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Chapter 584

Surface Water Quality Criteria for Toxic Pollutants

SUMMARY: This rule establishes ambient water quality criteria for toxic pollutants in the surface waters of the State. The rule also sets forth procedures that may be used to determine alternative statewide criteria or site-specific criteria adopted as part of a licensing proceeding.

- 1. Criteria and Applicability.** The ambient water quality criteria established by this rule are applicable to all surface waters of the State. These criteria are intended to prevent the occurrence of toxic pollutants in toxic amounts as prohibited by both the US Clean Water Act and State law and protect aquatic life and human health. Aquatic life criteria are intended to assure that toxic pollutants are not present in concentrations or amounts that would cause acute and or chronic adverse impacts on organisms in, on or using the surface waters. Human health criteria are intended to assure that toxic pollutants are not present in concentrations or amounts that would cause adverse impact to persons who eat organisms or drink water taken from the surface waters. In the case of marine waters the consumption of water will not be considered for application of human health criteria.
- 2. Narrative Water Quality Criteria.** Except as naturally occurs, surface waters must be free of pollutants in concentrations which impart toxicity and cause those waters to be unsuitable for the existing and designated uses of the water body.
- 3. Numerical Water Quality Criteria**

A. Statewide Criteria

- (1) Statewide Criteria for toxic pollutants with national water criteria. Except as naturally occur, levels of toxic pollutants in surface waters must not exceed federal water quality criteria as established by USEPA, pursuant to Section 304(a) of the Clean Water Act, or alternative criteria established below.

Statewide criteria are contained in Appendix A of this rule.

- (2) Alternative Statewide Criteria. Alternative statewide criteria must be adopted through rulemaking. Alternative statewide criteria must be based on sound scientific rationale and be as protective as EPA's water quality criteria. Such criteria must also be protective of the most sensitive designated and existing uses of the water body, including, but not limited to, habitat for fish and other aquatic life, human consumption of fish and drinking water supply after treatment. A proposal for alternative statewide criteria must be initiated in accordance with petition for rulemaking provisions of the State Administrative Procedures Act, 5 M.R.S.A., Section 8055, and include a thorough literature search of the properties of the toxicant, including but not limited to its toxicity, carcinogenicity, teratogenicity, mutagenicity, bioaccumulation/bioconcentration, and regulation by other states or foreign countries. Any such proposal must also take into consideration, at a minimum, the following:
 - (a) Aquatic Life Criteria. Physical, chemical or biological conditions found in Maine waters that differ from the information used as the basis for national criteria from the USEPA. When toxicity testing is to be done, the procedures in 3(B)(1) will be used. Ambient data must be collected in general conformance with Chapter 530, section 4(D) and have sufficient geographic distribution to reflect variation of the

characteristics in question. Where discharges may affect the factors used to determine water quality criteria, significant sources representative of the pollutant, characteristics and geographic distribution will be evaluated as part of a proposal.

- (b) Human Health Criteria. Changes to statewide criteria for the protection of human health must be supported by information following the general methods and considerations specified by USEPA in "Revisions to the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)," EPA-822-B-00-004, USEPA, Office of Science and Technology, Washington, D.C., 65 Federal Register No. 214, pp. 66443-66482, November 3, 2000. The Board shall consider this information and information provided by the Department of Human Services.

The Board may request additional materials and shall consider all relevant information when determining whether to adopt alternative statewide criteria.

- (3) Statewide criteria for toxic pollutants lacking national criteria. The requirements of section 3(A)(2) also apply to the adoption of criteria for toxic pollutants not having water quality criteria established by USEPA, pursuant to Section 304(a) of the Clean Water Act.

B. Site-Specific Criteria. Site-specific numerical criteria for a toxic substance reflecting specific circumstances different from those used in, or not considered in the derivation of the statewide criteria, or for toxic pollutants lacking national criteria, must be adopted by the Board only as part of a waste discharge license proceeding, pursuant to 38 MRSA Sections 413, 414, and 414-A. Site-specific criteria must be based on sound scientific rationale, be as protective as federal water quality criteria and must be protective of the most sensitive designated and existing uses of the water body, including, but not limited to, habitat for fish and other aquatic life, human consumption of fish and drinking water supply after treatment.

Establishment of site-specific criteria must be initiated with a request that the Board assume jurisdiction for issuance of a license. Where the Department finds a request for site-specific criteria may affect other sources discharging to the same waterway, it may, pursuant to 38 MRSA, Section 414-A(5)(A), reopen for modification those licenses for consideration in the same proceeding. The information necessary to ensure that criteria are adequately evaluated must be submitted by a person requesting alternative criteria. The adequacy of this information shall be determined by the Board and may include, among other things, a literature search, user surveys and consumption rate calculations. A literature search of the properties of toxicants includes, but is not limited to, its toxicity, carcinogenicity, teratogenicity, mutagenicity, bioaccumulation/bioconcentration, and regulation by other states or foreign countries. Requests must provide information identifying specific uses of the water body in question, and any other relevant site-specific circumstance or information different from those used, or any not considered, in the derivation of the statewide criteria. Relevant information includes such things as sensitive or unique physical, chemical or biological conditions of the waterbody, rare or significant plant or wildlife communities and habitats located in the water body, or human populations having distinct uses or needs with regard to the water body.

Any request to the Board to establish site-specific criteria must also include, at a minimum, the following. A plan of study must be submitted to the Department for review and approval prior to the beginning of the studies, and may include the consideration of existing relevant scientific information as well as proposals for site-specific investigations.

(1) Aquatic Life Criteria

- (a) Minimum requirements include toxicity tests conducted generally according to the USEPA Water Quality Standards Handbook: Second Edition, EPA-823-B-94-005-a, USEPA, Office of Water, Washington, DC, August, 1994, and applicable Water-effect Ratio Guidance or other guidance for development of site specific criteria approved by the Department.
 - (b) For complex effluents with more than one potentially toxic pollutant, both dilution waters (receiving water and laboratory water) must be spiked with all pollutants present in the effluent in significant amounts, except the pollutant of interest, or the whole effluent at levels representative of the calculated receiving water concentrations at the appropriate design flow. Pollutants present in significant amounts relative to toxic levels must be determined by means of periodic testing within two years of submitting the plan of study to the Department. The pollutant of interest must be added at various concentrations bracketing the target concentration (the existing or anticipated criterion) to determine an appropriate site-specific criterion. This procedure must be repeated for each pollutant for which site-specific criteria are to be proposed.
 - (c) For discharges to freshwater, the water flea (*Ceriodaphnia dubia*) reproductive and survival test, and the brook trout (*Salvelinus fontinalis*), or other salmonid approved by the Department, survival and growth tests must be conducted. For discharges to marine waters, Mysid shrimp (*Mysidopsis bahia*) survival test, and the sea urchin (*Arbacia punctulata*) fertilization test must be conducted.
 - (d) Results should be based on measured concentrations.
 - (e) For heavy metal tests, the metal must be added in the form of inorganic salts of relatively high solubility, such as nitrate salts or in some cases, chloride or sulfate salts.
 - (f) Sufficient testing must be conducted to properly characterize seasonal variations and the water quality criteria of concern. Receiving water and effluent sampling must be representative of expected conditions and exclude periods of floods, storm events and abnormal operation of the discharge source.
- (2) Human Health Criteria. Persons requesting site specific criteria for the protection of human health must provide information following the general methods and considerations specified by USEPA in "Revisions to the Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)," EPA-822-B-00-004, USEPA, Office of Science and Technology, Washington, D.C., 65 Federal Register No. 214, pp. 66443-66482, November 3, 2000. The Board shall consider this information and information provided by the Department of Human Services. In determining if site specific criteria are appropriate, the Board shall first evaluate whether

there is an identifiable population(s) using a water body whose use(s) is distinct from that of the population considered when establishing the statewide criteria. If the Board identifies such a population, it shall consider activities or customs that would constitute a use of the water body substantially different in type or extent than that upon which statewide criteria are based. The Board shall consider, among other things, the following:

- (a) Studies designed and implemented to provide accurate information regarding the fact and extent of specific human activities that create a potential exposure to toxics in the water body, including such things as the rate of consumption of organisms, use of a water body as a drinking water supply, recreation in and on the water, and other specific uses of the water body established by local cultural or commercial practices;
 - (b) The importance of organisms affected by a toxic substance, taking into consideration their places in the food chain and the degree to which they are used or consumed by humans;
 - (c) Scientific evidence typically relied upon by experts in the field of toxicology showing the potential effect of a toxic substance in the discharge that is the subject of the licensing, on human health, given a particular established use of the water body; and
 - (d) Unique characteristics of the water body or organisms depending on it that effect exposure of humans to toxics in the water body.
4. **Risk levels.** For any pollutant believed to be carcinogenic, a risk level that would result, at most, in one additional cancer per one million people (risk of 1×10^{-6}) exposed to the carcinogen must be used in determining the human health criterion.
5. The following assumptions have been used to determine the statewide criteria contained in Appendix A of this rule.

A. Form of metals. All metals criteria must be considered as total metal.

NOTE: Persons may request that the Department express criteria for metals as the dissolved form by submitting the appropriate information to allow recalculation of relative toxicity using conversion factors and translator procedures published by EPA: "The Metals Translator: Guidance for Calculating a Total Recoverable Permit Limit from a Dissolved Criterion", EPA 823-B-96-007, USEPA, Office of Water, Washington, DC, June 1996.

B. Ambient water physical characteristics. Fresh water quality must be calculated using a pH of 7.0, a temperature of 25 degrees Celsius, and a hardness of 20 mg/L. Marine water quality must be calculated using a pH of 8.0, a temperature of 20 degrees Celsius, and a salinity of 30 parts per thousand. Estuarine water quality must be calculated using a pH of 8.0, a temperature of 20 degrees Celsius and a salinity of 20 parts per thousand.

NOTE: These characteristics, however, may vary depending on the location of the discharge. The relative criteria for a pollutant subject to these considerations may be recalculated in any given licensing proceeding using the actual local ambient physical water characteristics. See Chapter 530.

- C. Human health assumptions.** Human health criteria are determined assuming consumption of 2 Liters of water and 32.4 grams of organisms per day taken from surface waters of the State by a person weighing 70 kg.
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AUTHORITY: 38 MRSA Sections 341-D and 420

EFFECTIVE DATE: October 9, 2005 (filing 2005-402, 06-096 Chapter 530.5 repealed and replaced by this rule and Chapter 530)

Chapter 584. Appendix A. Statewide criteria for toxic pollutants with national water quality criteria for Priority Pollutants and non Priority Pollutants. Patterned after the EPA's National Recommended Water Quality Criteria of November 2002 and December 2003. "FR Cite/Source" refers to the EPA publication from which the criteria are derived. The "Gold Book" is Quality Criteria for Water: 1986. EPA 440/5-86-001.

1. Table I. Criteria for Priority Pollutant listed pursuant to 304(a) of the Clean Water Act. See also the footnotes following this table.

Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/ Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Antimony	7440360					5.5 B	350	65FR66443
Arsenic	7440382	340 A,K	150 A,K	69 A,bb	36 A,bb	0.012 M,S	0.028 M,S	65FR31682 57FR60848
Beryllium	7440417					Z		65FR31682
Cadmium	7440439	0.42 E,K,bb	0.08 E,K,bb	40 bb	8.85 bb	Z		65FR31682 EPA-822-R-01-001
Chromium III	16065831	483 E,K	23.1 E,K			Z Total		EPA820/B-96-001 65FR31682
Chromium VI	18540299	16 K	11 K	1,108 bb	50 bb	Z Total		65FR31682
Copper	7440508	3.07 E,K,cc	2.36 E,K,cc	5.78 ff	3.73 ff	1,300 U		65FR31682
Lead	7439921	10.52 E,bb,gg	0.41 E,bb,gg	221 bb	8.52 bb	Z		65FR31682
Mercury	7439976	See Title 38 MRSA, Sections 420 (1-B) and 413(11)						
Nickel	7440020	120.2 E,K	13.4 E,K	75 bb	8.28 bb	400 B	1,000 B	65FR31682

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		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Selenium	7782492	L,R	5.0	291 bb,dd	71 bb,dd	162 Z	2,250	62FR42160 65FR31682 65FR66443
Silver	7740224	0.23 G, E		2.24 G				65FR31682
Thallium	7440280					0.17	0.25	68FR75507
Zinc	7440666	30.6 E,K	30.6 E,K	95 bb	86 bb	6,000 U	14,000 U	65FR31682 65FR66443
Cyanide	57125	22 K,Q	5.2 K,Q	1 Q,bb	1 Q,bb	140	140 jj	68FR75507
Asbestos	1332214					7x10 ⁶ fibers/L I		57FR60848
2,3,7,8-TCDD Dioxin	1746016	Also see Title 38 MRSA Section 420(2)				2.7E-9 J	2.8E-9 J	65FR66443
Acrolein	107028					122	157	65FR66443
Acrylonitrile	107131					0.04 B	0.13 B	65FR66443
Benzene	71432					0.58 B	7.55 B	IRIS 01/19/00 65FR66443
Bromoform	75252					4.2B	73 B	65FR66443
Carbon Tetrachloride	56235					0.23 B	0.89 B	65FR66443

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		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Chlorobenzene	108907					120 B, U, Z	840 B, U	68FR75507
Chlorodibromomethane	124481					0.40 B	6.94 B	65FR66443
Chloroethane	75003							
2-Chloroethylvinyl Ether	110758							
Chloroform	67663					5.4 P	94 P	62FR42160
Dichlorobromomethane	75274					0.53 B	9.3 B	65FR66443
1,1-Dichloroethane	75343							
1,2-Dichloroethane	107062					0.38 B	19.8 B	65FR66443
1,1-Dichloroethylene	75354					320 Z	3,900	68FR75507
1,2-Dichloropropane	78875					0.50 B	7.9 B	65FR66443
1,3-Dichloropropene	542756					0.34	11.4 B	68FR75507
Ethylbenzene	100414					435	1,150	68FR75507
Methyl Bromide	74839					46 B	800 B	65FR66443
Methyl Chloride	74873							65FR31682
Methylene Chloride	75092					4.6 B	320 B	65FR66443

Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/ Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
1,1,2,2-Tetrachloroethane	79345					0.16 B	2.2 B	65FR66443
Tetrachloroethylene	127184					0.59	1.77	65FR66443
Toluene	108883					1,200 Z	8,100	68FR75507
1,2-Trans-Dichloroethylene	156605					140 Z	5,500	68FR75507
1,1,1-Trichloroethane	71556					Z		65FR31682
1,1,2-Trichloroethane	79005					0.58 B	8.42 B	65FR66443
Trichloroethylene	79016					2.37	16.2	65FR66443
Vinyl Chloride	75014					0.025	1.32	68FR75507
2-Chlorophenol	95578					55.2 B,U	80.6 B,U	65FR66443
2,4-Dichlorophenol	120832					63.3 B,U	160 B,U	65FR66443
2,4-Dimethylphenol	105679					280 B	460 B,U	65FR66443
2-Methyl-4,6-Dinitrophenol	534521					12.5	155	65FR66443
2,4-Dinitrophenol	51285					68.4 B	2,900 B	65FR66443
2-Nitrophenol	88755							
4-Nitrophenol	100027							

Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/ Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
3-Methyl-4-Chlorophenol	59507					U	U	
Pentachlorophenol	87865	8.72 F,K	6.69 F,K	13 bb	7.9 bb	0.25 B	1.64 B,H	65FR66443 65FR31682
Phenol	108952					21,000 B,U	93,000 B,U	65FR66443
2,4,6-Trichlorophenol	88062					0.93 B	1.31 B	65FR66443
Acenaphthene	83329					430 B,U	540 B,U	65FR66443
Acenaphthylene	208968							
Anthracene	120127					7,100 B	22,000 B	65FR66443
Benzidine	92875					0.00006 B	0.0001 B	65FR66443
Benzo(a)Anthracene	56553					0.003 B	0.01 B	65FR66443
Benzo(a)Pyrene	50328					0.003 B	0.01 B	65FR66443
Benzo(b)Fluoranthene	205992					0.003 B	0.01 B	65FR66443
Benzo(ghi)Perylene	191242							
Benzo(k)Fluoranthene	207089					0.003 B	0.01 B	65FR66443

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		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Bis2-ChloroethoxyMethane	111911							
Bis2-ChloroethylEther	111444					0.029 B	0.28 B	65FR66443
Bis2-ChloroisopropylEther	108601					1,350 B	35,000 B	65FR66443
Bis2-EthylhexylPhthalate ^x	117817					0.8 B	1.19 B	65FR66443
4-Bromophenyl Phenyl Ether	101553							
Butylbenzyl Phthalate ^w	85687					900 B	1,050 B	65FR66443
2-Chloronaphthalene	91587					650 B	850 B	65FR66443
4-Chlorophenyl Phenyl Ether	7005723							
Chrysene	218019					0.003 B	0.01 B	65FR66443
Dibenzo(a,h)Anthracene	53703					0.003 B	0.01 B	65FR66443
1,2-Dichlorobenzene	95501					330	700	68FR75507
1,3-Dichlorobenzene	541731					250	520	65FR31682
1,4-Dichlorobenzene	106467					50	105	68FR75507

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		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
3,3'-Dichlorobenzidine	91941					0.013 B	0.015 B	65FR66443
Diethyl Phthalate ^w	84662					13,000 B	24,000 B	65FR66443
Dimethyl Phthalate ^w	131113					221,000	600,000	65FR66443
Di-n-Butyl Phthalate ^w	84742					1,400 B	2,400 B	65FR66443
2,4-Dinitrotoluene	121142					0.11	1.83	65FR66443
2,6-Dinitrotoluene	606202							
Di-n-Octyl Phthalate	117840							
1,2-Diphenylhydrazine	122667					0.03 B	0.11 B	65FR66443
Fluoranthene	206440					71 B	75 B	65FR66443
Fluorene	86737					950 B	2,100 B	65FR66443
Hexachlorobenzene	118741					0.0002 B	0.0002 B	65FR66443
Hexachlorobutadiene	87683					0.43 B	9.96 B	65FR66443
Hexachlorocyclopentadiene	77474					39 U	600 U	68FR75507

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		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
Hexachloroethane	67721					1.04 B	1.78 B	65FR66443
Ideno(1,2,3-cd)Pyrene	193395					0.003 B	0.01 B	65FR66443
Isophorone	78591					35 B	520 B	65FR66443
Naphthalene	91203							
Nitrobenzene	98953					16.7 B	370 B,H	65FR66443
N-Nitrosodimethylamine	62759					0.00069 B	1.63 B	65FR66443
N-Nitrosodi-n-Propylamine	621647					0.005 B	0.27 B	65FR66443
N-Nitrosodiphenylamine	86306					2.23 B	3.24 B	65FR66443
Phenanthrene	85018							
Pyrene	129000					710 B	2,160 B	65FR66443
1,2,4-Trichlorobenzene	120821					25	38	68FR75507
Aldrin	309002	3.0 G		1.3 G		0.000027 B	0.000027 B	65FR31682 65FR66443
alpha-BHC	319846					0.0017 B	0.0026 B	65FR66443

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		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water and Organisms (ug/L)	Organisms Only (ug/L)	
beta-BHC	319857					0.006 B	0.009 B	65FR66443
gamma-BHC (Lindane)	58899	0.95 K		0.16 G		0.68 Z	0.1	68FR75507
delta-BHC	319868							
Chlordane	57749	2.4 G	0.0043 G,aa	0.09 G	0.004 G, aa	.00044	0.00044	65FR31682 65FR66443
4,4'-DDT	50293	1.1 G,ii	0.001 G,aa,ii	0.13 G,ii	0.001 G,aa,ii	0.00012 B	0.00012 B	65FR31682 65FR66443
4,4'-DDE	72559					0.00012 B	0.00012 B	65FR66443
4,4'-DDD	72548					0.00017 B	0.00017 B	65FR66443
Dieldrin	60571	0.24 K	0.056 K,O	0.71 G	0.0019 G,aa	0.000029 B	0.000029 B	65FR31682 65FR66443
alpha-Endosulfan	959988	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	39 B	48 B	65FR31682 65FR66443
beta-Endosulfan	33213659	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	39 B	48 B	65FR31682 65FR66443
Endosulfan Sulfate	1031078					39	48 B	65FR66443
Endrin	72208	0.086 K	0.036 K,O	0.037 G	0.0023 G,aa	0.032	0.032	68FR75507

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Endrin Aldehyde	7421934					0.16 B	0.16 B,H	65FR66443
Heptachlor	76448	0.52 G	0.0038 G,aa	0.053 G	0.0036 G,aa	0.000043 B	0.000043 B	65FR31682 65FR66443
Heptachlor Epoxide	1024573	0.52 G,V	0.0038 G,V,aa	0.053 G,V	0.0036 G,V,aa	0.000021 B	0.000021 B	65FR31682 65FR66443
Polychlorinated Biphenyls PCBs:			0.014 N,aa		0.03 N,aa	0.000035 B,N	0.000035 B,N	65FR31682 65FR66443
Toxaphene	8001352	0.73	0.0002 aa	0.21	0.0002 aa	0.00015 B	0.000155 B	65FR31682 65FR66443

Footnotes to Table I:

- A. This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. In the arsenic criteria document (EPA 440/5-84-033, January 1985), Species Mean Acute Values are given for both arsenic (III) and arsenic (V) for five species and the ratios of the SMAVs for each species range from 0.6 to 1.7. Chronic values are available for both arsenic (III) and arsenic (V) for one species; for the fathead minnow, the chronic value for arsenic (V) is 0.29 times the chronic value for arsenic (III). No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.
- B. This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.
- E. The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 20 mg/L. Also see part 7 below.
- F. Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: $CMC = \exp(1.005(pH) - 4.869)$; $CCC = \exp(1.005(pH) - 5.134)$. Values displayed in table correspond to a pH of 7.0.
- G. This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endosulfan (EPA 440/5-80-046), Endrin (EPA 440/5-047), Heptachlor (440/580-052), Hexachlorocyclohexane (EPA 440/5-80-054), Silver (EPA 440/5-80-071). The Minimum Data Requirements and derivation procedures were different in the

1980 Guidelines than in the 1985 Guidelines. For example, a “CMC” derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

- H. No criterion for protection of human health from consumption of aquatic organisms excluding water was present in the 1980 criteria document or in the 1986 *Quality Criteria for Water*. Nevertheless, sufficient information was presented in the 1980 document to allow the calculation of a criterion, even though the results of such a calculation were not shown in the document.
- I. This criterion for asbestos is the Maximum Contaminant Level (MCL) developed under the Safe Drinking Water Act.
- J. These values are not applicable to bleach karft pulp mills. See 38 M.R.S.A., section 420(2)(I).
- K. This recommended criterion is based on a 304(a) aquatic life criterion that was issued in the 1995 *Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water*, (EPA-820-B-96-001, September 1996). This value was derived using the GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the difference between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. None of the decisions concerning the derivation of this criterion were affected by any considerations that are specific to the Great Lakes.
- L. The $CMC = 1/[(f1/CMC1) + (f2/CMC2)]$ where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 µg/l and 12.83 µg/l, respectively.
- M. EPA is currently reassessing the criteria for arsenic.
- N. This criterion applies to total PCBs (e.g. the sum of all congener or all isomer or homolog or Aroclor analyses).
- O. The derivation of the CCC for this pollutant did not consider exposure through the diet, which is probably important for aquatic life occupying upper trophic levels.
- P. Although a new RfD is available in IRIS, the surface water criteria will not be revised until the National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) is completed, since public comment on the relative source contribution (RSC) for chloroform is anticipated.
- Q. This recommended water quality criterion is expressed as µg free cyanide (as CN)/L.
- R. This value for Selenium was announced (61FR58444-58449, November 14, 1996) as a proposed GLI 303(c) aquatic life criterion. EPA is currently working on this criterion and so this value might change substantially in the near future.
- S. This recommended water quality criterion refers to the inorganic form only.
- U. The organoleptic effect criterion is more stringent than the value for priority toxic pollutants. Also see Part 6.
- V. This value was derived from data for heptachlor and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.
- W. Although EPA has not published a final criteria document for this compound, it is EPA’s understanding that sufficient data exist to allow calculation of aquatic criteria. It is anticipated that industry intends to publish in the peer reviewed literature draft aquatic life criteria generated in accordance with EPA Guidelines. EPA will review such criteria for possible issuance as national WQC.
- X. There is a full set of aquatic life toxicity data that show that BEHP is not toxic to aquatic organisms at or below its solubility limit.
- Y. This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha- endosulfan and beta-endosulfan.
- Z. A more stringent MCL has been issued. Also see part 6 below.
- aa This criterion is based on a 304(a) aquatic life criterion issued in 1980 or 1986, and in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Polychlorinated Biphenyls (EPA 440/5-80-019), Toxaphene (EPA 440/5-86-038). The CCC is currently based on the Final Residual Value (FRV) procedure. Since the publication of the

- Great Lakes Aquatic Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the FRV procedure for deriving CCCs for new or revised 304(a) aquatic life criteria. Therefore, the Agency anticipates that future revisions of this CCC will not be based on the FRV procedure.
- bb This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Arsenic (EPA 440/5-84-033), Cadmium (EPA 440/5-84-032), Chromium (EPA 440/5-84-029), Copper (EPA 440/5-84-031), Cyanide (EPA 440/5-84-028), Lead (EPA 440/5-84-027), Nickel (EPA 440/5-86-004), Pentachlorophenol (EPA 440/5-86-009), Toxaphene, (EPA 440/5-86-006), Zinc (EPA 440/5-87- 003).
- cc When the concentration of dissolved organic copper is elevated, copper is substantially less toxic and use of Water-Effects Ratios might be appropriate.
- dd The selenium criteria document (EPA 440/5-87-006, September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 µg/L in salt water because the saltwater CCC does not take into account uptake via the food chain.
- ff This recommended water quality criterion was derived in *Ambient Water Quality Criteria Saltwater Copper Addendum* (Draft, April 14, 1995) and was promulgated in the Interim final National Toxics Rule (60FR22228-22237, May 4, 1995).
- gg EPA is actively working on this criterion and so this recommended water quality criterion may change substantially in the near future.
- ii This criterion applies to DDT and its metabolites (i.e. the total concentration of DDT and its metabolites should not exceed this value).
- jj. This criterion is expressed as total cyanide, even though the IRIS RfD used to derive the criterion is based on free cyanide. The multiple forms of cyanide that are present in ambient water have significant differences in toxicity due to their differing abilities to liberate the CN-moiety. Some complex cyanides require even more extreme condition the refluxing with sulfuric acid to liberate the CN-moiety. Thus these complex cyanides are expected to have little or no 'bioavailability' to humans. If a substantial fraction of the cyanide present in water body is present in a complex form (e.g. $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$), this recommended criterion may be over conservative.

2. Table II. Criteria for Non-Priority Pollutants. See also the footnotes following this table.

Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/Source
		CMC (µg/L)	CCC (ug/L)	CMC (µg/L)	CCC (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	
Aluminum pH 6.5 - 9.0	7429905	750 G	87 G,L					53FR33178
Ammonia	7664417	24,100 D	3,000 D	7,300 D	1,100 D			EPA822-R-99-014 EPA440/5-88-004
Barium	7440393					1,000 A		Gold Book
Boron		Narrative Statement – See document						Gold Book
Chloride	16887006	860,000 G	230,000 G					53FR19028
Chlorine	7782505	19	11	13	7.5	C		Gold Book
Chlorophenoxy Herbicide 2,4,5,-TP	93721					10 A		Gold Book
Chlorophenoxy Herbicide 2,4,D	94757					100 A,C		Gold Book
Chloropyrifos	2921882	0.083 G	0.041 G	0.011 G	0.0056 G			Gold Book
Demeton	8065483		0.1 F		0.1 F			Gold Book
Ether, Bis Chloromethyl	542881					0.000079 E	0.00016 E	65FR66443
Guthion	86500		0.01 F		0.01 F			Gold Book
Hexachlorocyclo- hexane-Technical	319868					0.0123	0.0414	Gold Book

Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/Source
		CMC (µg/L)	CCC (ug/L)	CMC (µg/L)	CCC (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	
Iron	7439896		1000 F			300 A		Gold Book
Malathion	121755		0.1 F		0.1 F			Gold Book
Manganese	7439965					B	100 A	Gold Book
Methoxychlor	72435		0.03 F		0.03 F	100 A,C		Gold Book
Mirex	2385855		0.001 F		0.001 F			Gold Book
Nitrates	14797558					10,000 A		Gold Book
Nitrosamines						0.0008	1.24	Gold Book
Dinitrophenols	25550587					68	2,860	65FR66443
Nitrosodibutylamine,N	924163					0.0061 A	0.118 A	65FR66443
Nitrosodiethylamine,N	55185					0.0008 A	1.24 A	Gold Book
Nitrosopyrrolidine,N	930552					0.016	18.4	65FR66443
Parathion	56382	0.065 J	0.013 J					Gold Book
Pentachlorobenzene	608935					0.79 E	0.81 E	65FR66443
Sulfide-Hydrogen Sulfide	7783064		2.0 F		2.0 F			Gold Book
Tetrachlorobenzene,1,2, 4,5-	95943					0.55 E	0.58 E	65FR66443
Tributyltin TBT		0.46	0.072	0.42	0.0074			EPA 822-R-03-031

Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/Source
		CMC (µg/L)	CCC (ug/L)	CMC (µg/L)	CCC (ug/L)	Water and Organisms (µg/L)	Organisms Only (ug/L)	
Trichlorophenol,2,4,5-	95954					1,300 B,E	2,000 B,E	65FR66443

Footnotes to Table II:

- A This human health criterion is the same as originally published in the Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value is now published in the Gold Book.
- B The organoleptic effect criterion is more stringent than the value presented in the non priority pollutant table.
- C A more stringent MCL has been issued. Also see part 6 below.
- D Aquatic life criteria are pH, temperature and/or salinity dependent. See part 7(C) for fresh water and reference document for marine waters. The values presented in the table are based on pH of 7.0 and temperature of 25°C in fresh waters; and pH of 8.0, temperature of 20°C and salinity of 30 parts per thousand in marine waters.
- E This criterion has been revised to reflect The Environmental Protection Agency's q1* or RfD, as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) used to derive the original criterion was retained in each case.
- F The derivation of this value is presented in the Red Book (EPA 440/9-76-023, July, 1976).
- G This value is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Aluminum (EPA 440/5-86-008); Chloride (EPA 440/5-88-001); Chlorpyrifos (EPA 440/5-86-005).
- J This value is based on a 304(a) aquatic life criterion that was issued in the 1995 Updates: *Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water* (EPA-820-B-96-001). This value was derived using the GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the differences between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 Updates. No decision concerning this criterion was affected by any considerations that are specific to the Great Lakes.
- L There are three major reasons why the use of Water-Effect Ratios might be appropriate. (1) The value of 87 µg/l is based on a toxicity test with the striped bass in water with pH= 6.5-6.6 and hardness <10 mg/L. Data in "Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia" (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time. (2) In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters, however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide. (3) EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 µg aluminum/L, when either total recoverable or dissolved is measured.

N This value was announced (62FR42554, August 7, 1997) as a proposed 304(a) aquatic life criterion. Although EPA has not responded to public comment, EPA has published this as a 304(a) criterion as guidance for States and Tribes to consider when adopting water quality criteria.

ADDITIONAL NOTES

3. Criteria Maximum Concentration and Criterion Continuous Concentration

The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CMC and CCC are just two of the six parts of an aquatic life criterion; the other four parts are the acute averaging period, chronic averaging period, acute frequency of allowed exceedence, and chronic frequency of allowed exceedence. Because 304(a) aquatic life criteria are national guidance, they are intended to be protective of the vast majority of the aquatic communities in the United States.

4. Criteria Recommendations for Priority Pollutants, Non Priority Pollutants

This compilation lists all priority toxic pollutants and some non priority toxic pollutants, and both human health effect and aquatic organism effect criteria issued pursuant to CWA §304(a). Blank spaces indicate that EPA has no CWA §304(a) criteria recommendations. For a number of non-priority toxic pollutants not listed, CWA §304(a) “water + organism” human health criteria are not available, but EPA has published MCLs under the SDWA that may be used in establishing water quality standards to protect water supply designated uses. Because of variations in chemical nomenclature systems, this listing of toxic pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423.

5. Water Quality Criteria published pursuant to Section 304(a) or Section 303(c) of the CWA

Many of the values in the compilation were published in the California Toxics Rule. Although such values were published pursuant to Section 303(c) of the CWA, they represent the EPA’s most recent calculation of water quality criteria and are thus the Agency’s 304(a) criteria.

6. Maximum Contaminant Levels and Organoleptic Effects

The compilation includes footnotes for pollutants with Maximum Contaminant Levels (MCLs) more stringent than the recommended water quality criteria in the compilation. MCLs for these pollutants are not included in the compilation, but can be found in the appropriate drinking water regulations (10-144 CMR Chapter 231, 40 CFR 141.11-16 and 40 CFR 141.60-63). In addition to toxic effects, some pollutants impart organoleptic effects (e.g., taste and odor) that may impair uses of the waters of the State by making water and edible aquatic life unpalatable but not toxic to humans. Pollutants with organoleptic effect criteria more stringent than the criteria based on toxicity (e.g., included in both the priority and non-priority pollutant tables) are footnoted as such. For both MCL and organoleptic effects, the Department will consider all available information regarding such characteristics in regulating the discharge of pollutant to ensure the uses of the waters of the State are protected in all respects.

7. Specific Chemical Calculations

A. Selenium Aquatic Life

This compilation contains aquatic life criteria for selenium that are the same as those published in the proposed CTR. In the CTR, EPA proposed an acute criterion for selenium based on the criterion proposed for selenium in the Water Quality Guidance for the Great Lakes System (61 FR 58444). The GLI and CTR proposals take into account data showing that selenium's two prevalent oxidation states in water, selenite and selenate, present differing potentials for aquatic toxicity, as well as new data indicating that various forms of selenium are additive. The new approach produces a different selenium acute criterion concentration, or CMC, depending upon the relative proportions of selenite, selenate, and other forms of selenium that are present. EPA is currently undertaking a reassessment of selenium, and expects the 304(a) criteria for selenium will be revised based on the final reassessment (63FR26186). However, until such time as revised water quality criteria for selenium are published by the Agency, the recommended water quality criteria in this compilation are EPA's current 304(a) criteria.

B. Parameters for Calculating Freshwater Metals Criteria That Are Hardness-Dependent

Chemical	m_A	b_A	m_C	b_C
Cadmium	1.0166	-3.924	0.7409	-4.719
Chromium III	0.8190	3.7256	0.8190	0.6848
Copper	0.9422	-1.700	0.8545	-1.702
Lead	1.273	-1.460	1.273	-4.705
Nickel	0.8460	2.255	0.8460	0.0584
Silver	1.72	-6.59	--	--
Zinc	0.8473	0.884	0.8473	0.884

Hardness-dependant metals' criteria, as total metal, may be calculated from the following.

$$CMC = \exp\{m_A [\ln(\text{hardness})] + b_A\}$$

$$CCC = \exp\{m_C [\ln(\text{hardness})] + b_C\}$$

C. Calculation of Freshwater Ammonia Criterion

1. The one-hour average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CMC (acute criterion) calculated using the following equations.

To support all species of fish:

$$\text{CMC} = \frac{0.275}{1 + 10^{7.204 - \text{pH}}} + \frac{39.0}{1 + 10^{\text{pH} - 7.204}}$$

2. The thirty-day average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CCC (chronic criterion) calculated using the following equation:

(a) To support all life stages of fish:

$$\text{CCC} = \frac{0.0577}{1 + 10^{7.688 - \text{pH}}} + \frac{2.487}{1 + 10^{\text{pH} - 7.688}} \times \text{MIN}(2.85, 1.45 \times 10^{(0.028 \times (25 - T))})$$

(b) In addition, the highest four-day average within the 30-day period does not exceed 2.5 times the CCC.