

# Source Drinking Water Quality Guidelines

Guideline Summary

Ministry of Environment & Climate Change Strategy

Water Protection & Sustainability Branch



The **Water Quality Guideline Series** is a collection of British Columbia (B.C.) Ministry of Environment and Climate Change Strategy ambient water quality guidelines. Water quality guidelines are developed for a variety of water values; aquatic life, agriculture, drinking water sources, recreation and aesthetics and wildlife. The Water Quality Guideline Series focuses on publishing water quality guideline technical reports and guideline summaries using the best available science to aid in the management of B.C.'s water resources. This document is found on the B.C. approved water quality guidelines webpage: <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines>

**ISBN:** 978-0-7726-7162-2

**Citation:**

British Columbia Ministry of Environment and Climate Change Strategy. 2020. B.C. Source Drinking Water Quality Guidelines: Guideline Summary. Water Quality Guideline Series, WQG-01. Prov. B.C., Victoria B.C.

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**Cover Photo:**

Warneford River in Northeast B.C.

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## Updates from the 2017 version:

- Clarity added to introduction about the use of source drinking water quality guidelines
- Parameters added or updated include:
  - 1,1-Dichloroethylene
  - 1,2-Dichlorobenzene
  - 1,2-Dichloroethane
  - 1,4-Dichlorobenzene
  - Antimony
  - Carbon Tetrachloride
  - Chlorite
  - Chromium
  - Cobalt
  - Copper
  - Cyanobacterial Toxins- Total Microcystins
  - Dichloromethane
  - Diisopropanolamine (DIPA)
  - Fecal coliforms
  - Lead
  - Manganese
  - Molybdenum
  - Monochlorobenzene
  - Nickel
  - Nitritotriacetic acid (NTA)
  - Perfluorooctane Sulfonate (PFOS)
  - Perfluorooctanoic Acid (PFOA)
  - Polycyclic Aromatic Hydrocarbons (Carcinogenic)
  - Strontium
  - Sulfolane
  - Tetrachloroethylene
  - Trichloroethylene
  - Turbidity
  - Uranium
  - Vinyl Chloride
  - Zinc

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## ABBREVIATIONS

AO	Aesthetic objective
B[a]P	Benzo[a]pyrene
B.C.	British Columbia
CSR	Contaminated Sites Regulation
MAC	Maximum acceptable concentration
ENV	B.C. Ministry of Environment and Climate Change Strategy
EPA	Environmental Protection Agency
HLTH	B.C. Ministry of Health
NA	Not applicable
NOAEL	No observed adverse effect level
NTU	Nephelometric turbidity unit
SDWQG	Source drinking water quality guideline
PAH	Polycyclic aromatic hydrocarbon
TCU	Total colour units
THM	Trihalomethane
TPE	Total potency equivalents
WQG	Water quality guideline

## GLOSSARY

**Aesthetic Objective:** Established for parameters that may impair the taste, smell, or colour of water; or which may interfere with the supply of good quality water. They do not cause adverse health effects.

**Ambient:** Ambient refers to open waters such as rivers, lakes and streams, as opposed to closed water supply systems that distribute treated water or wastewater.

**Disinfection By-Product:** Harmful compounds that may result from chemical reactions between organic matter and water treatment chemicals during the water treatment process.

**Indicator Organism:** Microbiological indicators of water quality include bacteria such as fecal coliforms, *Escherichia coli* and enterococci, which indicate the risk of disease from bacteria, viruses, and other pathogenic organisms which could be harmful to human health.

**Maximum Acceptable Concentration:** A level that has been established for certain substances that are known or suspected to cause adverse health effects.

**No Observed Adverse Effect Level:** The highest tested concentration of a substance at which no such adverse effect is found in exposed test organisms where higher doses or concentrations resulted in an adverse effect.

**Operational Water Treatment Guideline:** An operational guidance value, provided by Health Canada in this case, used in water treatment processes which treated water must meet before it enters the distribution system.

## **INTRODUCTION**

The British Columbia (B.C.) Ministry of Environment and Climate Change Strategy (ENV) uses sound science and policy to inform resource management decisions, with respect to activities on the land base, to ensure our supply of clean water is sustainable. ENV provides leadership in the development of water strategies, policy, and legislation to protect and manage the quality of surface water and groundwater to support its goal of clean and safe water.

Water quality guidelines (WQGs) are conservative estimates of low-risk levels for chemical, physical, and biological attributes that are important in both fresh and marine waters. They are developed by ENV or adopted from other jurisdictions (ENV 2019a) and used to assess and manage the health, safety and sustainability of B.C.'s ambient water quality and support decisions related to the protection of water uses and values in the natural resource sector. Province-wide ambient WQGs may be developed for the protection of designated values, including aquatic life, wildlife, agriculture, drinking water sources, and recreation.

The source drinking water quality guidelines (SDWQGs) have been developed as part of the B.C. Ambient WQGs. The SDWQGs help reduce risks to future and current drinking water sources and are particularly relevant in multi-use watersheds where cumulative impacts are of concern to human health. Ambient SDWQGs are a key component of source water protection and the multi-barrier approach to drinking water safety. SDWQGs apply to drinking water sources from surface water and groundwater and are an important contribution to the Province's [Action Plan for Safe Drinking Water](#) (HLTH 2002).

## **AUTHORITY TO SET WATER QUALITY GUIDELINES**

Section 5(e) of the *Environmental Management Act* authorizes the Minister to prepare and publish "policies, strategies, objectives, guidelines and standards for the protection and management of the environment". SDWQGs are approved by the Executive Director of ENV's Water Protection and Sustainability Branch. Once approved, SDWQGs constitute ENV policy and must be considered in any decisions affecting water quality made within ENV.

## **HOW SOURCE DRINKING WATER QUALITY GUIDELINES ARE USED**

The SDWQGs provide benchmarks to assess ambient water quality data and are applicable province wide. As with all B.C. Ambient WQGs, the SDWQGs are not directly enforceable but may be used to support the development of waste management permits, approvals, plans or operating certificates. More specifically, SDWQGs may be used to inform resource management decisions within ENV, support human health risk assessments, environmental assessments, and source water assessments.

## **HOW SOURCE DRINKING WATER QUALITY GUIDELINES ARE DEVELOPED**

The SDWQGs provided in this document are current and replace any SDWQGs contained in individual B.C. WQG overview and technical documents.

SDWQGs are established through one of two approaches (ENV 2019a):

- adoption directly from Health Canada's Guidelines for Canadian Drinking Water Quality in consultation with the Ministry of Health (HLTH);



- in situations where a Health Canada Guideline for Canadian Drinking Water Quality is not available or not appropriate for source water, or where circumstances dictate that a B.C.-specific WQG is required, ENV will work collaboratively with HLTH and any other pertinent groups to develop or adopt an appropriate WQG.

## **HOW THESE GUIDELINES RELATE TO OTHER DRINKING WATER BENCHMARKS**

It is important to differentiate between the B.C. SDWQGs and the B.C. drinking water treatment objectives for [surface water](#) and [groundwater](#). The SDWQGs guidelines presented in this document apply to the ambient water before it is treated and distributed for domestic use. The drinking water treatment objectives are expectations for disinfection to reduce microbiological risks in potable water as required by Schedule A of the [Drinking Water Protection Regulation](#). The SDWQGs do not supersede or invalidate any requirement related to drinking water quality established under the *Drinking Water Protection Act*.

The Guidelines for Canadian Drinking Water Quality are assessed by parameter and adopted as SDWQGs if they make sense as a source water guideline in B.C. The Guidelines for Canadian Drinking Water Quality are also used as reference for other parameters (chemical, physical, microbiological) to further evaluate health risks of potable drinking water beyond requirements under the *Drinking Water Protection Regulation*, but are allowed discretion by the drinking water officer.

The SDWQGs may be used as a benchmark in a [drinking water source-to-tap screening tool](#) or a [comprehensive drinking water source-to-tap assessment guideline](#); tools used by water suppliers to characterize raw drinking water sources.

The SDWQGs also differ from the drinking water standards under the [Contaminated Sites Regulation](#) (CSR) in that they are not enforceable under legislation.

## **PARAMETERS UPDATED IN 2020**

In the 2020 update, water quality parameters (see Table 1) were reviewed with one of the following outcomes:

- 1) No change to guideline.
- 2) Guideline updated: new science resulted in adoption or development of an updated WQG. [These changes are in blue.](#)
- 3) New guideline: a SDWQG has not been previously adopted for use in B.C. [These changes are in blue.](#)

Pesticide guidelines were not included in the 2020 update as Health Canada is currently reviewing pesticides in the Guidelines for Canadian Drinking Water Quality. Any updates to Health Canada's pesticide guidelines will be examined for applicability in B.C. as a SDWQG in future updates.

## GUIDELINE SUMMARY TABLE

Table 1. B.C. ambient water quality guidelines for drinking water sources.

Parameter <sup>1</sup>	Maximum Allowable Concentration (MAC)	Aesthetic Objective (AO)	Guideline Source	2020 Update
Aluminum	9.5 mg/L	NA	ENV 2019b	No change
Antimony	0.006 mg/L	NA	Health Canada 1997	New SDWQG for use in B.C.
Arsenic	0.01 mg/L	NA	Health Canada 2006a	No change
Benzene	0.005 mg/L	NA	Health Canada 2009a	No change
Boron	5.0 mg/L	NA	ENV 2003a	No change
Cadmium	0.005 mg/L	NA	Health Canada 1986a	No change
Carbon Tetrachloride	0.002 mg/L	NA	Health Canada 2010a	New SDWQG for use in B.C.
Chlorate	1.0 mg/L	NA	Health Canada 2008	No change
Chloride	N/A	250 mg/L	Health Canada 1987a	No change
Chlorite	1.0 mg/L	NA	Health Canada 2008	New SDWQG for use in B.C.
<b>Chlorophenols:</b>				
<i>Monochlorophenol</i>	NA	0.0001 mg/L	ENV 1997a	No change
<i>2,4-dichlorophenol</i>	0.9 mg/L	0.0003 mg/L	Health Canada 1987b	No change
<i>Total Dichlorophenols</i>	NA	0.0003 mg/L	ENV 1997a	No change
<i>2,4,6-trichlorophenol</i>	0.005 mg/L	0.002 mg/L	Health Canada 1987b	No change
<i>Total Trichlorophenols</i>	NA	0.002 mg/L	ENV 1997a	No change
<i>2,3,4,6-tetrachlorophenol</i>	0.1 mg/L	0.001 mg/L	Health Canada 1987b	No change
<i>Total Tetrachlorophenols</i>	N/A	0.001 mg/L	ENV 1997a	No change
<i>Pentachlorophenol</i>	0.06 mg/L	0.03 mg/L	Health Canada 1987b	No change
Chromium	0.05 mg/L	N/A	Health Canada 2018a	New SDWQG for use in B.C.
Cobalt	0.001 mg/L	N/A	ENV 2019b	New SDWQG for use in B.C.
Colour, True	NA	15 TCU <sup>3</sup>	Health Canada 1979a	No change

Parameter <sup>1</sup>	Maximum Allowable Concentration (MAC)	Aesthetic Objective (AO)	Guideline Source	2020 Update
Copper	2.0 mg/L (includes short-term and long-term exposure)	1.0 mg/L	Health Canada 2019a	New SDWQG MAC for use in B.C.
Cyanide, Free	0.2 mg/L	NA	Health Canada 1991b	No change
Cyanobacterial Toxins: Total Microcystins	0.0015 mg/L (seasonal)	NA	Health Canada 2018b	Guideline updated. Changed from Microcystin-LR to Total Microcystins.
1,2-Dichlorobenzene	0.2 mg/L	0.003 mg/L	Health Canada 1987c	New SDWQG MAC for use in B.C.
1,4-Dichlorobenzene	0.005 mg/L	0.001 mg/L	Health Canada 1987c	New SDWQG MAC for use in B.C.
1,2-Dichloroethane	0.005 mg/L	NA	Health Canada 2014b	New SDWQG MAC for use in B.C.
1,1-Dichloroethylene	0.014 mg/L	NA	Health Canada 1994a	New SDWQG MAC for use in B.C.
Dichloromethane	0.05 mg/L	NA	Health Canada 2011	New SDWQG MAC for use in B.C.
Diisopropanolamine (DIPA)	3.5 mg/L	NA	ENV 2019b	Guideline updated. Decreased from 21 mg/L to 3.5 mg/L. Now a health-based guideline accounting for all exposure sources.
Ethylbenzene	0.14 mg/L	0.0016 mg/L	Health Canada 2014a	No change
Fluoride	1.5 mg/L	NA	Health Canada 2010b	No change
Iron	NA	0.3 mg/L	Health Canada 2005a	No change
Lead	0.005 mg/L	NA	Health Canada 2019c	Guideline updated. Decreased from 0.01 mg/L to 0.005 mg/L.
Manganese	0.12 mg/L	0.02 mg/L	Health Canada 2019d	Guideline updated. AO decreased from 0.05 mg/L to 0.02 mg/L. New SDWQG MAC for use in B.C.
Mercury	0.001 mg/L	NA	Health Canada 1986b	No change
Methyl Tertiary-Butyl Ether	NA	0.015 mg/L	Health Canada 2006b	No change
Microbiological Parameters & Bacteriological Indicators:				No change

Parameter <sup>1</sup>	Maximum Allowable Concentration (MAC)	Aesthetic Objective (AO)	Guideline Source	2020 Update
<i>Escherichia coli</i>	≤ 10 <i>E. coli</i> /100 mL; 90 <sup>th</sup> percentile (minimum of 5 samples)	NA	ENV 1988	No change
Enterococci	≤ 3 Enterococci/100 mL; 90 <sup>th</sup> percentile (minimum of 5 samples)	NA	ENV 1988	No change
Molybdenum	0.088 mg/L	NA	ENV 2020	Guideline updated. Decreased from 0.25 mg/L to 0.088 mg/L. Now a health-based guideline protective of all age groups.
Monochlorobenzene	0.08 mg/L	0.03 mg/L	Health Canada 1987d	New SDWQG MAC for use in B.C.
Nickel	0.08 mg/L	NA	ENV 2019b	New SDWQG MAC for use in B.C.
Nitrate	45 mg/L (nitrate) 10 mg/L (nitrate-N)	NA	Health Canada 2013b	No change
Nitilotriacetic acid (NTA)	0.4 mg/L	NA	Health Canada 1990	New SDWQG MAC for use in B.C.
Nitrite	3.0 mg/L (nitrite) 1.0 mg/L (nitrite-N)	NA	Health Canada 2013b	No change
Organic Carbon, Total	4.0 mg/L	NA	ENV 1998	No change
Perfluorooctanoic Acid (PFOA)	0.0002 mg/L	NA	Health Canada 2018c	New SDWQG for use in B.C.
Perfluorooctane Sulfonate (PFOS)	0.0006 mg/L	NA	Health Canada 2018d	New SDWQG for use in B.C.
Phosphorus, Total	NA	0.01 mg/L (lakes)	ENV 1985	No change
Polycyclic Aromatic Hydrocarbons (Carcinogenic) <sup>2</sup>	0.00004 mg/L	NA	Health Canada 2016	Guideline updated. Increased from 0.00001 mg/L but now includes all carcinogenic PAHs, not just Benzo[a]pyrene.
Selenium	0.01 mg/L	NA	ENV 2014	No change
Strontium	7.0 mg/L	NA	Health Canada 2019g	New SDWQG for use in B.C.

Parameter <sup>1</sup>	Maximum Allowable Concentration (MAC)	Aesthetic Objective (AO)	Guideline Source	2020 Update
Sulfolane	0.09 mg/L	NA	ENV 2019b	Guideline updated. Decreased from 0.27 mg/L to 0.09 mg/L. Now a health-based guideline accounting for all exposure sources.
Sulphate	NA	500 mg/L	Health Canada 1994b	No change
Temperature	NA	15°C	Health Canada 1979b	No change
Tetrachloroethylene	0.01 mg/L	NA	Health Canada 2015	New SDWQG for use in B.C.
Toluene	0.06 mg/L	0.024 mg/L	Health Canada 2014a	No change
Trichloroethylene	0.005 mg/L	NA	Health Canada 2005b	New SDWQG for use in B.C.
Turbidity	See Table 2	NA	ENV 1997b; HLTH (2012)	Guideline updated. Raw drinking water without treatment for particulates decreased <b>from:</b> Change from background of 1 NTU at any time when background is ≤ 5 NTU; Change from background of 5 NTU at any time, <b>to:</b> ≤ 1 NTU to be consistent with the Ministry of Health's drinking water treatment objective for turbidity.
Uranium	0.02 mg/L	NA	Health Canada 2019i	New SDWQG for use in B.C.
Vinyl Chloride	0.002 mg/L	NA	Health Canada 2013c	New SDWQG for use in B.C.
Xylenes, Total	0.09 mg/L	0.02 mg/L	Health Canada 2014a	No change
Zinc	3.0 mg/L	5.0 mg/L	ENV 2019b (MAC); Health Canada 1979c (AO)	New health-based SDWQG MAC for use in B.C.

<sup>1</sup> Metal guidelines are based on **total** concentrations.

<sup>2</sup> As benzo[a]pyrene total potency equivalents (TPE). TPE is calculated by multiplying the concentration of each PAH in a sample by its benzo[a]pyrene Potency Equivalence Factor given below and summing the products.

Benzo[a]pyrene Potency Equivalence Factors

Benzo[a]anthracene - 0.1

Benzo[a]pyrene - 1

Benzo[b+j+k]fluoranthene - 0.1

Chrysene - 0.01  
 Benzo[g,h,i]perylene - 0.01  
 Dibenz[a,h]anthracene - 1  
 Indeno[1,2,3-c,d]pyrene - 0.1

Table 2. B.C. source drinking water quality guidelines for turbidity (ENV 1997b) and HLTH (2012).

Current or Future Water Use	Guideline
Raw drinking water without treatment for particulates	≤ 1 NTU* of turbidity
Raw drinking water with treatment for particulates	Natural background turbidity is ≤ 50 NTU: Change from background <sup>1</sup> should not exceed 5 NTU.
	Natural background turbidity is > 50 NTU: Change from background should not exceed 10% of the background turbidity.

<sup>1</sup>There are operational and pre-operational background levels. Operational background levels are based on comparisons to levels measured at upstream control sites. Pre-operational background levels are based on historical background levels (ENV 1997b).

\* NTU is the abbreviation for Nephelometric Turbidity Units, the unit turbidity is measured in.

## **GUIDELINE RATIONALE**

### **1.1 Aluminum (Al)**

SDWQG: 9.5 mg/L (Maximum allowable concentration (MAC))

**Rationale:** The B.C. CSR total Al water standard of 9.5 mg/L was adopted as a SDWQG. This value is specific to the protection of human health and derived with a toxicological reference value protective of adults (ENV 2019b). Health Canada has not established a health-based water quality guideline (WQG), however ENV is aware of the Health Canada draft Al MAC, which will be reviewed in a future SDWQG update following Health Canada publishing of the updated Al guideline. Health Canada's current Al guideline applies to drinking water treatment systems; one of the few guidelines for Canadian drinking water quality that is a technical water treatment operational guideline, solely applicable to treated water (Health Canada 1998).

### **1.2 Antimony (Sb)**

SDWQG: 0.006 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's total Sb guideline of 0.006 mg/L (Health Canada 1997) to protect against microscopic changes that can occur in organs and tissues. Antimony is naturally occurring and commonly found in erosional runoff, as well as industrial effluents (Health Canada 2019b).

### **1.3 Arsenic (As)**

SDWQG: 0.01 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's As guideline of 0.01 mg/L (Health Canada 2006a). Health Canada set the MAC at 0.01 mg/L but recommends arsenic concentrations be as low as reasonably achievable, as the MAC is based on municipal and residential scale treatment achievability. However, As is classified as a human carcinogen and the concentration in drinking water representing an essentially negligible risk to humans is 0.0003 mg/L. Therefore, source water protection efforts should prevent increases in As above natural background levels. Elevated As levels are usually associated with groundwater (Health Canada 2006a).

### **1.4 Benzene**

SDWQG: 0.005 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's benzene guideline of 0.005 mg/L to protect against bone marrow changes and cancer (Health Canada 2009a). Benzene enters the environment in spills or releases from industrial uses (Health Canada 2019b).

### **1.5 Boron (B)**

SDWQG: 5.0 mg/L (MAC)

**Rationale:** The B.C. SDWQG is based on the B guideline of 5.0 mg/L (ENV 2003a) to prevent adverse health effects such as vomiting, diarrhea, irritability, seizures and death, depending on the dose. The SDWQG value is based on available drinking water treatment technology (Health Canada 1991a). Based solely on health considerations, Health Canada (1991a) calculated a drinking water value for boron of 0.2 mg/L. Boron concentrations in B.C. may be less than 5.0 mg/L, so increases to background concentrations should be minimized to decrease risks to human health. Boron enters the aquatic environment from natural sources or runoff from industrial uses (Health Canada 2019b).

## 1.6 Cadmium (Cd)

SDWQG: 0.005 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's total Cd guideline of 0.005 mg/L to protect against kidney damage and bone softening (Health Canada 1986a). The main source of Cd intake for humans is from food but Cd is not an essential element in human nutrition. As it is difficult to reduce Cd levels in food, Cd concentrations in drinking water should be maintained as low as possible to avoid overexposure (Health Canada 1986a).

## 1.7 Carbon Tetrachloride

SDWQG: 0.002 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's carbon tetrachloride guideline of 0.002 mg/L to protect against liver and kidney damage (Health Canada 2010a). Carbon tetrachloride is an organic chemical that volatilizes quickly. It enters the aquatic environment from industrial effluents and waste site leaching (Health Canada 2019b).

## 1.8 Chlorate

SDWQG: 1 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's chlorate guideline of 1 mg/L to protect against thyroid gland effects and to reduce formation of disinfection-by-products (Health Canada 2008). In B.C., the main source of chlorate in the ambient aquatic environment is pulp mill effluents where chlorine dioxide is used for bleaching (ENV 2002).

## 1.9 Chloride

SDWQG: 250 mg/L (Aesthetic objective (AO))

**Rationale:** B.C. adopts Health Canada's chloride guideline of 250 mg/L to protect against undesirable taste and prevent corrosion in water distribution systems (Health Canada 1987a). There are many sources of natural and man-made chloride in the aquatic environment including seawater intrusion, dissolved salt deposits, landfill leachate, road salt, industrial effluent, oil well operations, sewage and irrigation drainage (Health Canada 2019b).

## 1.10 Chlorite

SDWQG: 1 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's chlorite guideline to protect against neurobehavioural, brain and liver effects, and to reduce formation of disinfection-by-products (Health Canada 2008). In B.C., the main source of chlorite in the ambient aquatic environment is from pulp mill effluent where chlorine dioxide is used for bleaching (ENV 2002).

## 1.11 Chlorophenols

SDWQG: See Tables 3 and 4 (MAC, AO)

**Rationale:** B.C. adopts Health Canada's guidelines for four chlorophenols to prevent risks to human health (Table 3) and the AO guidelines for total chlorophenols (Table 4) (Health Canada 1987b). B.C. will also continue to use the ENV (1997a) WQG for total monochlorophenol (Table 4). Chlorophenols enter the aquatic environment from industrial effluent and as a by-product of drinking water disinfection with chlorine (Health Canada 2019b).



Table 3. B.C. water quality guidelines for chlorophenols in drinking water sources (Health Canada 1987b).

Chlorophenol	MAC	AO
	mg/L	mg/L
2,4-dichlorophenol	0.9	0.0003
2,4,6-trichlorophenol	0.005	0.002
2,3,4,6-tetrachlorophenol	0.1	0.001
pentachlorophenol	0.06	0.030

Table 4. B.C. water quality guidelines for total chlorophenols in drinking water sources (Health Canada 1987b and ENV 1997a).

Chlorophenols, Total	AO
Monochlorophenols	0.0001 mg/L
Dichlorophenols	0.0003 mg/L
Trichlorophenols	0.002 mg/L
Tetrachlorophenols	0.001 mg/L
Pentachlorophenol	0.03 mg/L

### 1.12 Chromium (Cr)

SDWQG: 0.05 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada’s total Cr guideline of 0.05 mg/L to protect against hyperplasia of the small intestine from chromium (VI). The total Cr MAC protects against both cancer and non-cancer effects from Chromium (VI). Chromium enters the environment through naturally occurring erosional processes and releases or spills from industrial uses (Health Canada 2018a).

### 1.13 Cobalt (Co)

SDWQG: 0.001 mg/L

**Rationale:** The B.C. CSR total Co water standard of 0.001 mg/L was adopted as a SDWQG (ENV 2019b). This standard is a health-based guideline from the 2019 United States Environmental Protection Agency (EPA) Regional Screening Levels for tapwater (EPA 2019). Cobalt enters the aquatic environment from both natural and anthropogenic sources including cobalt mining, coal-fired power plants and volcanic eruptions (ENV 2004).

### 1.14 Colour, True

SDWQG: 15 TCU (AO)

**Rationale:** B.C. adopts Health Canada’s guideline of 15 total colour units (TCU) (Health Canada 1979a). Colour is primarily an aesthetic concern in drinking water, however keeping colour levels ≤ 15 TCUs also helps to ensure drinking water sources can be treated effectively.

### 1.15 Copper (Cu)

SDWQG: 2.0 mg/L (MAC), 1.0 mg/L (AO)

**Rationale:** B.C. adopts Health Canada’s total Cu guideline of 2.0 mg/L to protect against gastrointestinal effects (short-term) and liver and kidney damage (long-term). The MAC is based on bottle-fed infants, the most sensitive sub-population. B.C. also uses Health Canada’s Cu AO guideline of 1.0 mg/L to prevent taste and water discoloration (Health Canada 2019a).

### 1.16 Cyanide

SDWQG: 0.2 mg/L (MAC)

**Rationale:** B.C. adopted Health Canada's guideline of 0.2 mg/L to minimize human health effects from the acute toxicity of free cyanide (Health Canada 1991b). Cyanide enters the aquatic environment through release from organic compounds and industrial effluents (Health Canada 2019b).

### 1.17 Cyanobacterial Toxins: Total Microcystins

SDWQG: 0.0015 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's seasonal MAC of 0.0015 mg/L (1.5 µg/L) for total microcystins in drinking water to protect against liver effects (Health Canada 2018b). This guideline is protective of the general population, including young children. The major route of human exposure to cyanobacterial toxins is the consumption of drinking water. These toxins are released from cyanobacteria (blue-green algae) in surface waters (Health Canada 2019b). See HLTH (2017) for more information on decision protocols for cyanobacterial toxins in B.C. drinking water.

### 1.18 1,2-Dichlorobenzene

SDWQG: 0.2 mg/L (MAC), 0.003 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's 1,2-dichlorobenzene MAC of 0.2 mg/L and AO of 0.003 mg/L to protect against increased blood cholesterol, protein and glucose levels, and unpalatable odour. 1,2-Dichlorobenzene is a chlorinated aromatic compound used in degreasing and paint removal and released to the aquatic environment in industrial effluents (Health Canada 1987c).

### 1.19 1,4-Dichlorobenzene

SDWQG: 0.005 mg/L (MAC), 0.001 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's 1,4-dichlorobenzene MAC of 0.005 mg/L and AO of 0.001 mg/L to protect against probable carcinogen effects and unpalatable odour. 1,4-Dichlorobenzene is a chlorinated aromatic compound, used in moth crystals and urinal deodorants and released to the aquatic environment in industrial effluents (Health Canada 1987c).

### 1.20 1,2-Dichloroethane

SDWQG: 0.005 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's 1,2-dichloroethane guideline of 0.005 mg/L to protect against mammary gland cancer. 1,2-Dichloroethane is a volatile organic compound which is classified as a probable carcinogen and used primarily in the synthesis of vinyl chloride (Health Canada 2014b). It enters the aquatic environment in industrial effluents and waste disposal leachate (Health Canada 2019b).

### 1.21 1,1- Dichloroethylene

SDWQG: 0.014 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's 1,1- dichloroethylene guideline of 0.014 mg/L to protect against liver effects. 1,1- Dichloroethylene is an organic chemical used in the food packaging industry (Health Canada 1994a). It enters the aquatic environment in industrial effluent releases or spills (Health Canada 2019b).

### 1.22 Dichloromethane

SDWQG: 0.05 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's dichloromethane guideline of 0.05 mg/L to protect against liver effects; it is also classified as a probable carcinogen (Health Canada 2011). Dichloromethane is a halogenated aliphatic hydrocarbon that does not occur naturally in the environment; it is primarily used to strip paint and as an industrial solvent. It enters the aquatic environment in industrial and municipal wastewater discharges (Health Canada 2019b).

### 1.23 Diisopropanolamine (DIPA)

SDWQG: 3.5 mg/L (MAC)

**Rationale:** The B.C. CSR total DIPA drinking water standard of 3.5 mg/L was adopted as a SDWQG. This guideline is specific to human health protection based on a toxicological reference value protective of adults (ENV 2019b). DIPA is an organic chemical used in natural gas processing and a variety of industrial and household applications (ENV 2003b).

### 1.24 Ethylbenzene

SDWQG: 0.14 mg/L (MAC), 0.0016 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's ethylbenzene MAC of 0.14 mg/L to protect against cancer and non-cancer health effects. The AO of 0.0016 mg/L protects against unfavorable odour (Health Canada 2014a). Ethylbenzene enters the aquatic environment from petroleum and chemical industry emissions, effluents or spills (Health Canada 2019b).

### 1.25 Fluoride

SDWQG: 1.5 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's fluoride guideline of 1.5 mg/L to protect against dental fluorosis (Health Canada 2010b). Fluoride is naturally occurring, and in some cases, is added to drinking water to promote dental health (Health Canada 2019b).

### 1.26 Iron (Fe)

SDWQG: 0.3 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's total Fe guideline of 0.3 mg/L (Health Canada 2005a) to prevent taste, odour and colour issues. Iron occurs naturally from the erosion and weathering of rocks and minerals. Iron also enters water from acidic mine water drainage, landfill leachates, sewage effluents and iron-related industries (Health Canada 2019b).

### 1.27 Lead (Pb)

SDWQG: 0.005 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's total Pb guideline of 0.005 mg/L (Health Canada 2019c) to protect against reduced intelligence effects in children. Health Canada set the MAC at 0.005 mg/L but recommends lead levels should be kept as low as reasonably achievable as the MAC considers treatment and analytical technology limitations. As Pb is classified as a probable carcinogen to humans and there is no known safe exposure level to lead, exposure should be kept as low as possible. Lead is found in the environment, both naturally and due to human activities. However, the most significant lead contribution in drinking water is usually from the lead service line that connects to the water main and provides drinking water to the home (Health Canada 2019b). See HLTH (2019a) for guidance on reducing lead exposure from drinking water at the tap.

### 1.28 Manganese (Mn)

SDWQG: 0.12 mg/L (MAC), 0.02 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's total Mn MAC of 0.12 mg/L and AO guideline of 0.02 mg/L (Health Canada 2019d). The MAC is based on preventing effects on neurological development and behaviour in formula fed infants. The AO is based on minimizing the occurrence of discoloured water in homes. Manganese is found in the environment naturally from dissolution of minerals commonly found in soil and rock. Other sources include industrial discharges, mining activities and landfill leachate (Health Canada 2019b). Guidance on assessing, communicating and managing risks related to manganese in drinking water can be found in the B.C. Ministry of Health Mn guidance document (HLTH 2019b).

### 1.29 Mercury (Hg)

SDWQG: 0.001 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's total Hg guideline of 0.001 mg/L (Health Canada 1986b) which includes all possible forms of mercury in water. In the environment, mercury poses many risks to human health. Mercury is a potent neurotoxin, particularly to infants and children. It also biomagnifies in the food chain and has carcinogenic effects (Health Canada 1986b). Mercury enters the aquatic environment through industrial effluent spills, disposal of waste, run-off from agricultural pesticides (Health Canada 2019b).

### 1.30 Methyl Tertiary-Butyl Ether (MTBE)

SDWQG: 0.015 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's MTBE guideline of 0.015 mg/L (Health Canada 2006b). This guideline prevents odours that make water unpalatable. The guideline is lower than concentrations associated with potential toxic effects and is therefore also considered protective of human health. MTBE enters the aquatic environment through gasoline refinery spills, boats using gasoline and groundwater seepage from storage tank leaks (Health Canada 2019b).

### 1.31 Microbiological Parameters & Bacteriological Indicators of Waterborne Pathogens:

Microbiological SDWQGs help protect and manage drinking water sources to avoid bacterial contamination from anthropogenic and/or natural sources. As analytical methods and costs limit the ability to monitor for specific pathogens of concern in drinking water sources, bacteriological indicator organisms are measured as an indicator of the possible presence of disease-causing pathogens (Health Canada 2013a).

Microbiological pathogens are considered the most significant threat to public health in drinking water because the effects can be acute; if ingested, pathogens can cause gastrointestinal illness within hours or days. The three main types of pathogens that pose a risk to human health in drinking water are viruses, bacteria and protozoa (HLTH 2012). The microorganisms typically identified as potential threats to Canadian drinking water supplies include the bacterium *E. coli* O157:H7 and the protozoa *Cryptosporidium* and *Giardia* (CCME 2004). For additional information on enteric protozoa and enteric viruses, refer to Health Canada 2019e and Health Canada 2019e, respectively.

Source water protection and water treatment are two key components of the multi-barrier approach for drinking water protection. The SDWQGs in this section apply to source water. Potable drinking water must meet the drinking water treatment objectives for [surface water](#) and [groundwater](#) of no detectable *E. Coli*, fecal coliforms and total coliforms. These are minimum performance targets for water suppliers to treat water to produce microbiologically safe drinking water (HLTH 2012). To protect drinking water sources against pathogens, quantitative microbial

risk assessment can be used by drinking water suppliers to quantify the health risks from potential microorganisms (Health Canada 2019h). The actual amount of treatment required will depend on the risks identified and may require greater levels of treatment (HLTH 2012).

### **1.31.1 Fecal Coliforms**

SDWQG: Archived

**Rationale:** B.C. has archived the bacteriological indicator fecal coliforms as they are a poor risk indicator for illness in humans. Fecal coliform standards under the *Drinking Water Protection Regulation* remain unchanged.

### **1.31.2 Escherichia coli**

SDWQG:  $\leq 10$  *E. coli* /100 mL; 90<sup>th</sup> percentile (minimum of 5 samples)

**Rationale:** B.C. uses the ENV (1988) fecal microbiological indicator *E. coli* for estimating pathogen contamination in drinking water sources. *E. coli* is the only member of the coliform group specific to the feces of warm-blooded animals and outnumbers the other thermotolerant coliforms in both human and animal excreta (WHO 2011a). The SDWQG of  $\leq 10$  *E. coli* /100 mL is a benchmark to protect current and future drinking water sources. Water for drinking must meet the *E. coli* water quality standard for potable water of no detectable *E. coli* for surface water (HLTH 2012) and groundwater (HLTH 2015) as specified under the *Drinking Water Protection Regulation*.

The presence of *E. coli* in water indicates fecal contamination and thus the potential for health risks, regardless of whether specific pathogens such as enteric protozoa or viruses are detected. However, the absence of *E. coli* does not necessarily indicate that enteric protozoa or viruses are also absent (Health Canada 2012). See Health Canada (2012) for more information on *E. coli* in drinking water.

### **1.31.3 Enterococci**

SDWQG:  $\leq 3$  enterococci /100 mL; 90<sup>th</sup> percentile (minimum of 5 samples)

**Rationale:** B.C. uses the ENV (1988) fecal microbiological indicator enterococci. Enterococci are the preferred fecal bacterial indicator in reservoirs, sewage contaminated waters and marine waters. Most enterococci species do not multiply in water and have an advantage over *E. coli* in that they survive longer in water (WHO 2011a).

## **1.32 Molybdenum (Mo)**

SDWQG: 0.088 mg/L (MAC)

**Rationale:** An updated total Mo guideline of 0.088 mg/L has been developed. This B.C. specific guideline is a health-based value protective of all age groups and replaces the ENV 1986 guideline of 0.25 mg/L. The Mo SDWQG was developed for B.C. as most Mo mining in Canada occurs in B.C. and Health Canada does not have a Mo guideline. Median background Mo concentrations in B.C. range from 0.072 µg/L on Vancouver Island to 0.820 µg/L in the Thompson Region. This guideline was derived using the Health Canada drinking water quality derivation equation, toxicity reference values from Health Canada (2010c) and receptor characteristics from Canadian studies (Richardson 2013). The SDWQG value is similar to guidelines from the United States Environmental Protection Agency (US EPA) (2018) of 0.04 mg/L and a value recommended by the WHO (2011b) of 0.07 mg/L. Mo is a trace element considered essential in human nutrition; however excessive intake may present toxic risks (Health Canada 2010d). Runoff over Mo-bearing mineral deposits and drainage from Mo mines are known sources of Mo in B.C. surface waters (ENV 1986; British Columbia Ministry of Energy and Mines 1998).

### 1.33 Monochlorobenzene

SDWQG: 0.08 mg/L (MAC), 0.03 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's monochlorobenzene guideline to protect against reduced survival and weight gain (Health Canada 1987d). Monochlorobenzene is a chlorinated aromatic compound used as a solvent for adhesives. It enters the aquatic environment in releases or spills of industrial effluents (Health Canada 2019b).

### 1.34 Nickel (Ni)

SDWQG: 0.08 mg/L (MAC)

**Rationale:** The B.C. CSR total Ni drinking water standard of 0.08 mg/L was adopted as a SDWQG (ENV 2019b). This standard is a health-based guideline based on the 2019 United States EPA Regional Screening Levels for tapwater (EPA 2019) and is consistent with the Health Canada recommended toxicity reference value for soluble nickel. Nickel enters the aquatic environment through natural and anthropogenic sources such as the erosion of rock and minerals and burning of fossil fuels (CCREM 1987).

### 1.35 Nitrate

SDWQG: 45 mg/L as nitrate (10 mg/L as nitrate-nitrogen) (MAC)

**Rationale:** B.C. uses Health Canada's nitrate guideline (Health Canada 2013b). This guideline is based on the no observed adverse effect level (NOAEL) for infantile methaemoglobinaemia and effects on thyroid gland function in bottle-fed infants in North American populations. Critical health effects from nitrate are based on short-term exposure. Nitrate enters the aquatic environment from natural sources, in runoff from agriculture or in domestic sewage discharges (Health Canada 2019b).

### 1.36 Nitrilotriacetic acid (NTA)

SDWQG: 0.4 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's NTA guideline of 0.4 mg/L to protect against kidney effects. NTA is an inorganic chemical classified as a probable carcinogen, however the guideline is not based on the cancer endpoint. This guideline is based on the rapid degradation of NTA in the environment and currently available analytical methods. NTA is used as an industrial chelating agent and as a replacement for phosphates in detergents. NTA enters the aquatic environment in sewage discharges (Health Canada 1990).

### 1.37 Nitrite

SDWQG: 3.0 mg/L as nitrite (1.0 mg/L as nitrite-nitrogen) (MAC)

**Rationale:** B.C. uses Health Canada's nitrite guideline (Health Canada 2013b). This guideline is based on the NOAEL for infantile methaemoglobinaemia in bottle-fed infants less than 6 months of age in North American populations. Critical health-effects from nitrite are based on short-term exposure. Nitrite enters the aquatic environment from natural sources, in runoff from agriculture, or in domestic sewage discharges (Health Canada 2019b).

### 1.38 Total Organic Carbon (TOC)

SDWQG: 4.0 mg/L (MAC)

**Rationale:** B.C. uses the ENV TOC guideline of 4.0 mg/L (ENV 1998). This MAC is based on evidence from the EPA's Disinfectants and Disinfection-By-Products rule and other studies (ENV 1998) which indicated the risk of exceeding the Health Canada trihalomethane (THM) guideline of 0.1 mg/L (Health Canada 2009b) is minimized with TOC levels at or below 4.0 mg/L in drinking water sources. As the health-based MAC for THMs is 0.08 mg/L (the 0.1 mg/L guideline is based on financial implications for treatment), keeping the TOC as low as reasonably achievable in source waters will help minimize THM formation during treatment. Every effort should be made to keep TOC in drinking water sources as low as reasonably achievable.

### 1.39 Perfluorooctanoic Acid (PFOA)

SDWQG: 0.0002 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's PFOA guideline of 0.0002 mg/L to prevent liver damage and adverse developmental effects. PFOA is a synthetic chemical used in consumer products and fire-fighting foams for its oil and water and repellent properties (Health Canada 2018c). Health Canada (2018c) recommends that drinking water suppliers examine source waters to assess PFOA and perfluorooctane sulfonate (PFOS) concentrations (see S. 1.40), especially near firefighting training areas, waste disposal sites, military bases, airports, and/or manufacturing areas. Health Canada (2018c) also recommends an additive approach for PFOS and PFOA. When PFOS and PFOA occur together in drinking water sources, the ratio of the observed concentration to the MAC should be calculated for both chemicals. These ratios should be summed, and the total should not exceed 1.

### 1.40 Perfluorooctane Sulfonate (PFOS)

SDWQG: 0.0006 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's PFOS guideline of 0.0006 mg/L to prevent liver and thyroid damage and adverse effects to the immune system. PFOS is a synthetic chemical used in consumer products and fire-fighting foams for its oil and water and repellent properties (Health Canada 2018d). Health Canada (2018d) recommends that drinking water suppliers examine source waters to assess PFOA (see S. 1.38) and PFOS concentrations, especially near firefighting training areas, waste disposal sites, military bases, airports, and/or manufacturing areas. Health Canada (2018c) also recommends an additive approach for PFOS and PFOA. When PFOS and PFOA occur together in drinking water sources, the ratio of the observed concentration to the MAC should be calculated for both chemicals. These ratios should be summed, and the total should not exceed 1.

### 1.41 Phosphorus (P), Total

SDWQG: 0.01 mg/L (AO). For lakes with residence time > 6 months, measure total P during spring overturn. For lakes with residence time < 6 months, measure mean epilimnetic total P during the growing season (ENV 1985).

**Rationale:** B.C. uses the ENV (1985) guideline of 0.01 mg/L as Health Canada does not have a drinking water guideline for P. There is a well-defined relationship between P, generally measured at spring overturn, and the amount of algal biomass in a lake during the growing season. A P SDWQG is recommended to reduce the risks of algal blooms and impairment of drinking water sources during the growing season (ENV 1985).

## 1.42 Polycyclic Aromatic Hydrocarbons (Carcinogenic)

SDWQG: 0.00004 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's benzo[a]pyrene (B[a]P) guideline of 0.00004 mg/L, representing total carcinogenic polycyclic aromatic hydrocarbons (PAH) as B[a]P total potency equivalents (TPE). This guideline includes carcinogenic PAHs other than B[a]P which are typically present when B[a]P is detected and therefore could cause an exceedance of the guideline if not accounted for. B[a]P and the set of PAHs below are a concern due to their carcinogenic effects to humans (Health Canada 2016). TPE is calculated by multiplying the concentration of each PAH in a sample by its B[a]P Potency Equivalence Factor given below and summing the products.

### Benzo[a]pyrene Potency Equivalence Factors

Benz[a]anthracene: 0.1

Benzo[a]pyrene: 1

Benzo[b+j+k]fluoranthene: 0.1

Chrysene: 0.01

Benzo[g,h,i]perylene: 0.01

Dibenz[a,h]anthracene: 1

Indeno[1,2,3-c,d]pyrene: 0.1

B[a]P sources include the incomplete combustion of organic matter from forest fires, municipal sewage effluent, oil spills and petroleum refinery wastewater. This guideline is based on a cancer risk of 1 in 1,000,000 instead of 1 in 100,000 to account for other sources of exposure like food (Health Canada 2019b).

## 1.43 Selenium (Se)

SDWQG: 0.01 mg/L (MAC)

**Rationale:** B.C. uses the ENV (2014) Se guideline of 0.01 mg/L. In 2015, Health Canada revised their Se MAC from 0.01 mg/L to 0.05 mg/L. At that time, HLTH determined that 0.01 mg/L was appropriate to prevent health risks from Se exposure conditions in B.C. (HLTH 2017b). Health risks include chronic selenosis when exposed to high levels. Selenium enters the aquatic environment through the natural erosion of rock and soil, or industrial releases from coal-fired power plants, mining and metal refining (Health Canada 2019b).

## 1.44 Strontium (Sr)

SDWQG: 7.0 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's total Sr guideline of 7.0 mg/L (Health Canada 2019g) to prevent adverse bone effects in infants. Strontium enters the environment from natural sources (rock and soil weathering) or industrial activities including mining (Health Canada 2019g).

## 1.45 Sulfolane

SDWQG: 0.09 mg/L (MAC)

**Rationale:** The B.C. CSR sulfolane drinking water standard of 0.09 mg/L was adopted as a SDWQG (ENV 2019b). This standard is a health-based value specific to the protection of human health with a toxicological reference value protective of adults. Sulfolane is an organic chemical and enters the environment through its use in the sweetening (i.e. removal of acidic gasses) of natural gas (ENV 2003c).



### 1.46 Sulphate

SDWQG: 500 mg/L (AO)

**Rationale:** B.C. uses Health Canada's sulphate guideline of 500 mg/L (Health Canada 1994b). Concentrations above 500 mg/L in drinking water can cause diarrhea and dehydration. This AO also protects against unpleasant taste in drinking water. Sulphate enters the aquatic environment from industrial waste products (Health Canada 2019b).

### 1.47 Temperature

SDWQG: 15°C (AO)

**Rationale:** B.C. uses Health Canada's temperature guideline of 15°C (Health Canada 1979b). Although temperature does not have a direct relationship to health, the importance of temperature is recognized as a determinant of other water quality parameters that directly affect human health. Water temperature may be affected by current and projected climate change trends and water levels as dry and wet periods intensify. Maintenance of the water temperature at or below this level offers several additional advantages including maintaining residual chlorine levels and discouraging the growth of nuisance organisms leading to unpleasant tastes and odours.

### 1.48 Tetrachloroethylene

SDQWG: 0.01 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's tetrachloroethylene guideline of 0.01 mg/L to prevent neurological and carcinogenic effects (Health Canada 2015). Tetrachloroethylene is an organic chemical which enters the environment through anthropogenic spills or other point source of contamination. It is primarily a concern in groundwater (Health Canada 2019b).

### 1.49 Toluene

SDQWG: 0.06 mg/L (MAC), 0.024 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's toluene guidelines (Health Canada 2014a). The AO is based on a threshold concentration to reduce taste and odour issues while the MAC is based on adverse neurological effects that may occur at concentrations greater than 0.06 mg/L. Toluene is an organic chemical found in the environment from anthropogenic emissions, effluents or spills from petroleum and chemical industries (Health Canada 2019a).

### 1.50 Trichloroethylene

SDQWG: 0.005 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's trichloroethylene guideline to prevent developmental and carcinogenic effects. Trichloroethylene is classified as a probable carcinogen and is used as a volatile solvent in the automotive and metals industries for degreasing and cleaning (Health Canada 2005b). It enters the aquatic environment through improper disposal and industrial effluents (Health Canada 2019b).

## 1.51 Turbidity

SDQWG:

Current or Future Water Use	Guideline
Raw drinking water without treatment for particulates	$\leq 1$ NTU* of turbidity
Raw drinking water with treatment for particulates	Natural background turbidity is $\leq 50$ NTU: Change from background <sup>†</sup> should not exceed 5 NTU
	Natural background turbidity is $> 50$ NTU: Change from background should not exceed 10% of the background turbidity

<sup>†</sup>There are operational and pre-operational background levels. Operational background levels are based on comparisons to levels measured at upstream control sites. Pre-operational background levels are based on historical background levels (ENV 1997b).

\* NTU is the abbreviation for Nephelometric Turbidity Units, the unit turbidity is measured in.

**Rationale:** B.C. uses the ENV (1997b) guidelines for raw drinking water with treatment for particulates and HLTH (2012) for raw drinking water without treatment for particulates. Health Canada's turbidity guideline is not appropriate for source waters as it is an operational water treatment guideline specific to water treatment filter type.

For source waters of exceptional clarity which normally do not require treatment to reduce natural turbidity, total turbidity should not exceed 1 NTU. This level is adopted from the turbidity treatment objective for potable surface water (HLTH 2012). See the [drinking water treatment objectives for surface water](#) in B.C. for more information. For raw waters that normally require treatment to reduce natural turbidity to a level which meets the drinking water treatment objective for turbidity of  $\leq 1$  NTU, change from background should not exceed 5 NTU when background turbidity is  $\leq 50$  NTU. When background levels are  $> 50$  NTU, the change from background should not be more than 10% of background turbidity.

Turbidity is caused by biotic and abiotic suspended or dissolved substances in the water body and often represent a microbiological risk to drinking water. Given the large variation in natural background turbidity levels in B.C., SDWQGs for turbidity are based on change from background turbidity. Minimizing change from background turbidity in source water decreases the level of water treatment and cost required for safe consumption (ENV 1997b).

## 1.52 Uranium (U)

SDWQG: 0.02 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's guideline of 0.02 mg/L for total naturally occurring U (chemical effects, not radiological) to prevent adverse kidney effects (Health Canada 2019i). This guideline value is based on the chemical toxicity of naturally occurring U and considers drinking water treatment achievability. Increases to background concentrations should be minimized to decrease risks to human health. Based solely on health considerations, Health Canada (2019i) calculated a health-based value of 0.014 mg/L. Uranium enters the aquatic environment through the weathering and leaching of natural deposits, volcanic eruptions, mill tailings, nuclear industry emissions, phosphate fertilizers and the combustion of fossil fuels (Health Canada 2019i).

### 1.53 Vinyl Chloride

SDQWG: 0.002 mg/L (MAC)

**Rationale:** B.C. adopts Health Canada's vinyl chloride guideline to prevent liver cancer and other effects (Health Canada 2013c). Vinyl chloride is a synthetic chemical which is classified as a human carcinogen, therefore Health Canada recommends levels should be kept as low as reasonably achievable below the guideline. It enters the aquatic environment from industrial effluents, as a degradation product from organic solvents in groundwater and, to a small extent, leaching from polyvinyl chloride pipes (Health Canada 2019b).

### 1.54 Xylenes, Total

SDWQG: 0.09 mg/L (MAC), 0.02 mg/L (AO)

**Rationale:** B.C. adopts Health Canada's guidelines for total xylenes to protect drinking water sources from unpleasant odours and human health from adverse neuromuscular effects (Health Canada 2014a). Xylenes are organic chemicals which enter the environment through anthropogenic emissions, effluents or spills from petroleum and chemical industries (Health Canada 2019b).

### 1.55 Zinc (Zn)

SDWQG: 3.0 mg/L (MAC), 5.0 mg/L (AO)

**Rationale:** The B.C. CSR total Zn drinking water standard of 3.0 mg/L was adopted as a SDWQG (ENV 2019b). This value is specific to the protection of human health and was derived using a toxicological reference value protective of adults. B.C. will continue to use Health Canada's Zn AO guideline of 5.0 mg/L to prevent an undesirable bitter taste and the formation of a greasy film when water is boiled (Health Canada 1979c). Zinc enters the aquatic environment through natural (e.g., erosion) and anthropogenic sources (e.g., zinc mining effluent) (ENV 1999).

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