



Determining Appropriate Drinking Water Chemical and Physical Monitoring Guidelines

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Ministry of Health

1. Purpose

The purpose of this document is to assist in determining Chemical Standards that are applicable to the water in a water supply system and how these should be monitored. This guideline is particularly relevant for sections 3.1.5.2, 3.2.5.2, 3.2.6 and 4.2.1 of Part A of the *Drinking Water Officers' Guide* (DWOG) as these sections deal with decision-making related to permitting, terms and conditions, and monitoring of water systems.

This guideline provides supplemental guidance for drinking water officer (DWO) decisions on monitoring water for various chemical and physical parameters. It also provides a decision tree to guide the DWO through a decision-making process to help determine if there is sufficient evidence to support the requirement to test for additional parameters in a specific water source. The approach specified also supports local DWOs in determining which parameters a new or existing water supply system should test for and how often the testing should be conducted.

2. Background

Under Section 8(3) of the [Drinking Water Protection Act](#) (DWPA), a DWO may place terms and conditions on an operating permit respecting monitoring of the drinking water source and the water in the water supply system, as well as standards applicable to the water in the water supply system.

The Ministry refers to the [Guidelines for Canadian Drinking Water Quality](#) (GCDWQ) to set out *maximum acceptable concentrations* (MAC) and *aesthetic objectives* (AO), as the water quality targets that B.C.'s water supply systems should strive to achieve when evaluating potability for chemical and other constituents. One exception to the general adoption of GCDWQ in B.C. is the MAC for Selenium (see DWOG, [Part A: Legislative Requirements](#) section 3.1.6.2 for more information). The MAC in the GCDWQ generally represents a health-based numerical water quality objective. The DWO will use this and other factors to evaluate the level of risk associated with drinking water.

Health Canada may sometimes conduct rapid reviews for emerging contaminants and publish *Objectives for Canadian Drinking Water Quality* (OCDWQ) while they continue to work on more comprehensive GCDWQ. OCDWQ differs from GCDWQ in that the limits they set are not health-based nor do they establish a MAC or an AO. These OCDWQ are put in place during the interim as limits to strive towards, to initiate monitoring, and instigate planning for achieving a MAC.

[Source Drinking Water Quality Guidelines](#) (SDWQGs) developed by the Ministry of Water, Land and Resource Stewardship are a distinct set of guidelines that apply to ambient source water *before* it is treated and distributed for domestic use. The GCDWQ and OCDWQ are adopted as SDWQGs if they make sense as a source water guideline in B.C. While not directly enforceable, the SDWQGs may be used as a benchmark for the [Drinking Water Source-to-Tap Screening Tool](#) and [Comprehensive Drinking Water Source-to-Tap Assessment Guideline](#), tools used by water suppliers to characterize raw drinking water sources.

For most water systems, it would be a significant financial burden to require frequent testing for all chemical and physical parameters listed in the GCDWQ. This approach would not necessarily improve public health outcomes, especially if data indicates that a parameter consistently meets criteria for the protection of public health. This guideline does not specify a testing frequency for a water supply. Rather, it allows flexibility to ensure testing is focused on site-specific parameters relevant to a particular water source. Minor exceedances of the guidelines would normally trigger actions such as:

- Increasing monitoring or sampling,
- Source investigation and management,
- Long term planning to meet the water quality objective, and
- Communication of the situation and the mitigation plan.

Where more significant exceedances occur, DWOs will use their discretion, based on available evidence, to determine at what point the level reaches an unacceptable risk and the appropriate public health response.

3. Process

Any new water source typically requires comprehensive testing. For example, a typical suite of tests may include something similar to the following:

For surface water sources (includes groundwater that is at risk for containing pathogens):

Alkalinity	Fluoride	Nitrite (dissolved)
Ammonia	Hardness	Organic Nitrogen
Calcium	Iron	pH
Chloride	Manganese	Sulphate
Colour	Metals Scan ¹	Total Dissolved Solids

¹ Aluminum, Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Potassium, Zinc (expand if mineralized to include Mercury)

Conductivity ²	Nitrate (dissolved)	Total Organic Carbon
Corrosiveness ³	Bacterial indicators	
Turbidity	Bromide (for systems using ozone)	

For groundwater sources:

Alkalinity	Fluoride	Phosphorous
Ammonia	Iron	Sodium
Calcium	Hardness	Sulphate
Chloride	Magnesium	Sulphide
Colour	Manganese	Total Dissolved Solids
Conductivity ⁴	Metal Scan ⁵	Total Organic Carbon
Corrosiveness ⁶	Nitrate	Uranium
	pH	Turbidity

Many analytical labs provide testing packages that cover many of these parameters. Consideration should also be given to appropriateness of testing source water or post-treated water or both.

The DWO may also require additional testing for other parameters should evidence suggest that additional substances of concern exist. DWOs should also consider the type of water source, local community history, known contaminant sources, seasonal variation, and historical water quality reports when deciding on a testing regime. These factors may give clues to what parameters could be of concern in the future.

Where the results of initial testing indicate that additional chemical parameters are less than the GCDWQ or OCDWQ, and local history shows that the parameters are unlikely to vary above the MAC or limit, then further routine testing frequency may be reduced. Another consideration in this decision involves determining whether the water will be consumed by persons on an ongoing or seasonal basis, special vulnerabilities of intended users (e.g., school children), or other such matters.

For chemical or physical parameters that are identified as being near the threshold set out in the GCDWQ or OCDWQ, the DWO should review the magnitude of the hazard that may be posed by the parameter falling in this range. If the DWO concludes that there is a health concern, he/she should consider requiring routine testing of the parameter at a defined frequency in the operating permit.

The DWO may wish to re-evaluate the testing requirements based on any new potential risks that impact water quality such as a chemical spill, a new industry with new emission sources, a change in land use, an unusual weather event, or other situation. The DWO may also wish to re-evaluate the testing requirements in the event of a change in GCDWQ or OCDWQ limits. Where there is an established history of stable and

² Conductance/Specific Conductance

³ Calcium Carbonate saturation/Langelier's index

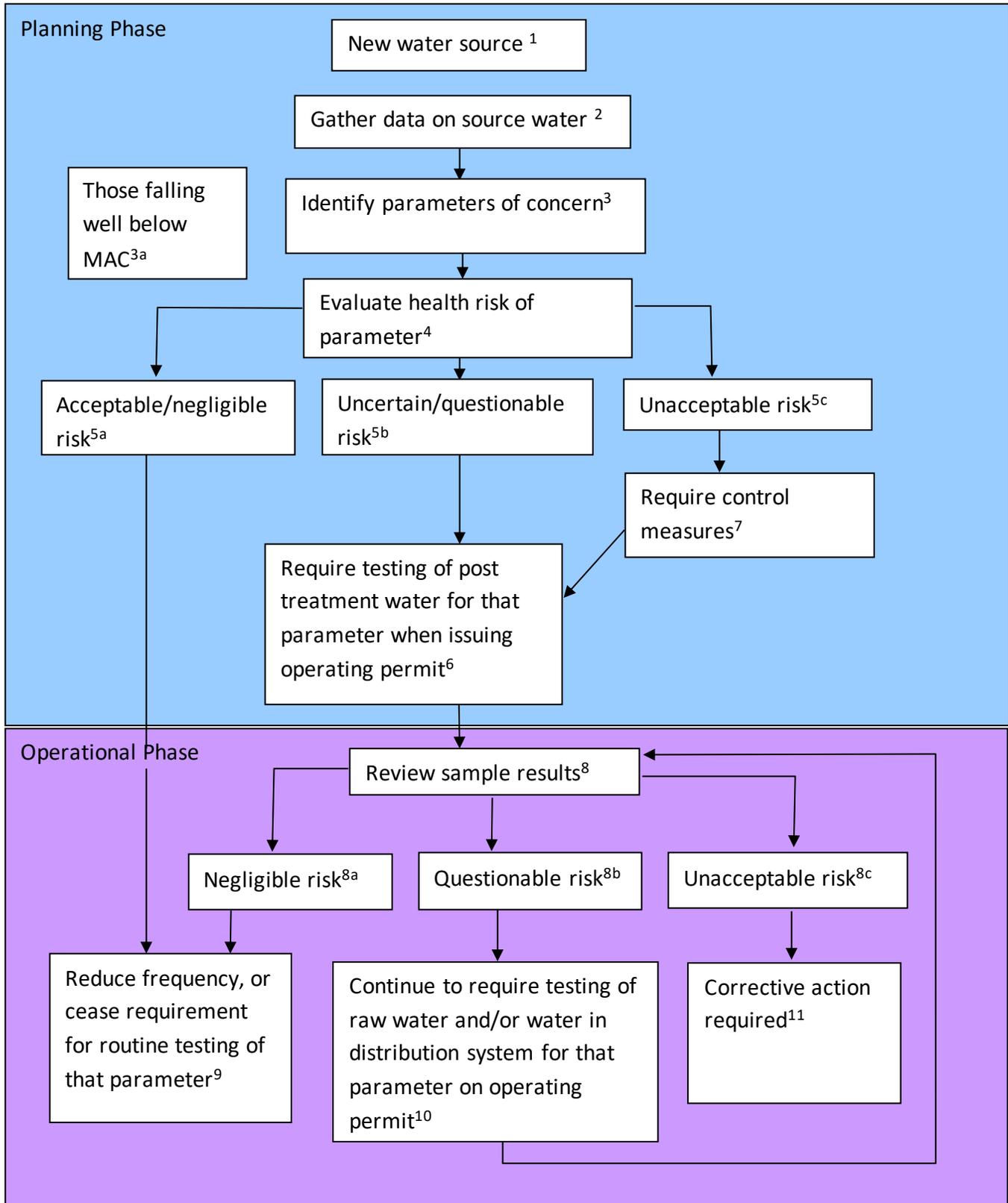
⁴ Conductance/Specific Conductance

⁵ Aluminum, Arsenic, Barium, Cadmium, Chromium, Copper, Lead, Potassium, Zinc (expand if mineralized to include Mercury)

⁶ Calcium Carbonate saturation/Langelier's index

predictable chemical results, a DWO may amend the operating permit to waive, or reduce the frequency of testing of a parameter. Where a parameter experiences great variability in values over time, risk increases and therefore increased monitoring frequency should be considered.

4. Decision Tree for Drinking Water: Requiring Additional Parameters



5. Decision Tree Endnotes

1. A new source for a water supply system under the DWPA, or re-evaluation of an existing system after an incident of contamination, or significant system modification.
2. The DWO should ask the supplier to provide the following information for consideration:
 - a. Historical data from nearby water sources
 - b. A suite of chemical and physical testing on the new source for health parameters in GCDWQ
 - c. Activities in the watershed that may contribute to elevated sample results (e.g., local industry, agriculture, historical chemical spills)
 - d. The type of water source (i.e. groundwater vs. surface supply etc.)
 - e. The anticipated effect of proposed treatment on parameters (e.g., formation of disinfection by-products)
 - f. Anticipated seasonal fluctuations in water quality and quantity

The supplier may accomplish this by providing the health authority a health risk assessment of water quality.

3. The DWO will compare data collected to GCDWQ, OCDWQ, and/or other standards to identify those which may require further consideration. Those that are measured at or near the MAC, or other standards need further consideration. This may include consideration of the anticipated effect of proposed treatment on parameters (e.g., formation of disinfection by-products)
 - a. Subject to consideration given under box 2, those falling well below the MAC or other standards may not require further routine testing.
4. Evaluate the magnitude of the risk for each parameter that is near or exceeding the threshold in the GCDWQ, OCDWQ, or other standards. The information in Box 2 should be considered in this evaluation.
5. Where the DWO concludes that the risk of a parameter is:
 - a. Acceptable/Negligible: no further routine testing is required; unless there is reason to believe the situation has changed. (Where an event such as a chemical spill, or the introduction of a new industry in the community occurs, or in the event of a change in GCDWQ or OCDWQ limit occurs, the DWO may wish to re-evaluate the testing requirements based on this new information).
 - b. Uncertain/Questionable: Require periodic sampling of the parameter in question on the operating permit (go to box 6)
 - c. Unacceptable – (go to box 7)
6. The DWO should require periodic sampling and reporting of this parameter on the conditions of the operating permit at source and/or distribution system as appropriate.

7. Where source water is found to be unacceptable, the DWO should require mitigation of the parameter to reduce risk, by:
 - a. Requiring control measures (e.g., water treatment)
 - b. Finding another source
 - c. Where water is currently in use, notifying users
 - d. Continuing to monitor to verify that control measures are effective (go to box 6)

This may be done through adding or modifying conditions on permit or by an order issued under the DWPA.

8. Once a water supply system is in operation, routine sampling will give an indication of whether the risk:
 - a. Is shown to be negligible (e.g., reducing concentration over time)
 - b. Requires further monitoring to ensure that risk does not increase, or
 - c. Increases to an unacceptable level on a temporary or long term basis.
9. With an established history of stable and predictable chemical and/or physical results, a DWO may amend the operating permit to reduce frequency or waive the requirements for testing of a parameter. The DWO may, however take into consideration that if a parameter monitored is part of a suite of measurements offered by a lab, it may not be of any consequence to reduce testing of a particular parameter.
10. Conditions on operating permit should require regular monitoring to ensure that risk does not increase.
11. Where monitoring reveals that the concentration of the parameter increases to an unacceptable level, the DWO should require notification of users. The DWO should evaluate the magnitude of the exceedance of the guideline, as well as whether the condition of the water is of a temporary or long term nature. As most parameters identified in the *Guidelines for Canadian Drinking Water Quality* are based on lifetime exposure, temporary minor exceedances are usually not a cause for immediate remedial action. However, if there the problem is of a long term nature, the DWO should consider requiring the water supplier to develop a plan for mitigating the problem which includes an established timeline for completion.

6. Definitions

Acceptable/Negligible Risk

- The parameter is below the MAC in the GCDWQ, the limit in the OCDWQ, or other prescribed standards

Uncertain/Questionable Risk:

- The parameter is near or exceeds the MAC in the GCDWQ, the limit in the OCDWQ, or other prescribed standards; or
- There is inadequate data to determine if levels are consistently below the MAC.

Unacceptable:

- Exceeds the MAC in the GCDWQ, or other prescribed standards; or
- Where no standard exists, the DWO has assessed the risk and determined that a drinking water health hazard exists.
- OCDWQ cannot fall under unacceptable risk as they are not health-based standards and therefore will not necessitate the accompanied required control measures.