum Concentrations

Beach Type	Indicator Bacteria	Maximum Allowable Concentration (CFU)[3]	
		Geomean of five samples[4]	Individual sample
Freshwater	*E. coli*	126/100mL	235/100 mL
Marine & Brackish	Enterococci	35/100mL	70/100 mL

A summary of monitoring requirements at all beaches is provided in Appendix B.

Beach Supervisors are trained on proper sample collection procedures by HRM's Water Resources Specialist at the start of each beach season. Only Beach Supervisors or the Aquatics Coordinator will collect water samples from supervised beaches for water quality monitoring. Sampling support can be provided by HRM Environment & Climate Change (ECC) in extenuating circumstances.

Handling procedures for water samples are intended to ensure safe, secure, and controlled collection of samples from the time they are collected until delivery at the analytical lab. This includes proper bottle labelling, storage, and refrigeration. **Bottles must be labelled with the following information:**

- Date and Time of sample collection
- Sample ID: Beach Name, Station Name (A,B,C,D,E)
- Sample Type: FW (Fresh Water) **or** SW (Salt Water)
- Analysis: *E. coli* (FW) **or** enterococci (SW)

The lab requires water samples to arrive at 10°C or cooler. Samples should be immediately placed into a cooler filled with ice upon collection. Samples being held overnight should be stored in a refrigerator.

The same type of bottle is used for all bacteria samples. This bottle contains powdered sodium thiosulphate ($Na_2S_2O_3$). Sodium thiosulfate is used as a de-chlorination agent for treated drinking water and is not necessary to stabilize surface water samples. While caution should be taken not to pollute, it is acceptable if the powder escapes the bottle upon sample collection. This material will not contact staff using the safe handling procedure. If skin contact with the material occurs, wash thoroughly with soap and water. The Safety Data Sheet (SDS) for sodium thiosulphate can be found in Appendix C.

Documentation of water samples is critical because incomplete, inaccurate, or missing paperwork can lead to confusing, misleading, or useless sample results, or samples being rejected by the analytical lab.

In addition to labeling the individual bottles, all water samples must be submitted with a correctly completed **Chain of Custody (COC) form**. The municipality has forms customized for the

[2] Prior HRM Beach Protocols used 200CFU/100mL as a maximum acceptable geomean and 400CFU/100mL as a maximum acceptable single sample concentration.

[3] CFU = Colony Forming Unit

[4] Beach advisories are based on the geomean unless one individual sample exceeds the threshold listed in this table.

beaches program and supplied by the analytical lab (Appendix D). To complete this form, staff must provide the following information:

- Field Sample Identification (Beach name & Station #),
- Date of sample collection
- Time of sample collection
- # and Type of Bottles – report each sampling station on its own line (row)
- Matrix (Fresh Water or Salt Water)
- Identification of Analysis Required (check *E. coli*, enterococci, or microcystin)
- Name (of HRM staff delivering samples), plus date and time of delivery.

Water samples collected for bacteriological analysis are only valid if analytical testing begins within 24 hours of sample collection. **Staff must ensure the delivery of all samples to the lab as soon as possible after they are collected.** Samples being held overnight must be stored in a refrigerator and must be delivered to the lab first thing the following morning, within 21 hours of sample collection. Samples delivered more than 24 hours after collection will be rejected by the lab and will need to be recollected.

BV Labs has implemented a non-contact sample receipt protocol. All samples should be left in the building lobby, accompanied by completed COC forms. These forms should be completed before leaving samples in the lobby to minimize traffic in the drop-off area. Lab drop-off times are listed in *Table 3*.

Table 3: Sample Drop-off Times for Bureau Veritas Laboratories

Drop-Off Day	**Parameter**	**Preferred Drop Time (same day)**	**Latest Acceptable Drop Time**	**Results Availability**
Monday – Thursday	*E. coli*	4pm	10am (day after sample collected)	Noon on Day 2
Monday-Thursday	enterococci	4pm	10am (day after sample collected)	Noon on Day 3
Monday - Friday	Microcystin	n/a	n/a	Standard: 7 Business Days; Rush: 3 or 5
Friday	*E. coli* & enterococci	n/a	2pm (same day)	Noon on following Monday
The tests for *E. coli* and enterococci must run for 24 hours and 48 hours, respectively. If samples are received in the afternoon the results will not be ready by noon the following day; they will be reported by noon on the second day. (i.e., if sample dropped off Monday at 3pm the results will be reported on Wednesday by noon).				
Notice for sample drop-off beyond regular cut-off times should be given as early as possible. During business hours, please contact Preeti Kapadia (Project Manager, at 902.420.0203 ext. 252) or as backup Maryann Comeau (Supervisor ext. 298, cell 902.229.2201). After business hours, please contact Suzanne Rogers (Lab Manager, 902.209.4055) or Jason Wang (Lab Supervisor, 902.448.4337).				

BV Labs sends analytical results to the following staff via email: Water Resources Specialist, Aquatics Specialist, and Manager of Aquatics and Inclusion.

Water Quality – Documentation Confirmation, Analysis & Reporting

HRM only contracts accredited and certified laboratories for water sample analysis. These labs apply thorough quality control and assurance programs at all stages of their work, which begins with sample reception. Reception staff are responsible for confirming that the number and type of bottles received match those reported on the COC form, and for following up on any inconsistencies, errors, or uncertainties with HRM staff.

Upon satisfactory receipt and confirmation of all samples, the lab conducts the analysis as requested on the COC. BV Labs conducts all *E. coli* and enterococci analyses on-site.

To restate, samples remain viable for analysis only when received and initially processed by the laboratory *within 24 hours of sample collection*. With a lag of up to 3 hours between receipt and processing, *samples need to be delivered within 21 hours of collection*. It is therefore critical to accurately observe and record the collection time, and to deliver samples less than 21 hours later. *Table 3* lists drop times and corresponding reporting periods for all parameters on a weekly basis. BV Labs will notify the Water Resources Specialist and the Aquatics Specialist in the event of holiday closures with updated sample drop-off times.

Beach Advisories and Swimming Lessons

Beginning in 2024, HRM is adopting a new approach to operating supervised beaches. The goal of the updated process is to balance public safety, transparency in decision making, and access to recreational resources during our short summer season.

HRM's process in prior years used Health Canada's Recreational Water Quality Guidelines as thresholds for total beach closures. This is a more conservative approach than is employed in other Canadian municipalities operating supervised freshwater beaches. For example, municipalities such as Ottawa, ON[5] and Hamilton, ON[6] post advisories recommending residents don't swim when bacteria concentrations are above Health Canada's thresholds, but do not issue beach closures.

The approach proposed below is also in line with Health Canada's most recent guidance, which describes the values listed in *Table 2* as Beach Action Values (BAVs) which "should trigger further actions by the responsible authorities. . . [which] may include issuing a swimming advisory, [or] immediate resampling of the site,"[7] both actions which are included in the 2024 protocols.

The water quality response protocol for 2024 is outlined in the sections below.

Swimming Lessons – HRM offers free swimming lessons on weekdays at its supervised beaches throughout the summer. These hour-long sessions take place in the shallow water. Prolonged water contact increases the risk of exposure to water-borne pathogens, especially in young children, who make up the majority of swimming lesson participants.

Swimming lessons at outdoor supervised beaches will be cancelled if bacteria concentrations

[5] Information on Ottawa Public Health's supervised beach program is available online here: Beach Water Quality Results - Ottawa Public Health

[6] Information on Hamilton Public Health Service's supervised beach program is available online here: Beach Water Quality | City of Hamilton

[7] recreational-water-quality-guidelines-indicators-fecal-contamination.pdf (canada.ca), page 6.

exceed the values listed in *Table 2*.

Open Swimming – beginning in 2024, HRM will no longer issue total beach closures due to the presence of high concentrations of bacteria. Instead, HRM will publish weekly water quality results as received from the analytical lab and will issue advisories against swimming if bacteria concentrations exceed the values listed in *Table 2*.

Where an advisory against swimming has been published, water use at supervised beaches will take place at the swimmer's own risk. The risks of swimming in an environment with elevated bacteria concentrations will be posted. Lifeguards will be on-site during opening hours while an advisory is in place and will notify beach users that bacteria concentrations are elevated, and swimming is not recommended.

Beach Retesting in Case of Advisory

When bacterial analysis results lead to advisories against open swimming at any municipal supervised beach, affected beaches are re-sampled on soon as possible, typically the following weekday. Beach advisories will remain in effect until the geomean of five samples is equal to or less than the guideline limits.

If a wastewater system overflow occurs near a supervised beach, the beach will be closed to swimming as a precaution. Water samples (*E. coli* or enterococci) should be collected no sooner than 24 hours after the overflow is contained. Beaches will remain closed until the geomean of five samples is equal to or less than guideline limits.

During retesting conditions, Beach Supervisors should consider documenting the following conditions to assist in interpreting water results as necessary:

- Was it raining at the time of collection or at any time during the previous 24-hour period?
- How clear or turbid was the water?
- Were ducks, geese, or other birds present? How many?
- Did you see any other signs of potential water contamination, or plausible causes for such contamination?

Cyanobacteria Overview

Cyanobacteria, also called blue-green algae, are a group of bacteria that naturally occur in the same freshwater environments as true algae, forming blooms or benthic mats if the right conditions are present.

Cyanobacteria can produce toxins when they bloom or form mats, but toxin production does not always occur. As the organisms die and decay, any toxins produced will be released into the water. People who make physical contact with blooms or mats may experience negative health symptoms, including skin irritations/rashes, sore throat, red eyes, swollen lips, and hay-fever-like symptoms. People and other animals who drink affected water or eat the mat material may be at risk of headaches, fever, diarrhea, vomiting, cramps, muscle, and joint pain, and even liver damage. Ingestion of mat material in particular can be fatal to humans and other mammals.

It is difficult to predict if blooms will form, and if blooms, when formed, will produce and subsequently release toxins. The municipality's cyanobacteria protocol is triggered by the observation of blooms or mats.

Cyanobacteria may vary considerably in colour, consistency, and overall appearance. Staff will assess blooms and mats observed directly and as reported by the public at HRM public beaches.

To streamline, document, and enable the assessment of public reports, ECC has initiated a review process in consultation with staff from the Parks division and 311. This review includes the collection of caller name and contact info, and the date, location, and description of the suspected bloom. For reported blooms or mats in lakes associated with supervised municipal beaches, staff will conduct a site visit. Other reports are forwarded to NSECC. The purpose of the site visit is to visually assess the environment of the bloom and reach one of two conclusions: 1) verify its presence; or 2) determine that the alleged bloom is not consistent with observations of confirmed algae blooms or mats.

This protocol adopts the approach that HRM will only issue closure notices at the 19 supervised beaches where the municipality currently conducts water quality monitoring to protect public safety, and the Shubie Park Dog Beach. For all other watercourses, Halifax maintains that the Province of Nova Scotia has jurisdiction, and HRM will duly notify staff at NSECC ((1) Environmental Health & (2) Bedford Office, Inspection, Compliance, & Enforcement Division) to enable their own risk assessment, risk management, and, if necessary, public communications procedures.

Once staff suspect the presence of blooms or mats near municipal supervised beaches and/or the Shubie Park Dog Beach, Public Affairs will issue public risk advisory notifications via Public Service Announcement (PSA) and Twitter, advising the public of possible cyanobacteria presence, to avoid swimming, allowing pets to enter the water, and to take any additional recommended precautions. Municipal beaches will be closed until the bloom or mat is determined not to pose a risk to public safety.

Following the initial risk advisory notification, staff will initiate the following three-step risk assessment process:

1. Taxonomic identification;
2. Toxin analysis through accredited laboratory services; and

3. Toxin level assessment through test-strips.

1. Taxonomic Identification

The first step is to identify what species are present, and whether they are potentially toxin-producing cyanobacteria. Staff will collect samples from blooms or mats, label the sample containers, and bring them to Bio-Limno Research & Consulting (BLRC) for taxonomic identification. Taxonomic identification is the process of recognizing the identity of organisms, in this case to the species level. BLRC staff identify which species are forms of cyanobacteria, and of those, which can produce toxins (microcystin, anatoxin, saxitoxin, nodularin, or cylindrospermopsin). Results are available within 48 hours of sample submission.

If this assessment determines the bloom does not contain cyanobacteria, or that those cyanobacteria present do not produce toxins, staff will reopen the affected beach. If the assessment confirms that the cyanobacteria species present may produce toxins, the beach will remain closed, and staff will begin regular visual observations. These observations will continue until the cyanobacteria is no longer visible, at which time staff will undertake the process for toxin analysis.

2. Toxin Analysis

Cyanobacteria are the most common toxin-producing harmful algal blooms in Canadian freshwater environments. Microcystin is the most frequently observed form of toxin produced by the toxin-producing species of cyanobacteria, and it is the only toxin for which Health Canada has published guideline values for recreational water quality.

If a bloom is confirmed to be potentially toxin-producing, samples for toxin analysis will be collected by ECC staff and submitted to the analytical lab. To further reduce the risk of exposure, staff will wear rubber boots or waders and nitrile gloves. For each location sampled, five discrete water samples will be collected and mixed in a clean container, from which a composite will be collected. This single composite sample is submitted to the analytical lab for analysis.

Samples must be submitted to the lab for toxin analysis during operating hours. For toxin analysis, staff will request a “rush” turnaround time of 3 days. Microcystin samples received by BV Labs’ Bedford office will be shipped to an accredited affiliate in Mississauga for analysis.

If toxin levels are acceptable (≤10 µg/L), and no new blooms appear in the area, staff will use test-strips to confirm current toxin levels.

3. Toxin level assessment by test strip

This secondary assessment is performed to ensure microcystin concentrations have not increased above safe levels since the date that samples were collected for analysis. ECC staff collect water samples for immediate subsequent assessment using a microcystin test strip, specifically designed to indicate whether the concentration of microcystin in fresh water are present in a concentration under or over the guideline value as stated in Health Canada’s Guidelines for Recreational Water Quality (≤10µg/L). The sampling procedure used is in accordance with the Manufacturer’s User Guidelines for the Microcystin Test Strip in Recreational Waters (Appendix E).

This analysis will be completed within 2 hours of return to the office following sample collection. Test results are available immediately upon completion of analysis.

If test strip results indicate toxin concentrations are below of ≤10µg/L, the concentration at which Health Canada guidelines state is safe for primary contact recreational use, staff will open the affected beaches.

If results indicate toxin levels are above the guideline level, affected beaches will remain closed, and ECC staff will repeat Step 2 in this risk assessment process. Steps 2 and 3 will be repeated until toxin levels are confirmed to remain below the guideline value. At that time, beaches will be reopened, and cyanobacteria signage removed.

The beach area will be monitored closely following a beach reopening, with cyanotoxin levels checked using test strips being done in the event the bloom reappears.

Beginning in 2020, Halifax added additional protocols for lakes with multiple beaches and public access points such as Lake Banook and Lake Micmac. In instances where blooms are contained to one portion of the lake, additional testing with test strips at the beach area will take place to ensure that blooms and toxins have not spread.

The authority to issue, revise, and lift closures lies with Water Resources Specialist. In their absence, that authority resides with the Environment Manager. Staff will advise the Directors of Environment & Climate Change and Parks and Recreation of forthcoming risk advisories prior to their publication.

Appendix A: Beach Locations 2024

Beach Name	Location	Lifeguard Supervision
Albro Lake Beach	Albro Lake, Dartmouth	July 1-August 31st, 2024
Birch Cove Beach	Lake Banook, Dartmouth	July 1-August 31st, 2024
Campbell Point Beach	Hatchet Lake, Halifax	July 1-August 31st, 2024
Chocolate Lake Beach	Chocolate Lake, Halifax	July 1-August 31st, 2024
Cunard Lake Beach	William's Lake, Halifax	July 1-August 31st, 2024
Kearney Lake Beach	Kearney Lake, Halifax	July 1-August 31st, 2024
Kidston Lake Beach	Kidston Lake, Halifax	July 1-August 31st, 2024
Kinap Beach	Porters Lake	July 1-August 31st, 2024
Lake Echo Beach	Lake Echo	July 1-August 31st, 2024
Long Pond Beach	Long Pond, Halifax	July 1-August 31st, 2024
Malay Falls	Sheet Harbour, Eastern Shore	July 1-August 31st, 2024
Oakfield Park Beach	Shubenacadie Grand Lake, Oakfield	July 1-August 31st, 2024
Penhorn Lake Beach	Penhorn Lake, Dartmouth	July 1-August 31st, 2024
Pleasant Drive Beach	Petpeswick Lake, Eastern Shore	July 1-August 31st, 2024
Sandy Lake Beach	Sandy Lake, Bedford	July 1-August 31st, 2024
Saunders Beach	Paper Mill Lake, Bedford	July 1-August 31st, 2024
Shubie Park Beach	Lake Charles, Shubie Park, Dartmouth	July 1-August 31st, 2024
Springfield Beach	Springfield Lake, Sackville	July 1-August 31st, 2024
Webber's Beach	Lake Charlotte, Eastern Shore	July 1-August 31st, 2024

Appendix B: Beach Monitoring Summary 2023

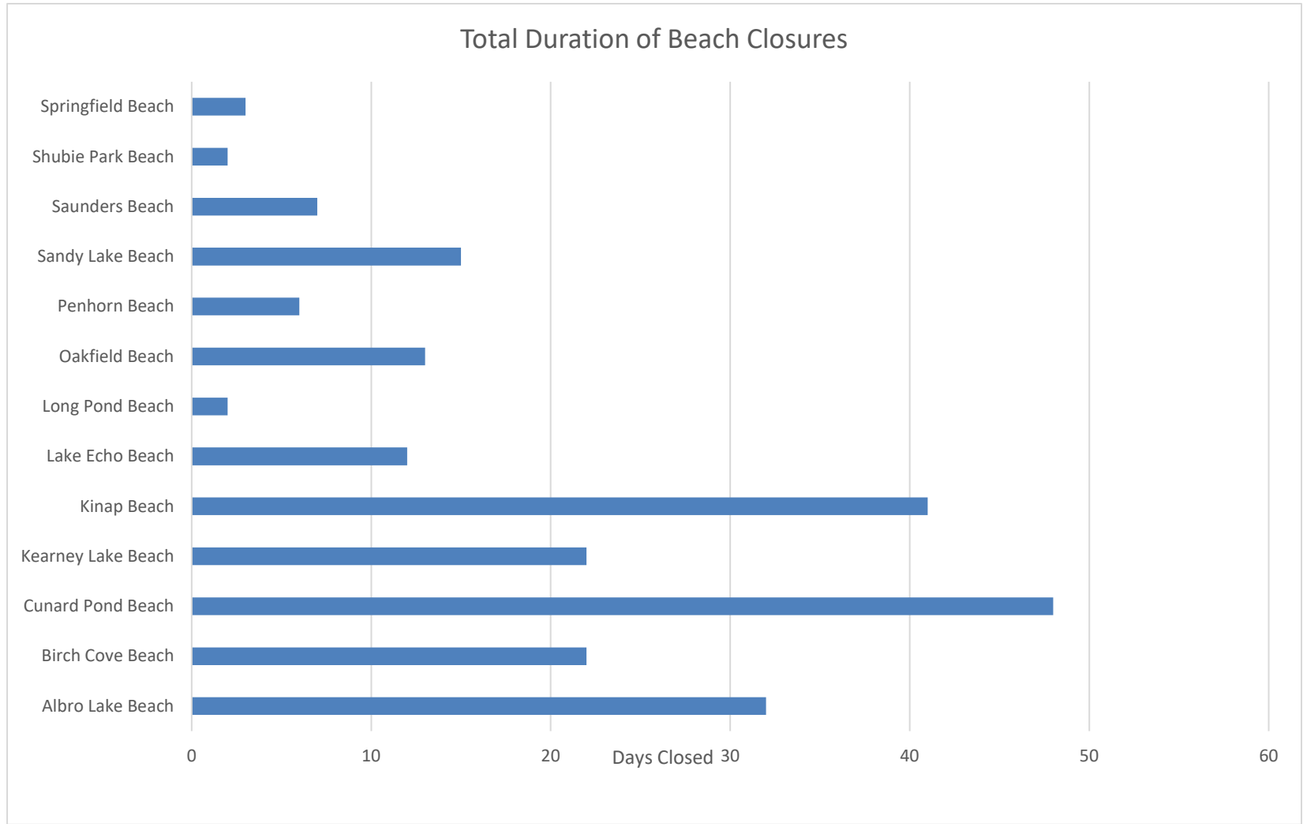
Closure #	Beach Name (Watercourse Name)	Date Closed[1]	Date Re-Opened[2]	Closure Duration (days)[3]	Closure reason	Indicator Used[4]	Indicator Concentration(s)
1	Springfield Beach (Lower Sackville)	1-Jul-23	4-Jul-23	3	Suspected blue-green algae bloom	Visual observation	N/A
2	Albro Lake Beach (Dartmouth)	6-Jul-23	10-Jul-23	4	High bacteria	*E. coli*	320,230,210,220,210
3	Kearney Lake Beach (Halifax)	6-Jul-23	10-Jul-23	4	High bacteria	*E. coli*	370,410,390,330,520
4	Lake Echo Beach (Lake Echo)	11-Jul-23	14-Jul-23	3	High bacteria	*E. coli*	52,20,>500,320,>500
5	Cunard Pond Beach (Halifax)	13-Jul-23	Closed for the whole season	48	Confirmed blue-green algae bloom	Visual observation	N/A
6	Sandy Lake Beach (Bedford)	13-Jul-23	17-Jul-23	4	High bacteria	*E. coli*	All samples >500
7	Kearney Lake Beach (Halifax)	18-Jul-23	31-Jul-23	13	High bacteria	*E. coli*	400,330,ND,310,400
8	Lake Echo Beach (Lake Echo)	19-Jul-23	28-Jul-23	9	High bacteria	*E. coli*	330, 270,400,310,220
9	Albro Lake Beach (Dartmouth)	20-Jul-23	4-Aug-23	15	High bacteria	*E. coli*	280,320,460,210,220
10	Kinap Beach (Porter's Lake	21-Jul-23	Closed for the rest of the season	41	High bacteria	Enterococci	49, 54,67,69, 18 (31,36,33,38,44)
11	Sandy Lake Beach (Bedford)	22-Jul-23	2-Aug-23	11	High water level and pump station failture	N/A	
12	Oakfield Beach (Grand Lake)	22-Jul-23	4-Aug-23	13	High water level	N/A	

13	Birch Cove (Dartmouth)	26-Jul-23	2-Aug-23	7	High bacteria	*E. coli*	>500,>500,>500, 400, 350
14	Saunders (Bedford)	26-Jul-23	28-Jul-23	2	High bacteria	*E. coli*	410,380,320,360,290
15	Shubie Park (Dartmouth)	26-Jul-23	28-Jul-23	2	High bacteria	*E. coli*	140,190,210,190,310
16	Long Pond (Halifax)	26-Jul-23	28-Jul-23	2	High bacteria	*E. coli*	400,410,340,450,380
17	Kearney Lake Beach (Halifax)	9-Aug-23	14-Aug-23	5	High bacteria	*E. coli*	160,140,280,290,250
18	Albro Lake Beach (Dartmouth)	9-Aug-23	15-Aug-23	5	High bacteria	*E. coli*	>500,460,500,>500,>500
19	Birch Cove (Dartmouth)	16-Aug-23	Closed for the rest of the season	15	High bacteria	*E. coli*	94,>500.200,200,140
20	Penhorn Beach (Dartmouth)	16-Aug-23	22-Aug-23	6	High bacteria	*E. coli*	360,400,420,380,380
21	Albro Lake Beach (Dartmouth)	16-Aug-23	23-Aug-23	6	High bacteria	*E. coli*	360,310,380,310,360
22	Albro Lake Beach (Dartmouth)	30-Aug-23	Closed for the rest of the season	2	High bacteria	*E. coli*	390,190,300,>500,190

Last Updated: 30-Aug-23

Beach	# Closures	Total Duration Closures	Rank (Ascending)	Notes
Albro Lake Beach	5	32	11	
Birch Cove Beach	2	22	9	
Cunard Pond Beach	1	48	13	Closed almost all summer due to blue-green algae.
Kearney Lake Beach	3	22	9	
Kinap Beach	1	41	12	
Lake Echo Beach	2	12	6	
Long Pond Beach	1	2	1	
Oakfield Beach	1	13	7	
Penhorn Beach	1	6	4	
Sandy Lake Beach	2	15	8	
Saunders Beach	1	7	5	
Shubie Park Beach	1	2	1	
Springfield Beach	1	3	3	

Total	22	225
Average	2	17
Median	1	13
Mode	1	22



Revision Date: April 25, 2024

Appendix C: MSDS Sodium Thiosulphate $Na_2S_2O_3$

SAFETY DATA SHEET

Version 6.3
Revision Date 25.05.2023
Print Date 05.05.2024

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Sodium thiosulfate

Product Number : 217263
Brand : SIGALD
CAS-No. : 7772-98-7

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : MilliporeSigma Canada Ltd.
2149 WINSTON PARK DRIVE
OAKVILLE ON L6H 6J8
CANADA

Telephone : +1 905 829-9500
Fax : +1 905 829-9292

1.4 Emergency telephone

Emergency Phone # : +1-703-527-3887 CHEMTREC (International)
24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

No hazard pictogram, no signal word, no hazard statement(s), no precautionary statement(s) required

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

- none

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SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	Sodium thiosulphate
Formula	:	$Na_2O_3S_2$
Molecular weight	:	158.11 g/mol
CAS-No.	:	7772-98-7
EC-No.	:	231-867-5

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first-aid measures

If inhaled
After inhalation: fresh air.

In case of skin contact
In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower.

In case of eye contact
After eye contact: rinse out with plenty of water. Remove contact lenses.

If swallowed
After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media
For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Sulfur oxides
Sodium oxides
Not combustible.
Ambient fire may liberate hazardous vapours.

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5.3 Advice for firefighters
In the event of fire, wear self-contained breathing apparatus.

5.4 Further information
Suppress (knock down) gases/vapors/mists with a water spray jet. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Advice for non-emergency personnel: Avoid inhalation of dusts. Evacuate the danger area, observe emergency procedures, consult an expert.
For personal protection see section 8.

6.2 Environmental precautions
Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up
Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up dry. Dispose of properly. Clean up affected area. Avoid generation of dusts.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions
Tightly closed. Dry.
Do not store near acids.

Keep in a dry place.

Storage class
Storage class (TRGS 510): 11: Combustible Solids

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters
Contains no substances with occupational exposure limit values.

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8.2 Exposure controls

Appropriate engineering controls
Change contaminated clothing. Wash hands after working with substance.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection
This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN374 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).
Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:KCL 741 Dermatril® L

Respiratory protection
required when dusts are generated.
Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure
Do not let product enter drains.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder Color: white
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	6.0 - 9.5 at 50 g/l at 20 °C (68 °F)

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e)	Melting point/freezing point	No data available
f)	Initial boiling point and boiling range	No data available
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapor pressure	No data available
l)	Vapor density	No data available
m)	Density	1.667 g/cm3 at 20 °C (68 °F)
	Relative density	No data available
n)	Water solubility	210 g/l at 20 °C (68 °F)
o)	Partition coefficient: n-octanol/water	Not applicable for inorganic substances
p)	Autoignition temperature	No data available
q)	Decomposition temperature	No data available
r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	none

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions
Risk of explosion with:
nitrates
nitrites
peroxi compounds
Strong oxidizing agents
Violent reactions possible with:

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Fluorine
acids

10.4 Conditions to avoid
no information available

10.5 Incompatible materials
No data available

10.6 Hazardous decomposition products
In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
Acute toxicity estimate Oral - > 2,000 mg/kg
(Calculation method)
LD50 Oral - Rat - female - > 2,000 mg/kg
(OECD Test Guideline 425)
Remarks: (in analogy to similar compounds)
LC50 Inhalation - Rat - male and female - 4 h - > 2.6 mg/l - aerosol

(OECD Test Guideline 403)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: potassium thiosulphate
Acute toxicity estimate Dermal - > 2,000 mg/kg
(Calculation method)
LD50 Dermal - Rabbit - male and female - > 2,000 mg/kg
(OECD Test Guideline 402)
The value is given in analogy to the following substances: potassium thiosulphate
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: No skin irritation - 4 h
(OECD Test Guideline 404)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: sodium sulphite

Serious eye damage/eye irritation
Eyes - Rabbit
Result: No eye irritation
(OECD Test Guideline 405)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: diammonium thiosulphate

Respiratory or skin sensitization
Local lymph node assay (LLNA) - Mouse
Result: negative
(OECD Test Guideline 429)
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: diammonium thiosulphate

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Germ cell mutagenicity
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: diammonium thiosulphateTest Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: diammonium thiosulphateTest Type: Chromosome aberration test in vitro
Test system: Chinese hamster ovary cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Remarks: (in analogy to similar products)
The value is given in analogy to the following substances: diammonium thiosulphate**Carcinogenicity**
No data available

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - NOAEL (No observed adverse effect level) - 108 mg/kg
Remarks: (in analogy to similar products)
(ECHA)
The value is given in analogy to the following substances: sodium metabisulphite

RTECS: XN6476000
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Hazardous properties cannot be excluded but are unlikely when the product is handled appropriately.

Therapeutically used substance.

Handle in accordance with good industrial hygiene and safety practice.

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SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 510 mg/l - 96 h Remarks: (in analogy to similar products) (ECHA) The value is given in analogy to the following substances: diammonium thiosulphate
Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 230 mg/l - 48 h Remarks: (in analogy to similar products) (ECHA) The value is given in analogy to the following substances: diammonium thiosulphate
Toxicity to algae	static test ErC50 - Pseudokirchneriella subcapitata (green algae) - > 100 mg/l - 72 h (OECD Test Guideline 201) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: diammonium thiosulphate
Toxicity to bacteria	static test EC50 - activated sludge - > 1,000 mg/l - 3 h (OECD Test Guideline 209) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: diammonium thiosulphate
Toxicity to fish(Chronic toxicity)	flow-through test NOEC - Danio rerio (zebra fish) - >= 316 mg/l - 34 d (OECD Test Guideline 210) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: sodium sulphite
Toxicity to daphnia and other aquatic invertebrates(Chronic toxicity)	semi-static test NOEC - Daphnia magna (Water flea) - > 10 mg/l - 21 d (OECD Test Guideline 211) Remarks: (in analogy to similar products) The value is given in analogy to the following substances: sodium sulphate

12.2 Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Chemical Oxygen	405 mg/g

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Demand (COD) Remarks: (IUCLID)

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Endocrine disrupting properties
No data available

12.7 Other adverse effects

Additional ecological information: Discharge into the environment must be avoided.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself.

SECTION 14: Transport information

TDG
Not regulated as a dangerous good

IMDG
Not dangerous goods

IATA
Not dangerous goods

Further information
Not classified as dangerous in the meaning of transport regulations.

SECTION 15: Regulatory information

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

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SECTION 16: Other information

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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Version: 6.3 Revision Date: 25.05.2023 Print Date: 05.05.2024

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Appendix D: Sample Customized Chain of Custody Form 2023

Bureau Veritas
200 Bluewater Road, Bedford, Nova Scotia Canada B4B 1G9 Tel:(902) 420-0203 Toll-free:800-563-6266 Fax:(902) 420-8612 www.bvna.com

Chain Of Custody Record

INVOICE TO:		Report Information		Project Information		Laboratory Use Only	
Company Name	#41187 Halifax Regional Municipality	Company Name		Quotation #	C11168	Bureau Veritas Job #	Bottle Order #:
Contact Name	Accounts Payable	Contact Name	Elizabeth Montgomery, Josh, Pat	P.O. #	2090010577		977269
Address	PO Box 1749 40 Alderney Dr	Address		Project #	HRM Beaches 2024	Chain Of Custody Record	Project Manager
	Dartmouth NS B3J 3A5			Project Name		C#977269-01-01	Preeti Kapadia
Phone	(902) 490-5618 Fax: (902) 490-3976	Phone	Fax:	Site #			
Email	hrmaplink@halifax.ca	Email	elizabeth.montgomery@halifax.ca;weaglejo@halifax.ca	Sampled By			

Regulatory Criteria:

** Specify Matrix: Surface/Ground/Tapwater/Sewage/Effluent/Seawater Potable/Nonpotable/Tissue/Soil/Sludge/Metal

Special Instructions

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:

Please provide advance notice for rush projects

Regular (Standard) TAT:

(will be applied if Rush TAT is not specified):

Standard TAT = 5-7 Working days for most tests..

Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)

Date Required: Time Required:

SAMPLES MUST BE KEPT COOL (< 10ºC) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered & Preserved	Lab Filtration Required	Fecal Enterococcus by Mem. Filt.	E.coli in water (CFU/100mL)	Microcystin	# of Bottles	Comments / Hazards / Other Required Analysis
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Lab Use Only: Time Sensitive	Temperature (ºC) on Receipt	Custody Seal Intact on Cooler?
									Yes / No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

White: Bureau Veritas Yellow: Client

Appendix E: Microcystin Test Strip User Guide

Importance of Microcystins/Nodularins Determination

Most of the world's population relies on surface freshwaters as its primary source for drinking water. The drinking water industry is constantly challenged with surface water contaminants that must be removed to protect human health. Toxic cyanobacterial blooms are an emerging issue worldwide due to increased source water nutrient pollution caused by eutrophication. Microcystins and Nodularins are cyclic toxin peptides. Microcystins (of which there are many structural variants, or congeners) have been found in fresh water throughout the world. To date, approximately 250 variants of Microcystin have been isolated. The most common variant is Microcystin-LR. Other common Microcystin variants include YR, RR, and LW. These toxins are produced by many types of cyanobacteria(blue-green algae), including *Microcystis, Anabaena, Oscillatoria, Nostoc, Anabaenopsis,* and terrestrial *Hapalosiphon.* Nodularins are produced by the genus Nodularia and they are found in marine and brackish water.

Acute poisoning of humans and animals constitutes the most obvious problem from toxic cyanobacterial blooms, and in several cases, has led to death. Human and animal exposure to these toxins occurs most frequently through the ingestion of water, through drinking or during recreational activities in which water is swallowed. These toxins mediate their toxicity by inhibiting liver function and are potent inhibitors of the serine/threonine protein phosphatases, and therefore they may act as tumor promoters.

To protect consumers from adverse health effects caused by these toxins, the World Health Organization (WHO) has proposed a provisional upper limit for Microcystin-LR of 1.0 ppb (µg/L) in drinking water. For recreational bathing waters, the WHO has established the following guidelines:

-Relatively low risk of exposure effect at 4 ng/mL (ppb)
-Moderate probability of exposure effect at 20 ng/mL
-High probability of exposure effect – scums

The U.S. Environmental Protection Agency (EPA) has also established guidelines for Microcystins in drinking water:

-For children below school age, 0.3 µg/L (ppb)
-For all other age groups, 1.6 µg/L (ppb)

Performance Data

Test sensitivity: The ABRAXIS® Microcystins Strip Test for Recreational Water will detect Microcystins and Nodularins at 2.5 ng/mL or higher. At this level, the test line exhibits moderate intensity. At levels greater than 10 ng/mL the test line is not visible. When compared with samples ofknown Microcystins concentration, it is possible to obtain a semi-quantitative result.

Selectivity: The assay exhibits very good cross-reactivity with all Microcystin cyclic peptide toxin congeners tested to date.

Cell Lysing: When comparing samples lysed using the QuikLyse™ reagents and the 3-cycle freeze/thawmethod, average recovery obtained was 94%, SD = 16.7%.

Samples: A sample correlation between the ABRAXIS® Strip Test and ELISA methods showed a good correlation.

General Limited Warranty/Disclaimer: Gold Standard Diagnostics warrants the products manufactured by the Company, against defects and workmanship when used in accordance with the applicable instructions for a period not to extend beyond the product's printed expiration date**. Gold Standard Diagnostics makes no other warranty, expressed or implied. There is no warranty of merchantability or fitness for a particular purpose.** The ETV verifies the performance of commercial ready technologies under specific criteria, testing conditions, and quality assurance. ETV does not imply approval or certification of this product, nor does it make any explicit or implied warranties or guarantees as to product performance. www.epa.gov/etv.

For ordering or technical assistance contact:
Gold Standard Diagnostics
124 Railroad Drive
Warminster, PA 18974
WEB: www.abraxiskits.com
Tel.: (215) 357-3911
Fax: (215) 357-5232
Ordering: info.abraxis@us.goldstandarddiagnostics.com
Technical Support: support.abraxis@us.goldstandarddiagnostics.com

Date this User Guide is effective :10APR2024 Version : 04

ABRAXIS® Microcystins Strip Test

Immunochromatographic Strip Test for the Detection of
Microcystins and Nodularins in Recreational Water at 10 ppb
ABRAXIS® QuikLyse™ reagents may be used in a method of U.S. Patent 9,739,777
Product No. 520023 (5 Test), 520022 (20 Test)

1. General Description

The ABRAXIS® Microcystins Strip Test for Recreational Water is a rapid immunochromatographic test designed for use in the qualitative screening of Microcystins and Nodularins in recreational water (freshwater samples only; please see the Gold Standard Diagnostics Horsham website for information on the screening of brackish or seawater samples and for sample preparation and testing of benthic mat samples). A rapid cell lysis step (ABRAXIS® QuikLyse™) performed prior to testing is required to measure total Microcystins (dissolved, or free, plus cell-bound). The ABRAXIS® Microcystins Strip Test provides only preliminary qualitative test results. If necessary, positive samples can be confirmed by ELISA, HPLC, or other conventional methods.

2. Safety Instructions

Discard samples according to local, state, and federal regulations.

3. Storage and Stability

The ABRAXIS® Microcystins Strip Kit should be stored between 2-30°C. The test strips, test vials, and water samples to be analyzed should be at room temperature before use. Reagents may be used until the last day of the month as indicated by the expiration date on the box.

4. Test Principle

The test is based on the recognition of Microcystins, Nodularins, and their congeners by specific antibodies. The toxin conjugate competes for antibody binding sites with Microcystins/Nodularins that may be present in the water sample. The test device consists of a vial containing specific antibodies for Microcystins and Nodularins labeled with a gold colloid and a membrane strip to which a conjugate of the toxin is attached. A control line, produced by a different antibody/antigen reaction, is also present on the membrane strip. The control line is not influenced by the presence orabsence of Microcystins in the water sample and, therefore, should be present in all reactions.
In the absence of toxin in the water sample, the colloidal gold labeled antibody complex moves with the water sample by capillary action to contact the immobilized Microcystins conjugate. An antibody-antigen reaction occurs forming a visible line in the 'test' area**.** The formation of two visible lines of similar intensity indicates a negative test result, meaning the test did not detect the toxin at or above the cut-off point established for the toxin. If Microcystins are present in the water sample, they compete with the immobilized toxin conjugate in the test area for the antibody binding sites on the colloidal gold labeled complex. If a sufficient amount of toxin is present, it will fill all of the available binding sites, thus preventing attachment of the labeled antibody to the toxin conjugate, therefore preventing the developmentof a colored line. If a colored line is not visible in the test line region, or if the test line is lighter than the control line, Microcystins are present at a level > 2.5 ppb. Semi-quantitative results in the range of 0-10 ppb can be obtained by comparing the sample test strip appearance to the appearance of test strips from solutions of known Microcystins concentrations (control solutions). ABRAXIS® Microcystins controls (PN 422011) are available through Gold Standard Diagnostics.

5. Limitations of the ABRAXIS® Microcystins Strip Test, Possible Test Interference

Numerous organic and inorganic compounds commonly found in water samples have been tested and found not to interfere with this test. However, due to the high variability of compounds that might be found in water samples, test interferences caused by matrix effects can't be completely excluded.
Mistakes in handling the test can also cause errors. Possible sources for such errors include:
Inadequate storage conditions of the test strip, too long or too short incubation times, extreme temperatures during the test performance (lower than 10°C or higher than 30°C).
The test is designed for use with freshwater recreational waters. The use of the test with brackish or seawater samples will produce inaccurate results. Please see the Brackish or Sea Water Sample Preparation technical bulletin for information on the preparation and screening of marine water samples using the ABRAXIS® Microcystins Strip Test for Finished Drinking Water. The ABRAXIS® Microcystins Strip Test provides only a preliminary qualitative test result. Use another more quantitative analytical method such as ELISA or instrumental analysis to obtain a confirmed quantitative analytical result. Apply good judgement to any test result, particularly when preliminary positive results are observed.

6. Warnings and Precautions

-The ABRAXIS® Microcystins Strip Test for Recreational Water is for the screening of freshwater recreational water samples for total Microcystins (free and cell-bound). Please see the Gold Standard Diagnostics Horsham website for information on sample preparation and testing of brackish water, seawater, or benthic mat samples using the ABRAXIS® Microcystins Strip Test for Finished Drinking Water at 1 ppb, PN 520016 (5 Test) or PN 520017 (20 Test).
-Use of the ABRAXIS® Microcystins Test Strips **without** the ABRAXIS® QuikLyse™ reagents will adversely affect the performance of the test, producing inaccurate results. To test samples without using ABRAXIS® QuikLyse™ reagents for cell lysis, such as when testing for free Microcystins only or when testing samples which have been previously lysed (such as those which have undergone the freeze/thaw method), please use the ABRAXIS® Microcystins Strip Test for Finished Drinking Water at 1 ppb, PN 520016 (5 Test) or PN 520017 (20 Test).
-Use only the ABRAXIS® Microcystins test strips and ABRAXIS® QuikLyse™ reagents from one kit lot, as they have been adjusted in combination.
-Test strips and conical test vials should be kept sealed in their original packaging with desiccant when not in use. Exposure to humidity during storage may adversely impact their performance and give inaccurate results. After initial use in high humidity conditions, remaining kit components should be stored tightly closed with desiccant and refrigerated (2 – 8 °C) when not in use. Conical test vials stored with indicating desiccant which has turned from blue to pink (indicating excessive exposure to moisture) should not be used and should be discarded.
-All reagents and samples should be allowed to reach room temperature before testing.
-Prior to use, ensure that the product has not expired by verifying that the date of use is prior to the expiration date on the label.
-Avoid cross-contamination of water samples by using a new sample vial and disposable pipette for each sample.
-Samples containing unusually large amounts of algal blooms or very thick algal scums should be diluted 1:1 with deionized or distilled water prior to lysis, as overly viscous samples may not allow for uniform cell lysis or proper capillary flow up the test strip. Diluted samples will have a cut-off of 20 ppb.
-Use reasonable judgment when interpreting the test results.
-Results should be interpreted within 5-10 minutes after completion of the test.

7. Sample Collection and Handling

-Collect water samples in glass or polyethylene terephthalate (PETG) containers only. The use of other types of plastic containers may result in adsorptive loss of Microcystins, producing inaccurate (falsely low) results.
-Samples can be stored refrigerated for up to 5 days. If samples must be held for greater than 5 days, samples should be stored frozen.

A. Materials Provided

1. Microcystins test strips in a desiccated container
2. Sample collection vials
3. Unlabeled Lysis vials (White Capped)
4. Graduated disposable pipettes (calibrated at 1 mL)
5. Disposable exact volume transfer pipettes (see package for usage instructions)
6. Reagent papers
7. Conical test vials
8. Forceps
9. User's guide
10. Vial labels

B. Additional Materials (not provided with the test)

1. Timer
2. ABRAXIS® Microcystins Check Samples, (PN 422011), for the preparation of control solutions which can be analyzed with samples, to obtain semi-quantitative sample results (see Section C, Controls, below).

C. Controls

It is a good laboratory practice to use positive and negative controls to ensure proper test performance. Water samples containing known quantities of Microcystins (positive and negative controls) should be analyzed with each lot of test strips to provide a reference for line intensity to be expected.

D. Test Preparation

-Allow the reagents and water sample to reach room temperature before use.
-Remove the number of conical test vials required from the package. The remaining conical test vials are stored in the tightly closed container with desiccant.

E. Procedure

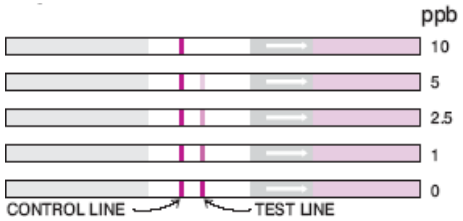
1. When analyzing for total Microcystins (dissolved, or free, and cell-bound), which may be present in recreational waters, a sample lysis is necessary before analysis. ABRAXIS® QuikLyse™ reagents provide a rapid option for cell lysis.
2. Using a new graduated disposable pipette for each sample, draw the sample to the 1 mL line (graduation mark slightly below bulb) and add 1 mL of sample to the lysis vial.
3. Cap the vial and shake for 2 minutes, then allow the sample in the vial to incubate at room temperature for 8 minutes, to begin the cell lysis.
4. Using the forceps provided, add 1 reagent paper to the lysis vial.
5. Cap the vial and shake for 2 minutes, then allow the sample in the vial to incubate at room temperature for 8 minutes.
6. Label conical test vials for each sample to be tested.
7. Using a new disposable exact volume transfer pipette for each sample, transfer 200 µL of the previously lysed water sample (Steps 1-4 above) to the appropriately labeled conical test vial (see pipette package for usage instructions).
8. Close the conical test vial and shake for 30 seconds. Examine the vial to ensure all dried reagents are completely dissolved (dried reagents will dissolve, turning the sample purple).
9. Insert test strip (arrows down) into the conical vial.
10. Allow the test to develop for 10 minutes.
11. Remove the test strip. Lay the strip flat and allow to continue developing for 5 minutes.
12. Read the results visually, as explained below in Section F, Interpretation of Results.

F. Interpretation of Results

Sample concentrations are determined by comparison of the intensity of the test line to the intensity of the control line on the same test strip. Although control line intensity may vary, a visible control line must be present for results to be considered valid. Test strips with a test line which is darker than or of equal intensity to the control line indicates a result which is below the limit of detection of the test. Test strips with a test line which is lighter than the control line indicates a result which is ≥ 2.5 ppb. Test strips with no test line visible (only the control line is visible) indicates a result which is ≥ 10 ppb. Results should be determined within 5-10 minutes after completion of the strip test procedure. Determination made using strips which have dried for more or less than the required time may be inaccurate, as line intensities may vary with drying time.

Control Line	***Test Line***	***Interpretation***
No control line present	No test line present	Invalid result
Control line present	No test line present	>10 ng/mL (ppb)
Control line present	Test line present	Between 0 and 10 ng/mL (ppb)

The appearance of test strips may also be compared to the illustration below to determine approximate sample concentration ranges. Please note that the illustration is intended for the demonstration of test line to control line intensity only. Results should not be determined by comparing the intensity of test lines from test strips to the test lineintensity of the illustration, as the overall intensity of test strips may vary slightly with different lots of reagents. To obtain semi-quantitative results in the range of 0-10 ppb, solutions of known Microcystins concentration (control solutions) must be tested concurrently with samples. Sample test line intensities can then be compared with control solution test line intensities, yielding approximate sample concentrations. Do not use strips run previously to determine semi-quantitative sample concentrations, as test line intensities may vary once strips are completely dry.



Alternately, test strips can also be interpreted using the AbraScan test strip reader (PN 475025), which provides objective determination of line intensities for consistent interpretation of results as well as a digital photographic record of all test strips.

G. Additional Analysis

If necessary, positive samples can be confirmed by ELISA, HPLC, or other conventional methods. These services are available from commercial analytical laboratories such as Green Water Labs (www.greenwaterlab.com).

H. References

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