

# Science and Information Branch

## Water Quality

### British Columbia Approved Water Quality Guidelines 2006 Edition

Prepared pursuant to Section 2(e) of the  
*Environment Management Act*, 1981

Original signed by Don Fast  
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## ***Introduction***

### **Welcome to British Columbia's Approved Guidelines Report for 2006.**

The following questions and answers will introduce you to the British Columbia Water Quality Guidelines Report — 2006. They will explain what the report is and guide you through its use. This report is revised periodically to incorporate new information. The authors invite your comments and suggestion on any errors and omissions in the guidelines cited here.

### **Why do we have an *Approved Water Quality Guidelines Report* — 2006?**

Water quality guidelines are developed in order that water quality data can be assessed and site-specific water quality objectives can be prepared. They provide the benchmarks for the assessment of water quality and setting water quality objectives. In general, water quality problems are non-existent if the substance concentration is lower than the guideline(s). However, if the substance concentration exceeds its guideline, an assessment of the water quality is desirable.

### **Why are some values for drinking water and recreation different between the Ministry publications and the approved guidelines listed in Table 1?**

When the Ministry prepares guideline reports, it does so for the six potential designated water uses. For drinking water and recreation uses, there are also parallel processes for guideline development under Health Canada mandate. Sometimes, the approved B.C. guidelines have not been accepted by Health Canada or there are time lags between the different processes. In such cases, the policy of the Ministry is that the Health Canada guidelines will be the official Ministry guidelines for drinking water and recreation, even if other values were approved independently by the Ministry.

### **Why are some tables listed as 'Criteria' and how are they related to 'Guidelines'?**

The term 'Criterion' was originally used for the 'Guideline' in B.C. but this nomenclature was changed in the late 1980s.

### **Who can use this report?**

Traditionally, water quality professionals such as consultants have used this report. We are hoping that members of the public, especially those associated with local stewardship groups, will use this new "user-friendly" edition of the report to evaluate water quality data that they collect.

### **What are the *Approved Water Quality Guidelines* and what do they protect?**

Tables 2 through 50 list guidelines that have been developed by the Ministry of Environment. They have been approved by the province and, as noted above, will be used to assess water quality in B.C.. Approved guidelines are given to protect up to seven major water uses: Drinking Water, Aquatic Life (freshwater and marine), Wildlife, Recreation and Aesthetics, Agriculture (Irrigation and Livestock Watering), and Industrial (e.g., Food Processing Industry).

### **Why does Table 1 look different from the other tables in the report?**

Table 1 lists guidelines for drinking water (at the point of consumption) and recreational waters. These guidelines, designed to protect human health, are the responsibility of Health and Welfare Canada. The list of substances considered by Health Canada is broader than that considered by the Province (Tables 2 through 50) and reflects a Canadian perspective.

Drinking water guidelines as stated in Tables 2 through 50 are, in some cases, for raw waters before treatment and should not be confused with those in Table 1.

### **How do you define water quality guidelines?**

Water quality guidelines apply province-wide and are safe levels of substances for the protection of a given water use, including drinking water, aquatic life, recreation and agricultural uses. In aquatic environments, water quality includes the physical, chemical and biological quality of the water, sediment and biota. These guidelines are being developed by the province substance by substance, starting with those most urgently needed for water quality assessments and objectives.

### **Are there other (than water column) guidelines recommended by the province?**

The province has recommended a limited number of sediment quality and tissue guidelines to protect aquatic environments. These guidelines are specified for contaminants such as mercury, PCBs, and PAHs.

### **What are site-specific water quality guidelines or objectives?**

Water quality objectives or site-specific guidelines are a refinement of the province-wide guidelines that are adapted to protect the most sensitive water use at a specific location, taking local circumstances into account. As suggested above, they have their basis in the water quality guidelines plus the site characteristics that may influence the toxic action of the substance of concern. The Ministry recognizes that site-specific factors may necessitate modification of the **Approved** or the **Working** guidelines and suggests means to do this in a 1997 publication: **Methods for Deriving Site-specific Water Quality Objectives in British Columbia and Yukon.**

### **I have seen other references to similar reports issued by the Ministry in the past. Are those reports still valid?**

As indicated above, this report is revised periodically to incorporate new information. Sections from the earlier versions that are still useful have been included in this 2006 report. The 2006 version supersedes the following documents:

1. **Preliminary Working Criteria for Water Quality**, October 1982.
2. **Working Criteria for Water Quality**, April 1985.
3. **Approved and Working Criteria for Water Quality**, April 1987, March 1989, May 1991, February 1994, and April 1995.
4. **British Columbia Approved Water Quality Guidelines (Criteria) 1998 Edition**, September 11, 1998 and updated August 24, 2001.

A second report, **A Compendium of Working Water Quality Guidelines for British Columbia**, which contains guidelines from other jurisdictions, has been published separately.

### **Which water quality guidelines have been developed by the Ministry?**

Water quality guidelines for the following substances have been approved\*.

| Substance                          | Table Number | Substance   | Table Number     |
|------------------------------------|--------------|---|------------------|
| Algae                              | 3            | Nitrate   | 16               |
| Aluminum                           | 6, 7         | Nitrite   | 16, 17           |
| Arsenic                            | 43           | Nitrogen (nitrate, nitrite and ammonia)             | 4, 5, 16, 21, 22 |
| Benthic sedimentation              | 2            | Nutrients (phosphorus) and algae                    | 3                |
| Boron                              | 49, 50       | Organic carbon                                      | 33               |
| Chlorate                           | 44           | Oxygen (dissolved)                                  | 18               |
| Chloride                           | 47           | PAHs (polycyclic aromatic hydrocarbons)             | 24, 25           |
| Chlorine                           | 19           | Particulate matter (suspended solids and turbidity) | 2                |
| Chlorophenols                      | 26, 27       | PCBs (polychlorinated biphenyls)                    | 23               |
| Cobalt                             | 48           | pH  | 28               |
| Coliforms                          | 8            | Phosphorus  | 3                |
| Colour                             | 32           | Polychlorinated biphenyls (PCBs)                    | 23               |
| Copper                             | 9            | Polycyclic aromatic hydrocarbons (PAHs)             | 24, 25           |
| Cyanide                            | 10           | Selenium  | 41               |
| Diisopropanolamine (DIPA)          | 45           | Silver  | 29               |
| Ethylbenzene                       | 35           | Sulphate  | 37               |
| Fluoride                           | 20           | Sulpholane  | 46               |
| Lead                               | 11, 12       | Suspended Solids                                    | 2                |
| Manganese                          | 38           | Temperature   | 42, 43           |
| Mercury                            | 13, 14       | Toluene   | 36               |
| Methyl tertiary-butyl ether (MTBE) | 40           | Total gas pressure                                  | 30               |
| Microbiological indicators         | 8            | Turbidity   | 2                |
| Molybdenum                         | 15           | Zinc  | 34               |

when using the guidelines to ensure accuracy and a full understanding of the guidelines.

### What guidelines have changed since the 1998 (updated in 2001) editions?

Approved guidelines have been added for:

Arsenic (Table 43)

Boron (Tables 49 and 50)

Chlorate (Table 44)

Chloride (Table 47)

Cobalt (Table 48)

Diisopropanolamine - DIPA (Table 45)

Sulpholane (Table 46)

Approved guidelines have been revised for:

Total gas pressure (Table 30)

Mercury (aquatic life; Tables 13 and 13a)

### Which water quality guidelines are currently being developed by the Ministry?

Guidelines for the following substances are being reviewed:

| Substance  |
|--|
| <ul style="list-style-type: none"><li>• Barium</li><li>• Benzene</li><li>• Beryllium</li><li>• Chromium</li><li>• Dioxins and furans</li><li>• Iron</li><li>• Toluene</li><li>• Xylene</li></ul> |

### Which other tools does the Ministry have to help one assess water quality?

In addition to this report and the **Compendium** report, the Ministry has developed several tools that can be used to assess water quality. For instance, the **Principles** document, the **User's Guide**, and the **Deriving Site-Specific Objectives** reports (see below) outline the process that can be used to develop site-specific water quality objectives. The **Status Report** indicates the state of water quality

for waterbodies in B.C. based on available data. The Ministry has also developed manuals that will help in designing and implementing monitoring programs, and interpreting water quality data. Titles of the completed reports are listed below:

- *Principles for Preparing Water Quality Objectives in British Columbia. 1986*
- *Developing Water Quality Objectives in British Columbia-A User's Guide. 1996*
- *British Columbia Water Quality Status Report. 1996*
- *Lake and Stream Bottom Sediment Sampling Manual. 1997*
- *Freshwater Biological Sampling Manual. 1997*
- *Ambient Fresh Water and Effluent Sampling Manual. 1997*
- *Guidelines for Designing and Implementing a Water Quality Monitoring Program in British Columbia. 1998*
- *Guidelines for Interpreting Water Quality Data. 1998*
- *Methods for Deriving Site-Specific Objectives in British Columbia and Yukon, 1997*

## **Tables of Recommended Guidelines**

**Table 1. Water Quality Guidelines for Drinking and Recreational Water Uses**

(For more up-to-date information for these guidelines use the web link:  
[http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/water-eau/drink-potab/guide/index_e.html))

| <b>Substance</b>  | <b>Water Use</b> | <b>Guidelines</b>  |
|---|------------------|--|
| Aldicarb (total)<br>-aldicarb, aldicarb sulfoxide, aldicarb sulfone | Drinking         | 9 µg/L (maximum)   |
| Aldrin + Dieldrin (total)   | Drinking         | 0.7 µg/L (maximum)   |
| Aluminum  | Drinking         | 0.1 (conventional treatment)<br>0.2 (other treatment)<br>also see Tables 6 and 7 for approved guidelines |
| Aluminum  | Recreation       | see Tables 6 and 7 for approved guidelines   |
| Antimony  | Drinking         | 6 µg/L (proposed interim maximum)  |
| Arsenic   | Drinking         | 25 µg/L (interim maximum)<br>5 µg/L (proposed maximum)   |
| Atrazine and its metabolites  | Drinking         | 5 µg/L (interim maximum)   |
| Azinphos-methyl   | Drinking         | 20 µg/L (maximum)  |
| Barium  | Drinking         | 1 mg/L (maximum)   |
| Bendiocarp  | Drinking         | 40 µg/L (maximum)  |
| Benzene   | Drinking         | 5 µg/L (maximum)   |
| Benzo[a]pyrene  | Drinking         | 0.01 µg/L (maximum)  |
| Boron   | Drinking         | 5 mg/L (maximum)   |
| Bromate   | Drinking         | 10 µg/L (maximum)  |

|  |            |   |
|--|------------|---|
| Bromodichloromethane (BDCM)                        | Drinking   | 16 µg/L (maximum)   |
| Bromoxnyil   | Drinking   | 5 µg/L (interim maximum)  |
| Cadmium (total)                                    | Drinking   | 5 µg/L (maximum)  |
| Carbaryl   | Drinking   | 90 µg/L (maximum)   |
| Carbofuran   | Drinking   | 90 µg/L (maximum)   |
| Carbon tetrachloride                               | Drinking   | 5 µg/L (maximum)  |
| Chloramines  | Drinking   | 3 mg/L (maximum)  |
| Chlorate   | Drinking   | 1 mg/L (proposed maximum)<br>also see Table 44 for approved guidelines          |
| Chloride (dissolved)                               | Drinking   | less than or equal to 250 mg/L<br>(aesthetic objective)                         |
| Chlorite   | Drinking   | 1 mg/L (proposed maximum)   |
| Chlorophyll a (approved B.C. guideline)            | Drinking   | 2 to 2.5 µg/L (lakes, summer average)   |
| Chlorpyrifos                                       | Drinking   | 90 µg/L (maximum)   |
| Chromium (total)                                   | Drinking   | 50 µg/L (maximum)   |
| Clarity (as Secchi disc visibility)                | Recreation | 1.2 m (minimum)   |
| Colour (true)                                      | Drinking   | less than or equal to 15 TCU<br>(aesthetic objective)                           |
| Colour (true)                                      | Recreation | should not impede visibility in swimming areas                                  |
| Conductivity (specific)                            | Drinking   | 700 µS/cm(maximum)<br>approximate equivalent of 500 mg/L total dissolved solids |
| Copper   | Drinking   | less than or equal to 1 mg/L<br>(aesthetic objective)                           |
| Cyanazine  | Drinking   | 10 µg/L (interim maximum)   |
| Cyanide  | Drinking   | 200 µg/L (maximum)  |
| Cyanobacterial toxins (as Microcystin-LR)          | Drinking   | 1.5 µg/L (maximum)  |
| 1,2-Dichlorobenzene                                | Drinking   | 200 µg/L (maximum)<br>less than or equal to 3 µg/L<br>(aesthetics objective)    |
| 1,2-Dichlorobenzene                                | Drinking   | less than or equal to 3 µg/L<br>(aesthetics objective)                          |
| Dichlorodiphenyltrichloroethane (DDT+ metabolites) | Drinking   | 30 µg/L (interim maximum)   |
| 2,4-Dichlorophenoxy acetic acid (2,4-D)            | Drinking   | 100 µg/L (interim maximum)  |
| Diazinon   | Drinking   | 20 µg/L (maximum)   |
| Dicamba  | Drinking   | 120 µg/L (interim maximum)  |
| 1,4-Dichlorobenzene                                | Drinking   | 5 µg/L (maximum)<br>less than or equal to 1µg/L<br>(aesthetics objective)       |



|                                      |            |   |
|--------------------------------------|------------|---|
| 1,2-Dichloroethane                   | Drinking   | 5 µg/L (interim maximum)  |
| 1,1-Dichloroethylene                 | Drinking   | 14 µg/L (maximum)   |
| Dichloromethane (methylene chloride) | Drinking   | 50 µg/L (maximum)   |
| 2,4-Dichlorophenol                   | Drinking   | 900 µg/L (maximum)<br>0.3 µg/L (aesthetic objective)  |
| Diclofop-methyl                      | Drinking   | 9 µg/L (maximum)  |
| Dimethoate                           | Drinking   | 20 µg/L (maximum)   |
| Dinoseb                              | Drinking   | 10 µg/L (maximum)   |
| Diquat                               | Drinking   | 70 µg/L (maximum)   |
| Diuron                               | Drinking   | 150 µg/L (maximum)  |
| Ethylbenzene                         | Drinking   | 2.4 µg/L (aesthetic objective)  |
| Ethylbenzene                         | Recreation | 2.4 µg/L (aesthetic objective)  |
| Fluoride (total)                     | Drinking   | 1.5 mg/L (maximum)  |
| Glyphosate                           | Drinking   | 280 µg/L (maximum)  |
| Hardness (total dissolved)           | Drinking   | 80 to 100 mg/L as CaCO <sub>3</sub> is acceptable<br>over 200 mg/L as CaCO <sub>3</sub> is poor but can be tolerated<br>over 500 mg/L as CaCO <sub>3</sub> is normally unacceptable |
| Iron                                 | Drinking   | less than or equal to 0.3 mg/L (aesthetic objective)  |
| Lead                                 | Drinking   | 10 µg/L (maximum)   |
| Magnesium (dissolved)                | Drinking   | 100 mg/L, taste threshold for sensitive people<br>500 mg/L, taste threshold for average people<br>over 700 mg/L, laxative effects for everyone                                      |
| Malathion                            | Drinking   | 190 µg/L (maximum)  |
| Manganese                            | Drinking   | less than or equal to 50 µg/L (aesthetic objective)   |
| Mercury                              | Drinking   | 1 µg/L (maximum)  |
| Methoxychlor                         | Drinking   | 900 µg/L (maximum)  |
| Methyl tertiary-butyl ether (MTBE)   | Drinking   | 0.02 mg/L (maximum)<br>0.015 mg/L (proposed maximum)  |
| Methyl tertiary-butyl ether (MTBE)   | Recreation | 0.02 mg/L (maximum)   |
| Metolachlor                          | Drinking   | 50 µg/L (maximum)   |
| Metribuzin                           | Drinking   | 80 µg/L (maximum)   |
| Microbiological indicators           | Drinking   | 0 total coliforms/100 mL<br>0 <i>E. coli</i> per 100 mL   |

|                                    |            |   |
|------------------------------------|------------|---|
| Microbiological indicators         | Recreation | 2000 E. coli/L (geometric mean, fresh water)<br>350 enterococci/L (geometric mean, marine water)<br>(resample at 4000 E. coli or 700 enterococci) |
| Monochlorobenzene                  | Drinking   | 80 µg/L (maximum)<br>less than or equal to 30 µg/L (aesthetic objective)  |
| MTBE (Methyl tertiary-butyl ether) | Drinking   | 0.02 mg/L (maximum)<br>0.015 mg/L (proposed maximum)  |
| MTBE (Methyl tertiary-butyl ether) | Recreation | 0.02 mg/L (maximum)   |
| Nitrate                            | Drinking   | 45 mg/L as NO <sub>3</sub> (maximum)<br>10 mg/L as N  |
| Nitrite                            | Drinking   | 3.2 mg/L as NO <sub>3</sub><br>1.0 mg/L as N  |
| Nitritotriacetic acid (NTA)        | Drinking   | 400 µg/L (maximum)  |
| Odour                              | Drinking   | inoffensive (aesthetic objective)   |
| Oil and grease                     | Recreation | not detectable by sight or smell  |
| Paraquat dichloride                | Drinking   | 10 µg/L (maximum)<br>(7 µg/L for the paraquat ion)  |
| Parathion                          | Drinking   | 50 µg/L (maximum)   |
| Pentachlorophenol                  | Drinking   | 60 µg/L (maximum)<br>30 µg/L (aesthetic objective)  |
| pH                                 | Drinking   | 6.5 to 8.5 (aesthetic objective)  |
| pH                                 | Recreation | 6.5 to 8.5 (aesthetic objective)  |
| pH                                 | Recreation | 5.0 to 9.0 (buffering capacity)   |
| Phorate                            | Drinking   | 2 µg/L (maximum)  |
| Picloram                           | Drinking   | 190 µg/L (interim maximum)  |
| Selenium                           | Drinking   | 10 µg/L (maximum)   |
| Simazine                           | Drinking   | 10 µg/L (interim maximum)   |
| Sodium                             | Drinking   | less than or equal to 200 mg/L (aesthetic objective)<br>20 mg/L alert level for people on sodium restricted diets                                 |
| Solids (floatable or settleable)   | Recreation | none  |
| Sulphate                           | Drinking   | less than or equal to 500 mg/L (aesthetic objective)  |
| Sulphide (as H <sub>2</sub> S)     | Drinking   | 50 µg/L (aesthetic objective)   |
| Taste                              | Drinking   | inoffensive (aesthetic objective)   |
| Temperature                        | Drinking   | 15 degrees Celsius maximum (aesthetic objective)  |
| Temperature                        | Recreation | 30 degrees Celsius maximum  |
| Terbufos                           | Drinking   | 1 µg/L (maximum)  |

|                           |            |   |
|---------------------------|------------|---|
| Tetrachloroethylene       | Drinking   | 30 µg/L (maximum)   |
| 2,3,4,6-Tetrachlorophenol | Drinking   | 100 µg/L (maximum)<br>less than or equal to 1 µg/L<br>(aesthetic objective)   |
| Toluene                   | Drinking   | less than or equal to 24 µg/L<br>(aesthetic objective)  |
| Total dissolved solids    | Drinking   | less than or equal to 500 mg/L<br>(aesthetic objective)   |
| Trichloroethylene         | Drinking   | 5 µg/L (maximum)  |
| 2,4,6-Trichlorophenol     | Drinking   | 5 µg/L (maximum)<br>less than or equal to 2 µg/L<br>(aesthetic objective)   |
| Trifluralin               | Drinking   | 45 µg/L (maximum)   |
| Trilomethanes             | Drinking   | 100 µg/L (annual average)<br>100 µg/L (proposed maximum)  |
| Turbidity                 | Drinking   | <0.1 NTU (target at all times)<br>0.3 NTU 95th percentile, 1.0 NTU<br>maximum for chemically assisted<br>filtration<br>1.0 NTU 95th percentile, 3.0 NTU<br>maximum for slow sand or<br>diatomaceous earth filtration<br>0.1 NTU 99th percentile, 0.3 NTU<br>maximum for membrane filtration |
| Turbidity                 | Recreation | 50 NTU (maximum)  |
| Uranium                   | Drinking   | 20µg/L (maximum)  |
| Vinyl chloride            | Drinking   | 2 µg/L (maximum)  |
| Xylenes (total)           | Drinking   | less than or equal to 300 µg/L<br>(aesthetic objective)   |
| Zinc                      | Drinking   | less than or equal to 5 mg/L<br>(aesthetic objective)   |

**1. From Health and Welfare Canada,  
References 21, 22, 23, 24 and 25.**

**Updated to 5-May-2006 from [www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/](http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/)**

**Table 2: Summary of Water Quality Guidelines for Turbidity, Suspended and Benthic Sediments**

| <b>Water Use</b>  | <b>Maximum Induced Turbidity - NTU or % of background</b>   | <b>Maximum Induced Suspended Sediments - mg/L or % of background</b>   | <b>Streambed Substrate Composition</b>   |
|---|---|--|--|
| Drinking Water - raw untreated  | 1 NTU when background is less than or equal to 5  | No Guideline   | No Guideline   |
| Drinking Water - raw treated  | 5 NTU when background is less than or equal to 50<br>10% when background is greater than 50   | No Guideline   | No Guideline   |
| Recreation and Aesthetics   | Maximum 50 NTU<br>Secchi disc visible at 1.2m   | No Guideline   | No Guideline   |
| Aquatic Life<br>- fresh<br>- marine<br>- estuarine                              | 8 NTU in 24 hours when background is less than or equal to 8<br>mean of 2 NTU in 30 days when background is less than or equal to 8 | 25 mg/L in 24 hours when background is less than or equal to 25<br>mean of 5 mg/L in 30 days when background is less than or equal to 25 | finest not to exceed<br>-10% as less than 2 mm<br>-19% as less than 3 mm<br>-25% as less than 6.35 mm at salmonid spawning sites |
| Aquatic Life<br>- fresh<br>- marine<br>- estuarine                              | 8 NTU when background is between 8 and 80<br>10% when background is greater than or equal to 80                                     | 25 mg/L when background is between 25 and 250<br>10% when background is greater than or equal to 250                                     | Geometric mean diameter not less than 12 mm<br>Fredle number not less than 5 mm  |
| Terrestrial Life<br>- wildlife<br>- livestock water<br>Irrigation<br>Industrial | 10 NTU when background is less than or equal to 50<br>20% when background is greater than or equal to 50                            | 20 mg/L when background is less than or equal to 100<br>20% when background is greater than or equal to 100                              | No Guideline   |

**References 1, 32**

**Table 3. Summary of Water Quality Guidelines for Nutrients and Algae**

| <b>Water Use</b>   | <b>Phosphorus<br/>µg/L (total)</b> | <b>Chlorophyll a<br/>mg/m<sup>2</sup></b> |
|--|------------------------------------|---|
| Drinking Water<br>- lakes  | 10 µg/L<br>(maximum)               | None proposed                             |
| Aquatic Life<br>- streams  | None proposed                      | 100 mg/m <sup>2</sup><br>(maximum)        |
| Aquatic Life<br>- lakes<br>(salmonids are the predominant fish<br>species) | 5 to 15 µg/L<br>(inclusive)        | None proposed                             |
| Recreation<br>- streams  | None proposed                      | 50 mg/m <sup>2</sup>                      |
| Recreation<br>- lakes  | 10 µg/L<br>(maximum)               | None proposed                             |

**1. Total phosphorus in lakes is either the spring overturn concentration, if the residence time of the epilimnetic water is greater than 6 months, or the mean epilimnetic growing season concentration, if the residence time of the epilimnetic water is less than 6 months**

**2. Chlorophyll a guidelines in streams apply to naturally growing periphytic algae.**

**Reference 2**

**Table 4. Average 30-day Concentration of Total Ammonia Nitrogen for Protection of Aquatic Life (mg/L of Nitrogen)**

**Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T=0.0</b> | <b>T=1.0</b> | <b>T=2.0</b> | <b>T=3.0</b> | <b>T=4.0</b> | <b>T=5.0</b> | <b>T=6.0</b> |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 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         | 1.95         | 1.92         |
| 7.3       | 2.08         | 2.05         | 2.02         | 1.99         | 1.97         | 1.95         | 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         | 1.93         |
| 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        |

**Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T=7.0</b> | <b>T=8.0</b> | <b>T=9.0</b> | <b>T=10.0</b> | <b>T=11.0</b> | <b>T=12.0</b> | <b>T=13.0</b> |
|-----------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|
| 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         |

### Temperature (T) in degrees Celsius

| pH  | T=14.0 | T=15.0 | T=16.0 | T=17.0 | T=18.0 | T=19.0 | T=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  |

**1. The average of the measured values must be less than the average of the corresponding individual values.**

**2. Each measured value is compared to the corresponding individual values.**

**3. No more than one in five of the measured values can be greater than 1.5 x the corresponding guidelines values.**

**Reference 3**



**Table 5. Maximum Concentration of Total Ammonia Nitrogen for Protection of Aquatic Life****Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T=0.0</b> | <b>T=1.0</b> | <b>T=2.0</b> | <b>T=3.0</b> | <b>T=4.0</b> | <b>T=5.0</b> | <b>T=6.0</b> |
|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| 6.5       | 27.7         | 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         | 12.2         | 12.0         | 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        |

**Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T=7.0</b> | <b>T=8.0</b> | <b>T=9.0</b> | <b>T=10.0</b> | <b>T=11.0</b> | <b>T=12.0</b> | <b>T=13.0</b> |
|-----------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|
| 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         |

### Temperature (T) in degrees Celsius

| pH  | T=14.0 | T=15.0 | T=16.0 | T=17.0 | T=18.0 | T=19.0 | T=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   | 5.64   | 5.62   | 5.61   | 5.60   |
| 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   | 1.55   | 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  |

**Reference 3**

**Table 6. Summary of Water Quality Guidelines for Aluminum**

| <b>Water Use</b>   | <b>maximum aluminum in mg/L<br/>(use instantaneous pH value)</b>        | <b>30-day mean aluminum in mg/L<br/>(use median pH value)</b>                                |
|--|---|--|
| Drinking Water Supply                                      | 0.2 mg/L dissolved Al   | None proposed  |
| Fresh Water Aquatic Life (pH greater than or equal to 6.5) | 0.1 mg/L dissolved Al   | 0.05 mg/L dissolved Al   |
| Fresh Water Aquatic Life (pH less than 6.5)                | dissolved Al =<br>$\exp(1.209 - 2.426 K + 0.286 K^2)$<br>[where K = pH] | dissolved Al =<br>$\exp(1.6 - 3.327 \text{ median } K + 0.402 K^2)$<br>[where K = median pH] |
| Wildlife Water Supply                                      | 5 mg/L total Al   | None proposed  |
| Livestock Water Supply                                     | 5 mg/L total Al   | None proposed  |
| Marine and Estuarine Aquatic Life                          | None proposed   | None proposed  |
| Irrigation Water Supply                                    | 5 mg/L total Al   | None proposed  |
| Recreation and Aesthetics                                  | 0.2 mg/L dissolved Al   | None proposed  |

**1. When detailed knowledge of the bioavailable forms of aluminum is available, the form of aluminum in the guidelines for aquatic life can be modified, as justified by the data.**

**2. The average is calculated from at least 5 weekly samples taken in a period of 30 days.**

**3. Tables 7a and 7b give maximum and 30-day average guidelines specified by the regression equations. (If the natural levels exceed the guidelines, the increase in aluminum levels above background to be allowed, if any, should be based on site-specific data).**

**Reference 4**

**Table 7. Examples of Freshwater Aluminum Guidelines Specified by the Regression Equations**

**Table 7a. Maximum Dissolved Aluminum Concentration (mg/L) at pH Less Than 6.5**

| pH           | Maximum    | pH     | Maximum    | pH     | Maximum    |
|--------------|------------|--------|------------|--------|------------|
| pH 4.0 - 4.6 | 0.020 mg/L | pH 5.3 | 0.027 mg/L | pH 5.9 | 0.043 mg/L |
| pH 4.7 - 4.8 | 0.021 mg/L | pH 5.4 | 0.029 mg/L | pH 6.0 | 0.047 mg/L |
| pH 4.9       | 0.022 mg/L | pH 5.5 | 0.031 mg/L | pH 6.1 | 0.052 mg/L |
| pH 5.0       | 0.023 mg/L | pH 5.6 | 0.033 mg/L | pH 6.2 | 0.059 mg/L |
| pH 5.1       | 0.024 mg/L | pH 5.7 | 0.036 mg/L | pH 6.3 | 0.066 mg/L |
| pH 5.2       | 0.025 mg/L | pH 5.8 | 0.039 mg/L | pH 6.4 | 0.074 mg/L |

**Reference 4**

**Table 7b. 30-Day Average Dissolved Aluminum Concentration (mg/L) at pH Less Than 6.5**

| Median pH    | 30-day mean | Median pH | 30-day mean | Median pH | 30-day mean |
|--------------|-------------|-----------|-------------|-----------|-------------|
| pH 4.0 - 4.5 | 0.005 mg/L  | pH 5.5    | 0.011 mg/L  | pH 6.0    | 0.020 mg/L  |
| pH 4.6 - 4.9 | 0.006 mg/L  | pH 5.6    | 0.012 mg/L  | pH 6.1    | 0.024 mg/L  |
| pH 5.0 - 5.1 | 0.007 mg/L  | pH 5.7    | 0.013 mg/L  | pH 6.2    | 0.028 mg/L  |
| pH 5.2       | 0.008 mg/L  | pH 5.8    | 0.015 mg/L  | pH 6.3    | 0.033 mg/L  |
| pH 5.3       | 0.009 mg/L  | pH 5.9    | 0.018 mg/L  | pH 6.4    | 0.040 mg/L  |
| pH 5.4       | 0.010 mg/L  | —         | —           | —         | —           |

**Reference 4**

**Table 8. Summary of Water Quality Guidelines for Microbiological Indicators**

| <b>Water Use</b>  | <b>Escherichia coli</b>                                   | <b>Enterococci</b>                                       | <b>Pseudomonas aeruginosa</b> | <b>Fecal coliforms</b>                                    |
|---|---|--|-------------------------------|---|
| Raw drinking water<br>- no treatment                    | 0/100 mL  | 0/100 mL   | 0/100 mL                      | 0/100 mL  |
| Raw drinking water<br>- disinfection only               | less than<br>or equal to<br>10/100 mL<br>90th percentile  | less than<br>or equal to<br>3/100 mL<br>90th percentile  | None applicable               | less than<br>or equal to<br>10/100 mL<br>90th percentile  |
| Raw drinking water<br>- partial treatment               | less than<br>or equal to<br>100/100 mL<br>90th percentile | less than<br>or equal to<br>25/100 mL<br>90th percentile | None applicable               | less than<br>or equal to<br>100/100 mL<br>90th percentile |
| Raw drinking water<br>- complete treatment              | None applicable   | None applicable  | None applicable               | None applicable   |
| Aquatic life<br>- shellfish<br>harvesting               | less than<br>or equal to<br>43/100 mL<br>90th percentile  | less than<br>or equal to<br>11/100 mL<br>90th percentile | None applicable               | less than<br>or equal to<br>43/100 mL<br>90th percentile  |
| Aquatic life<br>- shellfish<br>harvesting               | less than<br>or equal to<br>14/100 mL<br>median           | less than<br>or equal to<br>4/100 mL<br>median           | None applicable               | less than<br>or equal to<br>14/100 mL<br>median           |
| Wildlife  | None applicable   | None applicable  | None applicable               | None applicable   |
| Livestock - free<br>range animals                       | None applicable   | None applicable  | None applicable               | None applicable   |
| Livestock - general<br>livestock use                    | 200/100 mL<br>maximum                                     | 50/100 mL<br>maximum                                     | None applicable               | 200/100 mL<br>maximum                                     |
| Livestock - closely<br>confined (no<br>treatment)       | 0/100 mL<br>maximum                                       | 0/100 mL<br>maximum                                      | None applicable               | 0/100 mL<br>maximum                                       |
| Livestock - closely<br>confined<br>(disinfection only)  | less than<br>or equal to<br>10/100 mL<br>90th percentile  | less than<br>or equal to<br>3/100 mL<br>90th percentile  | None applicable               | less than<br>or equal to<br>10/100 mL<br>90th percentile  |
| Livestock - closely<br>confined (partial<br>treatment)  | less than<br>or equal to<br>100/100 mL<br>90th percentile | less than<br>or equal to<br>25/100 mL<br>90th percentile | None applicable               | less than<br>or equal to<br>100/100 mL<br>90th percentile |
| Livestock - closely<br>confined (complete<br>treatment) | None applicable   | None applicable  | None applicable               | None applicable   |
| Irrigation<br>- crops eaten raw                         | less than<br>or equal to                                  | less than<br>or equal to                                 | None applicable               | less than<br>or equal to                                  |

|  | 77/100 mL<br>geometric mean                               | 20/100 mL<br>geometric mean                              |  | 200/100 mL<br>geometric mean                              |
|--|---|--|--|---|
| Irrigation<br>- public access<br>- livestock access                        | less than<br>or equal to<br>385/100 mL<br>geometric mean  | less than<br>or equal to<br>100/100 mL<br>geometric mean | less than<br>or equal to<br>10/100 mL<br>75th percentile | None applicable   |
| Irrigation<br>- general irrigation   | less than<br>or equal to<br>1000/100 mL<br>geometric mean | less than<br>or equal to<br>250/100 mL<br>geometric mean | None applicable  | less than<br>or equal to<br>1000/100 mL<br>geometric mean |
| Recreation<br>- aesthetics<br>- non contact                                | None applicable   | None applicable  | None applicable  | None applicable   |
| Recreation<br>- secondary contact<br>- crustacean<br>harvesting            | less than<br>or equal to<br>385/100 mL<br>geometric mean  | less than<br>or equal to<br>100/100 mL<br>geometric mean | less than<br>or equal to<br>10/100 mL<br>75th percentile | None applicable   |
| Recreation<br>- primary contact  | less than<br>or equal to<br>77/100 mL<br>geometric mean   | less than<br>or equal to<br>20/100 mL<br>geometric mean  | less than<br>or equal to<br>2/100 mL<br>75th percentile  | less than<br>or equal to<br>200/100 mL<br>geometric mean  |
| Industrial water<br>(dairy, food<br>processing)<br>- no treatment          | 0/100 mL  | 0/100 mL   | None applicable  | 0/100 mL  |
| Industrial water<br>(dairy, food<br>processing)<br>- disinfection only     | less than<br>or equal to<br>10/100 mL<br>90th percentile  | less than<br>or equal to<br>3/100 mL<br>90th percentile  | None applicable  | less than<br>or equal to<br>10/100 mL<br>90th percentile  |
| Industrial water<br>(dairy, food<br>processing)<br>- partial treatment     | less than<br>or equal to<br>100/100 mL<br>90th percentile | less than<br>or equal to<br>25/100 mL<br>90th percentile | None applicable  | less than<br>or equal to<br>100/100 mL<br>90th percentile |
| Industrial water<br>(dairy, food<br>processing)<br>- complete<br>treatment | None applicable   | None applicable  | None applicable  | None applicable   |
| Industrial water<br>- other industries                                     | less than<br>or equal to<br>385/100 mL<br>geometric mean  | less than<br>or equal to<br>100/100 mL<br>geometric mean | less than<br>or equal to<br>10/100 mL<br>75th percentile | None applicable   |

***1. Fecal coliform guidelines that presently exist will apply on an interim basis until use of the other preferred indicators is adopted.***

***2. For the dairy industry there is an additional guideline of less than or equal to 5/100 mL lipolytic and/or proteolytic bacteria.***

***3. Medians and geometric means are calculated from at least 5 samples in a 30-day period. Ten samples are required for 90th percentiles.***

***4. These recreation and shell harvesting guidelines are applicable to fresh and marine waters, except the E. coli guidelines that apply only to fresh water.***

***5. Only a few salad greens that cannot be adequately washed to remove adhering or trapped pathogens are of concern under the crops eaten raw section of irrigation. Examples include lettuce, cabbage, broccoli, cauliflower and similar crops.***

***6. These primary contact recreation guidelines may be subject to revision depending upon the future results of a federal/provincial study group on Canadian recreational water quality.***

***Reference 5***



**Table 9. Summary of Water Quality Guidelines for Copper**

| <b>Water Use</b>   | <b>30-day averages<br/>µg/L total copper</b>    | <b>Maximum<br/>µg/L total copper</b>                              |
|--|---|---|
| Raw Drinking Water Supply  | —   | 500 µg/L  |
| Fresh Water Aquatic Life (when average water hardness as CaCO <sub>3</sub> is less than or equal to 50 mg/L) | less than or equal to 2µg/L                     | (0.094(hardness)+2) µg/L<br>(hardness as mg/L CaCO <sub>3</sub> ) |
| Fresh Water Aquatic Life (when average water hardness as CaCO <sub>3</sub> is greater than 50 mg/L)          | less than or equal to 0.04 (mean hardness) µg/L | (0.094(hardness)+2) µg/L<br>(hardness as mg/L CaCO <sub>3</sub> ) |
| Wildlife   | None proposed                                   | 300 µg/L  |
| Livestock Water Supply   | None proposed                                   | 300 µg/L  |
| Irrigation Water Supply  | None proposed                                   | 200 µg/L  |
| Recreation and Aesthetics  | None proposed                                   | 1000 µg/L   |
| Marine and Estuarine Aquatic Life  | less than or equal to 2 µg/L                    | 3 µg/L  |

**1. The average is calculated from at least 5 weekly samples taken in a period of 30 days.**

**2. When detailed knowledge on the the bioavailable forms of copper is available, the form of copper in the guidelines for aquatic life can be modified, as justified by the data.**

**3. If natural background levels exceed the guidelines for aquatic life, the increase in total copper above natural levels to be allowed, if any, should be based on site-specific data.**

**Reference 6**

**Table 10. Summary of Water Quality Guidelines for Cyanide**

| <b>Water Use</b>  | <b>Strong-acid dissociable cyanide plus thiocyanate<br/>µg/L (as CN)</b> | <b>Strong-acid dissociable cyanide<br/>µg/L (as CN)</b> | <b>Weak-acid dissociable cyanide<br/>µg/L (as CN)</b> |
|---|--|---|---|
| Raw Drinking Water<br>- includes food processing water<br>(maximum at any time) | 200 µg/L   | Not applicable  | Not applicable  |
| Freshwater Aquatic Life<br>(30-day average)                                     | Not applicable   | None proposed   | less than or equal to<br>5 µg/L                       |
| Freshwater Aquatic Life<br>(maximum at any time)                                | Not applicable   | None proposed   | 10 µg/L   |
| Marine and Estuarine<br>Aquatic Life<br>(maximum at any time)                   | Not applicable   | None proposed   | 1 µg/L  |

- 1. All characteristics apply to unfiltered water.**
  - 2. The average is calculated from at least 5 weekly samples taken in a period of 30 days.**
  - 3. Measure strong-acid dissociable cyanide in addition to weak-acid dissociable cyanide. If tests show that strong-acid dissociable cyanide is greater than the guidelines for weak-acid dissociable cyanide, further sampling of the receiving water is recommended at the same site during bright sunlight, and from sites further from the cyanide source.**
  - 4. If it can be shown for a particular water supply, that treatment methods (chlorination, ozonation or ultraviolet irradiation) do not produce free cyanide or cyanogen chloride from the dissociation of thiocyanate, then the guideline should apply only to strong-acid dissociable cyanide.**
- Reference 7**

**Table 11. Summary of Water Quality Guidelines for Lead**

| <b>Water Use</b>  | <b>30-day average<br/>(µg/L total lead)</b>  | <b>maximum<br/>(µg/L total lead)</b>     |
|---|--|--|
| Drinking Water Supply   | None proposed  | 50 µg/L total lead                       |
| Fresh Water Aquatic Life<br>(water hardness as CaCO <sub>3</sub><br>less than or equal to 8 mg/L) | None proposed  | 3 µg/L total lead                        |
| Fresh Water Aquatic Life<br>(water hardness as CaCO <sub>3</sub><br>less than or equal to 8 mg/L) | less than or equal to<br>$3.31 + e(1.273 \ln [\text{mean hardness}] - 4.704)$  | $e(1.273 \ln [\text{hardness}] - 1.460)$ |
| Wildlife Water Supply   | None proposed  | 100 µg/L total lead                      |
| Livestock Water Supply  | None proposed  | 100 µg/L total lead                      |
| Marine and Estuarine<br>Aquatic Life  | less than or equal to<br>2 µg/L total lead<br>—<br>(80% of the values<br>less than or equal to<br>3 µg/L total lead) | 140 µg/L total lead                      |
| Irrigation Water Supply<br>(neutral and alkaline<br>fine-textured soils)                          | None proposed  | 400 µg/L total lead                      |
| Irrigation Water Supply<br>(all other soils)  | None proposed  | 200 µg/L total lead                      |
| Industrial Water Supply<br>(food processing industry)   | None proposed  | 50 µg/L total lead                       |
| Recreation and Aesthetics   | None proposed  | 50 µg/L total lead                       |

**1. The average is calculated from at least 5 weekly samples taken in a period of 30 days.**

**2. If natural levels exceed the guidelines for aquatic life, the increase in total lead above natural levels to be allowed, if any, should be based on site-specific data.**

**3. The alert level for total lead in the edible portions of fish and shellfish for human consumption is 0.8 µg/g wet weight. A site-specific investigation should be done if levels approach or exceed this level.**

**Reference 8**

**Table 12. Details of Freshwater Aquatic Life Guidelines for Lead**

| <b>Water Hardness<br/>(mg/L CaCO<sub>3</sub>)</b> | <b>30-day average<br/>concentration<br/>(µg/L total lead)</b> | <b>maximum concentration<br/>(µg/L total lead)</b> |
|---|---|--|
| less than or equal to<br>8 mg/L                   | None proposed   | 3 µg/L total lead                                  |
| 20 mg/L   | 4 µg/L  | 10 µg/L  |
| 30 mg/L   | 4 µg/L  | 18 µg/L  |
| 40 mg/L   | 4 µg/L  | 25 µg/L  |
| 50 mg/L   | 5 µg/L  | 34 µg/L  |
| 80 mg/L   | 6 µg/L  | 61 µg/L  |
| 100 mg/L  | 6 µg/L  | 82 µg/L  |
| 200 mg/L  | 11 µg/L   | 197 µg/L   |
| 300 mg/L  | 16 µg/L   | 330 µg/L   |

***1. At least 80% of the measurements should be less than or equal to 1.5 times the 30-day average guideline.***

***Reference 8***

**Table 13. Summary of Water Quality Guidelines for Mercury**

| <b>Water Use</b>                                      | <b>30-day average<br/>µg/L total Hg</b> | <b>maximum at any time<br/>µg/L total Hg</b> |
|---|---|--|
| Drinking Water Supply                                 | None proposed                           | 1µg/L  |
| Fresh Water Aquatic Life                              | 0.02 µg/L                               | 0.1 µg/L                                     |
| Marine and Estuarine Aquatic Life                     | 0.02 µg/L                               | 2.0 µg/L                                     |
| Wildlife  | None proposed                           | Table 13a                                    |
| Livestock Water Supply                                | None proposed                           | 3.0 µg/L                                     |
| Irrigation Water Supply                               | None proposed                           | 2.0 µg/L                                     |
| Primary Contact Recreation                            | None proposed                           | 1.0 µg/L                                     |
| Industrial Water Supply<br>- food processing industry | None proposed                           | 1.0 µg/L                                     |

***1. The average is calculated from at least 5 weekly samples taken in a period of 30 days.***

***2. If natural levels exceed the guidelines for aquatic life, the increase in total mercury above natural levels to be allowed, if any, should be based on site-specific data.***

***3. Great Lakes Water Quality Initiative has recommended a guideline of 1.3 nanogram/L for the protection of wildlife (reference 26).***

***4. These guidelines may not be protective against Hg bioaccumulation in fish tissue; hence, they should be assessed in conjunction with the tissue residue guidelines for Hg in Table 14.***

***\* The maximum guideline for total Hg changes when the MeHg concentration in the environment changes. See Table 13a.***

***References 9 and 9a***

**Table 13a. Relationship between Methyl Mercury (MeHg) Concentration in the Environment and the Total Hg Guideline**

| % MeHg (of Total Hg) | Total Hg guideline in µg/L |
|----------------------|----------------------------|
| ≤0.5                 | 0.02                       |
| 1                    | 0.01                       |
| 2.5                  | 0.004                      |
| 5                    | 0.002                      |

**Table 13b. Tissue Residue Guideline to Protect Wildlife from Hg Toxicity**

| Maximum concentration of methyl Hg<br>in fish or shellfish consumed by wildlife |
|---|
| 0.033 µg as methyl Hg   |
| <i>References 9 and 9a</i>  |

**Table 14. Variations in (the Mercury) Aquatic Life Guidelines for Fish/Shellfish When the (Human) Diet is Based Primarily on Fish**

| Concentration of total Hg in the<br>edible portion of fish and shellfish<br>(µg Hg/g wet weight fish) | Safe quantity for weekly consumption<br>on a regular basis<br>(g fish wet weight) |
|---|---|
| 0.5 µg/g  | 210 g   |
| 0.4 µg/g  | 260 g   |
| 0.3 µg/g  | 350 g   |
| 0.2 µg/g  | 525 g   |
| 0.1 µg/g  | 1050 g  |

**1. The maximum concentration of total Hg in the edible portion of fish/shellfish should not exceed 0.5 µg/g wet weight. For people whose diet is based primarily on fish or shellfish, this guideline may need to be varied as indicated above.**

**References 9 and 9a**

**Table 15. Summary of Water Quality Guidelines for Molybdenum**

| <b>Water Use</b>  | <b>30-day averages<br/>mg/L total<br/>molybdenum</b> | <b>Maximum<br/>mg/L total<br/>molybdenum</b> |
|---|--|--|
| Raw Untreated Drinking Water  | None proposed  | 0.25 mg/L                                    |
| Fresh Water Aquatic Life  | less than or equal<br>to<br>1 mg/L                   | 2 mg/L                                       |
| Wildlife  | None proposed  | 0.05 mg/L                                    |
| Livestock Water Supply<br>(consuming forages not irrigated or if no molybdenum<br>containing fertilizers are applied to grow feed<br>consumed by livestock) | None proposed  | 0.08 mg/L                                    |
| Livestock Water Supply<br>(all other cases)   | None proposed  | 0.05 mg/L                                    |
| Irrigation Water<br>- Poorly Drained Soil<br>- Cu:Mo ratio is less than<br>2:1 in the irrigation water<br>- (forage crops)                                  | less than or equal<br>to<br>0.01 mg/L                | 0.05 mg/L                                    |
| Irrigation Water - Poorly<br>Drained Soil<br>- Cu:Mo ratio is greater than<br>2:1 in the irrigation water<br>- (forage crops)                               | less than or equal<br>to<br>0.02 mg/L                | 0.05 mg/L                                    |
| Irrigation Water - Well Drained Soil<br>(forage crops)  | less than or equal<br>to<br>0.02 mg/L                | 0.05 mg/L                                    |
| Irrigation Water - All Soils<br>(non-forage crops)  | less than or equal<br>to<br>0.03 mg/L                | None proposed                                |

**1. The average is calculated from at least 5 weekly samples taken in a period of 30 days.**

**Reference 10**

**Table 16. Summary of Water Quality Guidelines for Nitrogen**

| <b>Water Use</b>                      | <b>Nitrate<br/>mg/L as nitrogen</b>        | <b>Nitrite<br/>mg/L as nitrogen</b>   | <b>Ammonia (total)<br/>mg/L as nitrogen</b> |
|---------------------------------------|--|---|---|
| Drinking Water                        | 10 mg/L<br>(maximum)                       | 1 mg/L<br>(maximum)   | None proposed                               |
| Fresh Water Aquatic Life<br>- maximum | 200 mg/L<br>(maximum)                      | 0.06 mg/L (maximum)<br>when the chloride is<br>less than 2 mg/L<br>- also see Table 17                          | see Tables 4 and 5                          |
| Fresh Water Aquatic Life<br>- average | less than or equal to<br>40 mg/L (average) | less than or equal to<br>0.02 mg/L (average)<br>when the chloride is<br>less than 2 mg/L<br>- also see Table 17 | see Tables 4 and 5                          |
| Marine Aquatic Life<br>- maximum      | None proposed                              | None proposed   | see Table 21                                |
| Marine Aquatic Life<br>- average      | None proposed                              | None proposed   | see Table 22                                |
| Livestock Watering                    | 100 mg/L<br>(maximum)                      | 10 mg/L<br>(maximum)  | None proposed                               |
| Wildlife                              | 100 mg/L<br>(maximum)                      | 10 mg/L<br>(maximum)  | None proposed                               |
| Recreation and Aesthetics             | 10 mg/L<br>(maximum)                       | 1 mg/L<br>(maximum)   | None proposed                               |



***1. The average value is calculated from at least 5 weekly samples taken in a period of 30 days.***

***2. Where nitrate and nitrite are present, the total nitrate+nitrite nitrogen should not exceed these values.***

***3. These levels are too high for some amphibians. For example the 96-h LC<sub>50</sub> for the eastern American toad is 13.6 mg/L N.***

***4. Chronic effects are observed at lower levels, 5 to 10 mg/L N (reference 27)***

***Reference 3***

**Table 17. Guidelines for Nitrite for Protection of Freshwater Aquatic Life**

| <b>Chloride in mg/L</b> | <b>Nitrite (maximum)<br/>mg/L as nitrogen</b> | <b>Nitrite (average)<br/>mg/L as nitrogen</b> |
|-------------------------|---|---|
| less than 2 mg/L        | 0.06 mg/L                                     | 0.02 mg/L                                     |
| 2 to 4 mg/L             | 0.12 mg/L                                     | 0.04 mg/L                                     |
| 4 to 6 mg/L             | 0.18 mg/L                                     | 0.06 mg/L                                     |
| 6 to 8 mg/L             | 0.24 mg/L                                     | 0.08 mg/L                                     |
| 8 to 10 mg/L            | 0.30 mg/L                                     | 0.10 mg/L                                     |
| greater than 10 mg/L    | 0.60 mg/L                                     | 0.20 mg/L                                     |

***1. The 30-day average chloride concentration should be used to determine the appropriate 30-day average nitrite guideline.***

***Reference 3***

**Table 18. Summary of Water Quality Guidelines for Dissolved Oxygen for the Protection of Fresh, Marine and Estuarine Life**

| <b>Life Stages</b>                  | <b>All Life Stages other<br/>than buried<br/>embryo/alevin</b> | <b>Buried<br/>embryo/alevin<br/>life stages</b> | <b>Buried<br/>embryo/alevin<br/>life stages</b> |
|-------------------------------------|--|---|---|
| Dissolved oxygen<br>- concentration | Water column<br>mg/L O <sub>2</sub>                            | Water column<br>mg/L O <sub>2</sub>             | Interstitial water<br>mg/L O <sub>2</sub>       |
| Instantaneous<br>minimum            | 5  | 9   | 6   |
| 30-day mean                         | 8  | 11  | 8   |

**1. For the buried embryo/alevin life stages these are in-stream concentrations from spawning to the point of yolk sac absorption or 30 days post-hatch for fish; the water column concentrations recommended to achieve interstitial dissolved oxygen values when the latter are unavailable. Interstitial oxygen measurements would supersede water column measurements in comparing to guidelines.**

**2. The instantaneous minimum level is to be maintained at all times.**

**3. The mean is based on at least five approximately evenly spaced samples. If a diurnal cycle exists in the water body, measurements should be taken when oxygen levels are lowest (usually early morning).**

**Reference 11**

**Table 19. Summary of Water Quality Guidelines for Chlorine**

| <b>Water Use</b>                     | <b>Average exposure<br/>- continuous<br/>µg/L (as TRC or<br/>CPO)</b> | <b>Average exposure<br/>- controlled<br/>- intermittent<br/>µg/L (as TRC or<br/>CPO)</b> | <b>Maximum exposure<br/>- controlled<br/>- intermittent<br/>µg/L (as TRC or<br/>CPO)</b> |
|--------------------------------------|---|--|--|
| Freshwater Aquatic Life              | 2 µg/L  | 1074 (duration) <sup>-0.74</sup>   | 100 µg/L<br>regardless of either<br>duration or exposure                                 |
| Marine and Estuarine<br>Aquatic Life | 3 µg/L  | 20.36 (duration) <sup>-0.4</sup>   | 40 µg/L<br>regardless of either<br>duration or exposure                                  |
| Irrigation Water                     | None proposed   | None proposed  | 1000 µg/L  |

- 1. The continuous exposure average should be based on at least 5 samples, equally spaced in time and the averaging period should be not less than 4 days nor more than 30 days for freshwater and not less than 2 hours nor more than 30 days for marine or estuarine water. This is the threshold of chronic toxicity.***
- 2. The duration in controlled intermittent exposures is the exposure period in minutes. This is the threshold of acute toxicity.***
- 3. 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. This is the threshold of acute toxicity.***
- 4. TRC is the total residual chlorine in fresh water.***
- 5. CPO is the chlorine-produced oxidants in marine or estuarine water.***
- 6. The irrigation guideline applies to plants grown in soil-less media and should be applied as a maximum under continuous or intermittent exposure situations.***

***Reference 12***

**Table 20. Summary Table of Recommended Guidelines for Fluoride**

| <b>Water Use</b>  | <b>Guidelines (in mg/L as total fluoride)</b>  |
|---|--|
| Raw Drinking Water  | 1.0 mg/L as a 30-day mean<br>—<br>1.5 mg/L as a maximum  |
| Fresh Water Aquatic Life  | 0.2 mg/L maximum where water hardness is less than 50 mg/L as $\text{CaCO}_3$<br>—<br>0.3 mg/L maximum where water hardness is greater than or equal to 50 mg/L as $\text{CaCO}_3$ |
| Marine Aquatic Life   | 1.5 mg/L maximum   |
| Wildlife  | 1.0 mg/L as a 30-day mean<br>—<br>1.5 mg/L as a maximum  |
| Dairy Cows, Breeding Stock<br>- long-lived animals                          | 1.0 mg/L as a 30-day mean<br>—<br>1.5 mg/L as a maximum  |
| Livestock<br>- high fluoride diets<br>- mineral or bone meal feed additives | 1.0 mg/L as a 30-day mean<br>—<br>2.0 mg/L as a maximum  |
| All Other Livestock<br>- normal diet  | 2.0 mg/L as a 30-day mean<br>—<br>4.0 mg/L as a maximum  |
| Irrigation<br>- all soils   | 1.0 mg/L as a 30-day mean<br>—<br>2.0 mg/L as a maximum  |
| Recreation  | No guideline set   |
| Industrial<br>- beer<br>- beverages<br>- processed foods                    | 1.0 mg/L as a 30-day mean<br>—<br>1.5 mg/L as a maximum  |

**1. Table values are in mg/L of total fluoride.**

**2. The freshwater aquatic life guidelines are interim until carefully controlled experiments can determine the appropriate levels of fluoride under various combinations of water temperature and hardness, measured as calcium carbonate.**

**Reference 13**

**Table 21. Maximum Concentration of Total Ammonia Nitrogen for Protection of Saltwater Aquatic Life (mg/L of Nitrogen)**

**Salinity equals 10 g/kg; Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T = 0</b> | <b>T = 5</b> | <b>T = 10</b> | <b>T = 15</b> | <b>T = 20</b> | <b>T = 25</b> |
|-----------|--------------|--------------|---------------|---------------|---------------|---------------|
| 7.0       | 270          | 191          | 131           | 92            | 62            | 44            |
| 7.2       | 175          | 121          | 83            | 58            | 40            | 27            |
| 7.4       | 100          | 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          |

**Salinity equals 20 g/kg; Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T = 0</b> | <b>T = 5</b> | <b>T = 10</b> | <b>T = 15</b> | <b>T = 20</b> | <b>T = 25</b> |
|-----------|--------------|--------------|---------------|---------------|---------------|---------------|
| 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          |

**Salinity equals 30 g/kg; Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T = 0</b> | <b>T = 5</b> | <b>T = 10</b> | <b>T = 15</b> | <b>T = 20</b> | <b>T = 25</b> |
|-----------|--------------|--------------|---------------|---------------|---------------|---------------|
| 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          |

- 1. g/kg salinity is equivalent to parts per thousand (ppt)**
  - 2. The guideline value is obtained by using the average pH, temperature and salinity field values, and is compared to the mean of the measured ammonia concentrations.**
  - 3. Intermediate values of pH, temperature or salinity should be interpolated linearly.**
  - 4. The freshwater guidelines apply at salinity less than 10 g/kg (see Tables 4 and 5)**
- Reference 14**

**Table 22. Average 5 to 30-day Concentration of Total Ammonia Nitrogen for Protection of Saltwater Aquatic Life (mg/L of Nitrogen)**

**Salinity equals 10 g/kg; Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T = 0</b> | <b>T = 5</b> | <b>T = 10</b> | <b>T = 15</b> | <b>T = 20</b> | <b>T = 25</b> |
|-----------|--------------|--------------|---------------|---------------|---------------|---------------|
| 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          |



**Salinity equals 20 g/kg; Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T = 0</b> | <b>T = 5</b> | <b>T = 10</b> | <b>T = 15</b> | <b>T = 20</b> | <b>T = 25</b> |
|-----------|--------------|--------------|---------------|---------------|---------------|---------------|
| 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          |

**Salinity equals 30 g/kg; Temperature (T) in degrees Celsius**

| <b>pH</b> | <b>T = 0</b> | <b>T = 5</b> | <b>T = 10</b> | <b>T = 15</b> | <b>T = 20</b> | <b>T = 25</b> |
|-----------|--------------|--------------|---------------|---------------|---------------|---------------|
| 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          |

***1. g/kg salinity is equivalent to parts per thousand (ppt)***

***2. The guideline value is obtained by using the average pH, temperature and salinity field values, and is compared to the mean of the measured ammonia concentrations.***

***3. Intermediate values of pH, temperature or salinity should be interpolated linearly.***

***4. The freshwater criteria apply at salinity less than 10 g/kg (see Tables 4 and 5)***

***Reference 14***

**Table 23. Summary of Guidelines for Polychlorinated Biphenyls (PCBs)**

| <b>Water Use</b>   | <b>PCBs</b>  | <b>Recommended Maximum Concentration</b>                        |
|--|--|---|
| Drinking Water Supply  | —  | None proposed   |
| Wildlife   | —  | None proposed   |
| Livestock Water Supply   | —  | None proposed   |
| Irrigation Water   | Total  | 0.5 µg/L  |
| Primary Contact Recreation   | —  | None proposed   |
| Freshwater and Marine Aquatic Life<br>- water  | Total<br>PCB #105<br>PCB #169<br>PCB #77<br>PCB #126 | 0.1 ng/L<br>0.09 ng/L<br>0.06 ng/L<br>0.04 ng/L<br>0.00025 ng/L |
| Freshwater and Marine Aquatic Life<br>- fish and/or shellfish (for wildlife<br>consumption: whole animal)    | Total  | 0.1 µg/g wet weight   |
| Freshwater and Marine Aquatic Life<br>- fish and/or shellfish (for human<br>consumption: edible tissue only) | Total  | 2.0 µg/g wet weight   |
| Freshwater and Marine Aquatic Life<br>- sediment<br>(*containing 1% organic carbon)                          | Total  | 0.02 µg/g dry weight  |

**1. If sediment organic carbon is not 1%, the guideline is = (0.02 µg/g) x (% organic carbon content).**

**Reference 15**

**Table 24. Summary of Guidelines for Polycyclic Aromatic Hydrocarbons (PAHs)**

| <b>Water Use</b>   | <b>PAHs</b> | <b>Recommended Concentration</b> |
|--|-------------|----------------------------------|
| Drinking Water Supply  | B[a]P       | 0.01 µg/L                        |
| Wildlife Water Supply  | —           | None proposed                    |
| Livestock Water Supply   | —           | None proposed                    |
| Irrigation Water Supply  | —           | None proposed                    |
| Fish and/or Shellfish<br>(edible tissue for human consumption)<br>- low consumption of 50 g/week       | B[a]P       | 4 µg/kg wet weight               |
| Fish and/or Shellfish<br>(edible tissue for human consumption)<br>- moderate consumption of 100 g/week | B[a]P       | 2 µg/kg wet weight               |
| Fish and/or Shellfish<br>(edible tissue for human consumption)<br>- heavy consumption of 200 g/week    | B[a]P       | 1 µg/kg wet weight               |
| Primary Contact Recreation   | —           | None proposed                    |
| Food Processing Industries   | B[a]P       | 0.01µg/L                         |

**1. B[a]P = Benzo[a]pyrene**

***Reference 16***

**Table 25. Summary of Aquatic Life and Sediment Guidelines for Polycyclic Aromatic Hydrocarbons (PAHs)**

| PAH                    | Fresh Water (chronic) | Fresh Water (phototoxic) | Marine Water | Sediments (Fresh Water) | Sediments (Marine) |
|------------------------|-----------------------|--------------------------|--------------|-------------------------|--------------------|
| Naphthalene            | 1 µg/L                | NR                       | 1 µg/L       | 0.01 µg/g               | 0.01 µg/g          |
| Methylated naphthalene | NR                    | NR                       | 1 µg/L       | NR                      | NR                 |
| Acenaphthene           | 6 µg/L                | NR                       | 6 µg/L       | 0.15 µg/g               | 0.15 µg/g          |
| Fluorene               | 12 µg/L               | NR                       | 12 µg/L      | 0.2 µg/g                | 0.2 µg/g           |
| Anthracene             | 4 µg/L                | 0.1 µg/L                 | NR           | 0.6 µg/g                | NR                 |
| Phenanthrene           | 0.3 µg/L              | NR                       | NR           | 0.04 µg/g               | NR                 |
| Acridene               | 3 µg/L                | 0.05 µg/L                | NR           | 1 µg/g                  | NR                 |
| Fluoranthene           | 4 µg/L                | 0.2 µg/L                 | NR           | 2 µg/g                  | NR                 |
| Pyrene                 | NR                    | 0.02 µg/L                | NR           | NR                      | NR                 |
| Chrysene               | NR                    | NR                       | 0.1 µg/L     | NR                      | 0.2 µg/g           |
| Benz[a]anthracene      | 0.1 µg/L              | 0.1 µg/L                 | NR           | 0.2 µg/g                | NR                 |
| Benzo[a]pyrene         | 0.01 µg/L             | NR                       | 0.01 µg/L    | 0.06 µg/L               | 0.06 µg/L          |

**1. NR — not recommended due to insufficient data**

**2. \*sediment containing 1% organic carbon**

***Reference 16***

**Table 26. Summary of Water Quality Guidelines for Chlorophenols**

| <b>Water Use</b>   | <b>Guidelines (maximum)</b>   |
|--|---|
| Raw Drinking Water<br>- aesthetics<br>(taste and odour)  | MCPs: 0.1 µg/L<br>DCPs: 0.3 µg/L<br>TCPs: 2.0 µg/L<br>TTCPs: 1.0 µg/L<br>PCP: 30.0 µg/L               |
| Raw Drinking Water<br>- toxicity   | 2,4-DCP: 900 µg/L<br>2,4,6-TCP: 5 µg/L<br>2,3,4,6-TTCP: 100 µg/L<br>PCP: 60 µg/L                      |
| Livestock and Wildlife Drinking Water<br>- aesthetics  | MCPs: 0.1 µg/L<br>DCPs: 0.3 µg/L<br>TCPs: 2.0 µg/L<br>TTCPs: 1.0 µg/L<br>PCP: 30.0 µg/L               |
| Livestock and Wildlife Drinking Water<br>- toxicity for lactating animals<br>(high temperatures and high water intake rates)                     | MCPs: 185 mg/L<br>DCPs: 46 mg/L<br>TCPs: 21 mg/L<br>TTCPs: 41 mg/L<br>PCP: 17.5 mg/L                  |
| Livestock and Wildlife Drinking Water<br>- toxicity for non-lactating animals<br>(normal temperatures and low water intake rates)                | MCPs: 1854 mg/L<br>DCPs: 460 mg/L<br>TCPs: 210 mg/L<br>TTCPs: 410 mg/L<br>PCP: 175 mg/L               |
| Aquatic Life (fresh, marine and estuarine waters)<br>- flavour impairment guidelines for fish muscle   | all CPs: use Table 27b  |
| Aquatic Life (fresh, marine and estuarine waters)<br>- flavour impairment guidelines for water (when harvesting fish, crustaceans and shellfish) | MCPs: 0.1 µg/L<br>DCPs: 0.2 µg/L<br>TCPs: use Table 27a<br>TTCPs: use Table 27a<br>PCP: use Table 27a |
| Aquatic Life (fresh, marine and estuarine waters)<br>- toxicity guidelines for aquatic life  | all CPs: use Table 27a  |
| Recreation<br>- primary contact  | MCPs: 0.1 µg/L<br>DCPs: 0.3 µg/L<br>TCPs: 2.0 µg/L<br>TTCPs: 1.0 µg/L<br>PCP: 30.0 µg/L               |
| Recreation<br>- secondary contact  | MCPs: 0.3 µg/L<br>DCPs: 0.3 µg/L<br>TCPs: 11 µg/L<br>TTCPs: 600 µg/L<br>PCP: 860 µg/L                 |
| Irrigation   | No guideline set  |

|                                 |   |
|---------------------------------|---|
| Industrial<br>- food processing | MCPs: 0.1 µg/L<br>DCPs: 0.3 µg/L<br>TCPs: 2.0 µg/L<br>TTCPs: 1.0 µg/L<br>PCP: 30.0 µg/L |
| Industrial<br>- other uses      | No guideline set  |

***CP = Chlorophenol***

***MCP = Monochlorophenol***

***DCP = Dichlorophenol***

***TCP = Trichlorophenol***

***TTCP = Tetrachlorophenol***

***PCP = Pentachlorophenol***

***References 17, 17a***

**Table 27. Summary of Interim Aquatic Life and Tissue Residue Guidelines for Chloropheno**

**Table 27a. Aquatic Life Toxicity Guidelines**

| <b>Chlorophenol<br/>Congeners</b> | <b>pH<br/>5.7</b> | <b>pH<br/>6.2</b> | <b>pH<br/>6.7</b> | <b>pH<br/>7.2</b> | <b>pH<br/>7.7</b> | <b>pH<br/>8.2</b> | <b>pH<br/>8.7</b> | <b>pH<br/>9.2</b> |
|-----------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 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               | 6.2               | 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                           | 0.5               | 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               | 1.8               | 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               |

- 1. Multiply the table values by 2 at 0 degrees C and by 0.5 at 20 degrees C.**
- 2. These are maximum values in µg/L.**
- 3. These are final guidelines for PCP and interim guidelines for the other chlorophenol congeners.**

**References 17, 17a**



**Table 27b. Interim Fish Muscle Tissue Flavour Impairment Guidelines**

| <b>Chlorophenol</b> | <b>Guidelines (µg/g)</b> |
|---------------------|--------------------------|
| 2-MCP               | 10                       |
| 3-MCP               | 20                       |
| 4-MCP               | 40                       |
| 2,3-DCP             | 80                       |
| 2,4-DCP             | 0.2                      |
| 2,5-DCP             | 20                       |
| 2,6-DCP             | 30                       |
| 2,4,6-TCP           | 50                       |
| 2,3,4,5,6-PCP       | 20                       |

***1. These guidelines are based on the wet weight of muscle tissue.***

***2. They are maximum values.***

***References 17, 17a***

**Table 28. Summary of the pH Guidelines**

| <b>Water Use</b>         | <b>Guidelines - pH Units</b> | <b>Comments</b>   |
|--------------------------|------------------------------|---|
| Drinking Water Supply    | pH 6.5 to pH 8.5             | Designed to minimize solubilization of heavy metals and salts from water distribution pipes and the precipitation of carbonate salts in the distribution system, and maximize the effectiveness of chlorination. However, natural source water outside the guidelines may be safe to drink from a public health perspective.        |
| Fresh Water Aquatic Life | pH less than 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 and flora. Site-specific ambient water quality objectives to restrict the pH increase in areas with a unique fauna and flora are recommended.                                      |
| Fresh Water Aquatic Life | pH from 6.5 to 9.0           | Unrestricted change permitted within this range. This component of the freshwater guidelines should be used cautiously if the pH change causes the carbon dioxide concentration to decrease below a 10 µmol/L minimum or exceed a 1360 µmol/L maximum.  |
| Fresh Water Aquatic Life | pH over 9.0                  | No statistically significant increase in pH from background. Short-term increase (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. Carbon dioxide concentrations above 1360 µmol/L may be toxic to fish. |
| Wildlife Water Supply    | None proposed                | There is adequate protection from the aquatic life guidelines.  |
| Livestock Water Supply   | pH 5.0 to 9.5                | pH does not interfere with the palatability of water or the health of livestock.  |
| Marine Aquatic Life      | 7.0 to 8.7                   | Unrestricted change within this range (for the protection of mollusc embryo development).   |
| Irrigation Water Supply  | pH 5.0 to 9.0                | Recognizes that soil acidity, alkalinity and salinity are a concern in agriculture.   |
| Recreational Waters      | pH 5.0 to 9.0                | No irritation to eyes. Note that lakes with naturally low or high pH are not in contravention of the guideline.   |
| Industrial Water Supply  | None proposed                | See Canadian Water Quality Guidelines.  |

|                              |  |  |
|------------------------------|--|--|
| Aesthetics (Marl Lakes only) | No change in pH that will reduce the saturation index of calcium carbonate | Guideline applies to marl or limed lakes only. Temporary increases in pH to 9.5 for lake restoration projects is permitted as long as the maximum pH is not toxic to fish. |
|------------------------------|--|--|

***Sampling Requirements for Guidelines:***

***1. Streams: Statistical comparison of background (upstream) and downstream results should use a 1-tailed, two sample t-test, at the 0.05 probability level. The average is calculated from at least 5 weekly samples taken in a period of 30 days. The two 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 two 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.***

***2. Lakes: Same as streams or, if background stations are not available, pre-discharge data should be collected near the zone of influence, once every three weeks for one or two 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.***

***Reference 18***

**Table 29. Recommended Guidelines for the Protection of Marine and Freshwater Life for Silver**

| Environment  | Guidelines as total Silver | Conditions                              |
|--------------|----------------------------|---|
| Fresh Water  | 0.05 µg/L as a 30-day mean | hardness less than or equal to 100 mg/L |
| Fresh Water  | 0.1 µg/L maximum           | hardness less than or equal to 100 mg/L |
| Fresh Water  | 1.5 µg/L as a 30-day mean  | hardness greater than 100 mg/L          |
| Fresh Water  | 3.0 µg/L maximum           | hardness greater than 100 mg/L          |
| Marine Water | 1.5 µg/L as a 30-day mean  | open coast and estuaries                |
| Marine Water | 3.0 µg/L maximum           | open coast and estuaries                |

***Reference 19***

**Table 30. Summary of Guidelines for Total Gas Pressure (TGP)**

| <b>Water Use</b>  | <b>Recommended Guideline</b>   |
|---|--|
| Drinking Water Supply   | None proposed  |
| Freshwater and Marine Aquatic Life<br>- local water depth greater than 1 m  | maximum DP is less than or equal to<br>76 mm Hg or less than or equal to<br>110% at sea level                          |
| Freshwater and Marine Aquatic Life<br>- background levels exceed guidelines | no increase in DP or % TGP   |
| Freshwater and Marine Aquatic Life<br>- hatchery environments               | maximum DP = 24 mm Hg or<br>103% at sea level<br>DP=0 mm Hg when pO <sub>2</sub> is<br>less than or equal to 100 mm Hg |
| Wildlife  | None proposed  |
| Livestock Water Supply  | None proposed  |
| Irrigation  | None proposed  |
| Primary Contact Recreation  | None proposed  |

**1. DP = excess gas pressure in mm Hg.**

**2. pO<sub>2</sub> = partial pressure of dissolved oxygen in mm of Hg.**

**References 20 and 20a**

**Table 31. Summary of Water Quality Guidelines for Colour**

| <b>Water Use</b>  | <b>Colour Units</b> | <b>Recommended Guidelines</b>  |
|---|---------------------|--|
| Drinking Water Supply<br>(without treatment for colour removal) | True                | 15 mg/L Pt   |
| Aquatic Life<br>Fresh, Marine and Estuarine                     | Apparent            | 30-day average transmission of white light greater than or equal to 80% of background.   |
| Aquatic Life<br>Fresh, Marine and Estuarine                     | True                | 30-day average true colour of filtered water samples shall not exceed background levels by more than 5 mg/L Pt in clearwater systems or 20% in coloured systems. |
| Wildlife  | Apparent            | 30-day average transmission of white light greater than or equal to 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 clearwater systems or 20% in coloured systems. |
| Recreation and Aesthetics<br>- fresh, marine and estuarine      | Apparent            | Secchi disc sighting range greater than or equal to 1.5 m (30-day average).  |
| Recreation and Aesthetics<br>- fresh, marine and estuarine      | True                | 15 mg/L Pt (30-day average)  |

**1. A value of 15 mg/L platinum is the existing Ministry of Health value.**

**Reference 29**

**Table 32. Summary of Water Quality Guidelines for Organic Carbon**

| <b>Water Use</b>                              | <b>Organic Carbon</b> | <b>Recommended Guidelines</b>                                   |
|---|-----------------------|---|
| Drinking Water Supply<br>- with chlorination  | TOC                   | 4 mg/L source water   |
| Drinking Water Supply<br>- other disinfection | —                     | Not recommended   |
| Aquatic Life<br>- fresh water                 | TOC                   | 30-day median $\pm$ 20% of the median background concentration. |
| Aquatic Life<br>- fresh water                 | DOC                   | 30-day median $\pm$ 20% of the median background concentration. |
| Wildlife                                      | TOC                   | 30-day median $\pm$ 20% of the median background concentration. |
| Wildlife                                      | DOC                   | 30-day median $\pm$ 20%   |
| Industrial Water Supply                       | —                     | None recommended  |
| Irrigation                                    | —                     | None recommended  |
| Recreation and Aesthetics                     | —                     | None recommended  |
| Livestock Watering                            | —                     | None recommended  |

***TOC = Total organic carbon***

***DOC = Dissolved organic carbon***

***Reference 30***

**Table 33. Recommended Guidelines for Zinc**

| <b>Water Use</b>  | <b>Guideline (µg/L Total Zinc)</b>   |
|---|--|
| Drinking Water  | 5000   |
| Recreation and Aesthetics   | 5000   |
| Marine Life   | 10   |
| Livestock Watering  | 2000   |
| Irrigation<br>- soil pH less than 6   | 1000   |
| Irrigation<br>- soil pH equal to or greater than 6<br>and less than 7   | 2000   |
| Irrigation<br>- soil pH greater than or equal to 7  | 5000   |
| Freshwater Aquatic Life<br>- maximum concentration<br>—<br>water hardness less than or equal to 90<br>water hardness equal to 100<br>water hardness equal to 200<br>water hardness equal to 300<br>water hardness equal to 400        | use the equation<br>$33 + 0.75 \times (\text{hardness} - 90)$<br>—<br>33<br>40<br>115<br>190<br>265  |
| Freshwater Aquatic Life<br>- 30-day average concentration<br>—<br>water hardness less than or equal to 90<br>water hardness equal to 100<br>water hardness equal to 200<br>water hardness equal to 300<br>water hardness equal to 400 | use the equation<br>$7.5 + 0.75 \times (\text{hardness} - 90)$<br>—<br>7.5<br>15<br>90<br>165<br>240 |



**1. When the ambient zinc concentration in the environment exceeds the guideline, then further degradation of the ambient or existing water quality should be avoided.**

**2. These are instantaneous maximums.**

**3. Averages are of five weekly measurements taken over a 30-day period.**

**4. Water hardness is measured as mg/L of CaCO<sub>3</sub>.**

**Reference 31**

**Table 34. Recommended Guidelines for Ethylbenzene**

| <b>Water Use</b>                | <b>Guideline (mg/L Ethylbenzene)</b> |
|---------------------------------|--------------------------------------|
| Raw Drinking Water (aesthetics) | 0.0024 mg/L                          |
| Fresh Water Aquatic Life        | 0.20* mg/L                           |
| Marine Aquatic Life             | 0.25* mg/L                           |
| Recreation                      | 0.0024 mg/L                          |
| Crop Irrigation                 | insufficient data                    |
| Livestock Watering              | insufficient data                    |

**\*1. Revised B.C. guidelines based on review of CCME Water Quality Guidelines for Ethylbenzene**

**2. All guidelines are maximum values.**

**Reference 28**

**Table 35. Summary of Water Quality Guidelines for Toluene**

| <b>Water Use</b>                | <b>Guideline (mg/L Toluene)</b> |
|---------------------------------|---------------------------------|
| Raw Drinking Water (aesthetics) | 0.024 mg/L                      |
| Fresh Water Aquatic Life        | 0.039 mg/L                      |
| Marine Estuarine Aquatic Life   | 0.33 mg/L                       |
| Recreation                      | none proposed                   |
| Crop Irrigation                 | none proposed                   |
| Livestock Watering              | 0.024 mg/L                      |

***1. All guidelines are maximum total values.***

***Reference 33***

**Table 36. Summary of Water Quality Guidelines for Sulphate**

| <b>Water Use</b>                       | <b>Guideline (mg/L sulphate)</b> |
|--|----------------------------------|
| Raw Drinking Water (aesthetics)        | 500 mg/L                         |
| Fresh Water Aquatic Life (maximum)     | 100 mg/L                         |
| Fresh Water Aquatic Life (alert level) | 50 mg/L                          |

***1. Maximum concentration: not to be exceeded at any time.***

***2. Alert level: monitor the health of aquatic moss populations occasionally.***

***Reference 34***

**Table 37. Examples of the Recommended Acute Guidelines to Protect Freshwater Aquatic Life from the Toxic Effects of Manganese**

| Maximum at Specified CaCO <sub>3</sub> Hardness | Guideline (mg/L total Manganese) |
|---|----------------------------------|
| 25 mg/L   | 0.8 mg/L                         |
| 50 mg/L   | 1.1 mg/L                         |
| 100 mg/L  | 1.6 mg/L                         |
| 150 mg/L  | 2.2 mg/L                         |
| 300 mg/L  | 3.8 mg/L                         |

***1. When the ambient manganese concentration in the environment exceeds the guideline then further degradation of the ambient or existing water quality should be avoided.***

***2. The instantaneous maximum is calculated from less than or equal to 0.01102 hardness + 0.54.***

***Reference 35***

**Table 38. Examples of the Recommended Chronic Guidelines to Protect Freshwater Aquatic Life from the Toxic Effects of Manganese**

| 30-Day Mean at Specified CaCO <sub>3</sub> Hardness | Guideline (mg/L total Manganese) |
|---|----------------------------------|
| 25 mg/L   | 0.7mg/L                          |
| 50 mg/L   | 0.8 mg/L                         |
| 100 mg/L  | 1.0 mg/L                         |
| 150 mg/L  | 1.3 mg/L                         |
| 300 mg/L  | 1.9 mg/L                         |

**1. When the ambient manganese concentration in the environment exceeds the guideline then further degradation of the ambient or existing water quality should be avoided.**

**2. The mean of 5 weekly measurements over a 30-day period is calculated from less than or equal to 0.0044 hardness + 0.605.**

**Reference 35**

**Table 39. Recommended Guidelines for Methyl Tertiary-Butyl Ether (MTBE)**

| <b>Water Use</b>                 | <b>Recommended Guidelines</b> |
|----------------------------------|-------------------------------|
| Raw Drinking Water (aesthetics)  | 0.02 mg/L maximum             |
| Recreation and Aesthetics        | 0.02 mg/L maximum             |
| Livestock Watering               | 11.0 mg/L maximum             |
| Wildlife, Irrigation             | Insufficient Data             |
| Aquatic Life (freshwater)        | 3.4 mg/L maximum              |
| Aquatic Life (marine, estuarine) | 0.44 mg/L maximum             |

***For livestock watering, concentrations above the taste and odour thresholds that are below the livestock guideline may result in certain livestock avoiding water, reducing consumption and suffering associated adverse effects.***

**Reference 36**

**Table 40. Recommended Guideline for Selenium**

| <b>Water Use</b>          | <b>Guideline for Total Selenium</b>       |
|---------------------------|---|
| Drinking Water            | 10 µg/L maximum                           |
| Aquatic Life (freshwater) | 2.0 µg/L mean                             |
| Aquatic Life (marine)     | 2.0 µg/L mean                             |
| Aquatic Life (sediments)  | 2.0 µg/g<br>(dry weight) mean             |
| Aquatic Life (tissue)     | 1.0 µg/g body weight<br>(wet weight) mean |
| Wildlife                  | 4.0 µg/L mean                             |
| Irrigation                | 10 µg/L mean                              |
| Livestock Watering        | 30.0 µg/L mean                            |

***1. For the aquatic life sediment guideline the total organic carbon in the sediment is assumed to be 5%.***

***2. The aquatic life sediment and tissue values are interim guidelines and apply to both freshwater and marine environments.***

***3. The mean concentrations in the water column are based on at least 5 weekly samples taken over a 30-day period; in tissue or sediment samples they are based on 5 independent samples.***

***Reference 37***

**Table 41. Recommended Guidelines for Temperature**

| <b>Water Use</b>   | <b>Recommended Guideline</b>   |
|--|--|
| Drinking Water Supply  | 15 degrees Celsius maximum   |
| Freshwater Aquatic Life<br>- streams with bull trout and/or<br>Dolly Varden    | maximum 10 degrees Celsius-spawning<br>maximum 15 degrees Celsius-rearing<br>maximum 10 degrees Celsius-incubation<br>minimum 2 degrees Celsius-incubation   |
| Freshwater Aquatic Life<br>- streams with known fish<br>distribution           | + or - 1 degree Celsius change beyond optimum<br>temperature range as shown in<br>Table 42 for each life history phase of the<br>most sensitive salmonid species present<br>Hourly rate of change not to exceed<br>1 degree Celsius                                  |
| Freshwater Aquatic Life<br>- streams with unknown fish<br>distribution         | Mean Weekly Maximum Temperature (MWMT) = 18<br>degrees Celsius<br>(maximum daily temperature = 19 degrees Celsius)<br>Hourly rate of change not to exceed 1 degree Celsius<br>maximum incubation temperature = 12 degrees<br>Celsius<br>(in the Spring and the Fall) |
| Freshwater Aquatic Life<br>- lakes and impoundments                            | + or - 1 degree Celsius change<br>from natural ambient background  |
| Marine and Estuarine Aquatic Life  | + or - 1 degree Celsius change<br>from natural ambient background<br>hourly rate of change up to 0.5 degrees Celsius   |
| Wildlife and Livestock Watering<br>Irrigation and Industrial Water<br>Supplies | + or - 1 degree Celsius change<br>from natural ambient background  |
| Recreation and Aesthetics  | 30 degrees Celsius maximum<br>The thermal characteristics of waters used for bathing<br>and swimming should not cause an appreciable<br>increase or decrease in the deep body temperature of<br>bathers and swimmers.  |

**Reference 38**

**Table 42. Optimum Temperature Ranges of Specific Life History Stages of Salmonids and Other Cold water species for Guideline Application**

| Species                     | Incubation    | Rearing   | Migration | Spawning         |
|-----------------------------|---------------|-----------|-----------|------------------|
| <b><i>Salmon</i></b>        |               |           |           |                  |
| 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  | 7.2-11.8         |
| 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        |
| <b><i>Trout</i></b>         |               |           |           |                  |
| 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        |
| <b><i>Char</i></b>          |               |           |           |                  |
| 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             |
| <b><i>Grayling</i></b>      |               |           |           |                  |
| Arctic grayling             | 7.0-11.0      | 10.0-12.0 | —         | 4.0-9.0          |
| <b><i>Whitefish</i></b>     |               |           |           |                  |
| Lake Whitefish              | 4.0-6.0       | 12.0-16.0 | —         | greater than 8.0 |
| Mountain Whitefish          | less than 6.0 | 9.0-12.0  | —         | less than 6.0    |
| <b><i>Other Species</i></b> |               |           |           |                  |
| Burbot                      | 4.0-7.0       | 15.6-18.3 | —         | 0.6-1.7          |
| White Sturgeon              | 14.0-17.0     | —         | —         | 14.0             |

**Reference 38**

**Table 43. Summary of Water Quality Guidelines for Arsenic**

| Water Use                 | Recommended Guideline (µg/L of Total Arsenic) |
|---------------------------|---|
| Source Drinking Water     | 25 (interim guideline)                        |
| Aquatic Life              |   |
| Freshwater                | 5   |
| Marine and Estuarine      | 12.5 (interim guidelines)                     |
| Agriculture               |   |
| Irrigation                | 100 (interim guideline)                       |
| Livestock Watering        | 25 (interim guideline)                        |
| Wildlife                  | 25 (interim guideline)                        |
| Recreation and Aesthetics | None recommended                              |

**Reference 39**

**Table 44. Summary of Chlorate Guidelines**

| Water Use               | Guidelines |
|-------------------------|------------|
| Raw Drinking Water      | 2.4 mg/L   |
| Wildlife and Livestock  | 3 mg/L     |
| Freshwater Aquatic Life | 30 mg/L    |
| Marine Aquatic Life     | 5 µg/L     |



**Reference 40**

**Table 45. Summary of Recommended Water Quality Guidelines for Diisopropanolamine (DIPA)**

| <b>Water Use</b>        | <b>Guideline (mg DIPA/L)</b> |
|-------------------------|------------------------------|
| Freshwater Aquatic Life | 1.6 mg/L maximum             |
| Marine Aquatic Life     | Insufficient data            |
| Irrigation              | 3.9 mg/L maximum             |
| Livestock Watering      | 38 mg/L maximum              |

**Reference 41**

**Table 46. Summary of Recommended Guidelines for Sulpholane**

| <b>Water Use</b>        | <b>Guideline (mg Sulpholane/L)</b> |
|-------------------------|------------------------------------|
| Freshwater Aquatic Life | 50 maximum                         |
| Marine Aquatic Life     | Insufficient data                  |
| Irrigation              | 8.4 maximum                        |
| Livestock Watering      | 14 maximum                         |

**Reference 42**

**Table 47. Recommended Guidelines for Chloride**

| <b>Water Use</b>  | <b>Guideline (mg Chloride/L)</b>  |
|---|---|
| Drinking Water  | 250   |
| Recreation and Aesthetics                                   | None  |
| Freshwater Aquatic Life <sup>1</sup>                        |   |
| Instantaneous<br>Maximum<br>Concentration                   | 600   |
| 30-d Average<br>Concentration (5<br>weekly<br>measurements) | 150   |
| Marine Aquatic Life   | Human activities should not cause the chloride of marine and estuarine waters to fluctuate by more than 10% of the natural chloride expected at that time or depth. |
| Irrigation  | 100   |
| Livestock Watering  | 600   |
| Wildlife  | 600   |

***1. When ambient chloride concentration in the environment exceeds the guideline, then further degradation of the ambient or existing water quality should be avoided.***

***Reference 43***

**Table 48. Recommended Guidelines for Cobalt**

| Water Use                            | Guideline (µg/L Total Cobalt) |
|--------------------------------------|-------------------------------|
| Aquatic Life: Freshwater             |                               |
| Maximum                              | 110                           |
| 30-d Average (5 weekly measurements) | 4                             |
| Aquatic Life: Marine                 | Not recommended               |
| Wildlife                             | Not recommended               |
| Irrigation                           | Not recommended               |
| Livestock watering                   | Not recommended               |

**Reference 44**

**Table 49. Recommended Guidelines for Boron**

| Water Use          | Guideline (mg/L Total Boron)             |
|--------------------|--|
| Drinking Water     | 5  |
| Aquatic Life       |  |
| Freshwater         | 1.2                                      |
| Marine             | 1.2                                      |
| Wildlife           | 5  |
| Irrigation         | 0.5 to 6 (depends on crop; see Table 50) |
| Livestock watering | 5  |

**Table 50. Recommended Irrigation Water Guidelines for Boron**

| <b>Tolerance</b>     | <b>Boron in Irrigation Water (mg/L)</b> | <b>Agricultural Crop</b>   |
|----------------------|---|--|
| Very Sensitive       | <0.5                                    | Blackberry   |
| Sensitive            | 0.5 to 1                                | 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 to 2                                  | Red pepper, pea, carrot, radish, potato, cucumber  |
| Moderately Tolerant  | 2 to 4                                  | Lettuce, cabbage, celery, turnip, Kentucky bluegrass, oat, corn, artichoke, tobacco, mustard, clover, squash, muskmelon  |
| Tolerant             | 4 to 6                                  | Sorghum, tomato, alfalfa, purple vetch, parsley, red beet, sugar beet  |
| Very Tolerant        | 6 to 15                                 | Asparagus  |

**Reference 45**

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