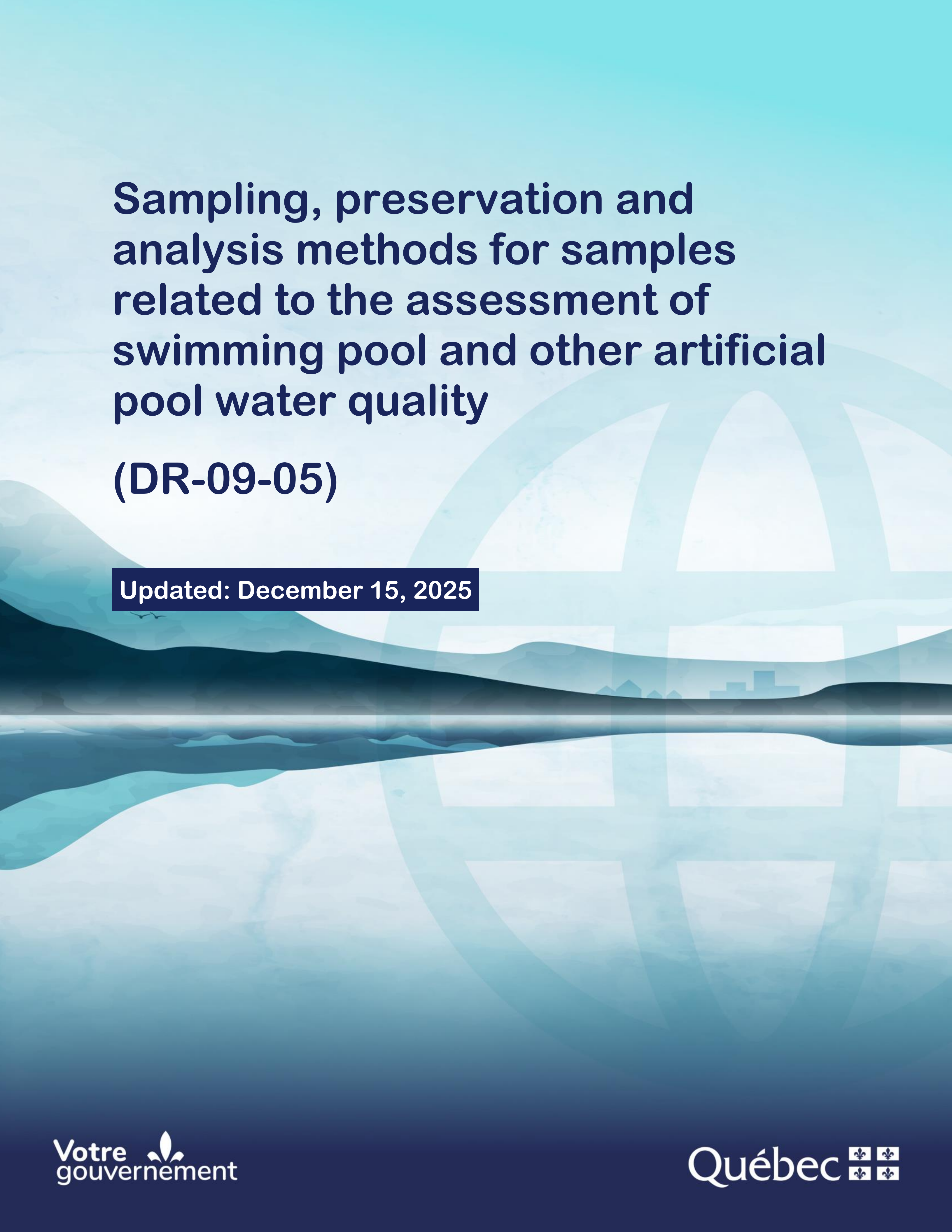

Sampling, preservation and analysis methods for samples related to the assessment of swimming pool and other artificial pool water quality

(DR-09-05)

Updated: December 15, 2025

Votre gouvernement

Québec

Coordination and drafting

This publication was prepared by the Centre d'expertise en analyse environnementale du Québec of the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP). It was produced by the MELCCFP's Direction des communications.

Contact information

Phone:	418 521-3830 1 800 561-1616 (toll-free)
Form:	www.environnement.gouv.qc.ca/formulaires/renseignements.asp
Internet:	www.environnement.gouv.qc.ca

Legal deposit – 2025
Bibliothèque et Archives nationales du Québec
ISBN 978-2-555-02882-1 (PDF)

Table of contents

Introduction 1

1. General precautions and responsibilities 1

1.1 General precautions 1

1.2 Responsibilities 2

2. Sampling for accredited laboratories 2

2.1 Preservation methods 2

Table 1. Preservation methods for microbiological and physico-chemical parameters (laboratory analysis) 2

2.2 Sampling method 2

3. On-site analyses 5

3.1 Special precautions 5

3.2 Preservation method 6

Table 2. Preservation methods for physico-chemical parameters 6

(on-site analysis) 6

3.3 Sampling method 7

3.4 Analytical methods 8

Table 3. Measured concentration ranges and graduation for each parameter 8

References 10

Introduction

This document sets out the sampling, preservation and analysis methods for the samples required to assess the water quality of swimming pools and other artificial pools. It supports the assessment of analytical parameters covered by the *Regulation respecting water quality in swimming pools and other artificial pools* (the “Regulation”), to ensure that bathing water is clean, safe and stable.

To this end, effective collaboration is essential between the persons in charge of a pool, the samplers, and the laboratory analysis personnel. Under the Regulation, the “person in charge of a pool” means any owner or operator of a swimming pool or other artificial pool (such as whirlpool bathtubs, also referred to as hot tubs, splash pads, etc.).

This document is intended for all persons in charge of a pool and aims to:

- provide them with information on the general preparations to be made and precautions to be taken during sampling;
- define the sample collection methods for swimming pools and other artificial pools;
- describe the physico-chemical analyses to be performed on site.

The document begins with a section on the collection and preservation of samples to be submitted for laboratory analysis. The following section covers on-site analysis of physico-chemical parameters in bathing water. The document also outlines the recommended sample volumes, preservation agents, types of containers to be used, and the time limits to be observed between sampling and analysis.

1. General precautions and responsibilities

1.1 General precautions

The sampling stage has a direct impact on the quality of the analytical results obtained. The sampler must take precautions to obtain representative samples and must avoid contamination through improper sampling techniques. These instructions apply to both laboratory analyses and on-site analyses.

1. Always begin a sampling campaign by collecting the samples intended for microbiological analysis. Then proceed, if applicable, with the samples for physico-chemical analysis. This prevents the collection of water for microbiological analysis after it may have been contaminated during physico-chemical sampling.
2. For analyses performed by an accredited laboratory offering services to external clients, refer to the Official list of accredited laboratories (DR-12-LLA-01) (in French). The containers used must be those provided by laboratories accredited by the Ministère de l’Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP).
3. For microbiological analyses, prior cleaning of hands and instruments is required (see the detailed sampling method in Section 2.2.1.2).

1.2 Responsibilities

The sampler or the person in charge of a pool must ensure the quality of the sample collection, as well as the proper preservation and transportation of the samples, before submitting them to a laboratory accredited by the MELCCFP.

2. Sampling for accredited laboratories

2.1 Preservation methods

The preservation methods to be used for the various analytical parameters covered by the Regulation are based on the analytical methods used in the laboratory (see Table 1). It must also be ensured that the time between sampling and analysis does not exceed the maximum holding time indicated in the table for each parameter.

Table 1. Preservation methods for microbiological and physico-chemical parameters (laboratory analysis)

Parameter	Preservation agent*	Container*	Minimum sample volume per parameter (mL)	Maximum holding time
Microbiology				
Fecal coliforms	ST3	SPP or SG	100	48 hours
Escherichia coli	ST3	SPP or SG	100	48 hours
Pseudomonas aeruginosa	ST3	SPP or SG	100	48 hours
Staphylococcus aureus	ST3	SPP or SG	100	48 hours
Physico-chemical				
Turbidity	N/A	P or G	125	48 hours

* P – Containers and cap liners are made of the following plastics: low- or high-density polyethylene, polypropylene, polystyrene, polyvinyl chloride or Teflon. SPP – Sterile polypropylene container. G – Glass container. SG – Sterile glass container. ST3 – Sodium thiosulfate at a final concentration of 0.01% (w/v).

The person in charge of the pool must work in cooperation with the staff of the selected accredited laboratory to obtain all necessary information.

2.2 Sampling method

Sampling period: Samples intended for microbiological analysis and turbidity analysis must be collected during regular operating hours.

Sampling site: Sampling must be conducted in an area with low bather traffic at the time of sampling. The sampling location must be at a reasonable distance from both the water discharge point and the return flow of treated water into the pool. It is recommended that routine samples be collected from the same locations to facilitate comparison over time. For splash pads, if the feature includes an accumulation zone deeper than 5 cm, that is where the sample should be taken. If the water feature is not supplied by a drinking water source or if the water is recirculated, sampling should be conducted at the outlet of the water jets.

Sampling depth: The sample must be collected 15 to 45 cm below the surface of the water. If the pool is less than 45 cm deep, the sample should be taken halfway between the water surface and the bottom. For whirlpools, samples may be collected at any point below the water surface.

> **Note**: Avoid collecting the sample directly at the water surface, as contaminants such as bacteria or skin particles may be present.

2.2.1 Before sampling

1. Ensure that samples intended for microbiological analyses are collected only in sterile wide-mouth containers provided by laboratories accredited by the MELCCFP. These containers must contain sodium thiosulfate (to neutralize any residual disinfectant in the water at the time of sampling). Do not rinse containers supplied by the laboratories.
2. Follow required aseptic procedures when collecting the sample (e.g., wash hands up to the elbows, avoid touching the neck or cap of the container, and minimize the container's exposure to open air during sampling).

   Note: If a sampling pole is available, it may be used to reduce potential contamination from the sampler. Ensure that the pole has been cleaned beforehand — at minimum, with soap and water — then rinsed thoroughly with tap water to remove all soap residue.
3. Store sampling equipment in a clean, well-ventilated area.

2.2.2 During sampling

1. Submerge the sampling container into the water at approximately a 45° angle in one quick motion (see Figure 1), while ensuring the preservation agent remains inside. This motion should be directed away from the sampler.
   a. Leave an air space of at least 2.5 cm between the surface of the liquid and the container cap (see Figure 2).
   b. If the container is overfilled, immediately discard a portion of the sample (down to the base of the neck or the fill line), seal the container, and shake the sample.

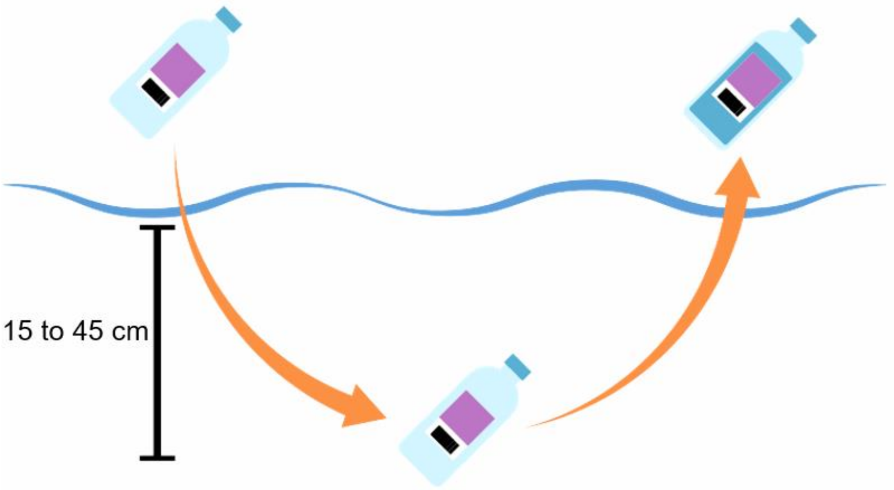

Figure 1. Diagram of microbiological sample collection

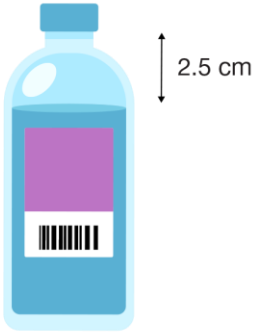

Figure 2. Filling of a sample container for microbiological analysis

2.2.3 After sampling

1. Seal the container tightly.
2. Carefully pack the sampling bottles to prevent breakage or accidental spillage.
3. Ship the sample in a cooler (preferably reserved exclusively for these samples) that is properly insulated and contains an appropriate refrigerant, particularly during the summer months.

   The amount of refrigerant must be adjusted based on the number of samples. Furthermore, samples must be kept at a temperature of approximately 4 °C from the time of collection until they are received by the laboratory.
4. Under no circumstances should the sample be frozen. Do not use any refrigeration method that may result in the sample freezing during shipment.
5. Properly and promptly log the collected samples using the analysis request forms provided by the laboratory.
6. Ensure that a reliable courier service is used to maintain the integrity of the samples and to meet the required time frames.

3. On-site analyses

3.1 Special precautions

3.1.1 Storage and handling of products and reagents

1. Store chemical reagents and color comparators in accordance with the manufacturers' recommendations, in a clean, dry, well-ventilated location protected from light, to prevent deterioration.
2. Never touch reagent bottles with wet fingers to avoid altering the results.
3. Properly seal reagent bottles after use.
4. Avoid prolonged exposure of reagents to sunlight.
5. Use products and reagents before their expiration date.

3.1.2 Before sampling

1. Always use containers that are free of contaminants.
2. Always use devices or instruments that have been calibrated at the required frequency (e.g., pH meter, spectrophotometer, if applicable), and that are appropriate for the parameter to be measured.
3. Prepare the containers and evaluation materials at the sampling sites.

3.1.3 During sampling

Follow all instructions provided by the manufacturer of the physico-chemical analysis kits used at the sampling site.

3.1.4 After sampling

Record the information related to the samples and results in the logbook required under section 20 of the Regulation.

3.2 Preservation method

The preservation methods to be used for the various analytical parameters covered by the Regulation are listed in Table 2.

Table 2. Preservation methods for physico-chemical parameters

(on-site analysis)

Parameter	Preservation agent*	Container*	Suggested volume (mL)	Maximum holding time
Alkalinity	None	P or G	10	30 minutes
Total residual bromine	None	P or G	10	30 minutes
Chloramines	None	P or G	10	30 minutes
Free residual chlorine	None	P or G	10	30 minutes
Total residual chlorine	None	P or G	10	30 minutes
Hardness	None	P or G	10	30 minutes
pH	None	P or G	10	2 hours
Water temperature	N/A	P or G	125	3 minutes

* P – Containers and cap liners are made of the following plastics: low- or high-density polyethylene, polypropylene, polystyrene, polyvinyl chloride, or Teflon. G – Glass container.

3.3 Sampling method

Sampling period: Samples for physico-chemical analysis must be collected during regular operating hours.

Sampling site: Sampling must be carried out in an area with low bather traffic at the time of sampling. In addition, the sample must be collected between the outlet of the filtration system and the water return point.

Sampling depth: Samples must be taken at a depth of 15 to 45 cm below the water surface. If the pool is less than 45 cm deep, the sample must be taken halfway between the water surface and the bottom of the pool. For whirlpools, samples may be collected at any depth below the surface of the water.

Manufacturer’s instructions: The sampler must strictly follow all instructions provided by the manufacturer of the physico-chemical analysis kits used. In case of discrepancies between the manufacturer's instructions and the requirements of the Regulation or this document, the latter two take precedence.

Use of measurement cells: The person collecting the samples must ensure that their hands are very clean to prevent any subsequent contamination (e.g., from sweat or residual chemicals) during handling. If applicable, the measurement cells of the various physico-chemical analysis kits must be clean, dry, free of cracks, and free of particles or stains. They must be rinsed with the sample water before being filled, and the sample level must be adjusted during measurement in accordance with the manufacturer's recommendations. The cells must then be wiped with a clean, soft cloth so that the outer surfaces are clean and dry before performing color comparisons. Cells must be filled to the marked level to avoid discrepancies in measurement. Finally, cells must be stored in a clean location after being cleaned and dried.

3.4 Analytical methods

3.4.1 Water temperature

When reading the water temperature, proceed as follows:

1. Submerge a thermometer into the sample and wait at least 3 minutes for the temperature to stabilize.
2. Read the temperature while holding the bottle and thermometer at eye level, ensuring the tip of the thermometer remains immersed in the sample.
3. Record the temperature to the nearest 0.5 °C (appropriate graduation). Only use thermometers that are in good working condition.

Water temperature may also be measured directly in the pool.

3.4.2 Other parameters

The person in charge of the pool may obtain various types of kits for on-site analysis of physico-chemical water quality parameters (e.g., pH, free and total residual chlorine, alkalinity). These kits help assess water quality and ensure that the treatment systems are functioning properly. The use of test strips with color indicators for analysis is prohibited.

Kits generally include test vials, measurement cells, and reagents that help determine the concentration of the targeted substances using color comparators.

The person in charge of a pool must have a kit that enables measurement of the following parameters:

Table 3. Measured concentration ranges and graduation for each parameter

Parameter	Measured concentration range	Graduation*
Free residual chlorine	Between 0.2 and 5.0 mg/L	0.2 mg/L
Total bromine	Between 1.0 and 5.0 mg/L	0.5 mg/L
pH	N/A	0.2 unit
Hardness and alkalinity	N/A	10 mg $CaCO_3$/l

* The term “graduation” refers to the graduation of the physico-chemical analysis kit used.

3.4.3 Dilution

When a disinfectant concentration (chlorine or bromine) equal to or greater than 5 mg/L is detected, the operator must first comply with the regulatory requirements and close the facility. Once the facility is closed, the following procedure may be applied to determine the exact concentration of chlorine or bromine. This will enable the operator to take the appropriate corrective actions to allow for the facility’s reopening.

This procedure may only be used when the residual disinfectant concentration (chlorine, bromine, etc.) exceeds the upper limit of the kit's measurement range. In such cases, the operator is permitted to perform a dilution to estimate the extent to which the residual disinfectant concentration exceeds the threshold.

For example, for a 1:2 dilution, the operator combines one part pool water with one equal part tap water or distilled or demineralized water. After mixing to homogenize the sample, the operator measures the relevant parameter and multiplies the result by two.

If a 1:2 dilution is insufficient for a reading using the kit, a 1:5 dilution may be performed. The sampler then uses four parts tap water or distilled or demineralized water to one part pool water and multiplies the result by five. The sampler must ensure that the dilution yields a measurable concentration using the kit. If not, the sample is too diluted and a less extensive dilution must be performed.

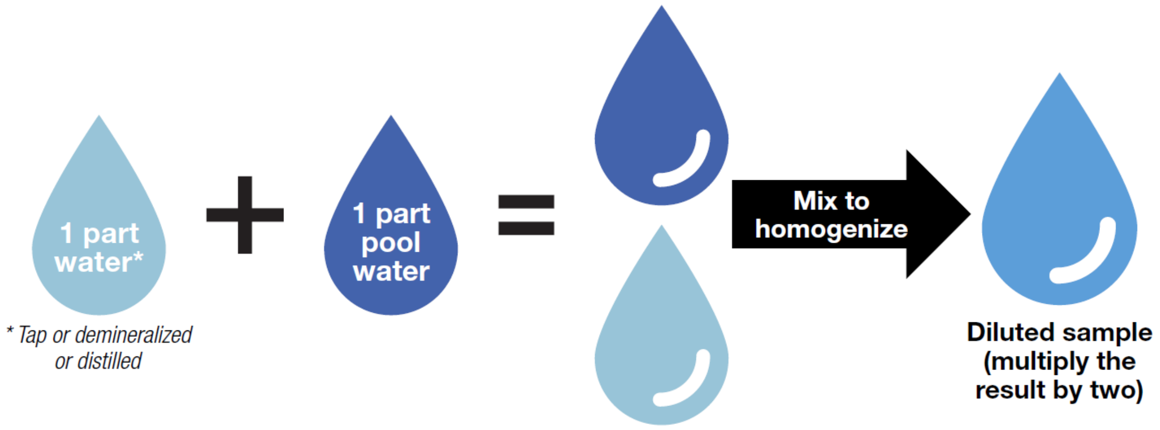

Figure 3. Diagram illustrating the dilution technique

3.4.4 Chloramines

As provided by the Regulation, the chloramine concentration is the difference between the measurement of total residual chlorine and that of free residual chlorine.

References

CDC (Centers for Disease Control and Prevention), *The 2018 Model Aquatic Health Code*, United States, The 2018 Model Aquatic Health Code (MAHC) (cdc.gov)

GOVERNMENT OF CANADA, *Guidelines for Canadian Recreational Water Quality – Third Edition*, current edition Page 18: Guidelines for Canadian Recreational Water Quality – Third Edition - Canada.ca

GOVERNMENT OF ONTARIO, *Recreational Water Facilites and Public Pools Spas*, Ontario, Public Health Ontario, current edition Recreational Water Facilities and Public Pools Spas | Public Health Ontario

ISO/IEC (International Organization for Standardization – International Electrotechnical Commission) *ISO 19458: 2006 Water quality – Sampling for microbiological analysis,* Switzerland, 18 p.

DIRECTION DE L'EAU POTABLE ET DES EAUX SOUTERRAINES (2016). Interpretation guide for the Regulation respecting water quality in swimming pools and other artificial pools, Québec, Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques, 32 p. [Online]. http://www.mddelcc.gouv.qc.ca/eau/piscine/index.htm

**Environnement,
Lutte contre
les changements
climatiques,
Faune et Parcs**

Québec