

WORLD ROWING STRATEGIC EVENT ATTRIBUTION PROCESS

WATER QUALITY TESTING GUIDELINES



General

The World Rowing Water Quality Testing Guidelines are intended to protect the health and safety of rowers at World Rowing competition venues, but also have in mind the long-term development of safe and healthy environments for sport and recreation. These guidelines are subordinate to global water quality guidelines such as the WHO-water quality guidelines (e.g. WHO Guidelines for Safe Recreational Water Environments, 2003)¹ or local legal regulations.

The IOC Medical Commission states in their guideline

“For an OCOG there are two principal concerns: first not to cause pollution through poor design and construction practices, or from on-site incidents (e.g. spillages and fuel leaks). The second concern is the impact of pollution in water catchment areas, or specific upstream incidents (e.g. heavy rainfall, agriculture, animals, sewage influxes) impacting on FOP during Games time.”

and

“The responsible agencies need to implement policies to mitigate water pollution, implement water monitoring technologies, quality standards and ensure effective response protocols to ensure the safety of the population. Regular chemical and biological analyses need to be done on all water sources used for the Games – for competition and for training, and also landscape water used in venues and the Village. These are normally the responsibility of the public environmental protection agency but it is important for the OCOG to be closely involved in the process so that the right parameters are being measured in a consistent and accurate way to inform on potential health risks.

Anti-pollution measures and wetland restoration programmes can be important legacy initiatives for host cities creating a healthier environment for people and wildlife.”

The World Rowing Guidelines include values for specific parameters used to monitor water quality, e.g. of faecal contamination, and values for physical and aesthetic objectives. This document also outlines the management approach to safe water quality.

The human health risks associated with recreational water activities is different for different water activities. According to the WHO, secondary contact is defined as

¹ Guidelines for safe recreational water environments. VOLUME 1: COASTAL AND FRESH WATERS, World Health Organization, Geneva, 2003, ISBN 92 4 154580 1

recreational activity in which only the limbs are regularly wetted and in which greater contact (including swallowing water) is unusual.

Because a lower degree of water exposure can be expected at most times, values for primary contact can be exceeded for secondary contact. According to the mentioned guidelines, primary contact activities are swimming (this includes bathing/wading for the purposes of this document), waterskiing and windsurfing. Secondary contact activities are rowing, canoeing or fishing in natural waters through intentional or incidental immersion.²³ Coastal rowing, however, could be considered a primary contact sport in certain scenarios e.g. very rough conditions.

Assessment of water quality should be performed in close cooperation with local health authorities. After the assessment procedure described here, a risk evaluation will be made. Most assessment will take a long-term view and may recommend infrastructural measures like repair of sewage channels, water inflow management, cleaning of waste fills and decontamination of water or river banks (via Chlorination or Chlorate injections). In certain cases, e.g. during heavy rainfall and sewage channel overflow, toxic algae bloom or others, more immediate actions may be necessary. In most cases, governmental institutions like waterway management and other infrastructural departments should be involved.



² Rijal, G.; Tolson, J.; Petroulou, C.; Granato, T.; Glymph, T.; Gerba, C.; DeFlaun, M.; O'Connor, C.; Kollias, L.; Lanyon, R. (2011). Microbial risk assessment for recreational use of the Chicago area waterway system. *Journal of Water Health* 9(1): 169–186.

³ Till, D.; McBride, G.; Ball, A.; Taylor, K.; Pyle, E. (2008). Large-scale freshwater microbiological study: Rationale, results and risks. *Journal of Water Health* 6: 443–460.

Water Quality Certification Procedure In The Bid Process

The following water quality certification procedure should be carried out by a local water quality authority responsible for the water course proposed for a World Rowing event venue during the bid phase in accordance with the WHO Guidelines for Safe Recreational Water Environments (2003), the addendum to the WHO guidelines of 2009⁴, and the WHO Quantitative Microbial Risk Assessment: Application for Water Safety Management (2016).⁵

The results will be included in the bid dossier submitted to World Rowing and assessed by World Rowing. Results will determine the corrective actions that need to be implemented in order to best mitigate risk, if such actions are deemed necessary. The principles and the overall procedure are shown in Figure 1.

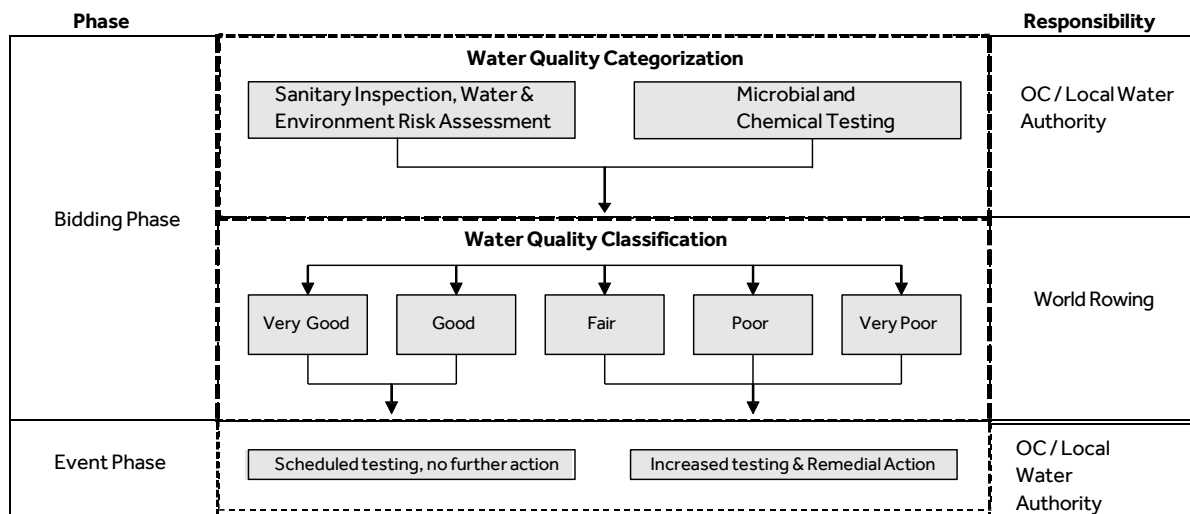


Figure 1: Sanitary Inspection, Water & Environment Risk Assessment and Water Quality Categorisation according to the WHO 2016 Guidelines.

⁴ Addendum to Guidelines for Safe Recreational Water Environments, Vol 1. World Health Organization – Geneva, Switzerland, WHO/HSE/WSH/10.04, 2009

⁵ WHO Quantitative Microbial Risk Assessment: Application for Water Safety Management. World Health Organization, Geneva, ISBN 978 92 4 156537 0 (2016).

Steps 1 and 2 described below occur during the bidding phase and will by default be performed by local water quality authorities, or in their absence, by the organising committee.

Before awarding an event, corrective actions (if required) and regular monitoring intervals have to be agreed upon with World Rowing. Reporting and required corrective actions are included in an action plan with milestones that includes the preparation phase through the regatta itself.

1. Sanitary Inspection, Water & Environment Risk Assessment:

The Sanitary Inspection, Water & Environment Risk Assessment is a visual analysis of the body of water that identifies possible sources of contamination. A risk assessment should be undertaken by local water quality authorities during the bid process in order to enable World Rowing to appropriately categorise the water quality. Community and/or health and water officers with knowledge about water supply and health hazards should visit the water body and inspect the presence of observable contamination sources and conditions that may lead to the introduction of hazards into the water system, the potential occurrence of hazardous events and how these are controlled by control measures.

Where there is epidemiological or other evidence of the presence of specific water quality hazards in water, a higher risk category will be assigned, and more frequent further testing will be required in addition to the scheduled testing. Evidence of such hazards may include:

- reports of a disease outbreaks or illnesses of specific aetiology
- reports of a suspected illness of undetermined cause
- levels of an indicator strongly suggesting the presence of a specific hazard
- reports of a specific event such as a sewage or chemical spill
- reports or evidence of the development of a cyanobacterial bloom
- Any other notable indicator of water quality hazard

If any of the above are observed, additional specific testing and corrective action will be taken based on the individual needs of the venue.

Contact with faecal pollution in the environment represents a significant concern particularly potential sources of faecal contamination, point sources (discharge or drainage that may contain sewage, storm water or other faecal wastes) and diffuse

sources (e.g., domestic and wild animals and birds, storm water runoff from the banks and surrounding areas and septic wastes). The effects of rainfall and storm events on water quality should be investigated. Certain contamination events (e.g., runoff, storm water discharges) may be visible only during rainfall periods. Representative water samples may also be collected and analysed to confirm the presence of contamination and determine its variability and source (Guidelines for Canadian Recreational Water Quality, 2012).⁶ An example of a sanitary inspection form is attached as Annex 1. This may be used as a template.

2. Preliminary Microbial and Chemical Testing (Water Sample Testing):

World Rowing adheres to the World Health Organization recommended water testing guidelines.

Water quality will be assessed according to the WHO protocol in terms of the 95th percentile of 100 measured *Escherichia coli* or enterococci levels (depending on the body of water). In the bidding process, a minimum of 60 samples from the past three to five years should be included for determination of 95th percentile. Ideally, the samples should be taken from the same location, however, when there are differences in the water quality in different locations within the water body e.g. due to different inlets and sources of contamination, additional sampling points should be included and data for these points should be also provided (Example see Annex 2). Depending on the results, further sampling may be required.

The samples should measure the ***Escherichia coli* or enterococci levels** (depending on the body of water).

In addition, a chemical analysis should be provided which includes the following parameters: pH, Cl, NH₄, NO₃, NO₂, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and optical density.

In all cases, the analyses must include periods during and after significant rainfall in order to ascertain the period of time it takes for the elevated levels of pollution to fall to below the recommended safety standards. Other influencing environmental factors may include agricultural runoff, sewage disposal, in flowing rivers, etc.

When there are other pathogens, chemicals or toxic algae blooms (cyanobacteria) present, they should be reported.

⁶ Guidelines for Canadian Recreational Water Quality, 3rd.ed., Health Canada, Ottawa, Ontario, Canada, 2012 (<http://www.healthcanada.gc.ca/>)

3. World Rowing Water Quality Categorisation

Based on the results of the microbial water quality assessment as well as the Water & Environment Inspection risk assessment, the water quality will be assigned an overall water quality assessment category by World Rowing. This will then allow World Rowing to determine the necessary testing schedule. Classification of a quality of poor or below will require remedial action on the part of the organizing committee, but not necessarily event cancellation.

World Rowing is using *Escherichia coli* as index pathogen for fresh water and *enterococci* for saltwater. If possible, faecal *Escherichia coli* should be reported as well. *Escherichia coli* is considered to be a good surrogate of the survival of enteric bacterial pathogens in recreational waters. In mixed water zones with fresh and salt water as in lagoons, World Rowing requires to report both index pathogens, *Escherichia coli* and *enterococci*.

World Rowing includes the Sanitary Inspection, Water & Environment Risk assessment in its assessment and water quality categorisation. These values represent a risk management decision based on the assessment of the expected exposure scenarios and potential health risks for the rower, and represents a tolerable and reasonable approach to protecting rowers from environmental hazards.

The following two tables illustrate the water quality classification parameters:

Table 1 (Freshwater classification)
(Modified and redrawn from WHO 2003¹ and WHO 2016⁵)

		Microbial Water Quality Assessment Category (95th percentile E. Coli/100 mL)				Exceptional Circumstances
		A: ≤40	B: 41-200	C: 201-500	D: ≥500	
Sanitary Inspection Water & Environment Risk Category	Very Low	Very Good	Very Good	Follow up	Follow up	Action
	Low	Very Good	Good	Fair	Follow up	
	Moderate	Good	Good	Fair	Poor	
	High	Good	Fair	Poor	Very Poor	
	Very High	Follow up	Fair	Poor	Very Poor	
Exceptional Circumstances		Action				

Table 2 (Saltwater classification)
 (Modified and redrawn from WHO 2003¹ and from WHO 2016⁵)

		Microbial Water Quality Assessment Category (95th percentile Enterococci/100 mL)				Exceptional Circumstances
		A: ≤40	B: 41-100	C: 101-200	D: ≥200	
Sanitary Inspection Water & Environment Risk Category	Very Low	Very Good	Good	Fair	Follow up	Action
	Low	Very Good	Good	Fair	Follow up	
	Moderate	Good	Fair	Poor	Poor	
	High	Good	Fair	Poor	Very Poor	
	Very High	Follow up	Fair	Poor	Very Poor	
	Exceptional Circumstances	Action				

Parameters:

The Fair water quality level for the “Low and Moderate” Water & Environment Inspection categories correspond to an Escherichia Coli level of between 201 and 500 parts per 100 mL. For bodies falling into the “High or Very High” Water & Environment Inspection categories, 41-200 pp/100mL is considered fair. The 95th percentile levels for Enterococci are poor for more than 201pp/100 mL and moderate conditions.

If there are known pathogenic virus loads, these have to be reported and monitored. If present, these should be included in the risk assessment.

Toxic cyanobacteria must also be included in the reports and should be included in the risk assessment. Total cyanobacteria should be less than 100,000 cells/mL and Cyanobacterial toxins (Total Microcystins) less than 20 µg/L.

Corrective action will occur on an as-needed basis when testing levels exceed the stated values (Poor), taking into consideration the causes and potential solutions for elevated microbial bacteria levels. These actions would be specified and agreed upon with the local water quality authorities and if required, by infrastructural authorities as described in the WHO Document “Quantitative Microbial Risk Assessment: Application for Water Safety Management (2016)⁵”.

These measures should be documented in a detailed plan which includes a proposed time plan of works and measures to mitigate the risks.

Risk management should also consider hygienic measures like the provision of toilets, showers, handwashing, hand disinfection, facilities cleaning and disinfection.

Monitoring Phase:

Once the event has been attributed to the venue, the water quality should be monitored according to the testing protocol described in this document and based on the water quality categorisation assigned to it during the bidding phase. The testing scheduling will vary based on the water quality categorisation, and venues with poor water quality will be expected to test water more frequently than those with fair or good water quality. Note that some samples must be recorded during the time of year that the event will be held in order to insure safety and cleanliness. Testing will include both bacterial assessment and sanitary inspection, water & environment inspections.

World Rowing adheres to the testing protocols (including scheduling) as recommended by the IOC.⁷

Table 3: Recommended Microbial Monitoring Schedule for Low Risk Water Bodies

Risk Category identified during classification	Microbial water quality testing
Very Good	<ul style="list-style-type: none"> • Minimum 5 samples per year • 1 month before the event: 1 sample • At the start of official training: 1 sample
Good	<ul style="list-style-type: none"> • Minimum 5 samples per year • 1 month before the event: 3 samples • At the start of official training: 1 sample

If at any point, the risk category identified during classification falls within “Fair”, “Poor” or “Very Poor”, the testing should be carried out at the frequencies detailed below in Table 4, as a minimum, during the time of year that the event will be held.

Table 4: Recommended Microbial Monitoring Schedule for Moderate to High Risk Water Bodies

Risk Category identified during classification	Microbial water quality testing
Fair	<ul style="list-style-type: none"> • Monthly testing in the years preceding the event • 1 month before the event: 5 samples • Every three days and on days of significant rain fall during official training until end of competition; weather monitoring
Poor	<ul style="list-style-type: none"> • Monthly testing in the years preceding the event • 1 month before the event: 10 samples • Every two days and on days of significant rain fall commencing two weeks prior to official training until end of competition; weather monitoring
Very Poor	<ul style="list-style-type: none"> • Monthly testing in the years preceding the event • 1 month pre Event; daily commencing two weeks prior to official training until end of competition; weather monitoring

⁷ IOC water quality testing guideline, working group paper, Lausanne, 2018

Incident Management Plans

Chemical and biological pollutants and floating debris may impact on rowing venues and potentially put athletes at risk.

Organizing committees need to maintain close collaboration with the responsible agencies throughout the preparation of the event and put in place incident management plans for exceptional incidents that ensure the continued protection of athletes' health.

In case of an incident or acute situation occurring during an event (e.g. heavy rainfall, agriculture, animals, sewage influxes, toxic cyanobacteria) the World Rowing Doctor will determine the appropriate action in close cooperation with World Rowing technical delegates and will propose it to the World Rowing Jury president or its representative for decision. The expertise of the local organizing committee and local health and water authorities will be taken into account and all information (historical and actual) at their disposal.

An Example of an OC water quality monitoring report is attached as Annex 2. This example from the Rio Olympic Games illustrates how the various monitoring methods (microbial testing, sanitary inspections and weather monitoring) are used together to assess water quality during an event.

World Rowing Sports Medicine
Commission December 2018

Annex 1: Example of a sanitary inspection form from "Guidelines for Canadian Recreational Water Quality, 2012"³

Guidelines for Canadian Recreational Water Quality: Third Edition

Appendix D: Recreational swimming area Environmental Health and Safety Survey (EHSS) checklist

Identification

Beach Name:	_____
Address:	_____ _____
Responsible Authority:	_____
Tel.:	_____ Fax: _____ E-mail: _____
Person(s) Conducting Survey:	_____
Date:	_____ Time: _____

Background Information

Water Body Type:	_____	
Dimensions of Beach:	Length (m): _____	Width (m): _____
Dimensions of Swimming Area:	Length (m): _____	Width (m): _____
Number of Sampling Sites:	_____	
[Attach Map or Aerial Photo of Suitable Scale (including location of sample sites)]		
Water Temperature	High/Low (°C): _____	Average (°C): _____
Prevailing Winds	Direction: _____	Avg. Speed (km/h): _____
Prevailing Currents	Direction: _____	Avg. Speed (km/h): _____
Seasonal Rainfall	Total (mm): _____	24-h High (mm): _____
Wave Height	Average (m): _____	Range (m): _____
Surrounding Land Uses (check all that apply):		
Urban	<input type="checkbox"/> Rural	<input type="checkbox"/> Agricultural (specify): _____ <input type="checkbox"/>
Residential	<input type="checkbox"/> Forest	<input type="checkbox"/> Commercial (specify): _____ <input type="checkbox"/>
Field	<input type="checkbox"/> Hills/Uplands	<input type="checkbox"/> Industrial (specify): _____ <input type="checkbox"/>
Marsh/Swamp	<input type="checkbox"/> Landfill	<input type="checkbox"/> River/Stream/Ditch: _____ <input type="checkbox"/>
Harbour	<input type="checkbox"/> Other: _____	<input type="checkbox"/> Other: _____ <input type="checkbox"/>

Microbiological Hazards

Potential Sources of Faecal Contamination			
Municipal Sewage Discharges	<input type="checkbox"/>	Combined Sewer Overflows (CSOs)	<input type="checkbox"/>
Stormwater Drains/Discharges	<input type="checkbox"/>	Septic Waste Systems	<input type="checkbox"/>
Wastes from Animal Feeding Operations	<input type="checkbox"/>		
Other Discharges Containing Faecal Wastes (List):		Other Sewage Collection/Disposal/Treatment Systems (List):	
_____	<input type="checkbox"/>	_____	<input type="checkbox"/>
_____	<input type="checkbox"/>	_____	<input type="checkbox"/>
Stormwater Runoff from:			
Agricultural Areas	<input type="checkbox"/>	Areas Receiving Sewage Sludge	<input type="checkbox"/>
Beach and Surrounding Facilities (e.g., parking)	<input type="checkbox"/>	Other: _____	<input type="checkbox"/>
		Other: _____	<input type="checkbox"/>
Other Environmental Sources:			
Discharging Rivers/Streams/Creeks	<input type="checkbox"/>		
Birds (e.g., gulls, ducks, geese, other)	<input type="checkbox"/>	(#'s: None Low Med High [circle one])	
Other wild animals	<input type="checkbox"/>	(#'s: None Low Med High [circle one])	
Pets	<input type="checkbox"/>	(#'s: None Low Med High [circle one])	
Swimmers	<input type="checkbox"/>	(#'s: Low Med High [circle one])	
Other: _____	<input type="checkbox"/>		
Other: _____	<input type="checkbox"/>		

Items for Consideration during the Resulting Risk Assessment:

- Proximity of potential contamination sources to the swimming area.
- Potential for contamination sources to have an impact on the swimming area (including an indication of their risk priority: Low, Medium, High).
- Evaluation of water quality according to historical microbiological data (e.g., frequency of exceedances of the guideline values for the recommended indicators of faecal contamination [e.g., continuous/periodic/sporadic]).
- Discharges: Assessment of such factors as volume, flow rate, treatment type, applicable indicator standards, periodicity (continuous, sporadic) and predictability.
- Effects of rainfall: Levels triggering contamination events and typical event duration.
- Assessment of swimming area circulation: Effect of onshore winds, tides, currents, flow patterns in transporting faecal contamination to and entrapping it within the swimming area.
- Animals and birds: Assessment of their types, numbers and droppings.
- Impact of swimmers on water quality—numbers, ages.
- Assessment of potential barriers: Barrier types and points at which they may be applied to reduce impact of the contamination source and/or swimmer exposure.

Chemical Hazards

Potential Sources of Chemical Contamination			
Commercial/Industrial Discharges	<input type="checkbox"/>	Marinas	<input type="checkbox"/>
Motorized Watercraft	<input type="checkbox"/>	Other: _____	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>		
Stormwater Runoff From:			
Areas subject to Pesticide Application	<input type="checkbox"/>	Urban Areas	<input type="checkbox"/>
Areas subject to Fertilizer Application	<input type="checkbox"/>	Other: _____	<input type="checkbox"/>

Items for Consideration during the Resulting Risk Assessment:

- Proximity of potential contamination sources to the bathing area.
- Potential for contamination sources to have an impact on the swimming area (including an indication of their risk priority: Low, Medium, High).
- Discharges: Assessment of such factors as volume, flow rate, treatment type, periodicity (continuous, sporadic) and predictability.
- Effects of rainfall: Levels triggering contamination events and typical event duration.
- Assessment of swimming area circulation: Effect of onshore winds, tides, currents, flow patterns in potentially transporting chemical contamination to and entrapping it within the swimming area.
- Motorized watercraft: Assessment of their types and numbers.
- Assessment of potential barriers: Barrier types and points at which they may be applied to reduce impact of the contamination source and/or swimmer exposure.

Other Biological Hazards

Other Biological Hazards Known to Affect the Recreational Water Area (Presence may be continuous, seasonal or sporadic.)			
Cyanobacterial Blooms	<input type="checkbox"/>	Schistosomes (Swimmer's Itch)	<input type="checkbox"/>
Large Numbers of Aquatic Plants	<input type="checkbox"/>	Other (specify): _____	<input type="checkbox"/>
Other (specify): _____	<input type="checkbox"/>		

Items for Consideration during the Resulting Risk Assessment:

- Seasonal nature of the hazard: continuous, annual, sporadic.
- Presence of contributing factors (as applicable): water conditions, local geography, temperatures, nutrient levels, presence of appropriate host species.
- Assessment of potential barriers to control hazard and/or reduce human exposure in areas/during times of increased risk.

Physical Hazards and Aesthetic Considerations

Subsurface Hazards:			
Steep Slopes or Dropoffs	<input type="checkbox"/>	Depths greater than 4.5 m	<input type="checkbox"/>
Large Rocks	<input type="checkbox"/>	Slippery or Uneven Bottom	<input type="checkbox"/>
Other: _____	<input type="checkbox"/>		
Other: _____	<input type="checkbox"/>		
Water Conditions:			
Strong Currents or Rip Tides	<input type="checkbox"/>	Undertows	<input type="checkbox"/>
Other:			
Litter on Beach	<input type="checkbox"/>	(None Low Med High [circle one])	
Floating Debris	<input type="checkbox"/>	(None Low Med High [circle one])	
Broken Glass or Other Sharp Objects	<input type="checkbox"/>	(None Low Med High [circle one])	
Medical Wastes	<input type="checkbox"/>	(None Low Med High [circle one])	
Seaweed/Algae on Beach	<input type="checkbox"/>	(None Low Med High [circle one])	
Vehicles Permitted on Beach or Near Bathing Area:			
Automobiles	Y / N	Boats/Watercraft	Y / N
		Specify: _____	

Items for Consideration during the Resulting Risk Assessment:

- Assessment of the physical characteristics of the beach and their potential impacts on safe enjoyable use of the area. Includes evaluation of physical layout (geography, topography), composition of shoreline and bottom material, influence of existing structures.
- Assessment of potential risks posed by specific hazards/factors in causing injury or illness or otherwise interfering with the enjoyable use of the area.
- Shoreline and water free from obstructions and of sufficient clarity to permit viewing of persons who may be in distress.
- Assessment of the nature and origin of litter and floating debris.
- Applicable physical and aesthetic parameters (pH, temperature, turbidity, colour, clarity, litter) in agreement with recommendations given in the *Guidelines for Canadian Recreational Water Quality*.
- Assessment of potential barriers to control hazard and/or reduce human exposure in areas/during times of increased risk.

Facilities and Safety Provisions

Facilities:					
Toilets	#: _____	<input type="checkbox"/>	Showers	#: _____	<input type="checkbox"/>
Drinking Water Fountains	#: _____	<input type="checkbox"/>	Litter Bins	#: _____	<input type="checkbox"/>
Other:	#: _____	<input type="checkbox"/>	Other	#: _____	<input type="checkbox"/>
Access for Persons with Disabilities <input type="checkbox"/>					
Safety Provisions:					
Lifeguard Stations	#: _____	<input type="checkbox"/>	Lifesaving Equipment	#: _____	<input type="checkbox"/>
Emergency Telephone	#: _____	<input type="checkbox"/>	First Aid Stations	#: _____	<input type="checkbox"/>
Signs/Communication Materials:					
Beach Posting/Suitability for Swimming	<input type="checkbox"/>		Emergency Contact Information	<input type="checkbox"/>	
Other Hazards (list):			Other: _____	<input type="checkbox"/>	
_____	<input type="checkbox"/>				
_____	<input type="checkbox"/>				
Formal Procedures or Reporting Mechanisms in Place to Deal with:					
Municipal or Industrial Spills/Discharges/Treatment Bypasses					<input type="checkbox"/>
Waterborne Disease Outbreaks					<input type="checkbox"/>
Swimmer Injuries					<input type="checkbox"/>

Items for Consideration during the Resulting Risk Assessment:

- Assessment of the adequacy of facilities and safety provisions.
- Evaluation of signs and other materials for public communication: Message clear and concise, signs placed in locations highly visible to the public.

Guidelines for Canadian Recreational Water Quality:

Date: _____

Time: _____

Appendix E: Example: Sample collection and reporting form

Beach Name: _____	Address: _____ _____
Responsible Authority: _____	Contact Information: _____ _____
Person Collecting Sample: _____	

Site	Indicator Counts <input type="checkbox"/> <i>E. coli</i> <input type="checkbox"/> Enterococci

Geometric Mean:	
Period Covered:	

Air Temperature (°C):	_____
Water Temperature (°C):	_____
pH:	_____
Salinity:	_____

Turbidity:	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High	Value (NTU): _____
Wave Activity:	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High	Height (m): _____
Rainfall: (during sampling)	<input type="checkbox"/> None	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> High
Rainfall: (Past 48 h)	<input type="checkbox"/> None	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> High
	Value (mm): _____			

Wind Direction: <input type="checkbox"/> None	<input type="checkbox"/> Offshore
<input type="checkbox"/> Onshore	<input type="checkbox"/> Parallel to Shore

Sunlight: <input type="checkbox"/> Sunny	<input type="checkbox"/> Overcast
<input type="checkbox"/> Partially Cloudy	<input type="checkbox"/> Rainy

Swimmer Density: <input type="checkbox"/> None	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
Approximate Number: _____			

Birds: • gulls	<input type="checkbox"/> None
• ducks	<input type="checkbox"/> Low
• geese	<input type="checkbox"/> Medium
Approximate Number: _____	

Litter:	<input type="checkbox"/> None	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
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Seaweed/ Algae (on beach)	<input type="checkbox"/> None	<input type="checkbox"/> Low	<input type="checkbox"/> Medium	<input type="checkbox"/> High
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Notes:

Annex 2: Example of an event water quality monitoring tool from the Rio 2016 Olympic Games

Daily Water Quality Assessment Sheet
LAG, Rio de Janeiro, Brazil

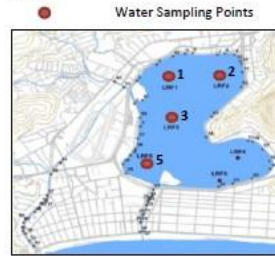
Date: 11th September 2016

1. Water Quality Analysis (last six results)

1a. Enterococci Levels

Date of Sample	LRF1	LRF2	LRF3	LRF5	Enterococci Standard (NMP/100mL)
08/09/2016	<1	<1	<1	<1	200
07/09/2016	<1	44	127	23	200
06/09/2016	9	11	6	2	200
05/09/2016	1	<1	<1	<1	200
04/09/2016	2	3	2	2	200
03/09/2016	10	20	12	15	200

Key:



1b. E.Coli Levels

Date of Sample	LRF1	LRF2	LRF3	LRF5	E.Coli Standard (NMP/100mL)
08/09/2016	110	79	13	240	2000
07/09/2016	17	33	22	49	2000
06/09/2016	17	33	33	49	2000
05/09/2016	5	9	13	22	2000
04/09/2016	130	22	23	23	2000
03/09/2016	29	39	24	15	2000

2. Weather report (today and forecast five days)

Day	Weather
11/09/2016	Partly cloudy
12/09/2016	Sunny
13/09/2016	Sunny
14/09/2016	Sunny
15/09/2016	Overcast (10% chance of rain)
16/09/2016	Overcast (10% chance of rain)

4. Weather forecast (previous six days)

Day	Weather
10/09/2016	Overcast
09/09/2016	Cloudy with drizzle
08/09/2016	Partly cloudy
07/09/2016	Partly cloudy with light rain in evening
06/09/2016	Cloudy
05/09/2016	Sunny

4. Canal Openings (for past five days)

Day	Open	Comments
08/09/2016	N	No water flow into Lagoa
08/09/2016	Y	No water flow into Lagoa
08/09/2016	Y	No water flow into Lagoa
07/09/2016	Y	No water flow into Lagoa
06/09/2016	Y	No water flow into Lagoa

5. Visual and Olfactory Inspections (last 12 hours)

Site	Visual Pollution	Odour	Nessler results	Aquatic biodiversity behaviour	Time of visit	Comments
Pipe 2	None	None	No sewage	Normal	06.15-06.45hrs	Pipes half submerged
Pipe 9	None	None	No sewage	Normal	06.15-06.45hrs	Pipes half submerged
Pipe 35	None	None	No sewage	Normal	06.15-06.45hrs	Pipes half submerged
Pipe 53	None	None	No sewage	Normal		Increased algae within the Lagoa has created a poor visual appearance of the water. This algae is harmless to human health
LRF1	None	None		Normal		
LRF2	None	None		Normal		
LRF3	None	None		Normal		
LRF5	None	None		Normal		

Key:



6. Summary:

All past five days the levels have been within the 'excellent' standard, with a 'very low' sanitary inspection. Therefore a rating of 1 has been given today.

7. Decision

No change to competition schedule.

Notes

Visually, the Lagoa has changed since the heavy rain we had on the 21st August. Since the 21st, we then experienced strong sunlight and these two weather conditions back to back have caused an algae bloom, due to the algae flourishing with increased photosynthesis. This is harmless to human health, but does cause a change in the colour of the water. The algae also causes a light foam and milky residue, which is also harmless to human health.