WATER QUALITY GUIDELINE SERIES

British Columbia Working Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture (Feb 2021)

Ministry of Environment and Climate Change Strategy

Water Protection & Sustainability Branch

No. WQG-08

BRITISH COLUMBIA

The Working Water Quality Guidelines are a collection of British Columbia (B.C.) Ministry of Environment and Climate Change Strategy water quality guidelines (WQGs) that are adopted from other environmental jurisdictions for the substances without approved WQGs. Working WQGs are developed to protect a variety of water values and uses: aquatic life, livestock watering, irrigation, and wildlife.

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Updates from the 2020 version

- Sediment quality guideline was added for molybdenum
- Water Quality guidelines for Perfluorooctane Sulfonate (PFOS), and Polybrominated Diphenyl Ethers (PBDE) including heptaBDE and octaBDE were corrected.
- Sediment quality guidelines for Benzo(g,h,i)perylene and Polychlorinated dibenzo-*p*-dioxins/dibenzo furans (PCDD/Fs) were corrected.

Updates from the 2017 version:

- Water quality guidelines were added for the following 11 substances: Bisphenol A (BPA), Diazinon, Hexabromocyclododecane (HBCD), Perfluorooctane Sulfonate (PFOS), Permethrin, Polybrominated Diphenyl Ethers (PBDE) including triBDE, tetraBDE, pentaBDE, hexaBDE, heptaBDE, octaBDE and Triclosan.
- Sediment quality guidelines for Polychlorinated Biphenyls (PCBs) previously adopted from CCME (2001) were rescinded including Arochlor 1016, Arochlor 1248, Arochlor 1254, Arochlor 1260, and total PCBs.
- Sediment quality guidelines were added for the following 6 substances: Atrazine, Bisphenol A (BPA), Chlorpyrifos, Diazinon, Hexabromocyclododecane (HBCD), Polychlorinated Biphenyls (PCBs).
- Tissue residues guidelines were added for the following five substances: Polybrominated Diphenyl Ethers (PBDE) including triBDE, tetraBDE, pentaBDE, hexaBDE, and Perfluorooctane Sulfonate (PFOS).
- Wildlife dietary guidelines were added for the following 13 substances: Bisphenol A (BPA), DDT, Hexabromocyclododecane (HBCD), Polybrominated Diphenyl Ethers (PBDE) including triBDE, tetraBDE, pentaBDE, hexaBDE, heptaBDE, octaBDE, nonaBDE, decaBDE, Polychlorinated Biphenyls (PCBs), and Perfluorooctane Sulfonate (PFOS).

Introduction

This document presents BC's updated Working Water Quality Guidelines and Working Sediment Quality Guidelines. These guidelines are revised periodically to incorporate new information and represent the best guidance the Ministry of Environment (ENV) can provide, at the time of publication, for substances without approved water quality guidelines (WQGs). The 2020 edition supersedes all previous versions.

Many jurisdictions develop WQGs to protect water quality. BC's WQGs represent safe levels of substances that protect different water uses, including: drinking water, recreation, aquatic life, wildlife and agriculture. In BC, the definition of water quality include the sediments, therefore WQG documents may include sediment quality values.

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

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

BC's Working Water Quality Guidelines

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

BC's Working Sediment Quality Guidelines

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

BC's Working Tissue Residue Guidelines

Tissue Residue Guidelines (TRGs) are intended to protect fish from direct adverse effects of bioaccumulative substances. The WTRGs provide benchmarks for those substances that have not yet been fully assessed and formally endorsed by the ENV and, like WWQGs, are obtained from other jurisdictions, including ECCC.

BC's Working Wildlife Dietary Guidelines

Wildlife Dietary Guidelines (WDGs) are concentrations of toxic substances in aquatic biota (whole body, ww) which are consumed by terrestrial and semi-aquatic wildlife. The WWDGs provide benchmarks for those substances that have not yet been fully assessed and formally endorsed by the ENV and, like WWQGs, are obtained from other jurisdictions, including ECCC.

How to use this document

Working Water Quality Guidelines (WWQGs)

The WWQGs are listed alphabetically by substance in Table 1. Substances are also classified according to their general nature (e.g., Metals, Herbicides, Organics etc.) to aid the reader. The water use that a specific WWQG is intended to protect is also provided. WWQG values are long-term (i.e., average) concentrations unless identified as a short-term maximum in the "Notes" column. Long-term WWQGs represent average substance concentrations calculated from 5 samples in 30 days.

The averaging period for the long-term WWQG may differ depending upon the substance under investigation. The 5-in-30 averaging period provides a reasonable and practical duration to assess long-term effects and fits into monitoring timetables for provincial agencies. Five samples is considered the minimum needed to calculate the average concentration. However, in some cases where concentrations fluctuate widely in nature, more than 5 may be necessary. In other situations where concentrations are uniform and rarely exceed the long-term WWQG, less frequent monitoring may be justified. In this case, failure of any individual sample to meet the long-term WWQG would serve as an alert signal to increase the monitoring. Notes and references for Table 1 are provided at the end of the table.

Working Sediment Quality Guidelines (WSQGs)

WSQGs substances are listed alphabetically in Table 2, classified according to their general nature, and may include values for both freshwater and marine aquatic life. In addition, most of the WSQGs have two values:

- Lower WSQG – a concentration that will protect aquatic life from the adverse effects of a toxic substance in most situations (equivalent to CCME's Threshold Effect Level or Interim Sediment Quality Guidelines (TEL or ISQGs; CCME 2001)); and
- Upper WSQGs – a concentration that if exceeded will likely cause severe effects on aquatic life (equivalent to CCME's Probable Effect Level (PEL; CCME (2001)).

The two values provide three ranges of concentrations to support sediment decision making (CCME 2001):

- Concentrations < Lower WSQG are rarely associated with adverse biological effects;
- Concentrations > Lower WSQG but < Upper WSQG are occasionally associated with adverse biological effects; and
- Concentrations > Upper WSQG are frequently associated with adverse biological effects.

These guidelines are not based on cause-effect studies, but on levels of toxic substances found in the sediment where biological effects have been measured. Caution should be exercised in the application of these guidelines. Further information on each WSQG can be found by referring to the reference. Notes and references for Table 2 are provided at the end of the table.

Working Tissue Residue Guidelines (WTRGs)

WTRG substances are listed alphabetically in Table 3, classified according to their general nature, and apply to both freshwater and marine fish. WTRGs specify the concentration of substance in whole body fish tissue (wet weight) which is not expected to cause adverse effects to the fish. Notes and references for Table 3 are provided at the end of the table.

Working Wildlife Dietary Guidelines (WWDGs)

WWDG substances are listed alphabetically in Table 4, classified according to their general nature. WWDGs specify the concentration of substance in whole food (wet weight) which is not expected to cause adverse effects to the wildlife consumers. Notes and references for Table 4 are provided at the end of the table.

Table 1. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
1,1,2,2-tetrachloroethene (tetrachloroethylene, perchlorethylene)	Chlorinated ethenes	Freshwater aquatic life	110	µg/L		CCME (1993)
1,1,2-trichloroethene, trichloroethylene	Chlorinated ethenes	Freshwater aquatic life	21	µg/L		CCME (1991)
1,1,2-trichloroethene, trichloroethylene	Chlorinated ethenes	Livestock watering	50	µg/L		CCME (1991)
1,2,3,4-tetrachlorobenzene	Chlorinated benzenes	Freshwater aquatic life	1.8	µg/L		CCME (1997)
1,2,3-trichlorobenzene	Chlorinated benzenes	Freshwater aquatic life	8	µg/L		CCME (1997)
1,2,4-trichlorobenzene	Chlorinated benzenes	Freshwater aquatic life	24	µg/L		CCME (1997)
1,2,4-trichlorobenzene	Chlorinated benzenes	Marine aquatic life	5.4	µg/L		CCME (1997)
1,2-dichlorobenzene	Chlorinated benzenes	Freshwater aquatic life	0.7	µg/L		CCME (1997)
1,2-dichlorobenzene	Chlorinated benzenes	Marine aquatic life	42	µg/L		CCME (1997)
1,4-dichlorobenzene	Chlorinated benzenes	Freshwater aquatic life	26	µg/L		CCME (1997)
1,2-dichloroethane	Chlorinated ethanes	Freshwater aquatic life	100	µg/L		CCME (1991)
1,2-dichloroethane	Chlorinated ethanes	Livestock watering	5	µg/L		CCME (1991)
1,2-propylene glycol	Glycols	Freshwater aquatic life	500	mg/L		CCME (1997)
1,3-dichlorobenzene	Chlorinated benzenes	Freshwater aquatic life	150	µg/L		CCME (1997)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Acrolein	Organics	Freshwater aquatic life	1.14	µg/L		US EPA (2009)
Aldicarb	Organic Pesticides	Freshwater aquatic life	1	µg/L		CCME (1993)
Aldicarb	Organic Pesticides	Irrigation	54.9	µg/L		CCME (1993)
Aldicarb	Organic Pesticides	Livestock	11	µg/L		CCME (1993)
Aldicarb	Organic Pesticides	Marine aquatic life	0.15	µg/L		CCME (1993)
Alkalinity (total $CaCO_3$)	Inorganics	Freshwater aquatic life	<10	mg/L	Waterbody is highly sensitive to acid inputs (<4 mg/L dissolved calcium)[3]	Swain (1987)
Alkalinity (total $CaCO_3$)	Inorganics	Freshwater aquatic life	10 – 20	mg/L	Waterbody is moderately sensitive to acid inputs (4-8 mg/L dissolved calcium)[3]	Swain (1987)
Alkalinity (total $CaCO_3$)	Inorganics	Freshwater aquatic life	>20	mg/L	Waterbody has low sensitivity to acid inputs (>8 mg/L dissolved calcium)[3]	Swain (1987)
Aniline (total)	Organics	Freshwater aquatic life	2.2	µg/L		CCME (1993)
Antimony (III)	Metals	Freshwater aquatic life	9	µg/L		ANZECC (2000b)
Antimony (III)	Metals	Marine aquatic life	270	µg/L		ANZECC (2000b)
Atrazine	Pesticides	Freshwater aquatic life	1.8	µg/L	Atrazine + metabolites[4]	CCME (1989)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Atrazine	Pesticides	Irrigation	10	µg/L	Atrazine + metabolites	CCME (1989)
Atrazine	Pesticides	Livestock	5	µg/L	Atrazine + metabolites	CCME (1989)
Barium	Metals	Freshwater aquatic life	1	mg/L		Haywood & Drinnin (1983)
Beryllium	Metals	Freshwater aquatic life	0.13	µg/L		ANZECC (2000a)
Beryllium	Metals	Marine aquatic life	100	µg/L		NAS-NAE (1972)
Beryllium	Metals	Irrigation	100	µg/L		CCREM (1987)
Beryllium	Metals	Livestock	100	µg/L		CCREM (1987)
Bisphenol A (BPA)	Organics	Freshwater-aquatic life	0.9	µg/L	See footnote #5	ECCC (2018a)
Bisphenol A (BPA)	Organics	Marine-aquatic life	0.9	µg/L	See footnote #5	ECCC (2018a)
Bromocil	Pesticides	Freshwater aquatic life	5	µg/L		CCME (1997)
Bromocil	Pesticides	Irrigation	0.2	µg/L		CCME (1997)
Bromocil	Pesticides	Livestock	1.1	mg/L		CCME (1997)
Bromoform	Organics	See Chloromethanes				
Bromoxynil	Herbicides	Freshwater aquatic life	5	µg/L		CCME (1993)
Bromoxynil	Herbicides	Irrigation	0.33	µg/L		CCME (1993)
Bromoxynil	Herbicides	Livestock	11	µg/L		CCME (1993)
Cadmium	Metals	Marine aquatic life	0.12	µg/L		CCME (2014)
Cadmium	Metals	Irrigation	5.1	ug/L	Short-term maximum guideline	CCME (1996)
Cadmium	Metals	Livestock	80	µg/L	Short-term maximum guideline	CCME (1996)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Calcium	Metals	Freshwater aquatic life	See Alkalinity			
Calcium (dissolved)	Metals	Livestock	1,000	mg/L		CCREM (1987)
Captan	Organic Pesticides	Freshwater aquatic life	1.3	µg/L		CCME (1991)
Captan	Organic Pesticides	Livestock	13	µg/L		CCME (1991)
Carbaryl	Organic Pesticides	Freshwater aquatic life	0.2	µg a.i./L	a.i. - active ingredient	CCME (2009)
Carbaryl	Organic Pesticides	Livestock	1.1	mg/L		CCME (1997)
Carbaryl	Organic Pesticides	Marine aquatic life	0.29	µg a.i./L	a.i. - active ingredient	CCME (2009)
Carbofuran	Organic Pesticides	Freshwater aquatic life	1.8	µg/L		CCME (1989)
Carbofuran	Organic Pesticides	Livestock	45	µg/L		CCME (1989)
Carbon tetrachloride	Halogenated methanes	See Chloromethanes				
Chlorothalonil (2,4,5,6-tetrachloro-1,3-benzenecarbonitrile, Daconil)	Fungicides, Organochlorine	Freshwater aquatic life	0.18	µg/L	Chlorothalonil + 4-hydroxy transformation product	CCME (1994)
Chlorothalonil (2,4,5,6-tetrachloro-1,3-benzenecarbonitrile, Daconil)	Fungicides, Organochlorine	Livestock watering	170	µg/L		CCME (1994)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Chlorothalonil (2,4,5,6-tetrachloro-1,3-benzenecarbonitrile, Daconil)	Fungicides, Organochlorine	Marine aquatic life	0.36	µg/L	Chlorothalonil + 4-hydroxy transformation product	CCME (1994)
Chlorothalonil (2,4,5,6-tetrachloro-1,3-benzenecarbonitrile, Daconil)	Fungicides, Organochlorine	Irrigation	5.8	µg/L	All crops other than cereals, tame hays or pastures	CCME (1994)
Chlorpyrifos	Organic Pesticides	Freshwater aquatic life	0.002	µg a.i./L	a.i. - active ingredient	CCME (2008)
Chlorpyrifos	Organic Pesticides	Livestock watering	24	µg/L		CCME (1997)
Chlorpyrifos	Organic Pesticides	Marine aquatic life	0.002	µg a.i./L	a.i. - active ingredient	CCME (2008)
Chromium (Cr(III))	Metals	Freshwater aquatic life	8.9	µg/L		CCME (1999a)
Chromium (Cr(III))	Metals	Irrigation	4.9	µg/L		CCME (1997)
Chromium (Cr(III))	Metals	Livestock watering	50	µg/L		CCME (1997)
Chromium (Cr(III))	Metals	Marine aquatic life	56	µg/L		CCME (1997)
Chromium (Cr(VI))	Metals	Freshwater aquatic life	1	µg/L		CCME (1997)
Chromium (Cr(VI))	Metals	Irrigation	8	µg/L		CCME (1997)
Chromium (Cr(VI))	Metals	Livestock watering	50	µg/L		CCME (1997)
Chromium (Cr(VI))	Metals	Marine aquatic life	1.5	µg/L		CCME (1997)
Cobalt	Metals	Irrigation	50	µg/L	Continuous or intermittent use on all soils[6]	CCME (1999)
Cobalt	Metals	Livestock watering	1	mg/L		CCME (1987)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Conductivity (specific)	Physical	Irrigation	<0.7	mS/cm	For low tolerance crops[7]	CCREM (1987)
Conductivity (specific)	Physical	Irrigation	<1.2	mS/cm	For slightly tolerant crops[7]	CCREM (1987)
Conductivity (specific)	Physical	Irrigation	<2.2	mS/cm	For moderately tolerant crops[7]	CCREM (1987)
Conductivity (specific)	Physical	Irrigation	<3.6	mS/cm	For tolerant crops[7]	CCREM (1987)
Conductivity (specific)	Physical	Irrigation	<5	mS/cm	For very tolerant crops[7]	CCREM (1987)
Cyanazine	Pesticides	Freshwater aquatic life	2	µg/L		CCME (1990)
Cyanazine	Pesticides	Irrigation	0.5	µg/L		CCME (1990)
Cyanazine	Pesticides	Livestock watering	10	µg/L		CCME (1990)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	1	µg/L	Short-term maximum at pH 5.0	Environment Ontario (1988)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	2	µg/L	Short-term maximum at pH 5.5	Environment Ontario (1988)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	2	µg/L	Short-term maximum at pH 6.0	Environment Ontario (1988)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	4	µg/L	Short-term maximum at pH 6.5	Environment Ontario (1988)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	8	µg/L	Short-term maximum at pH 7.0	Environment Ontario (1988)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	12	µg/L	Short-term maximum at pH 7.5	Environment Ontario (1988)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	13	µg/L	Short-term maximum at pH 8.0	Environment Ontario (1988)
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	14	µg/L	Short-term maximum at pH 8.5	Environment Ontario (1988)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Dehydroabietic acid (DHA)	Resin acids	Freshwater aquatic life	14	µg/L	Short-term maximum at pH 9.0	Environment Ontario (1988)
Deltamethrin	Organic Pesticides	Freshwater aquatic life	0.0004	µg/L		CCME (1997)
Deltamethrin	Organic Pesticides	Livestock watering	2.5	µg/L		CCME (1997)
Di-(2-ethylhexyl) phthalate (DEHP)	Phthalate esters	Freshwater aquatic life	16	µg/L		CCME (1993)
Diazinon	Pesticide	Freshwater aquatic life	0.0043	µg/L	See footnote #8	Efroymson et al. (1997)
Dibutyl phthalate (DBP, di-*n*-butylphthalate)	Phthalate esters	Freshwater aquatic life	19	µg/L		CCME (1993)
Dicamba	Organic Pesticides; Aromatic carboxylic acid	Freshwater aquatic life	10	µg/L		CCME (1993)
Dicamba	Organic Pesticides; Aromatic carboxylic acid	Irrigation	0.006	µg/L		CCME (1993)
Dicamba	Organic Pesticides; Aromatic carboxylic acid	Livestock watering	122	µg/L		CCME (1993)
Dichlorobromomethane	Halogenated methanes	Livestock watering	100	µg/L		CCME (1992)
Dichloromethane (methylene chloride)	Halogenated methanes	Freshwater aquatic life	98.1	µg/L		CCME (1992)
Dichloromethane (methylene chloride)	Halogenated methanes	Livestock watering	50	µg/L		CCME (1992)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Dichlorophenoxyacetic acid (2,4-D)	Herbicides	Freshwater aquatic life	4	µg/L		CCME (1999a)
Diclofop-methyl	Pesticides	Freshwater aquatic life	6.1	µg/L		CCME (1993)
Dichlorophenoxyacetic acid (2,4-D)	Herbicides	Livestock watering	100	µg/L		CCME (1999a)
Diclofop-methyl	Pesticides	Irrigation	0.18	µg/L		CCME (1993)
Diclofop-methyl	Pesticides	Livestock watering	9	µg/L		CCME (1993)
Didecyl dimethyl ammonium chloride (DDAC)	Organic Pesticides	Freshwater aquatic life	1.5	µg/L		CCME (1999a)
Dimethoate	Pesticides	Freshwater aquatic life	6.2	µg/L		CCME (1993)
Dimethoate	Pesticides	Livestock watering	3	µg/L		CCME (1993)
Di-n-butyl tin (total)	Organotin compounds	Freshwater aquatic life	0.08	µg/L		Ontario MOEE (1994)
Dinoseb	Pesticides	Freshwater aquatic life	0.05	µg/L		CCME (1992)
Dinoseb	Pesticides	Irrigation	16	µg/L		CCME (1992)
Dinoseb	Pesticides	Irrigation	46	µg/L	Cereals and hay	CCME (1999b)
Dinoseb	Pesticides	Irrigation	93	µg/L	Legumes	CCME (1999b)
Dinoseb	Pesticides	Livestock watering	150	µg/L		CCME (1992)
Total dissolved solids (filterable residue)	Inorganics	Livestock watering	1,000-3,000	mg/L	Species dependent - see Table 4-13 in CCREM 1987	CCREM (1987)
Total dissolved solids (filterable residue)	Physical	Irrigation	<500	mg/L	For low tolerance crops[7]	CCREM (1987)
Total dissolved solids (filterable residue)	Physical	Irrigation	<800	mg/L	For slightly tolerant crops[7]	CCREM (1987)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Total dissolved solids (filterable residue)	Physical	Irrigation	<1500	mg/L	For moderately tolerant crops[7]	CCREM (1987)
Total dissolved solids (filterable residue)	Physical	Irrigation	<2500	mg/L	For tolerant crops[7]	CCREM (1987)
Total dissolved solids (filterable residue)	Physical	Irrigation	<3500	mg/L	For very tolerant crops[7]	CCREM (1987)
Endosulfan	Pesticides	Freshwater aquatic life	0.0007	µg a.i./L	a.i. - active ingredient; See footnote #9	CCME (2010)
Endosulfan	Pesticides	Marine aquatic life	0.0016	µg a.i./L	a.i. - active ingredient	CCME (2010)
Ethylene glycol	Glycols	Freshwater aquatic life	192	mg/L		CCME (1997)
Glyphosate	Herbicides	Freshwater aquatic life	490	µg a.i./L	a.i. - active ingredient; See footnote #9	CCME (2012a)
Glyphosate	Herbicides	Livestock watering	280	µg/L		CCREM (1987)
Hexabromocyclododecane (HBCD)	Organics	Freshwater-aquatic life	0.56	µg/L		ECCC (2016)
Hexabromocyclododecane (HBCD)	Organics	Marine-aquatic life	0.56	µg/L		ECCC (2016)
Hexachlorobenzene	Chlorinated benzenes	Livestock	0.52	µg/L		CCREM (1987)
Hexachlorobutadiene (HCBD)	Organics	Freshwater aquatic life	1.3	µg/L		CCME (1999a)
Hexachlorocyclohexane (Lindane)	Organic Pesticides	Freshwater aquatic life	0.01	µg/L		CCREM (1987)
Hexachlorocyclohexane (Lindane)	Organic pesticides	Livestock watering	4	µg/L		CCREM (1987)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Imidacloprid	Organic pesticides	Freshwater aquatic life	0.23	µg a.i./L	a.i. - active ingredient; See footnote #9	CCME (2007)
Imidacloprid	Organic pesticides	Marine aquatic life	0.65	µg a.i./L	a.i. - active ingredient; See footnote #9	CCME (2007)
IPBC (3-Iodo-2-propynlbutylcarbamate)	Pesticides	Freshwater aquatic life	1.9	µg/L		CCME (1999a)
Lead - Tetra-ethyl lead	Metals, Organic	Freshwater aquatic life	0.0007	µg/L		Ontario MOEE (1994)
Lead - Tetra-methyl lead	Metals, Organic	Freshwater aquatic life	0.006	µg/L		Ontario MOEE (1994)
Linuron	Organic pesticides	Freshwater aquatic life	7	µg/L		CCME (1995)
Linuron	Organic pesticides	Irrigation	3.3	µg/L	Cereals, hay and pastures	CCME (1999c)
Linuron	Organic pesticides	Irrigation	0.071	µg/L	(e.g. tomato)	CCME (1995)
Lithium	Metals	Irrigation	2.5	mg/L	See footnote #10	CCREM (1987)
Lithium	Metals	Irrigation	0.75	mg/L	Citrus	CCREM (1987)
Malathion	Pesticides	Freshwater aquatic life	0.1	µg/L		US EPA (1986)
Malathion	Pesticides	Marine aquatic life	0.1	µg/L		US EPA (1986)
Manganese	Metals	Irrigation	200	µg/L		CCREM (1987)
Manganese	Metals	Marine aquatic life	100	µg/L	To protect consumers of shellfish	US EPA (1986)
Methlychlorophenoxyacetic acid (4-chloro-2-methylphenoxy acetic acid) (MCPA)	Herbicides	Freshwater aquatic life	2.6	µg/L		CCME (1995)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Methlychlorophenoxyacetic acid (4-chloro-2-methylphenoxy acetic acid) (MCPA)	Herbicides	Irrigation	0.025	µg/L		CCME (1995)
Methlychlorophenoxyacetic acid (4-chloro-2-methylphenoxy acetic acid) (MCPA)	Herbicides	Livestock watering	25	µg/L		CCME (1995)
Methlychlorophenoxyacetic acid (4-chloro-2-methylphenoxy acetic acid) (MCPA)	Herbicides	Marine aquatic life	4.2	µg/L		CCME (1995)
Metolachlor	Organic Pesticides	Freshwater aquatic life	7.8	µg/L		CCME (1991)
Metolachlor	Organic Pesticides	Irrigation	28	µg/L		CCME (1991)
Metolachlor	Organic Pesticides	Livestock watering	50	µg/L		CCME (1991)
Metribuzin	Organic Pesticides	Freshwater aquatic life	1	µg/L		CCME (1990)
Metribuzin	Organic Pesticides	Irrigation	0.5	µg/L		CCME (1990)
Metribuzin	Organic Pesticides	Livestock watering	80	µg/L		CCME (1990)
Monochlorobenzene	Chlorinated benzenes	Freshwater aquatic life	1.3	µg/L		CCME (1997)
Monochlorobenzene	Chlorinated benzenes	Marine aquatic life	25	µg/L		CCME (1997)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Nickel	Metals	Freshwater aquatic life	25	µg/L	For water hardness values from 0 to ≤60 mg/L $CaCO_3$	CCREM (1987)
Nickel	Metals	Freshwater aquatic life	110	µg/L	When water hardness is 120 mg/L $CaCO_3$. For hardness values >60 mg/L to ≤ 180 mg/L, the WWQG is calculated using an equation. See footnote #11.	CCREM (1987)
Nickel	Metals	Freshwater aquatic life	150	µg/L	When water hardness concentrations ≥180 mg/L $CaCO_3$	CCREM (1987)
Nickel	Metals	Irrigation	200	µg/L	See footnote #6	CCREM (1987)
Nickel	Metals	Livestock watering	1	mg/L		CCREM (1987)
Nickel	Metals	Marine aquatic life	8.3	µg/L		US EPA (1986)
Nonylphenol and its ethoxylates	Organics	Freshwater aquatic life	1	µg/L	See footnote #12.	CCME (2002)
Nonylphenol and its ethoxylates	Organics	Marine aquatic life	0.7	µg/L	See footnote #12.	CCME (2002)
Pentachlorobenzene	Chlorinated benzenes	Freshwater aquatic life	6	µg/L		CCME (1997)
Perfluorooctane Sulfonate (PFOS)	Organics	Freshwater-aquatic life	3.4[13]	µg/L		ECCC (2018b)
Permethrin	Pesticides	Freshwater-aquatic life	0.004	µg/L		CCME (2006)
Permethrin	Pesticides	Marine-aquatic life	0.001	µg/L		CCME (2006)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Picloram	Organic, Pesticides	Freshwater aquatic life	29	µg/L		CCME (1990)
Picloram	Organic, Pesticides	Livestock watering	190	µg/L		CCME (1990)
Polybrominated Diphenyl Ethers (PBDE) (triBDE)	Organics	Freshwater-aquatic life	0.046	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (triBDE)	Organics	Marine-aquatic life	0.046	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (tetraBDE)	Organics	Freshwater-aquatic life	0.024	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (tetraBDE)	Organics	Marine-aquatic life	0.024	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (pentaBDE)	Organics	Freshwater-aquatic life	0.0002	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (pentaBDE)	Organics	Marine-aquatic life	0.0002	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (hexaBDE)	Organics	Freshwater-aquatic life	0.12	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (hexaBDE)	Organics	Marine-aquatic life	0.12	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (heptaBDE)	Organics	Freshwater-aquatic life	0.017	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (heptaBDE)	Organics	Marine-aquatic life	0.017	µg/L		ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (octaBDE)	Organics	Freshwater-aquatic life	0.017	µg/L		ECCC (2013)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Polybrominated Diphenyl Ethers (PBDE) (octaBDE)	Organics	Marine-aquatic life	0.017	µg/L		ECCC (2013)
Quinoline	Polycyclic aromatic hydrocarbons (PAHs)	Freshwater aquatic life	3.4	µg/L		CCME (1999a)
Resin acids (total)	Organics	Freshwater aquatic life	1	µg/L	Short-term maximum at pH 5.0[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	3	µg/L	Short-term maximum at pH 5.5[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	4	µg/L	Short-term maximum at pH 6.0[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	9	µg/L	Short-term maximum at pH 6.5[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	25	µg/L	Short-term maximum at pH 7.0[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	45	µg/L	Short-term maximum at pH 7.5[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	52	µg/L	Short-term maximum at pH 8.0[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	60	µg/L	Short-term maximum at pH 8.5[14]	Environment Ontario (1988)
Resin acids (total)	Organics	Freshwater aquatic life	62	µg/L	Short-term maximum at pH 9.0[14]	Environment Ontario (1988)
Salinity	Inorganics	Estuarine aquatic life	± 10%		± 10% change in concentration (NaCl or equivalent)[15]	DoE (1972)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Simazine	Herbicides	Freshwater aquatic life	10	µg/L		CCME (1991)
Simazine	Herbicides	Irrigation	0.5	µg/L		CCME (1991)
Simazine	Herbicides	Livestock watering	10	µg/L		CCME (1991)
Styrene	Organic, Monocyclic aromatic compounds	Freshwater aquatic life	72	µg/L		CCME (1999a)
Sulphate (dissolved)	Metals, Inorganic	Livestock watering	1,000	mg/L		CCME (1987)
Sulphide (as unionized H2S)	Metals, Inorganic	Freshwater aquatic life	2	µg/L	See footnote #16	US EPA (1976) (p. 410)
Surfactant – Linear alkylbenzene sulphonates (LAS)	Organics	Freshwater aquatic life	65	µg/L	99% level of protection	ANZECC (2000a)
Surfactant – Alcohol ethoxylated sulphate (AES)	Organics	Freshwater aquatic life	340	µg/L	99% level of protection	ANZECC (2000a)
Surfactant – Alcohol ethoxylated surfactants (AE)	Organics	Freshwater aquatic life	50	µg/L	99% level of protection	ANZECC (2000a)
Tebuthiuron	Herbicides	Freshwater aquatic life	1.6	µg/L		CCME (1995)
Tebuthiuron	Herbicides	Irrigation	0.27	µg/L	Cereals, hay and pastures	CCME (1995)
Tebuthiuron	Herbicides	Livestock watering	130	µg/L		CCME (1995)
Tetrachloromethane (carbon tetrachloride)	Halogenated methanes	Freshwater aquatic life	13.3	µg/L		CCME (1992)
Tetrachloromethane (carbon tetrachloride)	Halogenated methanes	Livestock watering	5	µg/L		CCME (1992)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Thallium	Metals	Freshwater aquatic life	0.8	µg/L	30-day average, site-specific objective for the lower Columbia River,BC	MacDonald Environmental Sciences (1997)
Tin, Tributyltin	Organotin compounds	Freshwater aquatic life	0.008	µg/L		CCME (1992)
Tin, Tributyltin	Organotin compounds	Livestock watering	250	µg/L		CCME (1992)
Tin, Tributyltin	Organotin compounds	Marine aquatic life	0.001	µg/L		CCME (1992)
Tin, Tricyclohexyltin	Organotin compounds	Livestock watering	250	µg/L		CCME (1992)
Tin, Triethyltin	Organotin compounds	Freshwater aquatic life	0.4	µg/L		Ontario MOEE (1994)
Tin, Triphenyltin	Organotin compounds	Freshwater aquatic life	0.022	µg/L		CCME (1992)
Tin, Triphenyltin	Organotin compounds	Livestock watering	820	µg/L		CCME (1992)
Triallate	Organic, Pesticides	Freshwater aquatic life	0.24	µg/L		CCME (1992)
Triallate	Organic, Pesticides	Livestock watering	230	µg/L		CCME (1992)
Tribromomethane (bromoform)	Halogenated methanes	Livestock watering	100	µg/L		CCME (1992)
Trichlorfon	Pesticides	Freshwater aquatic life	0.009	µg a.i./L	a.i. - active ingredient	CCME (2012b)
Trichloromethane (chloroform)	Halogenated methanes	Freshwater aquatic life	1.8	µg/L		CCME (1992)
Trichloromethane (chloroform)	Halogenated methanes	Livestock watering	100	µg/L		CCME (1992)

Table 1 continued. Working water quality guidelines.

Substance[1]	Class	Water Use	Long-term WWQG[2]	Units	Notes	Reference
Triclosan	Organics	Freshwater-aquatic life	0.12	µg/L	See footnote #17	ECCC (2017)
Trifluralin	Herbicides	Freshwater aquatic life	0.2	µg/L		CCME (1993)
Trifluralin	Herbicides	Livestock watering	45	µg/L		CCME (1992)
Uranium	Metals	Freshwater aquatic life	8.5	µg/L	See footnote #8	CCME (2011)
Uranium	Metals	Irrigation	10	µg/L	See footnote #6	CCREM (1987)
Uranium	Metals	Livestock watering	200	µg/L		CCREM (1987)
Vanadium	Metals	Marine aquatic life	50	µg/L		ANZECC (2000a)
Vanadium	Metals	Irrigation	100	µg/L	See footnote #6	CCREM (1987)
Vanadium	Metals	Livestock watering	100	µg/L		CCREM (1987)

Notes

1. WWQG are given for total substance concentrations unless otherwise noted.
2. Values are for long-term concentrations unless otherwise noted.
3. Sensitivity to acid inputs can be determined by the concentration of dissolved calcium: < 4 mg/L is highly sensitive to acid inputs; 4 to 8 mg/L is moderately sensitive; and > 8 mg/L is low sensitivity.
4. New evidence presented in Tillitt et al. (2010) suggests a more conservative value may be needed.
5. An assessment factor of 4 was applied to the HC_5 of 3.5 µg/L derived by ECCC.
6. Older 20-year maximum concentrations have been removed as it is no longer considered appropriate to provide a value which will result in soil concentrations above the guidelines after 20 years.
7. Low tolerance crops: strawberry, raspberry, bean, carrot; slightly tolerant crops: all other fruits and berries, onions, parsnip, radish, pea, pumpkin, lettuce, pepper, muskmelon, sweet potato, sweet corn, potato, celery, cabbage kohlrabi, cauliflower, cowpea, broadbean, flax, sunflower, corn, clover; moderately tolerant crops: spinach, cantaloupe, cucumber, tomato, squash, brussel sprout, broccoli, turnip, brome, alfalfa, big trefoil, beardless, wildrye, vetch timothy, crested wheatgrass; tolerant crops: beet, zucchini, canola, sorghum, oat

hay, wheat hay, brume, tall fascue, sweet clover, perennial ryegrass; very tolerant crops: asparagus, soybean, safflower, oats, rye wheat, sugar beet, barley, barley hay, tall wheatgrass (Source: Table 4-7 CCREM 1987).

8. Assessment factor of 10 applied because only secondary data sources available.
9. Guideline was developed by CCME using the species sensitivity distribution (SSD) method. This method has not been adopted by BC and therefore the lower fudicial limit of the SSD 5th percentile is adopted as the BC WWQG.
10. May not be protective of barley and other cereal crops; 1.0 mg/L suggested for cereal crops.
11. To calculate the WWQG for nickel at hardness >60 to <180 mg/L use the equation: WWQG (µg/L)=$e^{\{0.76[\ln(\text{hardness})]+1.06\}}$; where hardness is in mg/L $CaCO_3$.
12. WWQG is for the total concentration of nonphenols and nonphenol equivalents which is calculated as the concentration of the mixture of nonylphenolic compounds expressed as the toxic equivalent of nonylphenolic compounds. See CCME (2002) for more information.
13. An assessment factor of 2 was applied to the HC_5 of 6.8 µg/L derived by ECCC.
14. Resin Acids — Total resin acids include abietic acid, neoabietic acid, pimaric acid, isopimaric acid, and sandaracopimaric acid but not dehydroabietic acid.
15. 24-hour change in salinity should not exceed 1 ‰ if natural salinity is 0 to 3.5 ‰; 2 ‰ if natural salinity is 3.5 to 13.5 ‰; and 4 ‰ if natural salinity is 13.5 to 35 ‰ (US EPA 1976).
16. Sulphide. The un-ionized H_2S can be calculated from dissolved sulphide, the sample pH and the ionization constant (which is dependent on the sample water temperature) of H_2S. Total sulphide = dissolved H_2S + HS + acid-soluble metal sulphides present in suspended matter. Dissolved sulphide is that remaining after suspended solids have been removed after flocculation or settling. In aquatic environments, H_2S and HS are in equilibrium as H_2S = H+ + HS-. The un-ionized H_2S can be calculated from dissolved sulphide, the sample pH and the ionization constant (which is dependent on the sample water temperature) of H_2S.
17. An assessment factor of 4 was applied to the HC5 of 0.47 µg/L derived by ECCC.

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Table 2. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
1,2,4-Trichlorobenzene	Organics	Marine aquatic life	0.0081[2]	0.018[2]		Washington State DoE (2013)
1,2-Dichlorobenzene	Organics	Marine aquatic life	0.023[2]	N/A		Washington State DoE (2013)
1,4-Dichlorobenzene	Organics	Marine aquatic life	0.031[2]	0.09[2]		Washington State DoE (2013)
2-methylnaphthalene	PAHs	Freshwater aquatic life	0.0202	0.201	Lower = ISQG; Upper = PEL	CCME (1998)
2-methylnaphthalene	PAHs	Marine aquatic life	0.02	0.202	Lower = ISQG; Upper = PEL	CCME (1998)
Acenaphthene	PAHs	Freshwater & marine aquatic life	0.00671	0.0889	Lower = ISQG; Upper = PEL	CCME (1998)
Acenaphthylene	PAHs	Freshwater & marine aquatic life	0.00587	0.128	Lower = ISQG; Upper = PEL	CCME (1998)
Aldrin	Organic Pesticides	Freshwater aquatic life	0.002[2]	0.08[2]	Based on SLC; upper SWQG is for severe effects	Jaagumagi (1993a)
Aldrin	Organic Pesticides	Marine aquatic life	0.005	N/A	EPA chronic marine EqP threshold; 0.0001 significantly toxic to R. abronius based on CoA	Long and Morgan (1990)
Anthracene	PAHs	Freshwater & marine aquatic life	0.0469	0.245	Lower = ISQG; Upper = PEL	CCME (1998)
Arsenic (total	Metalloids	Marine aquatic life	7.24	42	Lower = ISQG; Upper = PEL	CCME (1998)
Arsenic (total)	Metalloids	Freshwater aquatic life	5.9	17	Lower = ISQG; Upper = PEL	CCME (1998)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Atrazine	Pesticides	Freshwater aquatic life	0.0066	N/A		USEPA (2006)
Benzo(a)anthracene	PAHs	Freshwater aquatic life	0.0317	0.385	Lower = ISQG; Upper = PEL	CCME (1998)
Benzo(a)anthracene	PAHs	Marine aquatic life	0.0748	0.693	Lower = ISQG; Upper = PEL	CCME (1998)
Benzo(a)pyrene	PAHs	Freshwater aquatic life	0.0319	0.782	Lower = ISQG; Upper = PEL	CCME (1998)
Benzo(a)pyrene	PAHs	Marine aquatic life	0.0888	0.763	Lower = ISQG; Upper = PEL	CCME (1998)
Benzo(g,h,i)perylene	PAHs	Freshwater aquatic life	0.17	3.2[2]	Based on SLC	Ontario MOEE (1993)
Benzo(g,h,i)perylene	PAHs	Marine aquatic life	0.31[2]	0.78[2]		Washington State DoE (2013)
Benzo(k)fluoranthene	PAHs	Freshwater aquatic life	0.24	13.4[2]		Ontario MOEE (1993)
Benzofluoranthene	PAHs	Freshwater aquatic life	0.3	N/A	Based on BA method	EC and QC MoE (1992)
Benzofluroanthenes (all)	PAHs	Marine aquatic life	2.3[2]	4.5[2]		CCME (1998)
Bis (2-ethylhexyl) phthalate (DEHP)	Organic Phthalate esters	Marine aquatic life	0.47[2]	0.78[2]		Washington State DoE (2013)
Bisphenol A (BPA)	Pesticides	Freshwater aquatic life	0.025[2]	N/A		ECCC (2018)
Bisphenol A (BPA)	Pesticides	Marine aquatic life	0.025[2]	N/A		ECCC (2018)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Butyl benzyl phthalate	Organic Phthalate esters	Marine aquatic life	0.049[2]	0.64[2]		Washington State DoE (2013)
Cadmium (total)	Metals	Freshwater aquatic life	0.6	3.5	Lower = ISQG; Upper = PEL	CCME (1997)
Cadmium (total)	Metals	Marine aquatic life	0.7	4.2	Lower = ISQG; Upper = PEL	CCME (1997)
Chlordane (total)	Metals	Freshwater aquatic life	0.0045	0.00887	Lower = ISQG; Upper = PEL	CCME (1998)
Chlordane (total)	Metals	Marine aquatic life	0.00226	0.00479	Lower = ISQG; Upper = PEL	CCME (1998)
Chlorpyrifos	Pesticides	Freshwater aquatic life	0.012	0.063	Lower = ISQG; Upper = PEL	NYSDEC (2013)
Chlorpyrifos	Pesticides	Marine aquatic life	0.008	0.017	Lower = ISQG; Upper = PEL	NYSDEC (2013)
Chromium (total)	Metals	Freshwater aquatic life	37.3	90	Lower = ISQG; Upper = PEL	CCME (1998)
Chromium (total)	Metals	Marine aquatic life	52.3	160	Lower = ISQG; Upper = PEL	CCME (1998)
Chrysene	PAHs	Freshwater aquatic life	0.0571	0.862	Lower = ISQG; Upper = PEL	CCME (1998)
Chrysene	PAHs	Marine aquatic life	0.108	0.846	Lower = ISQG; Upper = PEL	CCME (1998)
Copper (total)	Metals	Freshwater aquatic life	35.7	197	Lower = ISQG; Upper = PEL	CCME (1998)
Copper (total)	Metals	Marine aquatic life	18.7	108	Lower = ISQG; Upper = PEL	CCME (1998)
Diazinon	Pesticides	Freshwater aquatic life	0.0024	N/A		USEPA (2006)
Dibenzo(a,h) anthracene	PAHs	Freshwater & marine aquatic life	0.00622	0.135	Lower = ISQG; Upper = PEL	CCME (1998)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Dibenzofuran	Organics	Marine aquatic life	0.15[2]	0.58[2]		Washington State DoE (2013)
Dichloro diphenyl dichloroethane (1,1-Dichloro 2,2-bis (p-chloro-phenyl) ethane) p,p'-DDD	Organic Pesticides	Freshwater aquatic life	0.00354	0.00851	Lower = ISQG; Upper = PEL	CCME (1998)
Dichloro diphenyl dichloroethane (1,1-Dichloro 2,2-bis (p-chloro-phenyl) ethane) p,p'-DDD	Organic Pesticides	Marine aquatic life	0.00122	0.00781	Lower = ISQG; Upper = PEL	CCME (1998)
Dichloro diphenyl dichloroethene (1,1-Dichloro 2,2-bis (p-chloro-phenyl) ethene) p,p'-DDE	Organic Pesticides	Freshwater aquatic life	0.00142	0.00675	Lower = ISQG; Upper = PEL	CCME (1998)
Dichloro diphenyl dichloroethene (1,1-Dichloro 2,2-bis (p-chloro-phenyl) ethene) p,p'-DDE	Organic Pesticides	Marine aquatic life	0.00207	0.374	Lower = ISQG; Upper = PEL	CCME (1998)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Dichloro diphenyl trichloroethane (1,1,1-Trichloro 2,2-bis (p-chloro-phenyl) ethane, total DDT)	Organic Pesticides	Freshwater & marine aquatic life	0.00119	0.00477	Lower = ISQG; Upper = PEL	CCME (1998)
Dieldrin	Organic Pesticides	Freshwater aquatic life	0.00285	0.00667	Lower = ISQG; Upper = PEL	CCME (1998)
Dieldrin	Organic Pesticides	Marine aquatic life	0.00071	0.0043	Lower = ISQG; Upper = PEL	CCME (1998)
Diethyl phthalate	Organic Pthalate Esters	Marine aquatic life	0.61[2]	1.10[2]	When sediment contains 1% organic carbon	Washington State DoE (2013)
Dimethyl phthalate	Organic Pthalate Esters	Marine aquatic life	0.53[2]	0.53[2]	Same value is given in reference	Washington State DoE (2013)
Di-n-butyl phthalate	Organic Pthalate Esters	Marine aquatic life	2.2[2]	17[2]		Washington State DoE (2013)
Di-n-octyl phthalate	Organic Pthalate Esters	Marine aquatic life	0.58[2]	45[2]		Washington State DoE (2013)
Endrin	Organic Pesticides	Freshwater & marine aquatic life	0.00267	0.0624	Lower = ISQG; Upper = PEL	CCME (1998)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Fluoranthene	PAHs	Freshwater aquatic life	0.111	2.355	Lower = ISQG; Upper = PEL	CCME (1998)
Fluoranthene	PAHs	Marine aquatic life	0.113	1.494	Lower = ISQG; Upper = PEL	CCME (1998)
Fluorene	PAHs	Freshwater & marine aquatic life	0.0212	0.144	Lower = ISQG; Upper = PEL	CCME (1998)
Heptachlor (Heptachlor epoxide)	Organic Pesticides	Freshwater & marine aquatic life	0.0006	0.00274	Lower = ISQG; Upper = PEL	CCME (1998)
Hexabromocyclododecane (HBCD)	Organics	Freshwater aquatic life	1.6	N/A		ECCC (2016)
Hexabromocyclododecane (HBCD)	Organics	Marine aquatic life	1.6	N/A		ECCC (2016)
Hexachlorobenzene	Organic Fungicides	Freshwater aquatic life	0.01[2]	0.24[2]	Lower SWQG based on EqP	Jaagumagi (1993a)
Hexachlorobenzene	Organic Fungicides	Marine aquatic life	0.0038[2]	0.023[2]	0.23 µg/g maximum level for dredge disposal based on AET	Washington State DoE (2013)
Hexachlorobutadiene	Organics	Marine aquatic life	0.039[2]	0.062[2]		Washington State DoE (2013)
Hexachlorocyclohexane - alpha (Benzene hexachloride-alpha; alpha-HCH)	Organics	Freshwater aquatic life	0.006[2]	0.10[2]	Effect levels based on SLC	Jaagumagi (1993a)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Hexachlorocyclohexane - beta (Benzene hexachloride-beta; beta-HCH)	Organics	Freshwater aquatic life	0.005[2]	0.21[2]	Effect levels based on SLC	Jaagumagi (1993a)
Hexachlorocyclohexane - total (Benzene hexachloride-total; BHC)	Organics	Freshwater aquatic life	0.003[2]	0.12[2]	Effect levels based on SLC	Jaagumagi (1993a)
Hexachlorocyclohexane (Lindane-gamma BHC)	Organic Pesticides	Freshwater aquatic life	0.00094	0.00138	Lower = ISQG; Upper = PEL	CCME (1998)
Hexachlorocyclohexane (Lindane-gamma BHC)	Organic Pesticides	Marine aquatic life	0.00032	0.00099	Lower = ISQG; Upper = PEL	CCME (1998)
Indeno (1,2,3,c,d) pyrene	PAHs	Freshwater aquatic life	0.2	3.2[2]	Effect levels based on SLC	Ontario MOEE (1993)
Indeno (1,2,3,c,d) pyrene	PAHs	Marine aquatic life	0.34[2]	0.88[2]		Washington State DoE (2013)
Iron (total)	Metals	Freshwater aquatic life	21,200 (about 2%)	43,766 (about 4%)	Effect levels based on SLC	Jaagumagi (1993b)
Lead (total)	Metals	Freshwater aquatic life	35	91.3	Lower = ISQG; Upper = PEL	CCME (1998)
Lead (total)	Metals	Marine aquatic life	30.2	112	Lower = ISQG; Upper = PEL	CCME (1998)
Manganese (total)	Metals	Freshwater aquatic life	460	1100	Effect levels based on SLC	Jaagumagi (1993b)
Mercury (total)	Metals	Freshwater aquatic life	0.17	0.486	Lower = ISQG; Upper = PEL	CCME (1997)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Mercury (total)	Metals	Marine aquatic life	0.13	0.7	Lower = ISQG; Upper = PEL	CCME (1997)
Mirex	Organic Pesticides	Freshwater aquatic life	0.007[2]	1.3[2]	Effect levels based on SLC	Jaagumagi (1993a)
Molybdenum	Metals	Freshwater Aquatic life	25	23000	Lower=MPC; Upper=SRC	Verbruggen et al. 2001
Naphthalene	PAHs	Freshwater & marine aquatic life	0.0346	0.391	Lower = ISQG; Upper = PEL	CCME (1998)
Nickel (total)	Metals	Freshwater aquatic life	16	75	Effect levels based on SLC	Jaagumagi (1993b)
Nickel (total)	Metals	Marine aquatic life	30	50	Effect levels based on NSTPA	Long and Morgan (1990)
N-Nitrosodiphenylamine	Organics	Marine aquatic life	0.11[2]	0.11[2]	Same value is given in reference	Washington State DoE (2013)
Nonylphenol and its ethoxylates	Organics	Freshwater aquatic life	1.4[2]	N/A	ISQG using equilibrium partitioning approach, expressed on a toxic equivalency basis using NP toxic equivalency factors. See reference.	CCME (2002)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Nonylphenol and its ethoxylates	Organics	Marine aquatic life	1.0[2]	N/A	ISQG using equilibrium partitioning approach, expressed on a toxic equivalency basis using NP toxic equivalency factors. See reference.	CCME (2002)
Phenanthrene	PAHs	Freshwater aquatic life	0.0419	0.515	Lower = ISQG; Upper = PEL	CCME (1998)
Phenanthrene	PAHs	Marine aquatic life	0.0867	0.544	Lower = ISQG; Upper = PEL	CCME (1998)
Polybrominated diphenyl ethers (PBDE) (total)	Organics	Marine aquatic life	0.001	N/A		Alava et al. (2016)
Polychlorinated Biphenyls (PCBs) (total PCBs)	Organics	Marine aquatic life	0.0000037	N/A		Alava et al. (2012)
Polychlorinated dibenzo-*p*-dioxins/dibenzo furans (PCDD/Fs)	Organics	Freshwater & marine aquatic life	0.00000085	0.0000215	Upper SWQG is provisional maximum expressed on a toxic equivalency basis using toxic equivalent factors for fish. See reference.	CCME (2001)
Polycyclic Aromatic Hydrocarbon (PAH) Benzo(g,h,i)perylene	PAHs	Freshwater aquatic life	0.17	3.2[2]	Effect levels based on SLC	Ontario MOEE (1993)
Polycyclic Aromatic Hydrocarbons (PAHs) HPAH higher molecular weight	PAHs	Freshwater aquatic life	1	N/A	Based on BA method	EC and QC MoE (1992)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Polycyclic Aromatic Hydrocarbons (PAHs) HPAH higher molecular weight	PAHs	Marine aquatic life	9.6[2]	53[2]		Washington State DoE (2013)
Polycyclic Aromatic Hydrocarbons (PAHs) LPAH lower molecular weight	PAHs	Freshwater aquatic life	0.1		Based on BA method	EC and QC MoE (1992)
Polycyclic Aromatic Hydrocarbons (PAHs) LPAH lower molecular weight	PAHs	Marine aquatic life	3.7[2]	7.8[2]		Washington State DoE (2013)
Polycyclic Aromatic Hydrocarbons (PAHs) total	PAHs	Freshwater aquatic life	4	35	Based on NSTPA, 100 µg/g shows severe effects (Persuad et al. 1993)	Long and Morgan (1990)
Pyrene	PAHs	Freshwater aquatic life	0.053	0.875	Lower = ISQG; Upper = PEL	CCME (1998)
Pyrene	PAHs	Marine aquatic life	0.153	1.398	Lower = ISQG; Upper = PEL	CCME (1998)
Silver (total)	Metals	Freshwater aquatic life	0.5	N/A	Ontario sediment guideline	Ontario MOEE (1993)
Silver (total)	Metals	Marine aquatic life	1	2.2	Based on NSTPA	Long and Morgan (1990)
Toxaphene	Organic Pesticides	Freshwater & marine aquatic life	0.0001[2]	N/A	ISQG	CCME (2002)

Table 2 continued. Working sediment quality guidelines.

Substance	Group	Use	Lower SWQG (µg/g dry weight)	Upper SWQG (µg/g dry weight)	Notes[1]	Reference
Zinc (total)	Metals	Freshwater aquatic life	123	315	Lower = ISQG; Upper = PEL	CCME (1998)
Zinc (total)	Metals	Marine aquatic life	124	271	Lower = ISQG; Upper = PEL	CCME (1998)

[1]Acronyms:
AET = Apparent Effects Threshold
BA = Background Approach
CoA = Co-Occurrence analysis
EqP = Equilibrium Partitioning
ISQG = Interim Sediment Quality Guideline
MPC=Maximum permissible Concentration
NSTPA = National Status and Trends Program Approach
PEL = Probable Effect Level
SLC = Screening Level Concentration
SRC=Serious Risk Concentration

[2]Concentrations are expressed as µg/g sediment containing 1% organic carbon. A guideline expressed as µg/g is based on the sediment as a whole and does not require adjustment for organic carbon content. Adjustments to guidelines are required when they are expressed in terms of the sediment containing 1% organic carbon. For sediments with organic carbon other than 1%, an adjustment in guidelines should be made by multiplying the guideline by the % organic carbon content of the sediment.

[3] This SQG is based on the water column guideline which is adapted by application an assessment factor of 4. Therefore, the tissue guideline recommended by ECCC, 2018 is divided by a factor of 4 to reflect the application of assessment factor to the water column guideline.

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Table 3. Working tissue residue guidelines.

Substance	Class	Water use	Long-term WWQG	Unit	Reference
Polybrominated Diphenyl Ethers (PBDE) (triBDE)	Organics	Aquatic life-fish tissue	120	µg/kg ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (tetraBDE)	Organics	Aquatic life-fish tissue	88	µg/kg ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (pentaBDE)	Organics	Aquatic life-fish tissue	1	µg/kg ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (hexaBDE)	Organics	Aquatic life-fish tissue	420	µg/kg ww	ECCC (2013)
Perfluorooctane Sulfonate (PFOS)	Organics	Aquatic life-fish tissue	4,700[1]	µg/kg ww	ECCC (2018)

[1]: An assessment factor of 2 was applied to the ECCC 2018 tissue guideline.

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Table 4. Working wildlife dietary guidelines.

Substance	Class	Water use	Long-term WWQG	Unit	Reference
Bisphenol A (BPA)	Organics	Wildlife	110	µg/kg food ww	ECCC (2018a)
DDT	Pesticides	Wildlife	14	µg/kg food ww	CCME (1997)
Hexabromocyclododecane (HBCD)	Organics	Wildlife	40,000	µg/kg food ww	ECCC (2016)
Polybrominated Diphenyl Ethers (PBDE) (tetraBDE)	Organics	Wildlife	44	µg/kg food ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (pentaBDE)	Organics	Wildlife	3	µg/kg food ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (hexaBDE)	Organics	Wildlife	4	µg/kg food ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (heptaBDE)	Organics	Wildlife	64	µg/kg food ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (octaBDE)	Organics	Wildlife	63	µg/kg food ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (nonaBDE)	Organics	Wildlife	78	µg/kg food ww	ECCC (2013)
Polybrominated Diphenyl Ethers (PBDE) (decaBDE)	Organics	Wildlife	9	µg/kg food ww	ECCC (2013)
Polychlorinated Biphenyls (total PCBs)	Organics	Wildlife	0.29	µg/kg food ww	Alava et al. (2012)
Perfluorooctane Sulfonate (PFOS)	Organics	Wildlife	4.6	µg/kg food ww	ECCC (2018b)

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