

British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture

Summary Report

Water Protection & Sustainability Branch

Ministry of Environment & Climate Change Strategy

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Updates from the 2018 version:

- The copper WQG (Table 12a and 12b) has been updated to reflect the updated B.C. copper WQG for the protection of aquatic life.
- Livestock and Irrigation WQGs for pH (Table 30) were added.
- Sediment WQGs were removed for PAHs (Table 33). These were rescinded in 2017. WQGs for PAHs in sediments can be found in the working WQGs.

Updates from the 2017 version:

- In table 46, the term “short-term average” was corrected to “short-term maximum”.

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Introduction

This document summarizes the British Columbia (B.C.) approved water quality guidelines (WQGs). This document will be updated periodically to incorporate new information and represent the best guidance the Ministry of Environment and Climate Change Strategy (ENV) can provide at the time of publication but may not contain the most recent additions or updates to the B.C. approved WQGs at any one time. Readers should refer to the [WQGs website](#) for the most recent approved WQG documents.

BC's approved water quality guidelines

Many jurisdictions develop WQGs to protect water quality. B.C.'s WQGs represent safe levels of substances that protect different water uses, including: drinking water, recreation, aquatic life, wildlife and agriculture. Approved WQGs for aquatic life, wildlife and agriculture are summarized in this document. In B.C., the definition of water quality includes the sediments, therefore WQG documents may include sediment quality values.

WQGs provide policy direction to those making decisions affecting water quality. Although WQGs do not have any direct legal standing, once approved, BC WQGs must be considered in any decision affecting water quality made within the ENV. WQGs are used to assess water quality and may be used as the basis for determining the allowable limits in waste discharge authorizations. Exceeding a WQG does not imply that unacceptable risks exists, but rather that the potential for adverse effects may be increased and additional investigation may be required. BC's approved WQGs are located at: <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines>.

All of the WQGs reported in this document are ambient guidelines, meaning they represent the background condition or natural state of the surrounding environment.

Long-term chronic and short-term acute water quality guidelines

Long-term chronic (i.e., "average") WQGs are intended to protect the most sensitive species and life stage against sub-lethal and lethal effects for indefinite exposures. An averaging period approach is used for these WQGs. This approach allows concentrations of a substance to fluctuate above and below the guideline provided that the short-term acute is never exceeded and the long-term chronic is met over the specified averaging period (e.g., 5 samples in 30 days).

The averaging period for the long-term chronic WQG may differ depending on the substance under investigation and is somewhat arbitrary. These averaging periods were chosen as reasonable and practical durations to address long-term effects and to fit into monitoring timetables for provincial agencies. Five samples are considered the minimum needed to calculate the average; however, in some cases where the concentrations fluctuate widely in nature, more than 5 samples may be necessary. On the other hand, if concentrations are uniform and rarely exceed the long-term average guideline, less frequent monitoring may be justified. In this case, failure of any individual sample to meet the long-term average guideline would serve as an alert signal to increase the monitoring frequency.

Short-term acute (i.e., "maximum") WQGs are set to protect against severe effects such as lethality (e.g. LC₅₀) or other equivalent measures (e.g., EC₅₀) to the most sensitive species and life stage over a defined short-term exposure period (e.g., 96 hours).

Interim water quality guidelines

An interim WQG can be developed in cases where there are insufficient data available to meet the minimum requirements of a full guideline. The interim WQGs may be upgraded to approved WQG status when the data gap is filled. While interim and working WQGs are both intended to be temporary, only the latter are based on guidelines approved elsewhere.

Working water quality guidelines

For substances that are relevant to B.C. but do not have formally approved WQGs, working water quality guidelines (WWQGs) and working sediment quality guidelines (WSQGs) are adopted. The WWQGs and WSQGs may be based on historic information or different derivation protocols from a number of different agencies and, therefore, should be used with caution.

The WWQGs are obtained from various Canadian provincial and federal jurisdictions (primarily the Canadian Council of the Ministers of the Environment or CCME), as well as the United States, Europe, and Australia/New Zealand, and from published scientific literature. WWQGs provide benchmarks for those substances that have not yet been fully assessed and formally endorsed by the ENV.

In addition to developing WQGs, many jurisdictions develop sediment guidelines to serve as benchmarks for the protection of benthic aquatic life in freshwater and marine environments. The WSQGs also provide benchmarks for those substances that have not yet been fully assessed and formally endorsed by the ENV and, like WWQGs, are obtained from other jurisdictions, including the CCME.

Hardness-based guidelines

Guidelines for five metals: cadmium, fluoride, lead, manganese and zinc, are given as an equation that includes a parameter for ambient hardness. Hardness, or the concentration of calcium and magnesium ions, is known to ameliorate the effect of certain metals on aquatic organisms. The guideline equations were derived from experimental data that tested a specific range of hardness and therefore the equation is only applicable within this range. Ambient hardness conditions outside this range may require a site-specific assessment. For more information on each individual WQG, please review the technical report.

How to use this document

This document presents only B.C.-approved WQGs. Water quality guideline summary tables are presented alphabetically, by substance. Each table includes explanatory notes and links to the appropriate technical document.

For WQGs that are dependent on other factors (e.g. pH, water hardness), worked examples are provided.

Users of this document are encouraged, when needed, to consult the technical reports for additional details and information on the WQGs presented here.

Water Quality Guidelines Summary Tables

Table 1. Water quality guidelines for aluminum (Al).

Water Use	Long-term Chronic WQG (mg/L)	Short-term Acute WQG (mg/L)
Freshwater Aquatic Life (pH < 6.5)	$WQG = e^{[1.6-3.327(\text{median pH})+0.402(\text{median pH})^2]}$ E.g. When median pH = 5.0 $WQG = 2.718^{[1.6-3.327(5.0)+0.402(5.0)^2]}$ $= 2.718^{[1.6-16.6375+0.402(25)]}$ $= 2.718^{[-4.9875]}$ $= 0.007$ (dissolved Al)	$WQG = e^{[1.209-2.426(\text{pH})+0.286(\text{pH})^2]}$ E.g. When pH = 5.0 $WQG = e^{[1.209-2.426(5.0)+0.286(5.0)^2]}$ $= 2.718^{[1.209-12.13+0.286(25)]}$ $= 2.718^{[-3.771]}$ $= 0.023$ (dissolved Al)
Freshwater Aquatic Life (pH ≥ 6.5)	0.05 (dissolved Al)	0.1 (dissolved Al)
Wildlife		5 (total Al)
Livestock		5 (total Al)
Irrigation		5 (total Al)

- *Long-term chronic WQGs* are calculated using the median of the pH values of the samples collected over the long-term averaging period.
- *Short-term acute WQGs* are calculated using the pH of the sample in question (instantaneous pH values).
- Source: *Water Quality Criteria for Aluminum: Overview Report (2001)*.

Table 2. Water quality guidelines for arsenic (As).

Water Use	Maximum WQG (µg/L total As)
Freshwater Aquatic Life	5
Marine Aquatic Life	12.5 *
Wildlife	25 *
Livestock	25 *
Irrigation	100 *

- * *Interim WQG*.
- Source: *Ambient Water Quality Guidelines for Arsenic: Overview Report (2002)*

Table 3. Water quality guidelines for benzene (C₆H₆).

Water Use	Long-term Chronic WQG (µg/L total C ₆ H ₆)
Freshwater Aquatic Life	40 *
Marine & Estuarine Aquatic Life	110 †

- * *Revised interim BC WQG* based on review of Canadian Council of Ministers of the Environment (1999) WQG.
- † *Interim Canadian Council of Ministers of the Environment (1999) WQG*.
- Source: *Ambient Water Quality Guidelines for Benzene: Overview Report (2007)*.

Table 4A. Water quality guidelines for boron (B).

Water Use	Long-term Chronic WQG (mg/L total B)
Freshwater & Marine Aquatic Life	1.2
Wildlife	5.0
Livestock	5.0
Irrigation	Crop-dependent, see Table 4B

- Source: *Ambient Water Quality Guidelines for Boron: Overview Report (2003)*.

Table 4B. Water quality guidelines for boron (B) to protect irrigation uses.

Tolerance	Long-term Chronic WQG (mg/L total B)	Agricultural Crop
Very Sensitive	< 0.5	Blackberry
Sensitive	0.5 – 1.0	Peach, cherry, plum, grape, cowpea, onion, garlic, sweet potato, wheat, barley, sunflower, mung bean, sesame, lupin, strawberry, Jerusalem artichoke, kidney bean, lima bean
Moderately Sensitive	1.0 – 2.0	Red pepper, pea, carrot, radish, potato, cucumber
Moderately Tolerant	2.0 – 4.0	Lettuce, cabbage, celery, turnip, Kentucky bluegrass, oat, corn, artichoke, tobacco, mustard, clover, squash, muskmelon
Tolerant	4.0 – 6.0	Sorghum, tomato, alfalfa, purple vetch, parsley, red beet, sugar beet
Very Tolerant	6.0 – 15.0	Asparagus

- Source: *Ambient Water Quality Guidelines for Boron: Overview Report (2003)*.

Table 5. Water quality guidelines for cadmium (Cd).

Freshwater Long-term Chronic WQG (µg/L dissolved Cd)	Freshwater Short-term Acute WQG (µg/L dissolved Cd)
$WQG = e^{[0.736 \times \ln(\text{hardness}^*) - 4.943]}$ E.g. Hardness = 50 mg/L CaCO ₃ $WQG = 2.718^{[0.736 \times \ln(50) - 4.943]}$ $= 2.718^{[0.736 \times 3.912 - 4.943]}$ $= 2.718^{-2.064}$ $= 0.127$	$WQG = e^{[1.03 \times \ln(\text{hardness}^{**}) - 5.274]}$ E.g. Hardness = 50 mg/L CaCO ₃ $WQG = 2.718^{[1.03 \times \ln(50) - 5.274]}$ $= 2.718^{[1.03 \times 3.912 - 5.274]}$ $= 2.718^{-1.245}$ $= 0.288$

- *Long-term chronic WQG applies to water hardnesses (mg/L CaCO₃) between 3.4 – 285 mg/L.
- **Short-term acute WQG applies to water hardnesses (mg/L CaCO₃) between 7 – 455 mg/L.
- When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.
- Source: *A User's Guide for the Ambient Water Quality Guidelines for Cadmium (2015)*.

- *Working WQGs for other water uses, and working Sediment Quality Guidelines, both for total Cd, are available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf*

Table 6. Water quality guidelines for chlorate (ClO_3^-).

Water Use	Long-term Chronic WQG (mg/L ClO_3^-)
Freshwater Aquatic Life	30
Marine Aquatic Life	5
Wildlife & Livestock	5

- Source: *Ambient Water Quality Guidelines for Chlorate: Technical Background Report (2002)*.

Table 7. Water quality guidelines for chloride (Cl^-).

Water Use	WQG (mg/L total Cl^-)
Freshwater Aquatic Life * Long-term Chronic Short-term Acute	150 600
Marine Aquatic Life	Human activities should not cause the Cl^- of marine and estuarine waters to fluctuate by more than 10% of the natural Cl^- expected at that time and depth.
Wildlife	600
Livestock	600
Irrigation	100

- * When *ambient* Cl^- concentrations exceed WQGs, increases in Cl^- due to human activities should be avoided.
- Source: *Ambient Water Quality Guidelines for Chloride: Overview Report (2003)*.

Table 8. Water quality guidelines for chlorine (Cl_2).

Water Use	WQG for Continuous Exposure ($\mu\text{g/L}$ TRC or CPO)	WQG for Controlled Intermittent Exposure ($\mu\text{g/L}$ TRC or CPO)	WQG for Short-term Controlled Intermittent Exposure ($\mu\text{g/L}$ TRC or CPO)
Freshwater Aquatic Life	2	1,074 (duration) ^{-0.74}	100 regardless of duration of exposure
Marine & Estuarine Aquatic Life	3	20.36 (duration) ^{-0.4}	40 regardless of duration of exposure
Irrigation			1,000

- TRC = total residual Cl_2 in fresh water, CPO = Cl_2 -produced oxidants in marine or estuarine water.
- The continuous exposure average should be based on at least 5 samples equally spaced in time, and the averaging period should be not be less than 4 days or more than 30 days for fresh water, and not less than 2 hours or more than 30 days for marine or estuarine water. This is the threshold of long-term toxicity.
- The duration in controlled intermittent exposures, the exposure period (min), is the threshold of short-term toxicity.
- For the maximum controlled intermittent exposure of aquatic life, the total duration of exposure in any consecutive 24-hour period should not exceed 2 hours, and is the threshold of short-term toxicity.

- The irrigation criterion applies to plants grown hydroponically or in soil-less media and should be applied as a maximum under continuous or intermediate exposure situations.
- Source: [Ambient Water Quality Criteria for Chlorine: Technical Appendix \(1989\)](#).

Table 9A. Water quality guidelines for chlorophenols (C₆H₅ClO).

Water Use	Short-term Acute WQG (mg/L)
Aquatic Life (Fresh, Marine & Estuarine Waters) - Toxicity WQGs for Aquatic Life	Use Table 9B
Livestock & Wildlife Drinking Water - Toxicity for Lactating Animals (High Temperatures & High Water Intake Rates)	MCPs: 185 DCPs: 46 TCPs: 21 TTCPs: 41 PCP: 17.5
Livestock & Wildlife Drinking Water - Toxicity for Non-Lactating Animals (Normal Temperatures & Low Water Intake Rates)	MCPs: 1,854 DCPs: 460 TCPs: 210 TTCPs: 410 PCP: 175

- DCPs = dichlorophenols, MCPs = monochlorophenols, PCPs = pentachlorophenols, TCPs = trichlorophenols, TTCPs = tetrachlorophenols.
- Source: [Ambient Water Quality Guidelines for Chlorophenol - First Update: Overview Report \(1997\)](#).

Table 9B. Water quality guidelines for chlorophenols (C₆H₅ClO) to protect aquatic life.

Chlorophenol Congeners	pH 5.7	pH 6.2	pH 6.7	pH 7.2	pH 7.7	pH 8.2	pH 8.7	pH 9.2
2-MCP	3.9	6.4	11	17	29	48	79	130
3-MCP	3.4	5.6	9.3	15	25	42	70	115
4-MCP	1.7	2.9	4.8	7.8	13	22	36	59
2,3-DCP	1.1	1.8	3.1	5.1	8.3	14	23	38
2,4-DCP	0.6	1.0	1.6	2.6	4.3	7.2	12	20
2,5-DCP	0.5	0.8	1.4	2.3	3.7	6.3	10	17
2,6-DCP	2.0	3.3	5.5	9.1	15	25	41	68
3,4-DCP	0.6	1.0	1.6	2.7	4.4	7.4	12	20
3,5-DCP	0.59	0.7	1.2	2.0	3.4	5.6	9.2	15
2,3,4-TCP	0.5	0.8	1.3	2.2	3.6	6.0	9.9	16
2,3,5-TCP	0.5	0.8	1.3	2.2	3.7	6.1	10	17
2,3,6-TCP	1.6	2.6	4.4	7.2	12	20	33	54
2,4,5-TCP	0.5	0.7	1.2	2.0	3.3	5.6	9.2	15
2,4,6-TCP	1.2	1.9	3.2	5.3	8.8	15	24	40
3,4,5-TCP	0.2	0.3	0.5	0.9	1.4	2.4	3.9	6.4
2,3,4,5-TTCP	0.4	0.6	1.0	1.7	2.8	4.7	7.8	13
2,3,4,6-TTCP	1.1	1.84	2.9	4.9	8.0	13	22	36
2,3,5,6-TTCP	0.5	0.8	1.3	2.2	3.6	6.1	10	17
2,3,4,5,6-PCP	0.2	0.3	0.5	0.7	1.2	2.0	3.4	5.5

- DCPs = dichlorophenols, MCPs = monochlorophenols, PCPs = pentachlorophenols, TCPs = trichlorophenols, TTCPs = tetrachlorophenols.
- All values are *short-term acute* (µg/L).
- Multiply values by 2 when temperature is 0 °C and by 0.5 for 20 °C.

- These are final WQGs for PCP and *interim WQGs* for the other chlorophenol congeners.
- Source: [Ambient Water Quality Guidelines for Chlorophenol - First Update: Overview Report \(1997\)](#).

Table 10. Water quality guidelines for cobalt (Co).

Water Use	WQG (µg/L total Co)
Freshwater Aquatic Life	
Long-term Chronic	4
Short-term Acute	110

- Source: [Ambient Water Quality Guidelines for Cobalt: Overview Report \(2004\)](#).

Table 11. Water quality guidelines for colour.

Water Use	Colour Units	WQG
Aquatic Life - Fresh, Marine & Estuarine	Apparent	30-day average transmission of white light ≥ 80% of background
Aquatic Life - Fresh, Marine & Estuarine	True	30-day average true colour of filtered water samples shall not exceed background levels by more than 5 mg/L Pt in clear water systems or 20% in coloured systems
Wildlife	Apparent	30-day average transmission of white light ≥ 80% of background
Wildlife	True	30-day average true colour of filtered water samples shall not exceed background levels by more than 5 mg/L Pt in clear water systems or 20% in coloured systems

- Source: [Ambient Water Quality Guidelines \(Criteria\) for Colour: Overview Report \(1999\)](#).

Table 12a. Water quality guidelines for copper (Cu).

Water Use	Long-term Chronic WQG (µg/L total Cu)	Short-term Acute WQG (µg/L total Cu)
Freshwater Aquatic Life (dissolved)	Calculated using BC BLM*	Calculated using BC BLM
Marine & Estuarine Aquatic Life (total)	≤ 2	3
Wildlife (total)		300
Livestock (total)		300
Irrigation (total)		200

- * Water chemistry (e.g. pH, DOC and hardness) is needed to calculate Cu WQGs using BC BLM. Examples of calculated Cu WQGs are provided in Table 12b.
- If natural background levels exceed the WQGs for aquatic life, then any allowed increase in total Cu above natural levels should be based on site-specific data.
- Source: [Copper Water Quality Guideline for the Protection of Freshwater Aquatic Life-User's Guide](#).
- Working WQGs for other water uses, and working Sediment Quality Guidelines are available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf

- **Table 12b.** Examples of long-term chronic and short-term acute WQGs calculated for eight different water chemistry scenarios.

Scenario	Water Chemistry Conditions				Chronic WQG (µg/L dissolved Cu)	Acute WQG (µg/L dissolved Cu)
	Temperature (°C)	Hardness (mg/L)	DOC (mg/L)	pH		
1	15	30	3	6.5	0.2	0.9
2	15	30	3	8	1.2	7.3
3	15	30	12.5	6.5	0.6	3.8
4	15	30	12.5	8	5.1	30.2
5	15	150	3	6.5	0.2	1.6
6	15	150	3	8	2.0	11.4
7	15	150	12.5	6.5	1.0	6.8
8	15	150	12.5	8	8.1	46.9

Table 13. Water quality guidelines for cyanide (CN⁻).

Water Use	WQG (µg/L Weak-acid Dissociable CN ⁻)
Freshwater Aquatic Life - Long-term Chronic	≤ 5
Freshwater Aquatic Life - Short-term Acute	10
Marine & Estuarine Aquatic Life - Short-term Acute	1

- Source: [Water Quality Criteria for Cyanide: Overview Report \(1986\)](#).

Table 14. Water quality guidelines for diisopropanolamine (DIPA).

Water Use	WQG (µg/L DIPA)
Freshwater Aquatic Life	1.6
Livestock	38
Irrigation	3.9

- Source: [Ambient Water Quality Guidelines for Diisopropanolamine \(DIPA\): Overview Report \(2003\)](#).

Table 15. Water quality guidelines for ethylbenzene (C₈H₁₀).

Water Use	Long-term Chronic WQG (mg/L ethylbenzene)
Freshwater Aquatic Life	0.20 *
Marine Aquatic Life	0.25 *

- * Revised [interim BC WQGs](#) based on review of Canadian Council of Ministers of the Environment (1996) WQGs.
- Source: [Ambient Water Quality Guidelines for Ethylbenzene: Overview Report \(1999\)](#).

Table 16. Water quality guidelines for fluoride (F⁻).

Water Use	Long-term Chronic WQG (mg/L total F ⁻)	Short-term Acute WQG (mg/L total F ⁻)
Freshwater Aquatic Life (Water hardness ≤ 10 mg/L)		0.4
Freshwater Aquatic Life (Water hardness > 10 mg/L)		WQG = [-51.73 + 92.57 log ₁₀ (hardness*)] × 0.01 E.g. When hardness = 50 mg/L CaCO ₃ WQG = [-51.73 + 92.57 log ₁₀ (50)] 0.01 = [-51.73 + 92.57(1.699)] 0.01 = [105.544] 0.01 = 1.055
Marine Aquatic Life		1.5
Wildlife	1.0	1.5
Dairy Cows, Breeding Stock - Long-Lived Animals	1.0	1.5
Livestock - High F ⁻ Diets, Mineral or Bone Meal, Feed Additives	1.0	2.0
All Other Livestock - Normal Diet	2.0	4.0
Irrigation - All Soils	1.0	2.0

- *Short-term acute WQG equation applies to water hardness between 10 – 385 mg/L CaCO₃, and is an interim WQG until carefully controlled experiments can determine the appropriate levels of F⁻ under various combinations of water temperature and hardness.
- When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.
- The Okanagan Valley is the only area in BC where background values generally exceed 0.2, and even there levels do not generally exceed 0.3.
- Source: [Ambient Water Quality Criteria for Fluoride \(1995, 2011\)](#).

Table 17. Water quality guidelines for total gas pressure (TGP).

Water Use	WQG (mm Hg TGP)
Freshwater & Marine Aquatic Life	Short-term acute $\Delta P \leq 76$ (or $\leq 110\%$ at sea level)
Background Levels Higher than WQGs	No increase in ΔP or % TGP
Hatchery Environments	Short-term acute $\Delta P = 24$ (or 103% at sea level); $\Delta P = 0$ when $p O_2 \leq 100$

- ΔP = excess gas pressure (mm Hg), $p O_2$ = partial pressure of dissolved oxygen in (mm Hg).
- Source: [Water Quality Guidelines for Total Gas Pressure: First Update \(2004\)](#).

Table 18. Water quality guidelines for iron (Fe).

Water Use	Form	Short-term acute WQG (mg/L)
Freshwater Aquatic Life	Total Fe	1
	Dissolved Fe	0.35

- Source: *Ambient Aquatic Life Guidelines for Iron: Overview Report (2008)*.
- Working WQGs for other water uses, and working Sediment Quality Guidelines are available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf

Table 19. Water quality guidelines for lead (Pb).

Water Use	Long-term Chronic WQG (µg/L total Pb)	Short-term Acute WQG (µg/L total Pb)
Freshwater Aquatic Life (Water Hardness ≤ 8 mg/L CaCO ₃)		3
Freshwater Aquatic Life (Water Hardness > 8 mg/L CaCO ₃)	$WQG \leq 3.31 + e^{[1.273 \ln(\text{hardness}^*) - 4.704]}$ E.g. Hardness = 50 mg/L CaCO ₃ $WQG \leq 3.31 + 2.718^{[1.273 \ln(50) - 4.704]}$ $\leq 3.31 + 2.718^{[1.273(3.912) - 4.704]}$ $\leq 3.31 + 2.718^{[0.276]}$ $\leq 3.31 + 1.318$ ≤ 4.628 In addition, no more than 20% (e.g. 1 in 5) of values in a 30-day period should exceed 1.5 times the long-term chronic WQG .	$WQG = e^{[1.273 \ln(\text{hardness}^*) - 1.460]}$ E.g. Hardness = 50 mg/L CaCO ₃ $WQG = 2.718^{[1.273 \ln(50) - 1.460]}$ $= 2.718^{[1.273(3.912) - 1.460]}$ $= 2.718^{[3.520]}$ $= 33.785$
Marine & Estuarine Aquatic Life	≤ 2 total lead (80% of values ≤ 2 total lead)	140
Wildlife		100
Livestock		100
Irrigation (Neutral & Alkaline Fine-Textured Soils)		400
Irrigation (All Other Soils)		200

- *Long-term chronic and short-term acute WQGs both apply to water hardnesses between 8 – 360 mg/L CaCO₃.
- If natural levels exceed the WQGs for aquatic life, then any allowed increase in total Pb above natural levels should be based on site-specific data.
- When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.
- Source: *Water Quality Criteria for Lead: Overview Report (1987)*.
- Working WQGs for other water uses, and working Sediment Quality Guidelines are available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf

Table 20. Water quality guidelines for manganese (Mn).

Freshwater Long-term Chronic WQG (mg/L total Mn)	Freshwater Short-term Acute WQG (mg/L total Mn)
WQG $\leq 0.0044 \text{ hardness}^* + 0.605$ E.g. When hardness = 50 mg/L CaCO ₃ WQG $\leq 0.0044(50) + 0.605$ ≤ 0.825	WQG $\leq 0.01102 \text{ hardness}^{**} + 0.54$ E.g. When hardness = 50 mg/L CaCO ₃ WQG $\leq 0.01102(50) + 0.54$ ≤ 1.091

- *Long-term average WQG applies to water hardness between 37 – 450 mg/L CaCO₃.
- **Short-term maximum WQG applies to water hardness between 25 – 259 mg/L CaCO₃.
- When water hardness is outside hardness range tested (i.e. lower or upper bound), a site-specific assessment may be required.
- Source: *Ambient Water Quality Guidelines for Manganese: Overview Report (2001)*.
- Working WQGs for other water uses, and working Sediment Quality Guidelines are available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf.

Table 21. Water quality guidelines for mercury (Hg).

Water Use	Long-term Chronic WQG (µg/L total Hg)	Short-term Acute WQG (µg/L total Hg)
Aquatic Life (Freshwater, Estuarine & Marine) * & Wildlife	WQG = $0.0001 / (\text{MeHg}/\text{total Hg})$, where MeHg is mass (or concentration) of methyl mercury and THg is total mass (or concentration) of mercury in a given water volume E.g. MeHg = 1 g and total Hg = 100 g WQG = $0.0001 / (1/100)$ = 0.01 Note: When MeHg $\leq 0.5\%$ of total Hg, WQG = 0.02	
Livestock		3.0
Irrigation		2.0

- * If natural levels exceed the WQGs for aquatic life, then any increase allowed above the natural levels should be based on site-specific data.
- Source: *Ambient Water Quality Guidelines for Mercury: Overview Report – First Update (2001)*. Working WQGs for other water uses, and working Sediment Quality Guidelines are available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf.

Table 22. Tissue residue guideline for methyl mercury (MeHg).

Water Use	WQG (µg/g wet weight MeHg)
In Fish or Shellfish Consumed by Wildlife	0.033

- Source: *Ambient Water Quality Guidelines for Mercury: Overview Report – First Update (2001)*.

Table 23. Water quality guidelines for methyl tert-butyl ether, MTBE (C₅H₁₂O).

Water Use	Short-term Acute WQG (mg/L total MTBE)
Freshwater Aquatic Life	3.4
Marine & Estuarine Aquatic Life	0.44
Livestock *	11.0

- * Concentrations above the taste and odour thresholds that are below the livestock WQG may result in certain livestock avoiding water, reducing consumption, and suffering adverse effects.
- Source: [Ambient Water Quality Guidelines for Methyl Tertiary-butyl Ether \(MTBE\) \(2001\)](#).

Table 24. Water quality guidelines for molybdenum (Mo).

Water Use	Long-term Chronic WQG (mg/L total Mo)	Short-term Acute WQG (mg/L total Mo)
Freshwater Aquatic Life	≤ 1	2
Wildlife		0.05
Livestock (Consuming Forages not Irrigated or if no Molybdenum Containing Fertilizers Are Applied to Grow Feed Consumed by Livestock)		0.08
Livestock (All Other Cases)		0.05
Irrigation - Poorly Drained Soil Cu:Mo Ratio < 2:1 in the Irrigation Water (Forage Crops)	≤ 0.01	0.05
Irrigation - Poorly Drained Soil Cu:Mo Ratio > 2:1 in the Irrigation Water (Forage Crops)	≤ 0.02	0.05
Irrigation - Well Drained Soil (Forage Crops)	≤ 0.02	0.05
Irrigation - All Soils (Non-Forage Crops)	≤ 0.03	

- Source: [Water Quality Criteria for Molybdenum: Overview Report \(1986\)](#).

Table 25. Water quality guidelines for naphthalene (C₁₀H₈).

Water Use	Short-term Acute WQG (µg/L naphthalene)
Freshwater Aquatic Life	1

- Source: [Ambient Water Quality Guideline for Naphthalene to Protect Freshwater Life: Overview Report – First Update \(2007\)](#)
- Working WQGs for other water uses, and working Sediment Quality Guidelines are available at: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf.

Table 26A. Water quality guidelines for nitrogen (N).

Water Use	Nitrate WQG (mg/L N)	Nitrite WQG (mg/L N)	Total Ammonia WQG (mg/L N)
Freshwater Aquatic Life - Long-term Chronic	3.0	0.02 when Cl ⁻ ≤ 2 - also see Table 26B	See Table 26C
Freshwater Aquatic Life - Short-term Acute	32.8	0.06 when Cl ⁻ ≤ 2 - also see Table 26B	See Table 26D
Marine Aquatic Life - Long-term Chronic	3.7	None proposed	See Table 26E
Marine Aquatic Life - Short-term Acute			See Table 26F
Wildlife – Short-term Acute	100 *	10	
Livestock – Short-term Acute	100 *	10	

- * When nitrate and nitrite are present, total nitrate- plus nitrite-nitrogen should not exceed the nitrate WQG.
- Source: [Water Quality Guidelines for Nitrogen \(Nitrate, Nitrite, and Ammonia\): Overview Report Update \(2009\)](#).

Table 26B. Water quality guidelines for nitrite (NO²⁻).

Chloride (mg/L Cl ⁻)	Freshwater Long-term Chronic NO ²⁻ WQG (mg/L as N)	Freshwater Short-term Acute NO ²⁻ WQG (mg/L as N)
< 2	0.02	0.06
2 to 4	0.04	0.12
4 to 6	0.06	0.18
6 to 8	0.08	0.24
8 to 10	0.10	0.30
> 10	0.20	0.60

- The [long-term chronic](#) Cl⁻ concentration should be used to find the appropriate [long-term chronic](#) NO²⁻ WQG.
- Source: [Water Quality Guidelines for Nitrogen \(Nitrate, Nitrite, and Ammonia\): Overview Report Update \(2009\)](#).

Table 26C. Long-term chronic water quality guidelines for ammonia nitrogen (NH₃ as mg/L N) to protect freshwater aquatic life.

pH	Temperature (°C)						
	0.0	1.0	2.0	3.0	4.0	5.0	6.0
6.5	2.08	2.05	2.02	1.99	1.97	1.94	1.92
6.6	2.08	2.05	2.02	1.99	1.97	1.94	1.92
6.7	2.08	2.05	2.02	1.99	1.97	1.94	1.92
6.8	2.08	2.05	2.02	1.99	1.97	1.94	1.92
6.9	2.08	2.05	2.02	1.99	1.97	1.94	1.92
7.0	2.08	2.05	2.02	1.99	1.97	1.94	1.92
7.1	2.08	2.05	2.02	1.99	1.97	1.94	1.92
7.2	2.08	2.05	2.02	1.99	1.97	1.94	1.92
7.3	2.08	2.05	2.02	1.99	1.97	1.94	1.92
7.4	2.08	2.05	2.02	2.00	1.97	1.95	1.92
7.5	2.08	2.05	2.02	2.00	1.97	1.95	1.92
7.6	2.09	2.05	2.03	2.00	1.97	1.95	1.93
7.7	2.09	2.05	2.03	2.00	1.98	1.95	1.93
7.8	1.78	1.75	1.73	1.71	1.69	1.67	1.65
7.9	1.50	1.48	1.46	1.44	1.43	1.41	1.39
8.0	1.26	1.24	1.23	1.21	1.20	1.18	1.17
8.1	1.00	0.989	0.976	0.963	0.952	0.942	0.932
8.2	0.799	0.788	0.777	0.768	0.759	0.751	0.743
8.3	0.636	0.628	0.620	0.613	0.606	0.599	0.594
8.4	0.508	0.501	0.495	0.489	0.484	0.479	0.475
8.5	0.405	0.400	0.396	0.381	0.387	0.384	0.380
8.6	0.324	0.320	0.317	0.313	0.310	0.308	0.305
8.7	0.260	0.257	0.254	0.251	0.249	0.247	0.246
8.8	0.208	0.206	0.204	0.202	0.201	0.200	0.198
8.9	0.168	0.166	0.165	0.163	0.162	0.161	0.161
9.0	0.135	0.134	0.133	0.132	0.132	0.131	0.131

Table 26C continued

pH	Temperature (°C)						
	7.0	8.0	9.0	10.0	11.0	12.0	13.0
6.5	1.90	1.88	1.86	1.84	1.82	1.81	1.80
6.6	1.90	1.88	1.86	1.84	1.82	1.81	1.80
6.7	1.90	1.88	1.86	1.84	1.83	1.81	1.80
6.8	1.90	1.88	1.86	1.84	1.83	1.81	1.80
6.9	1.90	1.88	1.86	1.84	1.83	1.81	1.80
7.0	1.90	1.88	1.86	1.84	1.83	1.81	1.80
7.1	1.90	1.88	1.86	1.84	1.83	1.81	1.80
7.2	1.90	1.88	1.86	1.85	1.83	1.81	1.80
7.3	1.90	1.88	1.86	1.85	1.83	1.82	1.80
7.4	1.90	1.88	1.87	1.85	1.83	1.82	1.80
7.5	1.91	1.88	1.87	1.85	1.83	1.82	1.81
7.6	1.91	1.89	1.87	1.85	1.84	1.82	1.81
7.7	1.91	1.89	1.87	1.86	1.84	1.83	1.81
7.8	1.63	1.62	1.60	1.59	1.57	1.56	1.55
7.9	1.38	1.36	1.35	1.34	1.33	1.32	1.31
8.0	1.16	1.15	1.14	1.13	1.12	1.11	1.10
8.1	0.922	0.914	0.906	0.899	0.893	0.887	0.882
8.2	0.736	0.730	0.724	0.718	0.714	0.709	0.706
8.3	0.588	0.583	0.579	0.575	0.571	0.568	0.566
8.4	0.471	0.467	0.464	0.461	0.458	0.456	0.455
8.5	0.377	0.375	0.372	0.370	0.369	0.367	0.366
8.6	0.303	0.301	0.300	0.298	0.297	0.297	0.296
8.7	0.244	0.243	0.242	0.241	0.241	0.240	0.240
8.8	0.197	0.197	0.196	0.196	0.196	0.196	0.196
8.9	0.160	0.160	0.160	0.160	0.160	0.161	0.161
9.0	0.131	0.131	0.131	0.131	0.132	0.132	0.133

Table 26C continued

pH	Temperature (°C)						
	14.0	15.0	16.0	17.0	18.0	19.0	20.0
6.5	1.78	1.77	1.64	1.52	1.41	1.31	1.22
6.6	1.78	1.77	1.64	1.52	1.41	1.31	1.22
6.7	1.78	1.77	1.64	1.52	1.41	1.31	1.22
6.8	1.78	1.77	1.64	1.52	1.42	1.32	1.22
6.9	1.78	1.77	1.64	1.53	1.42	1.32	1.22
7.0	1.79	1.77	1.64	1.53	1.42	1.32	1.22
7.1	1.79	1.77	1.65	1.53	1.42	1.32	1.23
7.2	1.79	1.78	1.65	1.53	1.42	1.32	1.23
7.3	1.79	1.78	1.65	1.53	1.42	1.32	1.23
7.4	1.79	1.78	1.65	1.53	1.42	1.32	1.23
7.5	1.80	1.78	1.66	1.54	1.43	1.33	1.23
7.6	1.80	1.79	1.66	1.54	1.43	1.33	1.24
7.7	1.80	1.79	1.66	1.54	1.44	1.34	1.24
7.8	1.54	1.53	1.42	1.32	1.23	1.14	1.07
7.9	1.31	1.30	1.21	1.12	1.04	0.970	0.904
8.0	1.10	1.09	1.02	0.944	0.878	0.818	0.762
8.1	0.878	0.874	0.812	0.756	0.704	0.655	0.611
8.2	0.703	0.700	0.651	0.606	0.565	0.527	0.491
8.3	0.564	0.562	0.523	0.487	0.455	0.424	0.396
8.4	0.453	0.452	0.421	0.393	0.367	0.343	0.321
8.5	0.366	0.365	0.341	0.318	0.298	0.278	0.261
8.6	0.296	0.296	0.277	0.259	0.242	0.227	0.213
8.7	0.241	0.241	0.226	0.212	0.198	0.186	0.175
8.8	0.197	0.198	0.185	0.174	0.164	0.154	0.145
8.9	0.162	0.163	0.153	0.144	0.136	0.128	0.121
9.0	0.134	0.135	0.128	0.121	0.114	0.108	0.102

- The average of the 5 measured NH₃ values must be less than the average of the 5 corresponding tabled NH₃ values (WQGs) obtained by finding the measured pH and temperature values in the table.
- No more than 1 of 5 of the measured values can exceed 1.5 times the corresponding WQG.
- Source: [Water Quality Guidelines for Nitrogen \(Nitrate, Nitrite, and Ammonia\): Overview Report Update \(2009\)](#).

Table 26D. Short-term acute water quality guidelines for ammonia nitrogen (NH₃ as mg/L N) to protect freshwater aquatic life.

	Temperature (°C)						
pH	0.0	1.0	2.0	3.0	4.0	5.0	6.0
6.5	28.7	28.3	27.9	27.5	27.2	26.8	26.5
6.6	27.9	27.5	27.2	26.8	26.4	26.1	25.8
6.7	26.9	26.5	26.2	25.9	25.5	25.2	24.9
6.8	25.8	25.5	25.1	24.8	24.5	24.2	23.9
6.9	24.6	24.2	23.9	23.6	23.3	23.0	22.7
7.0	23.2	22.8	22.5	22.2	21.9	21.6	21.4
7.1	21.6	21.3	20.9	20.7	20.4	20.2	19.9
7.2	19.9	19.6	19.3	19.0	18.8	18.6	18.3
7.3	18.1	17.8	17.5	17.3	17.1	16.9	16.7
7.4	16.2	16.0	15.7	15.5	15.3	15.2	15.0
7.5	14.4	14.1	14.0	13.8	13.6	13.4	13.3
7.6	12.6	12.4	12.0	11.9	11.9	11.7	11.6
7.7	10.8	10.7	10.5	10.4	10.3	10.1	10.0
7.8	9.26	9.12	8.98	8.88	8.77	8.67	8.57
7.9	7.82	7.71	7.60	7.51	7.42	7.33	7.25
8.0	6.55	6.46	6.37	6.29	6.22	6.14	6.08
8.1	5.21	5.14	5.07	5.01	4.95	4.90	4.84
8.2	4.15	4.09	4.04	3.99	3.95	3.90	3.86
8.3	3.31	3.27	3.22	3.19	3.15	3.12	3.09
8.4	2.64	2.61	2.57	2.54	2.52	2.49	2.47
8.5	2.11	2.08	2.06	2.03	2.01	1.99	1.98
8.6	1.69	1.67	1.65	1.63	1.61	1.60	1.59
8.7	1.35	1.33	1.32	1.31	1.30	1.29	1.28
8.8	1.08	1.07	1.06	1.05	1.04	1.04	1.03
8.9	0.871	0.863	0.856	0.849	0.844	0.839	0.836
9.0	0.703	0.697	0.692	0.688	0.685	0.682	0.681

Table 26D continued

pH	Temperature (°C)						
	7.0	8.0	9.0	10.0	11.0	12.0	13.0
6.5	26.2	26.0	25.7	25.5	25.2	25.0	24.8
6.6	25.5	25.2	25.0	24.7	24.5	24.3	24.1
6.7	24.6	24.4	24.1	23.9	23.7	23.5	23.3
6.8	23.6	23.4	23.1	22.9	22.7	22.5	22.3
6.9	22.5	22.2	22.0	21.8	21.6	21.4	21.3
7.0	21.1	20.9	20.7	20.5	20.3	20.2	20.0
7.1	19.7	19.5	19.3	19.1	18.9	18.8	18.7
7.2	18.1	17.9	17.8	17.6	17.4	17.3	17.2
7.3	16.5	16.3	16.2	16.0	15.9	15.7	15.6
7.4	14.8	14.7	14.5	14.4	14.2	14.1	14.0
7.5	13.1	13.0	12.9	12.7	12.6	12.5	12.4
7.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9
7.7	9.92	9.83	9.73	9.65	9.57	9.50	9.43
7.8	8.48	8.40	8.32	8.25	8.18	8.12	8.07
7.9	7.17	7.10	7.04	6.98	6.92	6.88	6.83
8.0	6.02	5.96	5.91	5.86	5.81	5.78	5.74
8.1	4.80	4.75	4.71	4.67	4.64	4.61	4.59
8.2	3.83	3.80	3.76	3.74	3.71	3.69	3.67
8.3	3.06	3.03	3.01	2.99	2.97	2.96	2.94
8.4	2.45	2.43	2.41	2.40	2.38	2.37	2.36
8.5	1.96	1.95	1.94	1.93	1.92	1.91	1.91
8.6	1.58	1.57	1.56	1.55	1.55	1.54	1.54
8.7	1.27	1.26	1.26	1.25	1.25	1.25	1.25
8.8	1.03	1.02	1.02	1.02	1.02	1.02	1.02
8.9	0.833	0.832	0.831	0.831	0.832	0.834	0.838
9.0	0.681	0.681	0.681	0.682	0.684	0.688	0.692

Table 26D continued

pH	Temperature (°C)						
	14.0	15.0	16.0	17.0	18.0	19.0	20.0
6.5	24.6	24.5	24.3	24.2	24.0	23.9	23.8
6.6	23.9	23.8	23.6	23.5	23.3	23.3	23.2
6.7	23.1	23.0	22.8	22.7	22.6	22.5	22.4
6.8	22.2	22.0	21.9	21.8	21.7	21.6	21.5
6.9	21.1	21.0	20.8	20.7	20.6	20.5	20.4
7.0	19.9	19.7	19.6	19.5	19.4	19.3	19.2
7.1	18.5	18.4	18.3	18.2	18.1	18.0	17.9
7.2	17.1	16.9	16.8	16.8	16.7	16.6	16.5
7.3	15.5	15.4	15.3	15.2	15.2	15.1	15.1
7.4	13.9	13.9	13.8	13.7	13.6	13.6	13.5
7.5	12.4	12.3	12.2	12.2	12.1	12.1	12.0
7.6	10.8	10.8	10.7	10.7	10.6	10.6	10.5
7.7	9.37	9.31	9.26	9.22	9.18	9.15	9.12
7.8	8.02	7.97	7.93	7.90	7.87	7.84	7.82
7.9	6.79	6.75	6.72	6.69	6.67	6.65	6.64
8.0	5.71	5.68	5.66	5.62	5.61	5.60	5.74
8.1	4.56	4.54	4.53	4.51	4.50	4.49	4.49
8.2	3.65	3.64	3.63	3.62	3.61	3.61	3.61
8.3	2.93	2.92	2.92	2.91	2.91	2.91	2.91
8.4	2.36	2.35	2.35	2.35	2.35	2.35	2.36
8.5	1.90	1.90	1.90	1.90	1.90	1.91	1.92
8.6	1.54	1.54	1.54	1.55	1.56	1.56	1.57
8.7	1.25	1.25	1.26	1.26	1.27	1.28	1.29
8.8	1.02	1.03	1.03	1.04	1.05	1.06	1.07
8.9	0.842	0.847	0.853	0.861	0.870	0.880	0.891
9.0	0.698	0.704	0.711	0.720	0.729	0.740	0.752

- Source: [Water Quality Guidelines for Nitrogen \(Nitrate, Nitrite, and Ammonia\): Overview Report Update \(2009\)](#).

Table 26E. Long-term chronic water quality guidelines for ammonia nitrogen (NH₃ as mg/L N) to protect marine aquatic life.

For Salinity of 10 ppt (g/kg)

pH	Temperature (°C)					
	0	5	10	15	20	25
7.0	41	29	20	14	9.4	6.6
7.2	26	18	12	8.7	5.9	4.1
7.4	17	12	7.8	5.3	3.7	2.6
7.6	10	7.2	5.0	3.4	2.4	1.7
7.8	6.6	4.7	3.1	2.2	1.5	1.1
8.0	4.1	2.9	2.0	1.4	0.97	0.69
8.2	2.7	1.8	1.3	0.87	0.62	0.44
8.4	1.7	1.2	0.81	0.56	0.41	0.29
8.6	1.1	0.75	0.53	0.37	0.27	0.20
8.8	0.69	0.50	0.34	0.25	0.18	0.14
9.0	0.44	0.31	0.23	0.17	0.13	0.10

For Salinity of 20 ppt (g/kg)

pH	Temperature (°C)					
	0	5	10	15	20	25
7.0	44	30	21	14	9.7	6.6
7.2	27	19	13	9.0	6.2	4.4
7.4	18	12	8.1	5.6	4.1	2.7
7.6	11	7.5	5.3	3.4	2.5	1.7
7.8	6.9	4.7	3.4	2.3	1.6	1.1
8.0	4.4	3.0	2.1	1.5	1.0	0.72
8.2	2.8	1.9	1.3	0.94	0.66	0.47
8.4	1.8	1.2	0.84	0.59	0.44	0.30
8.6	1.1	0.78	0.56	0.41	0.28	0.20
8.8	0.72	0.50	0.37	0.26	0.19	0.14
9.0	0.47	0.34	0.24	0.18	0.13	0.10

Table 26E continued

For Salinity of 30 ppt (g/kg)

pH	Temperature (°C)					
	0	5	10	15	20	25
7.0	47	31	22	15	11	7.2
7.2	29	20	14	9.7	6.6	4.7
7.4	19	13	8.7	5.9	4.1	2.9
7.6	12	8.1	5.6	3.7	3.1	1.8
7.8	7.5	5.0	3.4	2.4	1.7	1.2
8.0	4.7	3.1	2.2	1.6	1.1	0.75
8.2	3.0	2.1	1.4	1.0	0.69	0.50
8.4	1.9	1.3	0.90	0.62	0.44	0.31
8.6	1.2	0.84	0.59	0.41	0.30	0.22
8.8	0.78	0.53	0.37	0.27	0.20	0.15
9.0	0.50	0.34	0.26	0.19	0.14	0.11

- The average of the 5 measured NH₃ concentrations must be less than the corresponding tabled NH₃ value (WQG) found by using the average of the 5 measured pH, temperature, and salinity values.
- No more than 1 of 5 of the measured values can exceed 1.5 times the corresponding WQG.
- Source: [Water Quality Guidelines for Nitrogen \(Nitrate, Nitrite, and Ammonia\): Overview Report Update \(2009\)](#).

Table 26F. Short-term acute water quality guidelines for ammonia nitrogen (NH₃ as mg/L N) to protect marine aquatic life.

For Salinity of 10 ppt (g/kg)

pH	Temperature (°C)					
	0	5	10	15	20	25
7.0	270	191	131	92	62	44
7.2	175	121	83	58	40	27
7.4	110	77	52	35	25	17
7.6	69	48	33	23	16	11
7.8	44	31	21	15	10	7.1
8.0	27	19	13	9.4	6.4	4.6
8.2	18	12	8.5	5.8	4.2	2.9
8.4	11	7.9	5.4	3.7	2.7	1.9
8.6	7.3	5.0	3.5	2.5	1.8	1.3
8.8	4.6	3.3	2.3	1.7	1.2	0.92
9.0	2.9	2.1	1.5	1.1	0.85	0.67

Table 26F continued

For Salinity of 20 ppt (g/kg)

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	291	200	137	96	64	44
7.2	183	125	87	60	42	29
7.4	116	79	54	37	27	18
7.6	73	50	35	23	17	11
7.8	46	31	23	15	11	7.5
8.0	29	20	14	9.8	6.7	4.8
8.2	19	13	8.9	6.2	4.4	3.1
8.4	12	8.1	5.6	4.0	2.9	2.0
8.6	7.5	5.2	3.7	2.7	1.9	1.4
8.8	4.8	3.3	2.5	1.7	1.3	0.94
9.0	3.1	2.3	1.6	1.2	0.87	0.69

For Salinity of 30 ppt (g/kg)

	Temperature (°C)					
pH	0	5	10	15	20	25
7.0	312	208	148	102	71	48
7.2	196	135	94	64	44	31
7.4	125	85	58	40	27	19
7.6	79	54	37	25	21	12
7.8	50	33	23	16	11	7.9
8.0	31	21	15	10	7.3	5.0
8.2	20	14	9.6	6.7	4.6	3.3
8.4	12.7	8.7	6.0	4.2	2.9	2.1
8.6	8.1	5.6	4.0	2.7	2.0	1.4
8.8	5.2	3.5	2.5	1.8	1.3	1.0
9.0	3.3	2.3	1.7	1.2	0.94	0.71

- Source: [Water Quality Guidelines for Nitrogen \(Nitrate, Nitrite, and Ammonia\): Overview Report Update \(2009\)](#).

Table 27. Water quality guidelines for nutrients and algae.

Water Use	Total Phosphorous (µg/L P)	Short-term Acute Chlorophyll a (mg/m ²)
Aquatic Life - Streams		100 mg/m ²
Aquatic Life - Lakes (Salmonids Are Predominant Fish Species)	5 to 15 (inclusive)	

- Total P in lakes is either the spring overturn concentration, if the residence time of the epilimnetic water exceeds 6 months, or the mean epilimnetic growing season concentration, if residence time of epilimnetic water is below 6 months.
- Chlorophyll a WQGs in streams apply to naturally growing periphytic algae.
- Source: [Water Quality Criteria for Nutrients and Algae: Overview Report \(2001\)](#).

Table 28. Water quality guidelines for organic carbon.

Water Use	Fraction	WQG
Freshwater Aquatic Life	Dissolved	Long-term median within 20% of background median *
Freshwater Aquatic Life	Total	Long-term median within 20% of background median *
Wildlife	Dissolved	Long-term median within 20% of background median *
Wildlife	Total	Long-term median within 20% of background median *

- * The 30-day median for both DOC and TOC shall be within 20% of seasonally-adjusted median background levels as measured historically or at appropriate reference sites. The 30-day median calculation should be based on a minimum of 5 weekly samples taken over a period of 30 days.
- Source: [Ambient Water Quality Guidelines for Organic Carbon: Overview Report \(2001\)](#).

Table 29. Water quality guidelines for dissolved oxygen (DO).

Life Stages	All Life Stages Other than Buried Embryo / Alevin	Buried Embryo / Alevin Life Stages *	Buried Embryo / Alevin Life Stages
Location	Water Column (mg/L O ₂)	Water Column † (mg/L O ₂)	Interstitial Water (mg/L O ₂)
Long-term Chronic WQG	8	11	8
Instantaneous Minimum WQG	5	9	6

- * Instream concentrations from spawning to the point of yolk sac absorption or 30 days post-hatch.
- † Water column concentrations recommended to achieve interstitial DO values when the latter are unavailable. Interstitial oxygen measurements supersede water column data.
- The instantaneous minimum level is to be maintained at all times.
- If a diurnal cycle exists in the water body, measurements should be taken when oxygen levels are lowest (usually early morning).
- Source: [Ambient Water Quality Criteria for Dissolved Oxygen: Overview Report \(1997\)](#).

Table 30. Water quality guidelines for pH.

Environment	pH	WQG
Freshwater	< 6.5	No statistically significant * decrease in pH from background. No restriction on the increase in pH except in boggy areas that have a unique fauna or flora. Site-specific ambient water quality objectives to restrict the pH increase in areas with a unique fauna and flora are recommended.
Freshwater	6.5-9.0	Unrestricted change permitted within this pH range. This component of the freshwater WQGs should be used cautiously if the pH changes causes the carbon dioxide concentrations to exceed a 10 µmol/L minimum or a 1360 µmol/L short-term. Carbon dioxide concentrations below 10 µmol/L can cause a shift in the phytoplankton community to cyanobacteria, while CO ₂ concentrations above 1360 µmol/L can be toxic to fish.
Freshwater	> 9.0	No statistically significant * increase in pH from background. Short-term increases (2-3 days) to pH 9.5 are permitted for lake restoration projects. Decreases in pH are permitted as long as carbon dioxide concentrations are not elevated above 1360 µmol/L. CO ₂ concentrations above 1360 µmol/L may be toxic to fish.
Marine Water	7.0-8.7	Unrestricted change within this range (for protection of mollusc embryo development).
Livestock		5.0-9.5
Irrigation		5.0-9.5

- * Streams: Statistical comparison of background (upstream) and downstream results should use a 1-tailed, 2-sample t-test, at the 0.05 probability level. The minimum sampling requirement is 5 measurements collected weekly in 30 days. The 2-sample t-test requires the different stations to have similar variances (use the F-test). If, at the downstream site, data from spills or discharge events are pooled with steady state data, the variance may increase and become dissimilar to the upstream site invalidating the 2-sample t-test. To reduce the variance, consider the data from the steady state and the event as independent data sets. Additional pH measurements, or a pH sensor with an automatic recorder are recommended for sites subject to event-driven pH fluctuations. Lakes: Same as streams or, if background stations are not available, pre-discharge data should be collected near the zone of influence, once every 3 weeks for 1 or 2 years to determine the temporal variation. A pH sensor with an automatic recorder would collect more data and provide a better understanding of the temporal variability than normal field sampling.
- Source: [Ambient Water Quality Criteria for pH: Technical Appendix \(1991\)](#).

Table 31. Water quality guidelines for the pharmaceutically active compound (PhAC) 17α-ethinylestradiol (EE2).

Water Use	WQG (ng/L EE2)
Freshwater Long-term Chronic	0.50
Freshwater Short-term Acute	0.75

- Source: [Water Quality Guidelines for Pharmaceutically-active Compounds \(PhACs\): 17 α-ethinylestradiol \(EE2\) \(2009\)](#).

Table 32. Water quality guidelines for phenols.

Non-halogenated Phenol Species	Freshwater Short-term Acute WQG (µg/L phenols)
4-hydroxyphenol (hydroquinone, quinol)	4.5
3-hydroxyphenol (resorcinol)	12.5

Total of all other phenols *	50.0
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- * Total phenols minus all chlorinated phenols minus hydroquinone minus resorcinol.
- Source: *Ambient Interim Water Quality Guidelines for Phenols: Summary Report (2002)*

Table 33. Water quality guidelines for aquatic life for polycyclic aromatic hydrocarbons (PAHs).

PAH	Freshwater (Long-term Chronic) WQG (µg/L)	Freshwater (Phototoxic) WQG (µg/L)	Marine Water WQG (µg/L)
Acenaphthene	6		6
Acridene	3	0.05	
Anthracene	4	0.1	
Benz[a]anthracene	0.1	0.1	
Benzo[a]pyrene	0.01		0.01
Chrysene			0.1
Fluoranthene	4	0.2	
Fluorene	12		12
Methylated Naphthalene			1
Naphthalene	1		1
Phenanthrene	0.3		
Pyrene		0.02	

- Source: *Ambient Water Quality Criteria for Polycyclic Aromatic Hydrocarbons (PAHs): Overview Report (1993)*
- Working WQGs and working Sediment Quality Guidelines for other PAHs are available at: http://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf

Table 34. Water quality guidelines for polychlorinated biphenyls (PCBs).

Water Use	PCBs	Short-term Acute WQG
Freshwater & Marine Aquatic Life	Total	0.1 ng/L
	PCB 105	0.09 ng/L
	PCB 169	0.06 ng/L
	PCB 77	0.04 ng/L
	PCB 126	0.00025 ng/L
Freshwater & Marine Aquatic Life – Sediment (Containing 1% Organic Carbon *)	Total	0.02 µg/g dry weight
Freshwater & Marine Aquatic Life - Fish &/or Shellfish (for Wildlife Consumption: Whole Animal)	Total	0.1 µg/g wet weight
Irrigation	Total	0.5 µg/L

- * If sediment organic carbon (OC) ≠ 1%, then WQG = (0.02 µg/g dry weight) x (% OC x 100). For example, if sediment contains 3% OC, then WQG = 0.02 x 3 = 0.06 µg/g dry weight.
- Source: *Ambient Water Quality Criteria for Polychlorinated Biphenyls (PCBs): Overview Report (1992)*

Table 35. Water quality guidelines for selenium (Se).

Water Use	Long-term Chronic Se WQG	WQG Derivation Method/Approach
Aquatic Life <i>Water column freshwater & marine</i> Alert concentration WQG <i>Sediment - Alert concentration</i> Dietary Invertebrate tissue (<i>interim</i>) Tissue (fish) Egg/ovary Whole-body (WB) Muscle/muscle plug (<i>interim</i>)	1 µg/L 2 µg/L 2 µg/g (dw) 4 µg/g (dw) 11 µg/g (dw) 4 µg/g (dw) 4 µg/g (dw)	<p><i>Water column:</i> Review of previous WQG (uncertainty factor (UF) applied to toxicity threshold); weight of evidence including food web modelling and reported relationships between impacts and Se concentrations in water.</p> <p><i>Sediment:</i> Weight of evidence; lowest published toxicity thresholds, no UF applied; insufficient data for full WQGs at this time.</p> <p><i>Dietary:</i> Weight of evidence; lowest published toxicity thresholds, no UF applied; insufficient data for full WQGs at this time. Invertebrate tissue as surrogate for aquatic dietary tissue.</p> <p><i>Egg/ovary:</i> Combination weight of evidence and mean of published effects data with an UF of 2 applied; <i>Whole-body:</i> previous WB WQG compared with published literature, mean of published effects data with UF (2) applied and weight of evidence; <i>Muscle:</i> WB translation to derive muscle WQG, no additional UF applied to muscle WQG.</p>
Wildlife <i>Water column</i> Bird egg	2 µg/L 6 µg/g (dw)	The <i>water column</i> WQG for aquatic life (fish) is adopted for wildlife since dietary accumulation is most critical. <i>Bird eggs</i> were used as surrogate for all wildlife; weight of evidence; egg Se most direct/sensitive measure; mallard EC10 with UF of 2 applied.
Livestock 2001 WQG not updated	30 µg/L	Not updated at this time
Irrigation 2001 WQG not updated	10 µg/L	Not updated at this time

- Source: [Companion Document to Ambient Water Quality Guidelines for Selenium – Update \(2014\)](#)

Table 36. Sampling guidance for selenium (Se) water quality guidelines.

Water Use	WQG for Total Se	Sampling Guidance
Aquatic Life <i>Water column freshwater & marine</i> Alert concentration WQG <i>Sediment - Alert concentration</i> Dietary <i>Invertebrate tissue (interim)</i> Tissue (fish) Egg/ovary Whole-body (WB) Muscle/muscle plug (interim)	1 µg/L 2 µg/L 2 µg/g (dw) 4 µg/g (dw) 11 µg/g (dw) 4 µg/g (dw) 4 µg/g (dw)	<p><i>Water:</i> 30-day average determined as the mean concentration of 5 evenly spaced samples collected over 30 days and measured as total Se.</p> <p><i>Sediment:</i> Mean of ≥ 5 samples collected in a representative area.</p> <p><i>Dietary:</i> Mean concentration ≥ 8 replicate (composite) tissue samples representing an appropriate invertebrate or other prey species.</p> <p><i>Egg/ovary:</i> Mean of ≥ 8 egg or ripe ovary (from 8 individual fish) in a representative area, reported as dry weight.</p> <p><i>Whole-body:</i> Mean of ≥ 8 fish in a representative area, reported as dry weight.</p> <p><i>Muscle:</i> Mean of ≥ 8 muscle tissue samples (from 8 individual fish) in a representative area, reported as dry weight.</p>
Wildlife Water Bird egg	2 µg/L 6 µg/g (dw)	<p><i>Water:</i> 30-day average determined as the mean concentration of 5 evenly spaced samples collected over 30 days and measured as total Se.</p> <p><i>Bird egg:</i> Mean of ≥ 8 eggs (from 8 individual nests) in a representative area, reported as dry weight. A statistical analysis could also be used to determine a more specific sampling design.</p>
Livestock 2001 WQG (not updated in 2014)	30 µg/L	<p><i>Water:</i> A maximum WQG not to be exceeded.</p>
Irrigation 2001 WQG (not updated in 2014)	10 µg/L	<p><i>Water:</i> A maximum WQG not to be exceeded.</p>

- Source: [Companion Document to Ambient Water Quality Guidelines for Selenium – Update \(2014\)](#)

Table 37. Recommended monitoring and assessment framework for selenium (Se).

Water [Se] < 1 µg/L

- Continue monitoring to determine trends in concentrations, as necessary;
- Monitoring of other compartments may be desirable to determine baseline conditions.

Water [Se] > 1 µg/L < 2 µg/L

- Continue monitoring to determine trends in concentrations;
- Measure sediment [Se]:
 - If < 2 µg/g (dw), monitor periodically at an appropriate frequency to determine if changes are occurring over time;
 - If > 2 µg/g (dw), monitor other compartments as necessary.

Water [Se] > 2 µg/L

- Recommend:
 - Determine sediment [Se], compare with sediment Se alert concentration;
 - Determine invertebrate tissue [Se], compare with Se [interim dietary WQG](#);
- As necessary:
 - Determine fish tissue [Se];
 - Determine bird egg [Se].
- If natural background [Se] is > 2 µg/L, conduct sufficient sampling of each appropriate compartment above to establish background concentrations;
- If natural background [Se] is < 2 µg/L, conduct ongoing monitoring to determine trends for each appropriate compartment over time.
- Consider assessing other indicators (e.g. fish population structure, environmental effects assessment)

Water [Se] > 10 µg/L and/or fish tissue is > Human Consumption Screening Values

- As necessary:
 - Consult the local health authority

- Source: [Companion Document to Ambient Water Quality Guidelines for Selenium – Update \(2014\)](#)

Table 38. Water quality guidelines for silver (Ag).

Environment	Conditions	Long-term Chronic WQG (µg/L total Ag)	Short-term Acute WQG (µg/L total Ag)
Freshwater	Hardness ≤ 100 mg/L	0.05	0.1
Freshwater	Hardness > 100 mg/L	1.5	3.0
Marine Water	Open coast & estuaries	1.5	3.0

- Source: *Ambient Water Quality Criteria for Silver: Overview Report (1996)*.

Table 39. Water quality guidelines for sulfolane (C₄H₈O₂S).

Water Use	Long-term Chronic WQG (mg/L Sulfolane)
Freshwater Aquatic Life	50
Livestock	14
Irrigation	8.4

- Source: *Ambient Water Quality Guidelines for Sulfolane: Overview Report (2003)*.

Table 40. Water quality guidelines for sulphate (SO₄²⁻) to protect freshwater aquatic life.

Water Hardness * (mg/L CaCO ₃)	Freshwater Long-term Chronic WQG (mg/L total SO ₄ ²⁻)
Very Soft (0-30)	128
Soft to Moderately Soft (31-75)	218
Moderately Soft/Hard To Hard (76-180)	309
Very Hard (181-250)	429
>250	Determined on a site-specific basis †

- * Water hardness categories adapted from the Canadian Council of Ministers of the Environment.
- † Toxicity tests on early stage rainbow trout were only conducted up to a water hardness of 250 mg/L. Natural background concentrations of water hardness in BC are generally much lower than that.
- When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.
- Source: *Ambient Water Quality Guidelines for Sulphate: Technical Appendix (2013)*
- Working water quality guidelines for other water uses are available at:
<http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines>

Table 41. Water quality guideline for sulphate (SO₄²⁻) to protect livestock.

Water Use	WQG (mg/L total SO ₄ ²⁻)
Livestock	1,000

- Source: *Ambient Water Quality Guidelines for Sulphate: Technical Appendix (2013)*
- Working water quality guidelines for other water uses are available at: <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/water-quality-guidelines/approved-water-quality-guidelines>

Table 42A. Water quality guidelines for temperature.

Water Use	WQG (°C)
Freshwater Aquatic Life - Streams with Bull Trout &/or Dolly Varden	Short-term daily temperature is 15. Short-term incubation temperature is 10. Minimum incubation temperature is 2. Short-term spawning temperature is 10.
Freshwater Aquatic Life - Streams with Known Fish Distribution	± 1 change beyond optimum temperature range as shown in Table 42B for each life history phase of the most sensitive salmonid species present. Hourly rate of change not to exceed 1.
Freshwater Aquatic Life - Streams with Unknown Fish Distribution	MWMT = 18. (Short-term daily temperature = 19). Hourly rate of change not to exceed 1. Short-term incubation temperature = 12 (in spring and fall).
Freshwater Aquatic Life - Lakes & Impoundments	± 1 change from ambient background.
Marine & Estuarine Aquatic Life	± 1 change from ambient background. Hourly rate of change up to 0.5. See footnote.
Wildlife & Livestock Irrigation	± 1 change from ambient background. Hourly rate of change should not exceed 0.5.

- MWMT, mean weekly short-term temperature, is defined as the average of the warmest daily short-term temperatures for 7 consecutive days.
- The natural temperature cycle characteristic of the site should not be altered in amplitude or frequency by human activities.
- Source: *Water Quality Guidelines for Temperature: Overview Report (2001)*.

Table 42B. Optimum temperature ranges of specific life history stages of salmonids and other cold-water fishes for water quality guideline application.

Species	Incubation (°C)	Rearing (°C)	Migration (°C)	Spawning (°C)
<i>Salmon</i>				
Chinook	5.0-14.0	10.0-15.5	3.3-19.0	5.6-13.9
Chum	4.0-13.0	12.0-14.0	8.3-15.6	7.2-12.8
Coho	4.0-13.0	9.0-16.0	7.2-15.6	4.4-12.8
Pink	4.0-13.0	9.3-15.5	7.2-15.6	7.2-12.8
Sockeye	4.0-13.0	10.0-15.0	7.2-15.6	10.6-12.8
<i>Trout</i>				
Brown	1.0-10.0	6.0-17.6		7.2-12.8
Cutthroat	9.0-12.0	7.0-16.0		9.0-12.0
Rainbow	10.0-12.0	16.0-18.0		10.0-15.5
<i>Char</i>				
Arctic Char	1.5-5.0	5.0-16.0		4.0
Brook Trout	1.5-9.0	12.0-18.0		7.1-12.8
Bull Trout	2.0-6.0	6.0-14.0		5.0-9.0
Dolly Varden		8.0-16.0		
Lake Trout	5.0	6.0-17.0		10.0
<i>Grayling</i>				
Arctic Grayling	7.0-11.0	10.0-12.0		4.0-9.0
<i>Whitefish</i>				
Lake Whitefish	4.0-6.0	12.0-16.0		> 8.0
Mountain Whitefish	< 6.0	9.0-12.0		< 6.0
<i>Other Species</i>				
Burbot	4.0-7.0	15.6-18.3		0.6-1.7
White Sturgeon	14.0-17.0			14.0

- Source: [Water Quality Guidelines for Temperature: Overview Report \(2001\)](#).

Table 43. Water quality guideline for toluene (C₇H₈).

Water Use	WQG (µg/L Toluene)
Freshwater Long-term Chronic	0.5

- Source: [Ambient Aquatic Life Guidelines for Toluene \(2007\)](#)

Table 44. Water quality guidelines for turbidity, and suspended and benthic sediments.

Water Use	Turbidity	Non-filterable Residue (Total Suspended Solids)	Streambed Substrate Composition
Aquatic Life (Fresh, Marine, Estuarine)	<p>Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters</p> <p>Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters</p> <p>Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters</p> <p>Change from background of 10% when background is > 50 NTU at any time during high flows or in turbid waters</p>	<p>Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters</p> <p>Change from background of 5 mg/L at any one time for a duration of 30 d in all waters during clear flows or in clear waters</p> <p>Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters</p> <p>Change from background of 10% when background is > 100 mg/L at any time during high flows or in turbid waters</p>	<p>% fines not to exceed:</p> <ul style="list-style-type: none"> • 10% < 2 mm • 19% < 3 mm • 28% < 6.35 mm <p>at salmonid spawning sites</p> <p>Geometric mean diameter not less than 12 mm (minimum 30-d intra-gravel DO of 6 mg/L)</p> <p>Fredle number not less than 5 mm (minimum 30-d intra-gravel DO of 8 mg/L)</p>
Wildlife & Irrigation	<p>Change from background of 10 NTU when background is \leq 50 NTU</p> <p>Change from background of 20% when background > 50 NTU</p>	<p>Change from background of 20 mg/L when background is \leq 100 mg/L</p> <p>Change from background of 20% when background > 100 mg/L</p>	
Livestock	<p>Change from background of 5 NTU when background is \leq 50 NTU</p> <p>Change from background of 10% when background is > 50 NTU</p>	<p>Change from background of 10 mg/L when background is \leq 100 mg/L</p> <p>Change from background of 10% when background is > 100 mg/L</p>	

- DO = dissolved oxygen, NTU = nephelometric turbidity units.
- To determine if guidelines have been exceeded, for short-term exposures, hourly samples taken over a 24-h period are preferred to demonstrate the continuity of an event. Initially, less frequent monitoring may be appropriate to determine the need for more extensive monitoring. For long-term exposures, daily samples taken over a 30-d period are preferred, but may also be initially checked by less frequent monitoring.
- If it is not possible to measure turbidity using automated sampling equipment (needed to obtain hourly measurements over 24 h, and daily measurements over 30 d), non-automated equipment may be used instead (to obtain 5 measurements over 30 d).
- *Source: Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments: Overview Report (2001)*

Table 45. Water quality guideline for xylene (C₈H₁₀).

Water Use	WQG (mg/L total Xylene)
Freshwater Long-term Chronic	0.03

- Source: *Ambient Water Quality Guidelines for Xylene: Overview Report (2007)*.

Table 46. Water quality guidelines for zinc (Zn).

Water Use	Long-term Chronic (µg/L total Zn)	Short-term Acute (µg/L total Zn)
Freshwater Aquatic Life -- Water hardness ≤ 90 mg/L	7.5	33
Freshwater Aquatic Life -- Water hardness > 90 mg/L	WQG = 7.5 + 0.75 (hardness* - 90) E.g. When hardness = 100 mg/L CaCO ₃ WQG = 7.5 + 0.75(100 - 90) = 7.5 + 7.5 = 15.0	WQG = 33 + 0.75(hardness** - 90) E.g. When hardness = 100 mg/L CaCO ₃ WQG = 33 + 0.75(100 - 90) = 33 + 7.5 = 40.5
Marine Life	10	55
Livestock	2,000	
Irrigation - Soil pH < 6	1,000	
Irrigation - Soil pH ≥ 6 and < 7	2,000	
Irrigation - Soil pH ≥ 7	5,000	

- *Long-term Chronic WQG applies to water hardness between 90 – 330 mg/L CaCO₃.
- *Short-term acute WQG applies to water hardness between 90 – 500 mg/L CaCO₃.
- When the ambient Zn concentration exceeds the WQG, further degradation of the ambient or existing water quality should be avoided.
- When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.
- Source: *Ambient Water Quality Guidelines for Zinc: Overview Report (1999)*.
- Working Sediment Quality Guidelines are available at:
- https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/wqgs-wqos/bc_env_working_water_quality_guidelines.pdf