

# ALBERTA SURFACE WATER QUALITY GUIDELINES:

## A WORKING COMPENDIUM



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This "Alberta Surface Water Quality Guidelines: A Working Compendium" provides a summary of the numeric and descriptive water quality values applied in Alberta. It will be periodically reviewed in order to incorporate new full Alberta guidelines and/or any additional parameters that are of interest to Alberta.

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## GLOSSARY OF TERMS AND ACRONYMS

<b>Acute Guidelines</b>	Alberta acute guidelines are equal to one-half the Final Acute Value. Acute guidelines are designed to have an averaging period attached to the guideline.
<b>Acute Toxicity</b>	Toxicity that is expressed over a short time period relative to the lifespan of the organism, usually a few minutes or days. The measurement endpoint is often related to mortality (LC <sub>50</sub> ).
<b>AEP</b>	Alberta Environmental Protection.
<b>BOD</b>	Biochemical Oxygen Demand. A measure of the amount of oxygen consumed in the biological processes that breakdown organic matter in water.
<b>Carcinogens</b>	Agents that initiate the development of a carcinoma or any other sort of malignancy.
<b>CCME</b>	Canadian Council of Ministers of the Environment.
<b>CCREM</b>	Canadian Council of Resource and Environment Ministers (now CCME).
<b>Chronic Guidelines</b>	Guidelines that are equal to the lowest of the Final Chronic Value or the Final Plant Value, unless other data show that a lower value should be used.
<b>Criteria</b>	Represent a constituent concentration or level associated with a degree of environmental effect upon which scientific judgement may be based. As it is currently associated with the water environment, it has come to mean a designated concentration of a constituent that, when not exceeded, will protect an organism or an organism's community, or a prescribed water use or quality with an adequate degree of safety.
<b>CWQG</b>	Canadian Water Quality Guidelines.
<b>DBP</b>	Di-n-butylphthalate.
<b>DDE</b>	1,1-dichloro-2,2-bis( <i>p</i> -chlorophenyl)ethylene.
<b>DDT</b>	Dichlorodiphenyltrichloroethane.
<b>DEHP</b>	Di-(2-ethylhexyl)phthalate.
<b>Exceedance</b>	The occurrence of exceeding an ambient guideline as a result of background fluctuations or due to point source loading variability or a combination of the two.
<b>FAV</b>	Final Acute Value. An estimate of the concentration of the toxicant corresponding to a cumulative probability of 0.05 in the acute values of all genera for which acceptable acute tests have been conducted.

<b>FCV</b>	Final Chronic Value. An estimation of the concentration of the toxicant corresponding to geometric means of a no observed effects concentration (NOEC) and the lowest observed effects concentration (LOEC).
<b>f/L</b>	Fibres per litre.
<b>FPV</b>	Final Plant Value. Appropriate measures of acute toxicity tests to plants. The final plant value is obtained by selecting the lowest result from a test in which the concentrations of test material were measured and the endpoint was biologically important.
<b>Guidelines</b>	Numerical concentration or narrative statements recommended to support and maintain a designated water use.
<b>HHC</b>	Human Health Carcinogen.
<b>HHNC</b>	Human Health Non-Carcinogen.
<b>H<sub>2</sub>S</b>	Hydrogen Sulphide.
<b>Interim</b>	Tentative, or temporary.
<b>Isomers</b>	Compounds having the same molecular formula but with different physical and chemical properties due to their differences in molecular structure.
<b>L</b>	Litre.
<b>LC<sub>50</sub></b>	The concentration of a substance that causes mortality to 50% of the test organisms.
<b>LOEL</b>	Lowest Observed Effect Level.
<b>mg</b>	Milligram.
<b>mL</b>	Millilitre.
<b>Non-Carcinogens</b>	Agents that do not initiate the development of a carcinoma or any other type of malignancy.
<b>Organoleptic</b>	Referring to taste and odour.
<b>PCB</b>	Polychlorinated biphenyls.
<b>pH</b>	The negative logarithm of the hydrogen ion concentration.
<b>SAR</b>	Sodium Adsorption Ratio.
<b>Standards</b>	Norms that impose limits on the amount of effluent produced. Such limits are enforceable by a level of government through environmental control laws.

<b>TCDD</b>	Tetrachlorodibenzo-p-dioxin.
<b>TDE</b>	1,1,1-trichloro-2,2-bis( <i>p</i> -chlorophenyl)ethane.
<b>TDS</b>	Total Dissolved Solids.
<b>THM</b>	Trihalomethanes.
<b>USEPA</b>	United States Environmental Protection Agency.

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## ALBERTA SURFACE WATER QUALITY GUIDELINES: A WORKING COMPENDIUM

### 1.0 INTRODUCTION

This Compendium supercedes the document entitled "Alberta Ambient Surface Water Quality Interim Guidelines". It includes surface water quality guidelines that are relevant to Alberta for the protection of fresh water aquatic life, recreation, human health carcinogens and non-carcinogens, irrigation and livestock watering. It will be reviewed periodically, and at such times any new and/or updated information will be included in the revised editions. New relevant information will follow specified sequences before adoption. For instance, for freshwater aquatic life the sequence outlined in the document entitled "Protocol to Develop Alberta Water Quality Guidelines for the Protection of Freshwater Aquatic Life" (The Alberta Protocol; AEP 1996) will be followed. Any new Alberta Guidelines will also be incorporated at reviews. Users of this Compendium are invited to provide comments or information for consideration at the time of the periodic review.

This Compendium provides Department staff, industry and the public with information on surface water quality guidelines that are relevant to the Province of Alberta. It is intended to be used as a screening tool for the evaluation of water quality monitoring data and for setting approvals limits for effluent discharges. If during the review of monitoring data guidelines are not exceeded, problems are unlikely. On the other hand, if the guidelines are exceeded, a detailed assessment might be required in order to determine the extent of and/or the possible source(s) of the exceedance and the potential adverse effects arising from the exceedance.

On occasion guidelines are exceeded as a result of naturally high background levels or meteorological influences such as heavy run-off, extreme winter ice cover or high summer temperatures. Such occurrences might require an assessment in order to determine whether or not site specific objectives might be necessary. On the other hand, guideline exceedances might happen because of discharges from point sources. If instantaneous dispersal of the effluent occurs, then guidelines would be applicable at the end-of-pipe; if this does not happen, a defined mixing zone might be established and water quality guidelines must be met at the edge of the defined mixing zone. More details regarding the interpretation of frequency, magnitude and duration of guideline exceedances as these apply to Alberta can be obtained from the Water Quality Based Effluent Limits Procedures Manual (AEP 1995).

### 2.0 DEFINITIONS

The following definitions are used with regard to the information in this Compendium.

**Criteria-** Represent a constituent concentration or level associated with a degree of environmental effect upon which scientific judgement may be based. As it is currently associated with the water environment, it has come to mean a designated concentration of a constituent that, when not exceeded, will protect an organism or an organism's community, or a prescribed water use or quality with an adequate degree of safety (USEPA Definition).

**Scientific data which are use to derive chemical specific limits for a particular media (CCME Definition).**

Criteria are generally bioassay tests or ecological health effects studies of contaminants on receptor organisms, such as fish, plants, agricultural crops, livestock and human beings.

**Guidelines- Numerical concentration or narrative statements recommended to support and maintain a designated water use.**

Three types of guidelines that are commonly utilized. These are: full, interim and site-specific. Alberta Environmental Protection uses the Alberta Protocol for the purpose of developing full, interim and site-specific guidelines.

**Full Guidelines** are derived utilizing toxicological data from a number of different functional and taxonomic groups, representative of freshwater communities in Alberta. Full guidelines prevent short-term and long-term toxic effects on aquatic species.

**Interim Guidelines** are developed when all the scientific information necessary to produce full guidelines are not available. In these cases uncertainty factors are used to provide additional protection.

**Site-Specific** guidelines are developed when full guidelines are not applicable to a particular site or location in the province. This might occur if the species at the site are more or less sensitive than those utilized to develop the full guideline; or if the physical and/or chemical characteristics of water at the site alters the biological availability and/or toxicity of the material.

**Objective- Numerical concentration or narrative statement which has been established to support and protect the designated uses of water at a specific area.**

Site specific conditions determine how an objective would be developed. An objective for a specific area will depend on existing and future water uses and the most sensitive aquatic organisms that are present. For example, some water quality parameters such as dissolved oxygen, pH, copper and lead cover a range of guidelines values according to the biota present or the hardness characteristics of the water. An objective derived from a guideline would reflect these considerations.

**Standard- An objective that is recognized in enforceable environmental control laws of a level of government.**

An example of a standard is a restriction on the amount or emission rate of a contaminant present in a liquid effluent that might be discharged to a receiving stream. These quantities are noted as source standards and are specified in approval documents.

### 3.0 APPROACH

This Compendium includes the following types of guidelines:

- Water quality guidelines for the protection of aquatic life;
- Recreation water quality and aesthetics; and
- Agriculture uses.

This Compendium will be periodically reviewed to incorporate new Alberta guidelines and/or any additional parameters that are of interest to Alberta. The sequence outlined on Table 1 will be followed during reviews especially for freshwater aquatic life.

The approach adopted in the development of guidelines contained in this Compendium varies for different types of water quality uses. The approach utilized will be outlined in the relevant sections.

### 3.1 Water Quality for the Protection of Aquatic Life Guidelines

Derivation of numerical water quality guidelines for the protection of aquatic life and their uses is a detailed process that uses information from many areas of aquatic toxicology. Different jurisdictions use differing types of scientific information and dissimilar statistical methods to obtain numbers that suit their particular application. Alberta's process for developing guidelines is very closely related to that of the United States Environmental Protection Agency (USEPA). Alberta's sequence for guidelines selection therefore favours acute and chronic guidelines that have been developed by the USEPA. Both Alberta and USEPA guidelines provide a consistent, high level of protection. If Full or Interim Alberta Guidelines are not available for a particular substance, the selection process for water quality guidelines for the protection of aquatic life uses the equivalent USEPA guideline initially. If both Alberta and USEPA have no numbers, then the Canadian Council of Ministers of the Environment's Canada Water Quality Guidelines (CWQG) are recommended. Tables 2.0 to 2.9 outline the Water Quality Guidelines for the Protection of Aquatic Life.

Table 1.0 outlines the approach used during the development/adoption of the guidelines outlined in this document for Alberta. This table which was taken from the Alberta Protocol has been modified to accommodate guidelines that were developed using methods that were closest to the Alberta Protocol. This is also reflected in the priority sequence for selection.

Both Alberta Ambient Surface Water Quality Interim Guidelines (ASWQIG) and CWQG do not have values for Acute Guidelines. As a result, these have not been included as part of the Acute Guidelines selection.

**TABLE 1.0 Recommended Sequence for the Selection of Alberta Guidelines**

GUIDELINE TYPE	SEQUENCE
Acute Guidelines	<ol style="list-style-type: none"> <li>1. New acute guidelines for the protection of aquatic life developed using Alberta Protocol (AEP, 1996).</li> <li>2. If a new guideline has not been developed using Alberta Protocol (AEP, 1996), use the most recent United States Environmental Protection Agency (USEPA) acute guideline.</li> </ol>
Chronic Guidelines	<ol style="list-style-type: none"> <li>1. New chronic guidelines for the protection of aquatic life developed using Alberta Protocol (AEP, 1996).</li> <li>2. If a new chronic guideline has not been developed using Alberta Protocol (AEP, 1996), use Alberta Ambient Surface Water Quality Interim Guidelines, 1993.</li> <li>3. If 1993 Alberta Surface Water Quality Interim Guidelines do not exist, use the most recent USEPA chronic guidelines.</li> <li>4. If there are no USEPA chronic guidelines, use the Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CWQG) as chronic guidelines.</li> </ol>

The information used in the preparation of Tables 2.0 to 2.8 were obtained from the following documents:

- Alberta Water Quality Guideline for the Protection of Freshwater Aquatic Life - COPPER (1996);
- Alberta Water Quality Guideline for the Protection of Freshwater Aquatic Life - DISSOLVED OXYGEN (1997);
- Alberta Ambient Surface Water Quality Interim Guidelines (1994);
- USEPA Gold Book, Quality Criteria for Water (1986);
- Updates 1 (1995) and 2 (1995) of the Quality Criteria for Water, (1986);
- Water Quality Standards, Establishment of Numeric Criteria for Priority Toxic Pollutants, States' Compliance Final Rule USEPA Federal Register, Part II, EPA, 40 CFR Part 1310 (1992); and
- Canadian Water Quality Guidelines, CCREM Task Force; XXII Appendices and updates (1987 plus relevant updates to 1997).

### 3.2 Recreational Water Quality and Aesthetics

Table 3.0, which covers recreational water quality and aesthetics, is based on:

- Alberta Ambient Surface Water Quality Interim Guidelines (1994);
- Canadian Water Quality Guidelines, CCREM Task Force; XXII Appendices and updates (1987 plus relevant updates to 1997).

The guidelines outlined under the recreational water quality and aesthetics in Table 3.0 address potential health hazards related to recreational water use and situations/conditions that could affect the aesthetic quality of the water. Health hazards associated with direct recreational contact with water include infections transmitted by pathogenic micro-organisms and possible injuries that might occur as a result of impaired visibility in turbid waters.

### 3.3 Agricultural Uses

Tables 4.1 and 4.2 outline guidelines on agricultural uses for irrigation and livestock watering respectively. These guidelines have been obtained from the Canadian Water Quality Guidelines (CCREM 1987 and relevant updates to 1997) document. Because of the various updates that have taken place since 1987, it has been difficult for regulators, industry and the public to ensure that the numbers that they have been using are current. This part of the Compendium presents current numbers.

Further details regarding these guidelines may be obtained from the document entitled "Canadian Water Quality Guidelines, CCREM Task Force; XXII Appendices and updates (1987 plus relevant updates to 1997)".

### 4.0 APPLICATION

The water quality guidelines outlined in this document are designed for application to all surface waters in Alberta regardless of their existing use or condition. These guidelines are, therefore, used in combination with water quality monitoring data to assess ambient conditions in Alberta and to identify areas with existing or potential water quality concerns. They are not rules or standards, and as such, they do not have regulatory impact and are not per se enforceable by law. Rather, they are derived from scientific information and processes, which permit them to be employed in various water quality models in order to establish acceptable waste-load limits on a site-specific basis. Load limits that are derived from guidelines and are contained in control orders, licences, etc. are legally enforceable.

Full Alberta guidelines included in this document, in some cases, might be under- or over-protective because species at a given site might be more, or less, sensitive than those used for the development of the provincial guideline. Also, the physical and/or chemical characteristics of water at the site might alter the biological availability and/or toxicity of the material. In these cases the full guidelines could be assessed and the derivation of site-specific guidelines might be justified (AEP 1996).

## 5.0 WATER QUALITY GUIDELINES

### 5.1 Water Quality for the Protection of Aquatic Life Guidelines

The water quality guidelines for the protection of aquatic life are listed on Table 2.0. to Table 2.9. Table 2.0 outlines acute and chronic guidelines for parameters. The toxicity of some of these chemicals is affected by water hardness, temperature and/or pH. For these parameters, different guideline numbers have been calculated at various ranges of hardness, temperature and /or pH. Chemicals that are affected in this manner have been expressed on Tables 2.1 through 2.8. For parameters that have different acute and chronic guidelines for specific variables a cross reference is given in Table 2.0 indicating the table with the relevant values. Radioactive parameters are outlined on Table 2.9.

#### 5.1.1 Acute Guidelines

The acute column represents the acute guideline for the particular chemical/parameter specified in the substance column for freshwater aquatic life. The acute guideline is calculated by obtaining a Final Acute Value (FAV). The FAV is based on LC<sub>50</sub> data, a concentration which results in severe harm to 50% of sensitive species. The FAV is then divided by a factor to further protect freshwater aquatic life. This number is classified as the acute guideline. Details regarding the full process for developing acute guidelines are outlined in The Alberta Protocol (AEP 1996).

#### 5.1.2 Chronic Guidelines

The Chronic column represents the chronic guideline for the particular chemical/parameter specified in the substance column. This number is usually equal to the lowest of the Final Chronic Value (FCV) or Final Plant Value (FPV), unless the data show that a lower value should be used. Details regarding the full process for developing chronic guidelines are outlined in The Alberta Protocol (AEP 1996).

#### 5.1.3 Guidelines affected by Hardness, pH, and/or Temperature

There are certain guidelines that are affected by one or more of the above mentioned variables. If for these parameters the required guidelines are not expressed in the tables that follow, the guideline might be obtained by applying the following formulas with the hardness, pH and/or temperature information.

<b>Ammonia</b>	Acute:	$(0.52/(FTA*FPHA*2))*TOTAL)*0.822$
	Chronic:	$(0.8/(FTC*FPHC*RATIO))*TOTAL)*0.822$
<b>Cadmium</b>	Acute:	$EXP(1.128*(LN(hardness))-3.828/1000$
	Chronic:	$EXP(0.7852*(LN(hardness))-3.49/1000$
<b>Chromium</b>	Acute:	$EXP(0.819*(LN(hardness))+3.688/1000$
	Chronic:	$EXP(0.819*(LN(hardness))+1.581/1000$
<b>Copper</b>	Acute:	$EXP(0.979123*(LN(hardness))-8.64497$

<b>Lead</b>	Acute:	$EXP(1.273*(LN(hardness))-1.46/1000)$
	Chronic:	$EXP(1.273*(LN(hardness))-4.705/1000)$
<b>Nickel</b>	Acute:	$EXP(0.846*(LN(hardness))+3.3612/1000)$
	Chronic:	$EXP(0.846*(LN(hardness))+1.1645/1000)$
<b>Pentachlorophenol</b>	Acute:	$EXP(1.005*pH-4.83)/1000$
	Chronic:	$EXP(1.005*pH-5.29)/1000$
<b>Silver</b>	Acute:	$EXP(1.72*(LN(hardness))-6.52/1000)$
<b>Zinc</b>	Acute:	$EXP(0.8473*(LN(hardness))+0.8604/1000)$
	Chronic:	$EXP(0.8473*(LN(hardness))+0.7614/1000)$

**For the above equations:**

EXP: Exponential

FPHA: Factor of pH for Acute Values

FTA: Factor of Temperature for Acute Values

FPHC: Factor of pH for Chronic Values

FTC: Factor of Temperature for Chronic Values

LN: log natural

**5.1.4 Guidelines for Metals**

The application of the metal **acute guidelines** is based upon verifying that a one-hour average concentration of the parameter does not exceed the indicated numerical value at a particular hardness, and for the **chronic guideline** freshwater aquatic organisms should not be affected adversely if the four-day average concentration does not exceed the value at a measured hardness. An exceedance should not occur more than once every three years (USEPA 1986).

Most of the studies in the literature that were researched for the purpose of developing acute and chronic guidelines for metals seem to have used acid soluble fractions for their research. This would indicate that the guidelines might be based upon the dissolved form. It is not possible, however, to assume this because of differences in procedures among researchers. Until a standardized procedure is developed for acid-soluble or dissolved metallic form, all numerical guidelines for metallic parameters would be classified as **total recoverable**.

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Acenaphthene	1.700	0.520	Values represent LOEL; insufficient data to develop criteria (USEPA)
Acridine		0.004	(CCME)
Acrolein	0.068	0.021	Values represent LOEL; insufficient data to develop criteria (USEPA)
Acrylonitrile	7.550	2.600	Values represent LOEL; insufficient data to develop criteria (USEPA)
Aldicarb		0.001	Interim (CCME)
Aldrin	0.003		(USEPA)
Aluminum		0.005 0.1	pH < 6.5 (CCME) pH > 6.5 (CCME)
Ammonia	See Table 2.1	See Table 2.1a	(USEPA)
Aniline		0.002	(CCME)
Antimony	9.000	1.600	Values represent LOEL; insufficient data to develop criteria (USEPA)
Anthracene		0.00001	(CCME)
Arsenic (tri)	0.360	0.190	(USEPA)
Arsenic (pent)	0.850	0.0480	Values represent LOEL; insufficient data to develop criteria (USEPA)
Atrazine		0.0018	(CCME)
Benz[a]anthracene		0.00002	(CCME)
Benzene Hexachloride (BHC)	0.1		Value represents LOEL; insufficient data to develop criteria (USEPA)
Benzo[a]pyrene		0.00001	(CCME)
Benzidine	2.5		Value represents LOEL; insufficient data to develop criteria (USEPA)



**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Beryllium	0.13	0.0053	Values represent LOEL; insufficient data to develop criteria (USEPA)
BOD		Dependent on the assimilative capacity of the receiving water, the BOD must not exceed a limit, which would create a dissolved oxygen content of less than 6.5 mg/L. (ALBERTA)	
Bromacil		0.005	Interim (CCME)
Bromoxynil		0.005	(CCME)
Cadmium	See Table 2.2	See Table 2.2	(USEPA)
Captan		0.0013	Interim (CCME)
Carbaryl		0.0002	(CCME)
Carbofuran		0.0018	(CCME)
Carbon tetrachloride	35.2	0.013	Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Chlordane	0.0024	0.0000043	(USEPA)
Chloride	860	230	(USEPA)
Chlorinated naphthalenes	1.6		(USEPA)
Chlorinated benzenes	0.25	0.05	Values represent LOEL; insufficient data to develop criteria (USEPA)
Chlorine	0.019	0.011	(USEPA)
Chloroalkyl ethers	238		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Chloroform	28.9	1.24	Values represent LOEL; insufficient data to develop criteria (USEPA)
Chlorophenol (mono)		0.007	(CCME)
Chlorophenol (di)		0.0002	(CCME)
Chlorophenol (tri)		0.018	(CCME)
Chlorophenol (tetra)		0.001	(CCME)
Chlorophenol (penta)		0.0005	(CCME)

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Chlorophenol (2-)	4.38	2.0	Values represent LOEL; insufficient data to develop criteria (USEPA)
Chlorophenol (4-)	0.03		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Chlorophenoxy herbicide (2,4-D)		0.004	(CCME)
Chlorothalonil		0.0002	Interim (CCME)
Chlorpyrifos		0.0000035	(CCME)
Chromium (Hexa)	0.016	0.011	(USEPA)
Chromium (Tri)	See Table 2.3	See Table 2.3	(USEPA)
Chromium (Total)		0.02 0.002	For fish (CCME) For other aquatic life (CCME)
Colour		Not to be increased more than 30 colour units above natural value (ALBERTA)	
Copper	See Table 2.4	See Table 2.4	Full acute and chronic guidelines (ALBERTA)
Cyanazine		0.002	Interim (CCME)
Cyanide	0.022	0.0052	(USEPA)
DBP (Phthalate esters)		0.019	(CCME)
DEHP (Phthalate esters)		0.016	(CCME)
DDT metabolite (TDE)	0.0006		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
DDT metabolite (DDE)	1.05		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
DDT	0.0011	0.000001	(USEPA)
Deltamethrin		0.0000004	(CCME)
Demeton		0.0001	(USEPA)
Dicamba		0.010	Interim (CCME)
Diclofop-methyl		0.0061	(CCME)

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Dichlorobenzene (1,2-)		0.0007	Interim (CCME)
Dichlorobenzene (1,3-)		0.150	Interim (CCME)
Dichlorobenzene (1,4-)		0.026	Interim (CCME)
Dichlorobenzenes	1.12	0.763	Values represent LOEL; insufficient data to develop criteria (USEPA)
Dichloroethane (1,2-)		0.1	Interim (CCME)
Dichloroethylenes	11.6		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Dichlorophenol (2,4-)	2.02	0.365	Values represent LOEL; insufficient data to develop criteria (USEPA)
Dichlorophenols		0.0002	(CCME)
Dichloropropane	23.0	5.7	Values represent LOEL; insufficient data to develop criteria (USEPA)
Dichloropropene	6.06	0.244	Values represent LOEL; insufficient data to develop criteria (USEPA)
Dieldrin	0.0025	0.0000019	(USEPA)
Dimethoate		0.0062	Interim (CCME)
Dimethyl phenol (2,4-)	2.12		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Di-n-butyl phthalate		0.019	Interim (CCME)
Di(2-ethylhexyl) phthalate		0.016	Interim (CCME)
Dinitrotoluene (2,4-)	0.33	0.23	Values represent LOEL; insufficient data to develop criteria (USEPA)
Dinoseb		0.00005	(CCME)
Dioxin (2,3,7,8 TCDD)	<0.00001	<0.00000001	Values represent LOEL; insufficient data to develop criteria (USEPA)

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Dissolved Oxygen	5.0 (1-day min.)	6.5 (7-day mean when a & b do not apply) (a) 8.3 (May 15 to June 30 for the protection of mayfly emergence) (b) 9.5 (from spawning to 30 days after hatching for embryo development of <i>Salmo</i> , <i>Salvelinus</i> , and <i>Oncorhynchus</i> )  Where natural conditions alone create dissolved oxygen concentrations less than 110% of the applicable criteria means or minima or both, the minimum acceptable concentration is 90% of the natural concentrations.  Full acute and chronic guidelines (ALBERTA)	
Endosulfan	0.00022	0.000056	(USEPA)
Endrin	0.00018	0.0000023	(USEPA)
Ethylbenzene	32.0	0.09	Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)  Chronic value – Interim (CCME)
Ethylene glycol		192.0	(CCME)
Fluoranthene	3.98		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Fluorene		0.003	(CCME)
Gases (total dissolved)		<110% of saturation value	Applicable at the existing atmospheric and hydrostatic pressures (USEPA)
Fluoride		1.5	(ASWQO)
Glyphosate		0.065	Interim (CCME)
Guthion		0.00001	(USEPA)
Haloethers	0.36	0.122	Values represent LOEL; insufficient data to develop criteria (USEPA)

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Halomethanes	11.0		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Heptachlor and Heptachlor Epoxide		0.00001	(CCME)
Heptachlor	0.00052	0.0000038	(USEPA)
Hexachloroethane	0.98	0.54	Values represent LOEL; insufficient data to develop criteria (USEPA)
Hexachlorobutadiene	0.09	0.0093	Values represent LOEL; insufficient data to develop criteria (USEPA)
Hexachlorocyclohexane (total isomers)		0.00001	(CCME)
Hexachlorocyclohexane (lindane)	0.002	0.00008	(USEPA)
Hexachlorocyclopentadiene	0.007	0.0052	Values represent LOEL; insufficient data to develop criteria (USEPA)
Iron		1.0	(USEPA)
Isophorone	117.0		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Lead	See Table 2.5	See Table 2.5	(USEPA)
Lindane	0.002	0.00008	(USEPA)
Linuron		0.007	Interim (CCME)
Malathion		0.0001	(USEPA)
MCPA [(4-chloro-2-methyl phenoxy) acetic acid]		0.0026	Interim (CCME)
Mercury (total)	0.000013	0.000005	(ALBERTA)
Methoxychlor		0.00003	(USEPA)
Methyl mercaptan		0.05	(ASWQO)
Methylmercury	0.000002	0.000001	(ALBERTA)
Methylene chloride		0.098	Interim (CCME)
Metolachlor		0.0078	Interim (CCME)

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Metribuzin		0.001	Interim (CCME)
Mirex		0.000001	(USEPA)
Monochlorobenzene		0.0013	(CCME)
Monochlorophenol		0.007	(CCME)
Naphthalene	2.3	0.62	Values represent LOEL; insufficient data to develop criteria (USEPA)
Nickel	See Table 2.6	See Table 2.6	(USEPA)
Nitrates (nitrogen)		Concentrations that stimulate weed growth should be avoided. (CCME)	
Nitrogen (total inorganic and organic)		1.0	(ALBERTA)
Nitrobenzene	27.0		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Nitrophenols	0.23	0.15	Values represent LOEL; insufficient data to develop criteria (USEPA)
Nitrosamines	5.85		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Parathion	0.000065	0.000013	(USEPA)
PCB 1016		0.000014	(USEPA)
PCB 1221		0.000014	(USEPA)
PCB 1232		0.000014	(USEPA)
PCB 1242		0.000014	(USEPA)
PCB 1248		0.000014	(USEPA)
PCB 1254		0.000014	(USEPA)
PCB 1260		0.000014	(USEPA)
PCBs	0.002	0.000014	(USEPA)
PCBs (total)		0.000001	(CCME)
Pentachlorobenzene		0.006	Interim (CCME)
Pentachloroethane	7.24	1.1	Values represent LOEL; insufficient data to develop criteria (USEPA)

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Pentachlorophenol	0.020	0.013	pH dependent criteria; 7.8 pH used (USEPA)
pH		To be in the range of 6.5 to 8.5 but not altered by more than 0.5 pH units from background values (ASWQO)	
Phenanthrene		0.004	(CCME)
Phenol	10.2	2.56	Values represent LOEL; insufficient data to develop criteria (USEPA)
Phenol (total)		0.005	(ASWQO)
Phenoxy herbicides 2,4 D		0.004	(CCME)
Phthalate esters	0.94	0.003	Values represent LOEL; insufficient data to develop criteria (USEPA)
Picloram		0.029	Interim (CCME)
Propylene glycol		500.0	(CCME)
Pyrene		0.00002	(CCME)
Quinoline		0.003	(CCME)
Resin acids		0.1	(ASWQO)
Selenium	0.26	0.035	(USEPA)
Silver	See Table 2.7	See Table 2.7	(USEPA)
Simazine		0.01	(CCME)
Sulphide (H <sub>2</sub> S)		0.002	(USEPA)
Suspended Solids		Not to be increased by more than 10 mg/L over background value (ALBERTA)	
Tebuthiuron		0.0016	Interim (CCME)
Temperature		Not to be increased by more than 3°C above ambient water temperature (Alberta)	
Tetrachlorobenzene (1,2,3,4-)		0.0018	Interim (CCME)
Tetrachloroethane (1,1,2,2-)		2.4	Chronic value represents LOEL; insufficient data to develop criteria (USEPA)
Tetrachloroethanes	9.32		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)

**TABLE 2.0 WATER QUALITY GUIDELINES FOR THE PROTECTION OF FRESHWATER AQUATIC LIFE (All values in mg/L)**

SUBSTANCE	ACUTE	CHRONIC	COMMENTS
Tetrachloroethylene	5.28	0.84	Values represent LOEL; insufficient data to develop criteria (USEPA)
Tetrachlorophenols		0.001	(CCME)
Thallium	1.4	0.04	Values represent LOEL; insufficient data to develop criteria (USEPA)
Toluene	17.5	0.002	Acute value represents LOEL; insufficient data to develop acute criteria (USEPA) Chronic Value - Interim (CCME)
Toxaphene	0.00073	0.0000002	(USEPA)
Triallate		0.00024	Interim (CCME)
Tributyltin		0.000008	Interim (CCME)
Trichloroethanes	18.0		Acute value represents LOEL; insufficient data to develop acute criteria (USEPA)
Trichlorobenzene (1,2,4)		0.024	Interim (CCME)
Trichlorobenzene (1,2,3)		0.008	Interim (CCME)
Trichloroethane (1,1,2)		9.4	Chronic value represents LOEL; insufficient data to develop criteria (USEPA)
Trichloroethylene	45.0	21.9	Values represent LOEL; insufficient data to develop criteria (USEPA)
Trichlorophenol (2,4,6)		0.97	Chronic value represents LOEL; insufficient data to develop criteria (USEPA)
Trichlorophenols		0.018	(CCME)
Trifluralin		0.0001	(CCME)
Triphenyltin		0.00002	Interim (CCME)
Zinc	See Table 2.8	See Table 2.8	(USEPA)



TABLE 2.1 ACUTE TOTAL AMMONIA CRITERIA VALUES\* (mg/L as nitrogen)

pH	TEMPERATURE (DEGREES CENTIGRADE)						
	0	5	10	15	20	25	30
7.0	23.23	21.70	20.58	19.79	19.30	13.49	9.55
7.1	21.64	20.22	19.18	18.45	17.99	12.58	8.19
7.2	19.92	18.62	17.66	16.99	16.58	11.60	8.23
7.3	18.11	16.93	16.07	15.46	15.09	10.57	7.50
7.4	16.26	15.20	14.43	13.89	13.57	9.51	6.76
7.5	14.40	13.47	12.79	12.32	12.04	8.45	6.01
7.6	12.59	11.78	11.19	10.79	10.56	7.42	5.29
7.7	10.88	10.18	9.68	9.34	9.15	6.44	4.60
7.8	9.29	8.70	8.27	7.99	7.84	5.53	3.96
7.9	7.85	7.35	7.00	6.77	6.66	4.71	3.39
8.0	6.57	6.16	5.87	5.69	5.61	3.98	2.87
8.1	5.23	4.91	4.69	4.56	4.50	3.21	2.33
8.2	4.17	3.92	3.75	3.65	3.62	2.59	1.89
8.3	3.32	3.13	3.00	2.93	2.92	2.10	1.55
8.4	2.65	2.50	2.40	2.36	2.36	1.71	1.27
8.5	2.12	2.00	1.93	1.91	1.92	1.41	1.06
8.6	1.69	1.61	1.56	1.54	1.57	1.16	0.88
8.7	1.35	1.29	1.26	1.26	1.29	0.97	0.74
8.8	1.09	1.04	1.02	1.03	1.07	0.81	0.64
8.9	0.87	0.84	0.83	0.85	0.89	0.69	0.55
9.0	0.71	0.68	0.68	0.71	0.75	0.59	0.48

\* The average of the measured values must be less than the corresponding values in this Table. Each measured value is compared to the corresponding individual values. No more than one (1) in five (5) of the measured values can be greater than one-and-one-half times the corresponding guideline values in this table. The values on this table represent the maximum concentrations of Total Ammonia Nitrogen that should not be exceeded for the protection of freshwater aquatic life.

TABLE 2.1a CHRONIC TOTAL AMMONIA CRITERIA VALUES\* (mg/L as nitrogen)

TEMPERATURE (DEGREES CENTIGRADE)							
pH	0	5	10	15	20	25	30
7.0	2.08	1.94	1.84	1.77	1.22	0.86	0.61
7.1	2.08	1.94	1.84	1.77	1.23	0.86	0.61
7.2	2.08	1.95	1.85	1.78	1.23	0.86	0.61
7.3	2.08	1.95	1.85	1.78	1.23	0.86	0.61
7.4	2.08	1.95	1.85	1.78	1.23	0.87	0.61
7.5	2.08	1.95	1.85	1.78	1.23	0.87	0.62
7.6	2.09	1.95	1.85	1.79	1.24	0.87	0.62
7.7	2.09	1.95	1.86	1.79	1.24	0.88	0.63
7.8	1.78	1.67	1.59	1.53	1.07	0.75	0.54
7.9	1.50	1.41	1.35	1.30	0.904	0.64	0.46
8.0	1.26	1.18	1.13	1.09	0.762	0.54	0.39
8.1	1.00	0.942	0.899	0.874	0.611	0.44	0.32
8.2	0.799	0.751	0.718	0.700	0.491	0.35	0.26
8.3	0.636	0.599	0.575	0.562	0.396	0.29	0.21
8.4	0.508	0.479	0.461	0.452	0.321	0.23	0.17
8.5	0.405	0.384	0.370	0.365	0.261	0.19	0.14
8.6	0.324	0.308	0.298	0.296	0.213	0.16	0.12
8.7	0.260	0.247	0.241	0.241	0.175	0.13	0.10
8.8	0.208	0.200	0.196	0.198	0.145	0.11	0.09
8.9	0.168	0.161	0.160	0.163	0.121	0.90	0.07
9.0	0.135	0.131	0.131	0.135	0.102	0.08	0.07

\* The average of the measured values must be less than the corresponding values in this Table. Each measured value is compared to the corresponding individual values. No more than one (1) in five (5) of the measured values can be greater than one-and-one-half time the corresponding guideline values in this table. The values on this table represent the average 30-d concentration of Total Ammonia Nitrogen for the protection of freshwater aquatic life

TABLE 2.2 CADMIUM (mg/L)

HARDNESS (mg/L as CaCO <sub>3</sub> )	ACUTE	CHRONIC
100	0.00392	0.00113
125	0.00504	0.00135
150	0.0062	0.00156
175	0.00737	0.00176
200	0.00857	0.00195
225	0.00979	0.00214
300	0.01354	0.00269
325	0.01482	0.00286
350	0.01611	0.00303

TABLE 2.3 CHROMIUM III (mg/L)

HARDNESS (mg/L as CaCO <sub>3</sub> )	ACUTE	CHRONIC
100	1.73651	0.21116
125	2.08472	0.25351
150	2.42045	0.29433
175	2.74616	0.33394
200	3.06353	0.37253
225	3.37377	0.41026
300	4.27012	0.51926
325	4.55943	0.55444
350	4.84473	0.58913

TABLE 2.4 COPPER (mg/L)

HARDNESS (mg/L as CaCO <sub>3</sub> )	ACUTE	CHRONIC
100	0.01535	0.0072
125	0.01608	0.0072
150	0.02283	0.0072
175	0.02654	0.0072
200	0.03025	0.0072
225	0.03395	0.0072
300	0.04500	0.0072
325	0.04867	0.0072
350	0.05233	0.0072

TABLE 2.5 LEAD (mg/L)

HARDNESS (mg/L as CaCO <sub>3</sub> )	ACUTE	CHRONIC
100	0.08165	0.00318
125	0.10847	0.00423
150	0.1368	0.00533
175	0.16646	0.00649
200	0.19731	0.00769
225	0.22922	0.00893
300	0.3306	0.01288
325	0.36606	0.01427
350	0.40228	0.01568

TABLE 2.6 NICKEL (mg/L)

HARDNESS (mg/L as CaCO <sub>3</sub> )	ACUTE	CHRONIC
100	1.41824	0.15767
125	1.71292	0.19042
150	1.99859	0.22218
175	2.27699	0.25313
200	2.54931	0.2834
225	2.81642	0.3131
300	2.59249	0.39937
325	3.84418	0.42736
350	4.09291	0.45501

TABLE 2.7 SILVER (mg/L)

HARDNESS (mg/L as CaCO <sub>3</sub> )	ACUTE	CHRONIC
100	0.00406	0.0012
125	0.00596	0.0012
150	0.00815	0.0012
175	0.01063	0.0012
200	0.01337	0.0012
225	0.01637	0.0012
300	0.02686	0.0012
325	0.03082	0.0012
350	0.03501	0.0012

TABLE 2.8 ZINC (mg/L)

HARDNESS (mg/L as CaCO <sub>3</sub> )	ACUTE	CHRONIC
100	0.11702	0.10599
125	0.14138	0.12805
150	0.16499	0.14944
175	0.18802	0.17029
200	0.21054	0.19069
225	0.23263	0.21071
300	0.29685	0.26887
325	0.31768	0.28773
350	0.33826	0.30638

TABLE 2.9 RADIOACTIVE PARAMETERS (Bq/L)

PARAMETER	CHRONIC	COMMENT
Gross Beta	37.0	(ALBERTA)
Radium - 226	0.11	(ALBERTA)
Strontium - 90	0.37	(ALBERTA)

## 5.2 Recreational Water Quality and Aesthetics

These parameters, listed in Table 4.0 are not chemical in nature. They mainly represent qualitative or quantitative measurements of the physical state and aesthetics of the medium.

TABLE 3.0 RECREATIONAL WATER QUALITY AND AESTHETICS GUIDELINES

SUBSTANCE	RECREATION
<b>Aesthetics</b>	Water should be free from: <ul style="list-style-type: none"> <li>- objectionable deposits;</li> <li>- floating debris, oil, scum, etc.;</li> <li>- substances producing objectionable colour, taste, odour, or turbidity;</li> <li>- substances and conditions that produce undesirable aquatic life. (CCME)</li> </ul>
<b>Aquatic plants</b>	Rooting or floating plants could entangle bathers; Dense growth could affect other activities. (CCME)
<b>Coliforms (Fecal)</b>	The geometric mean of at least five samples taken during a period not to exceed 30d, should not exceed 2000 <i>E. coli</i> per litre. Resampling should be performed when any sample exceeds 4000 <i>E. coli</i> per litre. (CCME)
<b>Clarity</b>	Secchi disc visible at 1.2 m. (CCME)
<b>PH</b>	5.0 - 9.0, provided that when the pH is near the extremes of this range, the buffering capacity of the water is very low. (CCME)
<b>Oil and Grease</b>	Oil and petrochemicals not present in concentrations that: <ul style="list-style-type: none"> <li>- can be detected as visible film, sheen or discolouration;</li> <li>- can be detected by odour;</li> <li>- can form deposits on shorelines or bottom that can be seen or smell. (CCME)</li> </ul>
<b>Temperature</b>	Water thermal characteristics should not cause appreciable increase or decrease in deep body temperature. (CCME)
<b>Turbidity</b>	5.0 NTU over natural turbidity when turbidity is low (<50 NTU). (CCME)
<b>Enterococci</b>	The geometric mean of at least five samples taken during a period not to exceed 30 d should not exceed 350 enterococci per litre. Resampling should be performed when any sample exceeds 700 enterococci per litre. (CCME)
<b>Nuisance organisms</b>	Bathing areas should be free as possible from nuisance organisms that: <ul style="list-style-type: none"> <li>- endanger health and physical comfort of users; or</li> <li>- render the area unusable. (CCME)</li> </ul>
<b>Odour</b>	The cold (20°C) threshold odour number not to exceed 8. (ALBERTA)
<b>Waterborne Pathogens</b>	Pathogens most frequently responsible for diseases associated with recreational water uses: <i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i> , <i>Salmonella</i> , <i>Shigella</i> , <i>Aeromonas</i> , <i>Campylobacter jejuni</i> , <i>Legionella</i> , <i>Giardia lamblia</i> , <i>Cryptosporidium</i> and human enteric viruses. (CCME)

### 5.3 Agricultural Uses

A summary of the water quality guidelines for irrigation and livestock water is presented on Table 4.0 and 5.0 respectively. These guidelines have been compiled from the Canadian Water Quality Guidelines (CCREM 1987 documents and its various updates to 1997). More in-depth information may be obtained from the above mentioned document.

**TABLE 4.0 IRRIGATION WATER GUIDELINES (mg/L)**

SUBSTANCE	IRRIGATION WATER
Aldicarb	0.0549 <sup>1</sup>
Aluminum	5.0
Arsenic	0.1 <sup>1</sup>
Atrazine	0.01 <sup>1</sup>
Beryllium	0.1
Boron	0.5 - 6.0 0.5 - 1.0: for peach, cherry, plum, grape, cowpea, onion, garlic, sweet potato, wheat, barley, sunflower, mung bean, sesame, lupin, strawberry, jerusalem artichoke, kidney bean, and lima bean; 1.0 - 2.0: for red pepper, pea, carrot, radish, potato and cucumber; 2.0 - 4.0: for lettuce, cabbage, celery, turnip, Kentucky bluegrass, oat, corn, artichoke, tobacco, mustard, clover, squash and muskmelon; 4.0 - 6.0: for sorghum, tomato, alfalfa, purple vetch, parsley, red beet and sugar beet; 6.0: for asparagus.
Bromacil	0.0002 <sup>1</sup>
Bromoxynil	0.00033-0.0025
Cadmium	0.005



TABLE 4.0 IRRIGATION WATER GUIDELINES (mg/L)

SUBSTANCE	IRRIGATION WATER
Chloride	100 - 700 <i>Foliar damage</i> 100 - 178: for almond, apricot and plum; 178 - 355: for grape, pepper, potato and tomato; 355 - 710: for alfalfa, barley, corn and cucumber; >710: for cauliflower, cotton, safflower, sesame, sorghum, sugar beet and sunflower;  <i>Rootstocks</i> 180 - 600: for stone fruit (peaches, plums, etc.) 710 - 900: for grapes;  <i>Cultivars</i> 110 - 180: for strawberry; 230 - 460: for grapes; 250: for boysenberry, blackberry and raspberry.
Chlorothalonil	0.0058 <sup>1</sup>
Chromium III	0.005 <sup>1</sup>
Chromium IV	0.008
Cobalt	0.05
Coliform (fecal)	100/100mL
Coliform (total)	1000/100mL
Copper	0.2 - 1.0 0.20: for cereals; 1.0: for tolerant crops;
Cyanazine	0.0005 <sup>1</sup>
Dicamba	0.000006
Diclofop-methyl	0.0002
Dinoseb	0.016-0.096
Fluoride	1.0
Iron	5.0
Lead	0.2
Linuron	0.00007 <sup>1</sup>
Lithium	2.5
Manganese	0.2

TABLE 4.0 IRRIGATION WATER GUIDELINES (mg/L)

SUBSTANCE	IRRIGATION WATER
Methyl chloro phenoxy acetic acid (2,4-) (MCPA)	0.00003 - 0.00016
Metolachlor	0.028 <sup>1</sup>
Metribuzin	0.0005 <sup>1</sup>
Molybdenum	0.01 - 0.050.05: for short-term use on acidic soils.
Nickel	0.2
Selenium	0.02 - 0.05 0.02: for continuous use; 0.05: for intermittent use.
Simazine	0.0005
Sodium	Very sensitive: 2-8 SAR Sensitive: 8-18 SAR Mod. Tolerant: 18-46 SAR Tolerant: 46-102 SAR SAR: Sodium Adsorption Ratio.
Total Dissolved Solids (TDS)	500 - 3500 500: for strawberry, raspberry, bean and carrot; 500 - 800: boysenberry, currant, blackberry, gooseberry, plum, apricot, peach, pear, cherry, apple, onion, parsnip, radish, pea, pumpkin, lettuce, pepper, muskmelon, sweet potato, sweet corn, potato, celery, cabbage, kohlrabi, cauliflower, cowpea, broadbean, flax, sunflower and corn; 800 - 1500: for spinach, cantaloupe, cucumber, tomato, squash, brussel sprout, broccoli, turnip, smooth brome, alfalfa, big trefoil, breadless, wildrye, vetch, timothy and crested wheat grass; 1500-2500: for beet, zucchini, rape, sorghum, oat hay, wheat hay, mountain brome, tall fescue, sweet clover, reed canary grass, birdsfoot trefoil and perennial ryegrass; 3500: for asparagus, soybean, safflower, oats, rye, wheat, sugar beet, barley, barley hay and tall wheat grass.
Uranium	0.01 <sup>1</sup>
Vanadium	0.1
Zinc	1.0 - 5.0

<sup>1</sup>Interim Guideline

TABLE 5.0 LIVESTOCK WATER GUIDELINES (mg/L)

SUBSTANCE	LIVESTOCK WATER
Acrolein	0.0007
Aldicarb	0.011 <sup>1</sup>
Aluminum	5.0
Arsenic	0.025 <sup>1</sup>
Atrazine	0.06 <sup>1</sup>
Beryllium	0.10 <sup>1</sup>
Blue-green algae	avoid heavy growth
Boron	0.50
Bromacil	1.10
Bromoxynil	0.011 <sup>1</sup>
Cadmium	0.08
Calcium	1000.0
Captan	0.013 <sup>1</sup>
Carbaryl	0.10
Carbofuran	0.045
Carbon tetrachloride	0.005 <sup>1</sup>
Chlordane	0.007
Chloropyrifos	0.024 <sup>1</sup>
Chlorothalonil	0.17 <sup>1</sup>
Chromium III	0.05 <sup>1</sup>
Chromium IV	0.05 <sup>1</sup>
Cobalt	1.0
Copper	0.5 - 5.0 0.50 for sheep; 1.0 for Cattle; 5.0 for swine and poultry
Cyanazine	0.01 <sup>1</sup>
DDT (total)	0.03
Deltamethrin	0.0025
Dicamba	0.122
Dichloroethane (1,2)	0.005
Diclofop-methyl	0.009 <sup>1</sup>

TABLE 5.0 LIVESTOCK WATER GUIDELINES (mg/L)

SUBSTANCE	LIVESTOCK WATER
Dimethoate	0.003 <sup>1</sup>
Dinoseb	0.15
Endrin	0.0002
Ethylbenzene	0.0024
Fluoride	1.0 - 2.0
	1.0: if feed contains fluoride
Glyphosate	0.28
Heptachlor	0.003
Hexachlorobenzene	0.0005 <sup>1</sup>
Lead	0.1
Lindane	0.004
Mercury	0.003
Methyl chloro phenoxy acetic acid (2,4-) (MCPA)	0.025 <sup>1</sup>
Methylene chloride	0.05 <sup>1</sup>
Metolachlor	0.05
Metribuzin	0.08
Molybdenum	0.5
Nickel	1.0
Nitrate and Nitrite	100.0
Nitrite	10.0
Phenoxy herbicides (2,4 D)	0.1
Picloram	0.19
Selenium	0.05
Simazine	0.01 <sup>1</sup>
Sulphate	1000.0
Tebuthiuron	0.13 <sup>1</sup>
Toluene	0.024
Total Dissolved Solids (TDS)	3000.0
Toxaphene	0.005
Triallate	0.23 <sup>1</sup>

TABLE 5.0 LIVESTOCK WATER GUIDELINES (mg/L)

SUBSTANCE	LIVESTOCK WATER
Tributyltin	0.25 <sup>1</sup>
Trichloroethylene	0.05 <sup>1</sup>
Tricyclohexyltin	0.25
Trifluralin	0.045 <sup>1</sup>
Trihalomethanes (THMs)	0.35
Triphenyltin	0.8 <sup>1</sup>
Uranium	0.2
Vanadium	0.1
Zinc	50.0

<sup>1</sup>Interim Guideline

## 6.0 REFERENCES

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