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National Recommended Water Quality Criteria

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Priority Pollutants

	Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health for the consumption of		FR Cite / Source
			CMC [1] (acute) (µg/L)	CCC [1] (chronic) (µg/L)	CMC [1] (acute) (µg/L)	CCC [1] (chronic) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)	
1	Antimony	7440360					5.6 B	640 B	65 FR 66443
2	Arsenic	7440382	340 A,D,K	150 A,D,K	69 A,D,bb	36 A,D,bb	0.018 C,M,S	0.14 C,M,S	65 FR 31682 57 FR 60848
3	Beryllium	7440417					Z		65 FR 31682
4	Cadmium	7440439	2.0 D,E,K,bb	0.25 D,E,K,bb	40 D,bb	8.8 D,bb	Z		EPA 822R-01-001 65 FR 31682
5a	Chromium (III)	16065831	570 D,E,K	74 D,E,K			Z Total		EPA 820B-96-001 65 FR 31682
5b	Chromium (VI)	18540299	16 D,K	11 D,K	1,100 D,bb	50 D,bb	Z Total		65 FR 31682
6	Copper	7440508	Freshwater criteria calculated using the BLM mm - See Document (epa.gov/waterscience/criteria/copper/)		4.8 D,cc,ff	3.1 D,cc,ff	1,300 U		EPA-822-R-07-001 65 FR 31682 72 FR 7983
7	Lead	7439921	65 D,E,bb,gg	2.5 D,E,bb,gg	210 D,bb	8.1 D,bb			65 FR 31682
8a	Mercury	7439976	1.4 D,K,hh	0.77 D,K,hh	1.8 D,ee,hh	0.94 D,ee,hh			62 FR 42160
8b	Methylmercury	22967926						0.3 mg/kg J	EPA 823R-01-001
9	Nickel	7440020	470 D,E,K	52 D,E,K	74 D,bb	8.2 D,bb	610 B	4,600 B	65 FR 31682
10	Selenium	7782492	L,R,T	5.0 T	290 D,bb,dd	71 D,bb,dd	170 Z	4200	62 FR 42160 65 FR 31682 65 FR 66443

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11	Silver	7440224	3.2 D,E,G		1.9 D,G				65 FR 31682
12	Thallium	7440280					0.24	0.47	68 FR 75510
13	Zinc	7440666	120 D,E,K	120 D,E,K	90 D,bb	81 D,bb	7,400 U	26,000 U	65 FR 31682 65 FR 66443
14	Cyanide	57125	22 K,Q	5.2 K,Q	1 Q,bb	1 Q,bb	140 jj	140 jj	EPA 820B-96001 57 FR 60848 68 FR 75510
15	Asbestos	1332214					7 million fibers/L I		57 FR 60848
16	2,3,7,8-TCDD (Dioxin)	1746016					5.0E-9 C	5.1E-9 C	65 FR 66443
17	Acrolein	107028	3ug/L	3ug/L			6 II	9 II	74 FR 27535 74 FR 46587
18	Acrylonitrile	107131					0.051 B,C	0.25 B,C	65 FR 66443
19	Benzene	71432					2.2 B,C	51 B,C	IRIS 01/19/00 65 FR 66443
20	Bromoform	75252					4.3 B,C	140 B,C	65 FR 66443
21	Carbon Tetrachloride	56235					0.23 B,C	1.6 B,C	65 FR 66443
22	Chlorobenzene	108907					130 Z,U	1,600 U	68 FR 75510
23	Chlorodibromomethane	124481					0.40 B,C	13 B,C	65 FR 66443
24	Chloroethane	75003							
25	2-Chloroethylvinyl Ether	110758							
26	Chloroform	67663					5.7 C,P	470 C,P	62 FR 42160

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27	Dichlorobromomethane	75274					0.55 B,C	17 B,C	65 FR 66443
28	1,1-Dichloroethane	75343							
29	1,2-Dichloroethane	107062					0.38 B,C	37 B,C	65 FR 66443
30	1,1-Dichloroethylene	75354					330	7,100	68 FR 75510
31	1,2-Dichloropropane	78875					0.50 B,C	15 B,C	65 FR 66443
32	1,3-Dichloropropene	542756					0.34 C	21 C	68 FR 75510
33	Ethylbenzene	100414					530	2,100	68 FR 75510
34	Methyl Bromide	74839					47 B	1,500 B	65 FR 66443
35	Methyl Chloride	74873							65 FR 31682
36	Methylene Chloride	75092					4.6 B,C	590 B,C	65 FR 66443
37	1,1,2,2-Tetrachloroethane	79345					0.17 B,C	4.0 B,C	65 FR 66443
38	Tetrachloroethylene	127184					0.69 C	3.3 C	65 FR 66443
39	Toluene	108883					1,300 Z	15,000	68 FR 75510
40	1,2-Trans-Dichloroethylene	156605					140 Z	10,000	68 FR 75510
41	1,1,1-Trichloroethane	71556					Z		65 FR 31682
42	1,1,2-Trichloroethane	79005					0.59 B,C	16 B,C	65 FR 66443
43	Trichloroethylene	79016					2.5 C	30 C	65 FR 66443
44	Vinyl Chloride	75014					0.025 C,kk	2.4 C,kk	68 FR 75510
45	2-Chlorophenol	95578					81 B,U	150 B,U	65 FR 66443

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46	2,4-Dichlorophenol	120832					77 B,U	290 B,U	65 FR 66443
47	2,4-Dimethylphenol	105679					380 B	850 B,U	65 FR 66443
48	2-Methyl-4,6Dinitrophenol	534521					13	280	65 FR 66443
49	2,4-Dinitrophenol	51285					69 B	5,300 B	65 FR 66443
50	2-Nitrophenol	88755							
51	4-Nitrophenol	100027							
52	3-Methyl-4-Chlorophenol	59507					U	U	
53	Pentachlorophenol	87865	19 F,K	15 F,K	13 bb	7.9 bb	0.27 B,C	3.0 B,C,H	65 FR 31682
54	Phenol	108952					10,000 ll,U	860,000 ll,U	74 FR 27535
55	2,4,6-Trichlorophenol	88062					1.4 B,C	2.4 B,C,U	65 FR 66443
56	Acenaphthene	83329					670 B,U	990 B,U	65 FR 66443
57	Acenaphthylene	208968							65 FR 66443
58	Anthracene	120127					8,300 B	40,000 B	65 FR 66443
59	Benzidine	92875					0.000086 B,C	0.00020 B,C	65 FR 66443
60	Benzo(a) Anthracene	56553					0.0038 B,C	0.018 B,C	65 FR 66443
61	Benzo(a) Pyrene	50328					0.0038 B,C	0.018 B,C	65 FR 66443
62	Benzo(b) Fluoranthene	205992					0.0038 B,C	0.018 B,C	65 FR 66443
63	Benzo(ghi) Perylene	191242							65 FR 66443
64	Benzo(k) Fluoranthene	207089					0.0038 B,C	0.018 B,C	65 FR 66443

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65	Bis(2-Chloroethoxy) Methane	111911							
66	Bis(2-Chloroethyl) Ether	111444					0.030 B,C	0.53 B,C	65 FR 66443
67	Bis(2-Chloroisopropyl) Ether	108601					1,400 B	65,000 B	65 FR 66443
68	Bis(2-Ethylhexyl) Phthalatex	117817					1.2 B,C	2.2 B,C	65 FR 66443
69	4-Bromophenyl Phenyl Ether	101553							
70	Butylbenzyl Phthalatew	85687					1,500 B	1,900 B	65 FR 66443
71	2-Chloronaphthalene	91587					1,000 B	1,600 B	65 FR 66443
72	4-Chlorophenyl Phenyl Ether	7005723							
73	Chrysene	218019					0.0038 B,C	0.018 B,C	65 FR 66443
74	Dibenzo(a,h)Anthracene	53703					0.0038 B,C	0.018 B,C	65 FR 66443
75	1,2-Dichlorobenzene	95501					420	1,300	68 FR 75510
76	1,3-Dichlorobenzene	541731					320	960	65 FR 66443
77	1,4-Dichlorobenzene	106467					63	190	68 FR 75510
78	3,3'-Dichlorobenzidine	91941					0.021 B,C	0.028 B,C	65 FR 66443
79	Diethyl Phthalatew	84662					17,000 B	44,000 B	65 FR 66443
80	Dimethyl Phthalatew	131113					270,000	1,100,000	65 FR 66443
81	Di-n-Butyl Phthalatew	84742					2,000 B	4,500 B	65 FR 66443
82	2,4-Dinitrotoluene	121142					0.11 C	3.4 C	65 FR 66443
83	2,6-Dinitrotoluene	606202							

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84	Di-n-Octyl Phthalate	117840							
85	1,2-Diphenylhydrazine	122667					0.036 B,C	0.20 B,C	65 FR 66443
86	Fluoranthene	206440					130 B	140 B	65 FR 66443
87	Fluorene	86737					1,100 B	5,300 B	65 FR 66443
88	Hexachlorobenzene	118741					0.00028 B,C	0.00029 B,C	65 FR 66443
89	Hexachlorobutadiene	87683					0.44 B,C	18 B,C	65 FR 66443
90	Hexachlorocyclopentadiene	77474					40 U	1,100 U	68 FR 75510
91	Hexachloroethane	67721					1.4 B,C	3.3 B,C	65 FR 66443
92	Ideno(1,2,3-cd)Pyrene	193395					0.0038 B,C	0.018 B,C	65 FR 66443
93	Isophorone	78591					35 B,C	960 B,C	65 FR 66443
94	Naphthalene	91203							
95	Nitrobenzene	98953					17 B	690 B,H,U	65 FR 66443
96	N-Nitrosodimethylamine	62759					0.00069 B,C	3.0 B,C	65 FR 66443
97	N-Nitrosodi-n-Propylamine	621647					0.0050 B,C	0.51 B,C	65 FR 66443
98	N-Nitrosodiphenylamine	86306					3.3 B,C	6.0 B,C	65 FR 66443
99	Phenanthrene	85018							
100	Pyrene	129000					830 B	4,000 B	65 FR 66443
101	1,2,4-Trichlorobenzene	120821					35	70	68 FR 75510

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102	Aldrin	309002	3.0 G		1.3 G		0.000049 B,C	0.000050 B,C	65 FR 31682 65 FR 66443
103	alpha-BHC	319846					0.0026 B,C	0.0049 B,C	65 FR 66443
104	beta-BHC	319857					0.0091 B,C	0.017 B,C	65 FR 66443
105	gamma-BHC (Lindane)	58899	0.95 K		0.16 G		0.98	1.8	65 FR 31682 68 FR 75510
106	delta-BHC	319868							
107	Chlordane	57749	2.4 G	0.0043 G,aa	0.09 G	0.004 G,aa	0.00080 B,C	0.00081 B,C	65 FR 31682 65 FR 66443
108	4,4'-DDT	50293	1.1 G,ii	0.001 G,aa,ii	0.13 G,ii	0.001 G,aa,ii	0.00022 B,C	0.00022 B,C	65 FR 31682 65 FR 66443
109	4,4'-DDE	72559					0.00022 B,C	0.00022 B,C	65 FR 66443
110	4,4'-DDD	72548					0.00031 B,C	0.00031 B,C	65 FR 66443
111	Dieldrin	60571	0.24 K	0.056 K,O	0.71 G	0.0019 G,aa	0.000052 B,C	0.000054 B,C	65 FR 31682 65 FR 66443
112	alpha-Endosulfan	959988	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	62 B	89 B	65 FR 31682 65 FR 66443
113	beta-Endosulfan	33213659	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	62 B	89 B	65 FR 31682 65 FR 66443
114	Endosulfan Sulfate	1031078					62 B	89 B	65 FR 66443
115	Endrin	72208	0.086 K	0.036 K,O	0.037 G	0.0023 G,aa	0.059	0.060	65 FR 31682 68 FR 75510
116	Endrin Aldehyde	7421934					0.29 B	0.30 B,H	65 FR 66443
117	Heptachlor	76448	0.52 G	0.0038 G,aa	0.053 G	0.0036 G,aa	0.000079 B,C	0.000079 B,C	65 FR 31682 65 FR 66443

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118	Heptachlor Epoxide	1024573	0.52 G,V	0.0038 G,V,aa	0.053 G,V	0.0036 G,V,aa	0.000039 B,C	0.000039 B,C	65 FR 31682 65 FR 66443
119	Polychlorinated Biphenyls (PCBs)			0.014 N,aa		0.03 N,aa	0.000064 B,C,N	0.000064 B,C,N	65 FR 31682 65 FR 66443
120	Toxaphene	8001352	0.73	0.0002 aa	0.21	0.0002 aa	0.00028 B,C	0.00028 B,C	65 FR 31682 65 FR 66443

Footnotes

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 (PDF) (74 pp., 3.2 MB) (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.

C This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

D Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. The recommended water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and multiplying it by a conversion factor (CF). The term "Conversion Factor" (CF) represents the recommended conversion factor for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column. (Conversion Factors for saltwater CCCs are not currently available. Conversion factors derived for saltwater CMCs have been used for both saltwater CMCs and CCCs). See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria (PDF)," (49 pp., 3MB) October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center and 40CFR§131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble-Conversion Factors for Dissolved Metals.

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 100 mg/L. Criteria values for other hardness may be calculated from the following: CMC (dissolved) = $\exp\{m_A [\ln(\text{hardness})] + b_A\}$ (CF), or CCC (dissolved) = $\exp\{m_C [\ln(\text{hardness})] + b_C\}$ (CF)

and the parameters specified in Appendix B-Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent.

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 7.8.

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 (PDF) (153 pp., 7.3 MB) (EPA 440/5-80-019), Chlordane (PDF) (68 pp., 3.1 MB) (EPA 440/5-80-027), DDT (PDF) (175 pp., 8.3 MB) (EPA 440/5-80-038), Endosulfan (PDF) (155 pp., 7.3 MB) (EPA 440/5-80-046), Endrin (PDF) (103 pp., 4.6 MB) (EPA 440/5-80-047), Heptachlor (PDF) (114 pp., 5.4 MB) (EPA 440/5-80-052), Hexachlorocyclohexane (PDF) (109 pp., 4.8 MB) (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 (PDF) (104 pp., 3.3 MB) . 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 presented 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 (SDWA).

J This fish tissue residue criterion for methylmercury is based on a total fish consumption rate of 0.0175 kg/day.

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 (60 FR 15393-15399, 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 g/l and 12.82 g/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 (Endrin) 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 g free cyanide (as CN)/L.

R This value for selenium was announced (61 FR 58444-58449, 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 for arsenic refers to the inorganic form only.

T This recommended water quality criterion for selenium is expressed in terms of total recoverable metal in the water column. It is scientifically acceptable to use the conversion factor (0.996-CMC or 0.922-CCC) that was used in the GLI to convert this to a value that is expressed in terms of dissolved metal.

U The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

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 completed criteria document for butylbenzyl phthalate 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 DEHP 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 by EPA. Refer to drinking water regulations (40 CFR 141) or Safe Drinking Water Hotline (1-800-426-4791) for values.

aa This criterion is based on a 304(a) aquatic life criterion issued in 1980 or 1986, and was issued in one of the following documents: Aldrin/Dieldrin (PDF) (153 pp., 7.3 MB) (EPA 440/5-80-019), Chlordane (PDF) (68 pp., 3.1 MB) (EPA 440/5-80027), DDT (PDF) (175 pp., 8.3 MB) (EPA 440/5-80-038), Endrin (PDF) (103 pp., 4.6 MB) (EPA 440/5-80-047), Heptachlor (PDF) (114 pp., 5.4 MB) (EPA 440/5-80-052), Polychlorinated biphenyls (EPA 440/5-80-068), Toxaphene (EPA 440/5-86-006). This CCC is currently based on the Final Residue Value (FRV) procedure. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60 FR 15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value 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 (PDF) (104 pp., 3.3 MB) (*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 (PDF) (74 pp., 3.2 MB) (EPA 440/5-84-033), Cadmium (EPA 822-R-01-001), Chromium (EPA 440/5-84-029), Copper (PDF) (150 pp., 6.2 MB) (EPA 440/5-84-031), Cyanide (PDF) (67 pp., 2.7 MB) (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 carbon is elevated, copper is substantially less toxic and use of Water-Effect 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 g/L in salt water because the saltwater CCC does not take into account uptake via the food chain.

ee This recommended water quality criterion was derived on page 43 of the mercury criteria document (PDF) (144 pp., 6.4 MB) (EPA 440/5-84-026, January 1985). The saltwater CCC of 0.025 ug/L given on page 23 of the criteria document is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60 FR 15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.

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 (60 FR 22228-222237, 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.

hh This recommended water quality criterion was derived from data for inorganic mercury (II), but is applied here to total mercury. If a substantial portion of the mercury in the water column is methylmercury, this criterion will probably be under protective. In addition, even though inorganic mercury is converted to methylmercury and methylmercury bioaccumulates to a great extent, this criterion does not account for uptake via the food chain because sufficient data were not available when the criterion was derived.

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 recommended water quality criterion is expressed as total cyanide, even though the IRIS RFD we 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 conditions than 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 a water body is present in a complexed form (e.g., $Fe_4[Fe(CN)_6]_3$), this criterion may be over conservative.

kk This recommended water quality criterion was derived using the cancer slope factor of 1.4 (LMS exposure from birth).

ll This criterion has been revised to reflect the Environmental Protection Agency's cancer slope factor (CSF) or reference dose (RfD), as contained in the Integrated Risk Information System (IRIS) as of (Final FR Notice June 10, 2009). The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.

mm The available toxicity data, when evaluated using the procedures described in the “Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses” indicate that freshwater aquatic life should be protected if the 24-hour average and four-day average concentrations do not respectively exceed the acute and chronic criteria concentrations calculated by the Biotic Ligand Model.

Non Priority Pollutants

	Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health for the consumption of		FR Cite / Source
			CMC (acute) (µg/L)	CCC (chronic) (µg/L)	CMC (acute) (µg/L)	CCC (chronic) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)	
1	**Alkalinity**	—		20000 F					Gold Book
2	**Aluminum pH 6.5 – 9.0**	7429905	750 G,I	87 G,I,L					53 FR 33178
3	**Ammonia**	7664417	FRESHWATER CRITERIA ARE pH, Temperature and Life-stage DEPENDENT — SEE DOCUMENT D SALTWATER CRITERIA ARE pH AND TEMPERATURE DEPENDENT						EPA 822-R99-014 EPA 440-588-004
4	**Aesthetic Qualities**	—	NARRATIVE STATEMENT — SEE DOCUMENT						Gold Book
5	**Bacteria**	—	FOR PRIMARY RECREATION AND SHELLFISH USES — SEE DOCUMENT						Gold Book
6	**Barium**	7440393					1,000 A		Gold Book
7	**Boron**	—	NARRATIVE STATEMENT — SEE DOCUMENT						Gold Book
8	**Chloride**	16887006	860000 G	230000 G					53 FR 19028
9	**Chlorine**	7782505	19	11	13	7.5	C		Gold Book
10	**Chlorophenoxy Herbicide (2,4,5,-TP)**	93721					10 A		Gold Book
11	**Chlorophenoxy Herbicide (2,4-D)**	94757					100 A,C		Gold Book
12	**Chloropyrifos**	2921882	0.083 G	0.041 G	0.011 G	0.0056 G			Gold Book
13	**Color**	—	NARRATIVE STATEMENT — SEE DOCUMENT F						Gold Book
14	**Demeton**	8065483		0.1 F		0.1 F			Gold Book
15	**Ether, Bis(Chloromethyl)**	542881					0.00010 E,H	0.00029 E,H	65 FR 66443
16	**Gases, Total Dissolved**	—	NARRATIVE STATEMENT — SEE DOCUMENT F						Gold Book

	Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health for the consumption of		FR Cite / Source
			CMC (acute) (µg/L)	CCC (chronic) (µg/L)	CMC (acute) (µg/L)	CCC (chronic) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)	
17	**Guthion**	86500		0.01 F		0.01 F			Gold Book
18	**Hardness**	—	NARRATIVE STATEMENT — SEE DOCUMENT						Gold Book
19	**Hexachlorocyclo-hexane-Technical**	608731					0.0123 H	0.0414 H	EPA 440/5-80-054
20	**Iron**	7439896		1000 F			300 A		Gold Book
21	**Malathion**	121755		0.1 F		0.1 F			Gold Book
22	**Manganese**	7439965					50 A,O	100 A	Gold Book
23	**Methoxychlor**	72435		0.03 F		0.03 F	100 A,C		Gold Book
24	**Mirex**	2385855		0.001 F		0.001 F			Gold Book
25	**Nitrates**	14797558					10,000 A		Gold Book
26	**Nitrosamines**	—					0.0008	1.24	Gold Book
27	**Dinitrophenols**	25550587					69	5300	65 FR 66443
28	**Nonylphenol**	84852153	28ug/L	28ug/L	7ug/L	7ug/L			71 FR 9337
29	**Nitrosodibutylamine, N**	924163					0.0063 A,H	0.22 A,H	65 FR 66443
30	**Nitrosodiethylamine, N**	55185					0.0008 A,H	1.24 A,H	Gold Book
31	**Nitrosopyrrolidine, N**	930552					0.016 H	34 H	65 FR 66443
32	**Oil and Grease**	—	NARRATIVE STATEMENT — SEE DOCUMENT F						Gold Book
33	**Oxygen, Dissolved Freshwater Oxygen, Dissolved Saltwater**	7782447	WARMWATER AND COLDWATER MATRIX — SEE DOCUMENT N SALTWATER — SEE DOCUMENT						Gold Book EPA 822-R00-012
34	**Diazinon**	333415	0.17ug/L	0.17ug/L	0.82ug/L	0.82ug/L			71 FR 9336

	Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health for the consumption of		FR Cite / Source
			CMC (acute) (µg/L)	CCC (chronic) (µg/L)	CMC (acute) (µg/L)	CCC (chronic) (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)	
35	**Parathion**	56382	0.065 J	0.013 J					Gold Book
36	**Pentachlorobenzene**	608935					1.4 E	1.5 E	65 FR 66443
37	**pH**	—		6.5 – 9 F		6.5 – 8.5 F,K	5 – 9		Gold Book
38	**Phosphorus Elemental**	7723140				0.1 F,K			Gold Book
39	**Nutrients**	—	See EPA's Ecoregional criteria for Total Phosphorus, Total Nitrogen, Chlorophyll *a* and Water Clarity (Secchi depth for lakes; turbidity for streams and rivers) (& Level III Ecoregional criteria)						P
40	**Solids Dissolved and Salinity**	—						250,000 A	Gold Book
41	**Solids Suspended and Turbidity**	—	NARRATIVE STATEMENT—SEE DOCUMENT F						Gold Book
42	**Sulfide-Hydrogen Sulfide**	7783064		2.0 F		2.0 F			Gold Book
43	**Tainting Substances**	—	NARRATIVE STATEMENT—SEE DOCUMENT						Gold Book
44	**Temperature**	—	SPECIES DEPENDENT CRITERIA—SEE DOCUMENT M						Gold Book
45	**Tetrachlorobenzene,1,2,4,5**	95943					0.97 E	1.1 E	65 FR 66443
46	**Tributyltin (TBT)**	—	0.46 Q	0.072 Q	0.42 Q	0.0074 Q			69 FR 342
47	**Trichlorophenol,2,4,5**	95954					1,800 B,E	3,600 B,E	65 FR 66443

Footnotes

A This human health criterion is the same as originally published in the Red Book (EPA 440/9-76-023, July, 1976) 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 (Quality Criteria for Water: 1986. EPA 440/5-86-001).

B The organoleptic effect criterion is more stringent than the value presented in the non priority pollutants table.

C A more stringent Maximum Contaminant Level (MCL) has been issued by EPA under the Safe Drinking Water Act. Refer to drinking water regulations 40CFR141 or Safe Drinking Water Hotline (1-800-426-4791) for values.

D According to the procedures described in the *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, except possibly where a very sensitive species is important at a site, freshwater aquatic life should be protected if both conditions specified in Appendix C to the Preamble-Calculation of Freshwater Ammonia Criterion are satisfied.

E This criterion has been revised to reflect EPA'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 440/5-88001); Chloropyrifos (EPA 440/5-86-005).

H This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5}, move the decimal point in the recommended criterion one place to the right).

I This value for aluminum is expressed in terms of total recoverable metal in the water column.

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 (60 FR 15393-15399, 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.

K According to page 181 of the Red Book (EPA 440/9-76-023, July, 1976): For open ocean waters where the depth is substantially greater than the euphotic zone, the pH should not be changed more than 0.2 units from the naturally occurring variation or any case outside the range of 6.5 to 8.5. For shallow, highly productive coastal and estuarine areas where naturally occurring pH variations approach the lethal limits of some species, changes in pH should be avoided but in any case should not exceed the limits established for fresh water, i.e., 6.5-9.0.

L There are three major reasons why the use of Water-Effect Ratios might be appropriate.

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.

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.

EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 g aluminum/L, when either total recoverable or dissolved is measured.

M U.S. EPA. 1973. Water Quality Criteria 1972. EPA-R3-73-033. National Technical Information Service, Springfield, VA.; U.S. EPA. 1977. Temperature Criteria for Freshwater Fish: Protocol and Procedures. EPA 600/3-77-061. National Technical Information Service, Springfield, VA.

N U.S. EPA. 1986. Ambient Water Quality Criteria for Dissolved Oxygen. EPA 440/5-86-003. National Technical Information Service, Springfield, VA.

O This criterion for manganese is not based on toxic effects, but rather is intended to minimize objectionable qualities such as laundry stains and objectionable tastes in beverages.

P Lakes and Reservoirs in Nutrient Ecoregion: II EPA 822-B-00-007, III EPA 822-B-01-008, IV EPA 822-B-01-009, V EPA 822-B-01-010, VI EPA 822-B-00-008 , VII EPA 822-B-00-009, VIII EPA 822-B-01-015, IX EPA 822-B-00-011, XI EPA 822-B-00-012, XII EPA 822-B-00-013, XIII EPA 822-B-00-014, XIV EPA 822-B-01-011; Rivers and Streams in Nutrient Ecoregion: I EPA 822-B-01-012, II EPA 822-B-00-015, III EPA 822-B-00-016, IV EPA 822-B-01-013, V EPA 822-B-01-014, VI EPA 822-B-00-017, VII EPA 822-B-00-018, VIII EPA 822-B-01-015, IX EPA 822-B-00-019, X EPA 822-B-01-016, XI EPA 822-B-00-020, XII EPA 822-B-00-021, XIV EPA 822-B-00-022; and Wetlands in Nutrient Ecoregion (PDF) (77 pp., 257 K) XIII EPA 822-B-00-023.

Q EPA announced the availability of a draft updated tributyltin (TBT) document on August 7, 1997 (62 FR 42554). The Agency has reevaluated this document and anticipates releasing an updated document for public comment in the near future.

Organoleptic Effects (e.g., taste and odor)

	Pollutant	CAS Number	Organoleptic Effect Criteria (µg/L)	FR Cite / Source
1	Acenaphthene	83329	20	Gold Book
2	Monochlorobenzene	108907	20	Gold Book
3	3-Chlorophenol	—	0.1	Gold Book
4	4-Chlorophenol	106489	0.1	Gold Book
5	2,3-Dichlorophenol	—	0.04	Gold Book
6	2,5-Dichlorophenol	—	0.5	Gold Book
7	2,6-Dichlorophenol	—	0.2	Gold Book
8	3,4-Dichlorophenol	—	0.3	Gold Book
9	2,4,5-Trichlorophenol	95954	1	Gold Book
10	2,4,6-Trichlorophenol	88062	2	Gold Book
11	2,3,4,6-Tetrachlorophenol	—	1	Gold Book
12	2-Methyl-4-Chlorophenol	—	1800	Gold Book
13	3-Methyl-4-Chlorophenol	59507	3000	Gold Book
14	3-Methyl-6-Chlorophenol	—	20	Gold Book
15	2-Chlorophenol	95578	0.1	Gold Book
16	Copper	7440508	1000	Gold Book
17	2,4-Dichlorophenol	120832	0.3	Gold Book
18	2,4-Dimethylphenol	105679	400	Gold Book
19	Hexachlorocyclopentadiene	77474	1	Gold Book
20	Nitrobenzene	98953	30	Gold Book
21	Pentachlorophenol	87865	30	Gold Book
22	Phenol	108952	300	Gold Book
23	Zinc	7440666	5000	45 FR79341

Notes

1. These criteria are based on organoleptic (taste and odor) effects. Because of variations in chemical nomenclature systems, this listing of pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service (CAS) registry numbers, which provide a unique identification for each chemical.

Additional Notes

1. 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.

2. Criteria Recommendations for Priority Pollutants, Non Priority Pollutants and Organoleptic Effects

This compilation lists all priority toxic pollutants and some non priority toxic pollutants, and both human health effect and organoleptic 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. Also listed are the Chemical Abstracts Service CAS registry numbers, which provide a unique identification for each chemical.

3. Human Health Risk

The human health criteria for the priority and non priority pollutants are based on carcinogenicity of 10-6 risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10-5, move the decimal point in the recommended criterion one place to the right).

4. 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 Agency's most recent calculation of water quality criteria and are thus the Agency's 304(a) criteria.

5. Calculation of Dissolved Metals Criteria

The 304(a) criteria for metals, shown as dissolved metals, are calculated in one of two ways. For freshwater metals criteria that are hardness-dependent, the dissolved metal criteria were calculated using a hardness of 100 mg/l as CaCO3 for illustrative purposes only. Saltwater and freshwater metals' criteria that are not hardness-dependent are calculated by multiplying the total recoverable criteria before rounding by the appropriate conversion factors. The final dissolved metals' criteria in the table are rounded to two significant figures. Information regarding the calculation of hardness dependent conversion factors are included in the footnotes.

6. **Maximum Contaminant Levels**

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 (40 CFR 141.11-16 and 141.60-63), or can be accessed through the Safe Drinking Water Hotline (800-426-4791) or online.

7. **Organoleptic Effects**

The compilation contains 304(a) criteria for pollutants with toxicity-based criteria as well as non-toxicity based criteria. The basis for the non-toxicity based criteria are organoleptic effects (e.g., taste and odor) which would make water and edible aquatic life unpalatable but not toxic to humans. The table includes criteria for organoleptic effects for 23 pollutants. 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.

8. **Gold Book**

The Gold Book is Quality Criteria for Water: 1986. EPA 440/5-86-001.

9. **Correction of Chemical Abstract Services Number**

The Chemical Abstract Services number (CAS) for Bis(2-Chlorisoprpyl) Ether, has been revised in IRIS and in the table. The correct CAS number for this chemical is 108-60-1. The previous CAS number for this pollutant was 39638-32-9.

10. **Contaminants with Blanks**

EPA has not calculated criteria for contaminants with blanks. However, permit authorities should address these contaminants in NPDES permit actions using the States' existing narrative criteria for toxics.

11. **Specific Chemical Calculations**

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 (63 FR 26186). 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.

Appendices

Appendix A — Conversion Factors for Dissolved Metals

Metal	Conversion Factor			
	freshwater CMC	freshwater CCC	saltwater CMC	saltwater CCC[1]
Arsenic	1.000	1.000	1.000	1.000
Cadmium	1.136672-[(ln hardness)(0.041838)]	1.101672-[(ln hardness)(0.041838)]	0.994	0.994
Chromium III	0.316	0.860	—	—
Chromium VI	0.982	0.962	0.993	0.993
Copper	0.960	0.960	0.83	0.83
Lead	1.46203-[(ln hardness)(0.145712)]	1.46203-[(ln hardness)(0.145712)]	0.951	0.951
Mercury	0.85	0.85	0.85	0.85
Nickel	0.998	0.997	0.990	0.990
Selenium	—	—	0.998	0.998
Silver	0.85	—	0.85	—
Zinc	0.978	0.986	0.946	0.946

Appendix B — Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent

Chemical	mA	bA	mC	bC	Freshwater Conversion Factors (CF)	
					CMC	CCC
Cadmium	1.0166	-3.924	0.7409	-4.719	1.136672[(*ln*hardness)(0.041838)]	1.101672[(*ln*hardness)(0.041838)]
Chromium III	0.8190	3.7256	0.8190	0.6848	0.316	0.860
Copper	0.9422	-1.700	0.8545	-1.702	0.960	0.960
Lead	1.273	-1.460	1.273	-4.705	1.46203[(*ln*hardness)(0.145712)]	1.46203[(*ln*hardness)(0.145712)]
Nickel	0.8460	2.255	0.8460	0.0584	0.998	0.997
Silver	1.72	-6.59	—	—	0.85	—
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

Hardness-dependant metals' criteria may be calculated from the following:

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

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

Appendix 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:

   - Where salmonid fish are present:

     $CMC = (0.275/(1 + 10^{7.204-pH})) + (39.0/(1 + 10^{pH-7.204}))$

   - Or where salmonid fish are not present:

     $CMC = (0.411/(1 + 10^{7.204-pH})) + (58.4/(1 + 10^{pH-7.204}))$

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

      - When fish early life stages are present:

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

      - When fish early life stages are absent:

        - $CCC = ((0.0577/(1 + 10^{7.688-pH})) + (2.487/(1 + 10^{pH-7.688}))) \times 1.45 \bullet 10^{0.028 \bullet (25-MAX(T,7))}$

   B. In addition, the highest four-day average within the 30-day period should not exceed 2.5 times the CCC.