

**Updated Code of Maryland Regulations from 2023  
Interim Update of Water Quality Standards**

**Title 26 DEPARTMENT OF THE ENVIRONMENT  
Subtitle 08 WATER POLLUTION**

**Chapter 02 Water Quality**

These regulations were copied and pasted from the online version of Code of Maryland Regulations (COMAR) on March 11, 2024. (<https://dsd.maryland.gov/regulations/Pages/26.08.02.03-2.aspx>)

### **.03-2 Numerical Criteria for Toxic Substances in Surface Waters.**

A. Numerical toxic substance criteria shall be applied:

- (1) In intermittent streams, at the end of the discharge pipe; and
- (2) In all other water bodies, at the edge of the mixing zones determined in accordance with Regulation .05C—E of this chapter.

B. Acceptable laboratory methods for the detection and measurement of toxic substances shall be specified by the Department.

C. Site-specific numerical toxic substance criteria may be developed on a site-specific basis. A person who wishes to develop a site-specific numerical toxic substance criterion shall:

- (1) Do so in accordance with a scientifically defensible methodology approved by the Department; and
- (2) Notify the Department of their intent not later than the time specified in COMAR 26.08.04.01-1.

D. The toxicity of certain substances in Tables 1 and 6 of §G of this regulation is increased or decreased by hardness or pH. For these toxic substances:

- (1) The Department may:
  - (a) Require the discharger to provide site-specific measurements; or
  - (b) Recalculate the aquatic life criteria based on available water quality data.
- (2) The permittee may voluntarily provide site-specific information for the recalculation of the criteria. It is within the Department's discretion to determine the weight given this information.

(3) After reviewing the information provided in §D(1) or (2), the Department shall determine if one or more of these criteria should be modified at a particular location.

(4) For calculation of site-specific copper criteria, a discharger may use the Biotic Ligand Model in accordance with "Aquatic Life Ambient Freshwater Quality Criteria-Copper 2007 Revision (EPA-822-R-07-001, February 2007)" which is incorporated by reference.

E. In those cases where numerical toxic substance criteria for aquatic life protection and protection of human health both apply, the most restrictive of the criteria shall be used.

F. Acute and chronic numeric toxic substance criteria for fresh, estuarine, and salt water aquatic life protection and for human health protection are shown in Tables 1—6 of §G. For the instream application of the acute and chronic criteria for the protection of aquatic life in Tables 1—6 of §G of this regulation:

- (1) The metals shall be measured as dissolved metal or as biologically available equivalence and may be translated to total recoverable measurements for waste load allocation to derive discharge permit limits using the procedures for the biological translator or chemical translator described in COMAR 26.08.04;
- (2) The organic substances shall be measured directly or as biologically available equivalence and may be translated for waste load allocation to derive discharge permit limits using the procedures for the biological translator described in COMAR 26.08.04; and
- (3) Cyanide shall be measured as either free cyanide or cyanide amenable to chlorination.

G. Tables of Ambient Water Quality Criteria.

(1) Table 1. Toxic Substances Criteria for Ambient Surface Waters — Inorganic Substances.

Substance	CAS#	Aquatic Life (µg/L)						Human Health for Consumption of:		
		Fresh Water		Estuarine Water		Salt Water		Drinking Water + Organism (µg/L)	Organism Only (µg/L)	Drinking Water MCL (mg/L)
		Acute	Chronic	Acute	Chronic	Acute	Chronic			
Antimony	7440360							5.6	640	0.006
Arsenic	7440382	340	150			69	36	0.18 <sup>d</sup>	1.4 <sup>a,d</sup>	0.010
Asbestos	1332214								7 million fibers/L	7 million fibers/L
Barium	7440393							1,000		2
Beryllium								4		0.004
Cadmium <sup>1</sup>	7440439	1.8	0.72			33.13	7.9	5		0.005
Chlorine <sup>2</sup>	7782505	19	11			13	7.5			
Chromium (total)	7440473							100		0.1
Chromium III <sup>1</sup>	16065831	570	74							
Chromium VI	18540299	16	11			1100	50			
Copper <sup>1</sup>	7440508	13	9	6.1		4.8	3.1	1,300 <sup>d</sup>		1.3 <sup>c</sup>
Cyanide	57125	22	5.2			1	1	140	140	0.2
Lead <sup>1</sup>	7439921	65	2.5			210	8.1			0.015 <sup>c</sup>
Mercury	7439976	1.4	0.77			1.8	0.94			0.002
Methylmercury <sup>b</sup>	22967926								0.3 mg/kg in fish tissue	
Nickel <sup>1</sup>	7440020	470	52			74	8.2	610	4,600	
Selenium	7782492	20	5			290	71	170	4,200	0.05
Silver <sup>1</sup>	7440224	3.2				1.9				0.10
Thallium	7440280							0.24	0.47	0.002

Zinc <sup>1</sup>	7440666	120	120			90	81	7,400	26,000	
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1 Refer to §D of this regulation.

2 The more stringent of these criteria or the discharge requirements in COMAR 26.08.03.06 shall be used as the basis for determining discharge permit limitations.

a This criterion will be applied against the actual measurement of inorganic arsenic (As+3) rather than total arsenic.

b Per EPA recommendation, total mercury concentrations, as opposed to methylmercury, will be used in MDE fish consumption risk-calculation. This approach is deemed to be most protective of human health and most cost-effective.

c Lead and Copper are regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. The values listed are technically action levels.

d Criterion is based on a carcinogenic risk level of 10<sup>-5</sup>.

\* Drinking water MCLs apply to Public Water Supply designated waters only.

(2) Table 2. Coefficients Used to Adjust Applicable Numerical Toxic Substance Fresh Water Aquatic Life Criteria. \*

Substance	CAS#	mA	bA	mC	bC
Cadmium	7440439	0.9789	-3.866	0.7977	-3.909
Chromium III	16065831	0.8190	3.7256	0.8190	0.6848
Lead	7439921	1.273	-1.460	1.273	-4.705
Nickel	7440020	0.8460	2.255	0.8460	0.0584
Silver	7440224	1.72	-6.59	-	-
Zinc	7440666	0.8473	0.884	0.8473	0.884

(3) Table 3. Conversion Factors Used to Adjust Applicable Numerical Toxic Substance Fresh Water Aquatic Life Criteria.

Substance	CAS#	Freshwater Acute Conversion Factor (CF)	Freshwater Chronic Conversion Factor (CF)
Cadmium	7440439	1.136672-LN(Hardness)*0.041838	1.101672-LN(Hardness)*0.041838
Chromium III	16065831	0.316	0.86
Lead	7439921	1.46203-LN(Hardness)*0.145712	1.46203-LN(Hardness)*0.145712
Nickel	7440020	0.998	0.997
Silver	7440224	0.85	-
Zinc	7440666	0.978	0.986

\*Hardness-dependent criteria may be calculated from the following:

$$\text{Acute Criteria} = e^{-m_A \cdot \text{LN}(\text{hardness}) + b_A} \cdot \text{CF}$$

$$\text{Chronic Criteria} = e^{-m_C \cdot \text{LN}(\text{hardness}) + b_C} \cdot \text{CF}$$

(4) Table 4. Toxic Substances for Ambient Water Quality Criteria — Organic Compounds.

Substance	CAS#	Aquatic Life (µg/L)				Human Health for Consumption of:		
		Fresh Water		Salt Water		Drinking Water + Organism (µg/L)	Organism Only (µg/L)	Drinking Water MCL (mg/L)
		Acute	Chronic	Acute	Chronic			
1,1 Dichloroethylene (DCE)	75354					300	20000	0.007
1,1,1-Trichloroethane (TCA)	71556					200		0.2
1,1,2,2-Tetrachloroethane	79345					1.7 <sup>a</sup>	40 <sup>a</sup>	
1,1,2-Trichloroethane	79005					5.9 <sup>a</sup>	160 <sup>a</sup>	0.005
1,2,4-Trichlorobenzene	120821					35 <sup>a</sup>	70 <sup>a</sup>	0.07
1,2,4,5-Tetrachlorobenzene	95943					0.03	0.03	
1,2-Dichlorobenzene	95501					1000	3000	0.6
1,2-Dichloroethane	107062					99 <sup>a</sup>	6500 <sup>a</sup>	0.005
1,2-Dichloropropane	78875					5 <sup>a</sup>	150 <sup>a</sup>	0.005
1,2-Diphenylhydrazine	122667					0.3 <sup>a</sup>	2 <sup>a</sup>	
1,2-Trans-Dichloroethylene	156605					100	4000	0.1
1,3-Dichlorobenzene	541731					320	960	
1,3-Dichloropropene	542756					3.4 <sup>a</sup>	210 <sup>a</sup>	
1,4-Dichlorobenzene	106467					300	900	0.075
2,4,5-Trichlorophenol	95954					300	600	
2,4,6-Trichlorophenol	88062					14 <sup>a</sup>	24 <sup>a</sup>	
2,4-Dichlorophenol	120832					77	290	
2,4-Dimethylphenol	105679					100	3000	
2,4-Dinitrotoluene	121142					1.1 <sup>a</sup>	34 <sup>a</sup>	

2-Chloronaphthalene	91587					800	1000	
2-Chlorophenol	95578					81	150	
2-Methyl-4,6-Dinitrophenol	534521					2	30	
3,3'-Dichlorobenzidine	91941					0.49 <sup>a</sup>	1.5 <sup>a</sup>	
3-Methyl-4-Chlorophenol	59507					500	2000	
Acrolein	107028	3	3			6	9	
Acrylonitrile	107131					0.61 <sup>a</sup>	70 <sup>a</sup>	
Benzene	71432					22 <sup>a</sup>	510 <sup>a</sup>	0.005
Benzidine	92875					0.0014 <sup>a</sup>	0.11 <sup>a</sup>	
Bis(2-Chloroethyl) Ether	111444					0.3 <sup>a</sup>	22 <sup>a</sup>	
Bis2(Chloroisopropyl) Ether	108601					200	4000	
Bis(Chloromethyl) Ether	542881					0.0015 <sup>a</sup>	0.17 <sup>a</sup>	
Bromoform <sup>1</sup>	75252					See Trihalomethanes	1400 <sup>a</sup>	
Carbon tetrachloride	56235					4 <sup>a</sup>	50 <sup>a</sup>	0.005
Chlorobenzene	108907					130	1600	0.1
Chlorodibromomethane <sup>1</sup>	124481					8 <sup>a</sup>	210 <sup>a</sup>	
Chloroform <sup>1</sup>	67663					60	2000	
Chlorophenoxy Herbicide (2,4-D)	94757					1300	12000	
Chlorophenoxy Herbicide (2,4,5-TP)	93721					100	400	
Dichlorobromomethane <sup>1</sup>	75274					See Trihalomethanes	170 <sup>a</sup>	
Dinitrophenols	25550587					10	1000	
Ethylbenzene	100414					530	2100	0.7
Hexachlorobenzene	118741					0.00079 <sup>a</sup>	0.00079 <sup>a</sup>	0.001
Hexachlorobutadiene	87683					4.4 <sup>a</sup>	180 <sup>a</sup>	
Hexachlorocyclopentadiene	77474					4	4	0.05
Hexachloroethane	67721					14 <sup>a</sup>	33 <sup>a</sup>	

Hexachlorocyclohexane (HCH)-Technical	608731					0.066 <sup>a</sup>	0.1 <sup>a</sup>	
Isophorone	78591					340 <sup>a</sup>	18000 <sup>a</sup>	
Methoxychlor	72435					0.02	0.02	
Methyl bromide	74839					100	10000	
Methylene chloride	75092					200 <sup>a</sup>	10000 <sup>a</sup>	0.005
Nitrobenzene	98953					10	600	
N-Nitrosodimethylamine	62759					0.0069 <sup>a</sup>	30 <sup>a</sup>	
N-Nitrosodi-n-Propylamine	621647					0.05 <sup>a</sup>	5.1 <sup>a</sup>	
N-Nitrosodiphenylamine	86306					33 <sup>a</sup>	60 <sup>a</sup>	
Nonylphenol	84852153	28	6.6	7	1.7			
Phenol	108952					4000	300000	
Tetrachloroethylene	127184					100 <sup>a</sup>	290 <sup>a</sup>	0.005
Toluene	108883					1300	15000	1
Trichloroethylene (TCE)	79016					6 <sup>a</sup>	70 <sup>a</sup>	0.005
Trihalomethanes <sup>1</sup>						80		0.08
Vinyl chloride	75014					0.22 <sup>a</sup>	16 <sup>a</sup>	0.002

<sup>1</sup> Four compounds (bromoform, chlorodibromomethane, chloroform, and dichlorobromomethane) are found in combination and comprise a category of contaminants called "trihalomethanes" formed as a result of drinking water disinfection. The concentration of any of these compounds individually, or all of them in sum, may not exceed 80 micrograms per liter. This criterion is equal to the Safe Drinking Water Act Maximum Contaminant Level.

<sup>a</sup> Criterion is based on a carcinogenic risk level of 10<sup>-5</sup>.

\* Drinking water MCLs apply to Public Water Supply designated waters only.

(5) Table 5. Toxic Substances for Ambient Water Quality Criteria-Polycyclic Aromatic Hydrocarbons and Phthalates.

Substance	CAS#	Aquatic Life (µg/L)		Human Health for Consumption of:		
		Fresh Water	Salt Water	Drinking Water + Organism (µg/L)	Organism Only (µg/L)	Drinking Water MCL (mg/L)

		Acute		Chronic				
Acenaphthene	83329					70	90	
Anthracene	120127					300	400	
Benzo(a)Anthracene	56553					0.012 <sup>a</sup>	0.013 <sup>a</sup>	
Benzo(a)Pyrene	50328					0.0012 <sup>a</sup>	0.0013 <sup>a</sup>	0.0002
Benzo(b)Fluoranthene	205992					0.012 <sup>a</sup>	0.013 <sup>a</sup>	
Benzo(k)Fluoranthene	207089					0.12 <sup>a</sup>	0.13 <sup>a</sup>	
Chrysene	218019					0.038 <sup>a</sup>	0.18 <sup>a</sup>	
Dibenzo(a,h)Anthracene	53703					0.0012 <sup>a</sup>	0.0013 <sup>a</sup>	
Fluoranthene	206440					20	20	
Fluorene	86737					50	70	
Ideno(1,2,3-cd)Pyrene	193395					0.012 <sup>a</sup>	0.013 <sup>a</sup>	
Pyrene	129000					20	30	
Bis(2-Ethylhexyl) Phthalate	117817					3.2 <sup>a</sup>	3.7 <sup>a</sup>	0.006
Butylbenzyl Phthalate	85687					1 <sup>a</sup>	1 <sup>a</sup>	
Diethyl Phthalate	84662					600	600	
Dimethyl Phthalate	131113					2000	2000	
Di-n-Butyl Phthalate	84742					20	30	

<sup>a</sup> Criterion is based on a carcinogenic risk level of 10<sup>-5</sup>.

\* Drinking water MCLs apply to Public Water Supply designated waters only.

(6) Table 6. Toxic Substances for Ambient Water Quality Criteria — Pesticides and Chlorinated Compounds.

Substance	CAS#	Aquatic Life (µg/L)				Human Health for Consumption of:		
		Fresh Water		Salt Water		Drinking Water + Organism (µg/L)	Organism Only (µg/L)	Drinking Water MCL (mg/L)
		Acute	Chronic	Acute	Chronic			
2, 3, 7, 8-TCDD (Dioxin)	1746016					0.00000005 <sup>a</sup>	0.00000051 <sup>a</sup>	3 X 10 <sup>-8</sup>
4,4'-DDD	72548					0.0012 <sup>a</sup>	0.0012 <sup>a</sup>	



4,4'-DDE	72559					0.0018 <sup>a</sup>	0.0018 <sup>a</sup>	
4,4'-DDT	50293	1.1	0.001	0.13	0.001	0.0003 <sup>a</sup>	0.0003 <sup>a</sup>	
Aldrin	309002	3		1.3		0.0000077 <sup>a</sup>	0.0000077 <sup>a</sup>	
alpha-BHC	319846					0.036 <sup>a</sup>	0.039 <sup>a</sup>	
alpha-Endosulfan	959988	0.22	0.056	0.034	0.0087	20	30	
Atrazine	1912249					3		0.003
beta-BHC	319857					0.08 <sup>a</sup>	0.14 <sup>a</sup>	
beta-Endosulfan	33213659	0.22	0.056	0.034	0.0087	20	40	
Carbaryl	63252	2.1	2.1	1.6				
Chlordane	57749	2.4	0.0043	0.09	0.004	0.0031 <sup>a</sup>	0.0032 <sup>a</sup>	0.002
Chlorpyrifos	2921882	0.083	0.041	0.011	0.0056			
Diazinon	333415	0.17	0.17	0.82	0.82			
Dieldrin	60571	0.24	0.056	0.71	0.0019	0.000012 <sup>a</sup>	0.000012 <sup>a</sup>	
Endosulfan Sulfate	1031078					20	40	
Endrin	72208	0.086	0.036	0.037	0.0023	0.059	0.060	0.002
Endrin Aldehyde	7421934					1	1	
gamma-BHC (Lindane)	58899	0.95		0.16		4.2	4.4	0.0002
Heptachlor	76448	0.52	0.0038	0.053	0.0036	0.000059 <sup>a</sup>	0.000059 <sup>a</sup>	0.0004
Heptachlor Epoxide	1024573	0.52	0.0038	0.053	0.0036	0.00032 <sup>a</sup>	0.00032 <sup>a</sup>	0.0002
Polychlorinated Biphenyls PCBs			0.014		0.03	0.00064 <sup>a</sup>	0.00064 <sup>a</sup>	0.0005
Toxaphene	8001352	0.73	0.002	0.21	0.002	0.007 <sup>a</sup>	0.0071 <sup>a</sup>	0.003
Tributyltin (TBT)		0.46	0.072	0.42	0.0074			
Pentachlorobenzene	608935					0.1	0.1	
Pentachlorophenol (PCP) <sup>1</sup>	87865	19	15	13	7.9	2.7 <sup>a</sup>	30 <sup>a</sup>	0.001

<sup>1</sup> The freshwater aquatic life criteria for PCP are expressed as a function of pH. Refer to §D of this regulation.

<sup>a</sup> Criterion is based on a carcinogenic risk level of 10<sup>-5</sup>.

\* Drinking water MCLs apply to Public Water Supply designated waters only.

H. Acute Numeric Toxic Substance Criteria for Ammonia for the Protection of Fresh Water Aquatic Life.

(1) The use of Tables 3 and 4 requires documentation acceptable to the Department of the absence of freshwater mussels using the methods outlined in the document “Procedures for Applying the Mussel-Absent Ammonia Criteria to Maryland Surface Waters”, which is incorporated by reference.

(2) Presence of Salmonid Fish. In Class III, III-P, IV, and IV-P waters, the concentration of total ammonia (in milligrams of nitrogen per liter) may not exceed the acute criterion listed in Table 1.

(3) Absence of Salmonid Fish. In Class I and I-P waters, the concentration of total ammonia (in milligrams of nitrogen per liter) may not exceed the acute criterion listed in Table 2.

(4) Presence of Salmonid Fish and Absence of Freshwater Mussels. In Class III, III-P, IV, and IV-P waters, the concentration of total ammonia (in milligrams of nitrogen per liter) may not exceed the acute criterion listed in Table 3.

(5) Absence of Salmonid Fish and Absence of Freshwater Mussels. In Class I and I-P waters, the concentration of total ammonia (in milligrams of nitrogen per liter) may not exceed the acute criterion listed in Table 4.

(6) Table 1. Acute Water Quality Criteria for Freshwater Aquatic Life for Ammonia Where Salmonids May Be Present (milligrams of nitrogen per liter) <sup>1</sup>.

Temperature ( ° C)																	
pH	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	32.6	32.6	31.6	29.1	26.8	24.6	22.7	20.9	19.2	17.7	16.3	15.0	13.8	12.7	11.7	10.8	9.9
6.6	31.3	31.3	30.3	27.9	25.7	23.6	21.8	20.0	18.4	17.0	15.6	14.4	13.2	12.2	11.2	10.3	9.5
6.7	29.8	29.8	28.8	26.5	24.4	22.5	20.7	19.0	17.5	16.1	14.9	13.7	12.6	11.6	10.7	9.8	9.0
6.8	28.0	28.0	27.2	25.0	23.0	21.2	19.5	18.0	16.5	15.2	14.0	12.9	11.9	10.9	10.0	9.2	8.5
6.9	26.2	26.2	25.3	23.3	21.5	19.8	18.2	16.7	15.4	14.2	13.1	12.0	11.1	10.2	9.4	8.6	7.9
7.0	24.1	24.1	23.3	21.5	19.8	18.2	16.8	15.4	14.2	13.1	12.0	11.1	10.2	9.4	8.6	7.9	7.3
7.1	21.9	21.9	21.3	19.6	18.0	16.6	15.3	14.0	12.9	11.9	11.0	10.1	9.3	8.5	7.9	7.2	6.7
7.2	19.7	19.7	19.1	17.6	16.2	14.9	13.7	12.6	11.6	10.7	9.8	9.1	8.3	7.7	7.1	6.5	6.0
7.3	17.5	17.5	17.0	15.6	14.4	13.2	12.2	11.2	10.3	9.5	8.7	8.0	7.4	6.8	6.3	5.8	5.3
7.4	15.3	15.3	14.9	13.7	12.6	11.6	10.7	9.8	9.0	8.3	7.7	7.0	6.5	6.0	5.5	5.1	4.7
7.5	13.3	13.3	12.9	11.8	10.9	10.0	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4.0
7.6	11.4	11.4	11.0	10.1	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
7.7	9.6	9.6	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	2.9
7.8	8.1	8.1	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.2	2.9	2.7	2.5
7.9	6.8	6.8	6.6	6.0	5.6	5.1	4.7	4.3	4.0	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	5.6	5.6	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.9	1.7

8.1	4.6	4.6	4.5	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4		
8.2	3.8	3.8	3.7	3.4	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2		
8.3	3.1	3.1	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	1.0		
8.4	2.6	2.6	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8		
8.5	2.1	2.1	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.6		
8.6	1.8	1.8	1.7	1.6	1.5	1.3	1.2	1.1	1.0	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5		
8.7	1.5	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4		
8.8	1.2	1.2	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4		
8.9	1.0	1.0	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3		
9.0	0.9	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3		

<sup>1</sup> The acute water quality criteria for total ammonia where salmonids may be present was calculated using the following equation, which may also be used to calculate unlisted values: Acute water quality criteria for ammonia (salmonids present) =

$$CMC = MIN \left[ \left( \frac{0.275}{1 + 10^{7.204 - pH}} + \frac{39}{1 + 10^{pH - 7.204}} \right), \left( 0.7249 * \left( \frac{0.0114}{1 + 10^{7.204 - pH}} + \frac{1.6181}{1 + 10^{pH - 7.204}} \right) * (23.12 * 10^{0.036 * (20 - T)}) \right) \right]$$

Where MIN indicates the lesser of the two values separated by a comma.

(7) Table 2. Acute Water Quality Criteria for Freshwater Aquatic Life for Ammonia Where Salmonids Are Absent (milligrams of nitrogen per liter) <sup>1</sup>.

pH	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	50.9	47.8	44.0	40.5	37.3	34.3	31.6	29.1	26.8	24.6	22.7	20.9	19.2	17.7	16.3	15.0	13.8	12.7	11.7	10.8	9.9
6.6	48.9	45.9	42.2	38.9	35.8	32.9	30.3	27.9	25.7	23.6	21.8	20.0	18.4	17.0	15.6	14.4	13.2	12.2	11.2	10.3	9.5
6.7	46.5	43.6	40.2	37.0	34.0	31.3	28.8	26.5	24.4	22.5	20.7	19.0	17.5	16.1	14.9	13.7	12.6	11.6	10.7	9.8	9.0
6.8	43.8	41.1	37.9	34.8	32.1	29.5	27.2	25.0	23.0	21.2	19.5	18.0	16.5	15.2	14.0	12.9	11.9	10.9	10.0	9.2	8.5
6.9	40.8	38.3	35.3	32.5	29.9	27.5	25.3	23.3	21.5	19.8	18.2	16.7	15.4	14.2	13.1	12.0	11.1	10.2	9.4	8.6	7.9
7.0	37.6	35.3	32.5	29.9	27.6	25.4	23.3	21.5	19.8	18.2	16.8	15.4	14.2	13.1	12.0	11.1	10.2	9.4	8.6	7.9	7.3
7.1	34.3	32.2	29.6	27.3	25.1	23.1	21.3	19.6	18.0	16.6	15.3	14.0	12.9	11.9	11.0	10.1	9.3	8.5	7.9	7.2	6.7
7.2	30.8	28.9	26.6	24.5	22.6	20.8	19.1	17.6	16.2	14.9	13.7	12.6	11.6	10.7	9.8	9.1	8.3	7.7	7.1	6.5	6.0
7.3	27.3	25.7	23.6	21.7	20.0	18.4	17.0	15.6	14.4	13.2	12.2	11.2	10.3	9.5	8.7	8.0	7.4	6.8	6.3	5.8	5.3
7.4	24.0	22.5	20.7	19.1	17.5	16.1	14.9	13.7	12.6	11.6	10.7	9.8	9.0	8.3	7.7	7.0	6.5	6.0	5.5	5.1	4.7

7.5	20.7	19.5	17.9	16.5	15.2	14.0	12.9	11.8	10.9	10.0	9.2	8.5	7.8	7.2	6.6	6.1	5.6	5.2	4.8	4.4	4.0
7.6	17.8	16.7	15.4	14.1	13.0	12.0	11.0	10.1	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5
7.7	15.1	14.1	13.0	12.0	11.0	10.1	9.3	8.6	7.9	7.3	6.7	6.2	5.7	5.2	4.8	4.4	4.1	3.8	3.5	3.2	2.9
7.8	12.7	11.9	10.9	10.1	9.3	8.5	7.9	7.2	6.7	6.1	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.2	2.9	2.7	2.5
7.9	10.6	9.9	9.1	8.4	7.7	7.1	6.6	6.0	5.6	5.1	4.7	4.3	4.0	3.7	3.4	3.1	2.9	2.6	2.4	2.2	2.1
8.0	8.8	8.2	7.6	7.0	6.4	5.9	5.4	5.0	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6	2.4	2.2	2.0	1.9	1.7
8.1	7.2	6.8	6.3	5.8	5.3	4.9	4.5	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4
8.2	6.0	5.6	5.2	4.8	4.4	4.0	3.7	3.4	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2
8.3	4.9	4.6	4.2	3.9	3.6	3.3	3.1	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.0	1.0
8.4	4.1	3.8	3.5	3.2	3.0	2.7	2.5	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8
8.5	3.3	3.1	2.9	2.7	2.4	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.6
8.6	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.5	1.3	1.2	1.1	1.0	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5
8.7	2.3	2.2	2.0	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4
8.8	1.9	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4
8.9	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3
9.0	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.3

<sup>1</sup> The acute water quality criteria for total ammonia where salmonids are absent were calculated using the following equation, which may also be used to calculate unlisted values: Acute water quality criteria for ammonia (salmonids absent) =

$$CMC = \left[ 0.7249 * \left( \frac{0.0114}{1 + 10^{7.204 - pH}} + \frac{1.6181}{1 + 10^{pH - 7.204}} \right) * MIN \left( 51.93, 23.12 * 10^{0.036 * (20 - T)} \right) \right]$$

Where MIN indicates the lesser of the two values separated by a comma.

(8) Table 3. Acute Water Quality Criteria for Freshwater Aquatic Life for Ammonia Where Salmonids May Be Present and Freshwater Mussels Are Absent (milligrams of nitrogen per liter)<sup>1</sup>.

Temperature ( °C)																		
pH	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
6.5	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	32.6	31.4	28.9	26.6	
6.6	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	31.3	30.1	27.7	25.5	
6.7	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	29.8	28.7	26.4	24.3	
6.8	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	27.0	24.9	22.9	
6.9	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	26.2	25.2	23.2	21.3	

7.0	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	24.1	23.2	21.4	19.7
7.1	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.1	19.5	17.9
7.2	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.7	19.0	17.5	16.1
7.3	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	17.5	16.9	15.5	14.3
7.4	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	15.3	14.8	13.6	12.5
7.5	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	12.8	11.8	10.8
7.6	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.4	11.0	10.1	9.3
7.7	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.6	9.3	8.5	7.9
7.8	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	8.1	7.8	7.2	6.6
7.9	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.5	6.0	5.5
8.0	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.4	5.0	4.6
8.1	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.5	4.1	3.8
8.2	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.7	3.4	3.1
8.3	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.1	3.0	2.8	2.6
8.4	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.5	2.3	2.1
8.5	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.9	1.7
8.6	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.7	1.6	1.4
8.7	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.4	1.3	1.2
8.8	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.1	1.0
8.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.8
9.0	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.7

<sup>1</sup> The acute water quality criteria for total ammonia where salmonids are present and freshwater mussels are absent were calculated using the following equation, which may also be used to calculate unlisted values: Acute water quality criteria for ammonia (salmonids present and freshwater mussels absent) =CMC=

$$MIN \left[ \left( \frac{0.275}{1+10^{7.204-pH}} + \frac{39}{1+10^{pH-7.204}} \right), \left( 0.7249 * \left( \frac{0.0114}{1+10^{7.204-pH}} + \frac{1.6181}{1+10^{pH-7.204}} \right) * (62.15 * 10^{0.036*(20-T)}) \right) \right]$$

Where MIN indicates the lesser of the two values separated by a comma.

(9) Table 4. Acute Water Quality Criteria for Freshwater Aquatic Life for Ammonia Where Salmonids Are Absent and Freshwater Mussels Are Absent (milligrams of nitrogen per liter) <sup>1</sup>.

Temperature ( °C)																	
pH	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	47.5	43.8	40.3	37.1	34.1	31.4	28.9	26.6
6.6	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	48.9	45.6	42.0	38.6	35.6	32.7	30.1	27.7	25.5
6.7	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	46.5	43.4	39.9	36.8	33.8	31.1	28.7	26.4	24.3
6.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	43.8	40.9	37.6	34.6	31.9	29.3	27.0	24.9	22.9
6.9	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	40.8	38.1	35.1	32.3	29.7	27.4	25.2	23.2	21.3
7.0	37.6	37.6	37.6	37.6	37.6	37.6	37.6	37.6	37.6	35.1	32.3	29.8	27.4	25.2	23.2	21.4	19.7
7.1	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	34.3	32.0	29.4	27.1	24.9	23.0	21.1	19.5	17.9
7.2	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	30.8	28.8	26.5	24.4	22.4	20.6	19.0	17.5	16.1
7.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	27.3	25.5	23.5	21.6	19.9	18.3	16.9	15.5	14.3
7.4	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0	22.4	20.6	18.9	17.4	16.1	14.8	13.6	12.5
7.5	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	20.7	19.4	17.8	16.4	15.1	13.9	12.8	11.8	10.8
7.6	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	17.8	16.6	15.3	14.0	12.9	11.9	11.0	10.1	9.3
7.7	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	15.1	14.1	12.9	11.9	11.0	10.1	9.3	8.5	7.9
7.8	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	12.7	11.8	10.9	10.0	9.2	8.5	7.8	7.2	6.6
7.9	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	10.6	9.9	9.1	8.4	7.7	7.1	6.5	6.0	5.5
8.0	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.2	7.5	6.9	6.4	5.9	5.4	5.0	4.6
8.1	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	7.2	6.8	6.2	5.7	5.3	4.9	4.5	4.1	3.8
8.2	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.6	5.1	4.7	4.3	4.0	3.7	3.4	3.1
8.3	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.9	4.6	4.2	3.9	3.6	3.3	3.0	2.8	2.6
8.4	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	3.8	3.5	3.2	2.9	2.7	2.5	2.3	2.1
8.5	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.1	2.9	2.6	2.4	2.2	2.1	1.9	1.7
8.6	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.6	2.4	2.2	2.0	1.9	1.7	1.6	1.4
8.7	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.1	2.0	1.8	1.7	1.5	1.4	1.3	1.2
8.8	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.8	1.7	1.5	1.4	1.3	1.2	1.1	1.0
8.9	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8
9.0	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.3	1.2	1.1	1.0	0.9	0.9	0.8	0.7

<sup>1</sup> The acute water quality criteria for total ammonia where salmonids are present and freshwater mussels are absent were calculated using the following equation, which may also be used to calculate unlisted values: Acute water quality criteria for ammonia (salmonids present and freshwater mussels absent) =

$$\left[ 0.7249 * \left( \frac{0.0114}{1 + 10^{7.204 - pH}} + \frac{1.6181}{1 + 10^{pH - 7.204}} \right) * \text{MIN} \left( \begin{matrix} 51.93, \\ 62.15 * 10^{0.036 * (20 - T)} \end{matrix} \right) \right]$$

Where MIN indicates the lesser of the two values separated by a comma.

I. Chronic Numeric Toxic Substance Criteria for Ammonia, Expressed as a 30-day Average, for the Protection of Fresh Water Aquatic Life.

(1) Averaging Period. The concentration of total ammonia nitrogen (in milligrams of nitrogen per liter) expressed as a 30-day average may not exceed the chronic criterion listed in Tables 1, 2 or 3.

(2) The use of Table 3 requires documentation acceptable to the Department of the absence of fish early life stages.

(3) The use of Table 2 or 3 requires documentation acceptable to the Department of the absence of freshwater mussels using the methods outlined in the document Procedures for Applying Mussel-Absent Ammonia Criteria to Maryland Surface Waters.

(4) In addition, the highest 4-day average within the 30-day period may not exceed 2 1/2 times the chronic criterion.

(5) Table 1. Chronic Ammonia Criteria for Waters Where Freshwater Fish Early Life Stages May Be Present (milligrams of nitrogen per liter). <sup>1</sup>

	Temperature (°C)																													
pH	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						
6.5	4.92	4.61	4.33	4.06	3.80	3.57	3.34	3.13	2.94	2.75	2.58	2.42	2.27	2.13	2.00	1.87	1.75	1.64	1.54	1.45	1.36	1.27	1.19	1.12						
6.6	4.85	4.54	4.26	3.99	3.75	3.51	3.29	3.09	2.89	2.71	2.54	2.38	2.24	2.10	1.97	1.84	1.73	1.62	1.52	1.42	1.33	1.25	1.17	1.10						
6.7	4.76	4.46	4.18	3.92	3.68	3.45	3.23	3.03	2.84	2.66	2.50	2.34	2.19	2.06	1.93	1.81	1.70	1.59	1.49	1.40	1.31	1.23	1.15	1.08						
6.8	4.65	4.36	4.08	3.83	3.59	3.37	3.16	2.96	2.77	2.60	2.44	2.29	2.14	2.01	1.88	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13	1.05						
6.9	4.52	4.23	3.97	3.72	3.49	3.27	3.07	2.88	2.70	2.53	2.37	2.22	2.08	1.95	1.83	1.72	1.61	1.51	1.42	1.33	1.24	1.17	1.09	1.03						
7	4.36	4.09	3.84	3.60	3.37	3.16	2.96	2.78	2.60	2.44	2.29	2.15	2.01	1.89	1.77	1.66	1.56	1.46	1.37	1.28	1.20	1.13	1.06	0.99						
7.1	4.18	3.92	3.68	3.45	3.23	3.03	2.84	2.66	2.50	2.34	2.20	2.06	1.93	1.81	1.70	1.59	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.95						
7.2	3.98	3.73	3.50	3.28	3.07	2.88	2.70	2.53	2.38	2.23	2.09	1.96	1.84	1.72	1.61	1.51	1.42	1.33	1.25	1.17	1.10	1.03	0.96	0.90						
7.3	3.75	3.51	3.29	3.09	2.90	2.72	2.55	2.39	2.24	2.10	1.97	1.84	1.73	1.62	1.52	1.43	1.34	1.25	1.17	1.10	1.03	0.97	0.91	0.85						
7.4	3.49	3.28	3.07	2.88	2.70	2.53	2.37	2.23	2.09	1.96	1.83	1.72	1.61	1.51	1.42	1.33	1.25	1.17	1.10	1.03	0.96	0.90	0.85	0.79						
7.5	3.22	3.02	2.83	2.66	2.49	2.33	2.19	2.05	1.92	1.80	1.69	1.59	1.49	1.39	1.31	1.22	1.15	1.08	1.01	0.95	0.89	0.83	0.78	0.73						

7.6	2.94	2.75	2.58	2.42	2.27	2.13	1.99	1.87	1.75	1.64	1.54	1.44	1.35	1.27	1.19	1.12	1.05	0.98	0.92	0.86	0.81	0.76	0.71	0.67
7.7	2.64	2.48	2.32	2.18	2.04	1.91	1.79	1.68	1.58	1.48	1.39	1.30	1.22	1.14	1.07	1.00	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60
7.8	2.35	2.20	2.07	1.94	1.82	1.70	1.60	1.50	1.40	1.32	1.23	1.16	1.08	1.02	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53
7.9	2.07	1.94	1.82	1.70	1.60	1.50	1.40	1.32	1.23	1.16	1.08	1.02	0.95	0.89	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47
8	1.80	1.68	1.58	1.48	1.39	1.30	1.22	1.14	1.07	1.01	0.94	0.88	0.83	0.78	0.73	0.68	0.64	0.60	0.56	0.53	0.49	0.46	0.43	0.41
8.1	1.55	1.45	1.36	1.28	1.20	1.12	1.05	0.99	0.92	0.87	0.81	0.76	0.71	0.67	0.63	0.59	0.55	0.52	0.49	0.45	0.43	0.40	0.37	0.35
8.2	1.32	1.24	1.16	1.09	1.02	0.96	0.90	0.84	0.79	0.74	0.69	0.65	0.61	0.57	0.54	0.50	0.47	0.44	0.41	0.39	0.36	0.34	0.32	0.30
8.3	1.13	1.05	0.99	0.93	0.87	0.82	0.76	0.72	0.67	0.63	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26
8.4	0.95	0.89	0.84	0.78	0.74	0.69	0.65	0.61	0.57	0.53	0.50	0.47	0.44	0.41	0.39	0.36	0.34	0.32	0.30	0.28	0.26	0.25	0.23	0.22
8.5	0.80	0.75	0.71	0.66	0.62	0.58	0.55	0.51	0.48	0.45	0.42	0.40	0.37	0.35	0.33	0.31	0.29	0.27	0.25	0.24	0.22	0.21	0.19	0.18
8.6	0.68	0.64	0.60	0.56	0.52	0.49	0.46	0.43	0.41	0.38	0.36	0.33	0.31	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.16	0.15
8.7	0.57	0.54	0.50	0.47	0.44	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13
8.8	0.49	0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19	0.17	0.16	0.15	0.14	0.13	0.13	0.12	0.11
8.9	0.42	0.39	0.37	0.34	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.21	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.09
9	0.36	0.34	0.32	0.30	0.28	0.26	0.24	0.23	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.10	0.09	0.09	0.08

<sup>1</sup> The freshwater chronic water quality criteria for total ammonia where fish early life stages may be present were calculated using the following equation, which may also be used to calculate unlisted values:

Freshwater chronic water quality criterion for ammonia (fish early life stages present) =

$$CCC = 0.8876 * \left( \frac{0.0278}{1 + 10^{7.698 - pH}} + \frac{1.1994}{1 + 10^{pH - 7.698}} \right) * (2.126 * 10^{0.028 * (20 - MAX(T, 7))})$$

Where MAX indicates the greater of the two values separated by a comma.

(6) Table 2. Chronic Ammonia Criteria for Waters Where Freshwater Fish Early Life Stages Are Present and Freshwater mussels are absent (milligrams of nitrogen per liter). <sup>1</sup>

		Temperature (°C)																													
pH	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30							
6.5	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.34	7.04	6.60	6.19	5.80	5.44	5.10	4.78	4.48	4.20							
6.6	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	7.23	6.93	6.50	6.09	5.71	5.36	5.02	4.71	4.41	4.14							
6.7	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	7.10	6.80	6.38	5.98	5.61	5.26	4.93	4.62	4.33	4.06							
6.8	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.65	6.23	5.84	5.48	5.14	4.81	4.51	4.23	3.97							
6.9	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.74	6.46	6.06	5.68	5.32	4.99	4.68	4.39	4.11	3.86							



7	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.51	6.24	5.85	5.48	5.14	4.82	4.52	4.24	3.97	3.73
7.1	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	6.24	5.98	5.61	5.26	4.93	4.62	4.33	4.06	3.81	3.57
7.2	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.94	5.69	5.33	5.00	4.69	4.40	4.12	3.86	3.62	3.40
7.3	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.59	5.36	5.03	4.71	4.42	4.14	3.88	3.64	3.41	3.20
7.4	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.21	5.00	4.69	4.39	4.12	3.86	3.62	3.39	3.18	2.98
7.5	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.61	4.32	4.05	3.80	3.56	3.34	3.13	2.93	2.75
7.6	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.20	3.94	3.69	3.46	3.24	3.04	2.85	2.67	2.51
7.7	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.94	3.78	3.54	3.32	3.11	2.92	2.74	2.57	2.41	2.26
7.8	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.36	3.15	2.95	2.77	2.60	2.43	2.28	2.14	2.01
7.9	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	3.08	2.95	2.77	2.60	2.43	2.28	2.14	2.01	1.88	1.76
8	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.68	2.57	2.41	2.26	2.12	1.99	1.86	1.75	1.64	1.53
8.1	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.31	2.21	2.08	1.95	1.82	1.71	1.60	1.50	1.41	1.32
8.2	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.89	1.77	1.66	1.56	1.46	1.37	1.29	1.21	1.13
8.3	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.61	1.51	1.41	1.33	1.24	1.17	1.09	1.02	0.96
8.4	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.36	1.28	1.20	1.12	1.05	0.99	0.92	0.87	0.81
8.5	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.15	1.08	1.01	0.95	0.89	0.83	0.78	0.73	0.69
8.6	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	0.97	0.91	0.85	0.80	0.75	0.70	0.66	0.62	0.58
8.7	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.82	0.77	0.72	0.68	0.63	0.60	0.56	0.52	0.49
8.8	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.70	0.65	0.61	0.58	0.54	0.51	0.47	0.44
8.9	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.60	0.56	0.52	0.49	0.46	0.43	0.40	0.38
9	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.51	0.48	0.45	0.42	0.40	0.37	0.35	0.33	0.31

<sup>1</sup> The freshwater chronic water quality criteria for total ammonia where fish early life stages are present but freshwater mussels are absent were calculated using the following equation, which may also be used to calculate unlisted values:

Freshwater chronic water quality criterion for ammonia (fish early life stages present and freshwater mussels absent) =CCC=

$$\left[ 0.9405 * \left( \frac{0.0278}{1 + 10^{7.688 - pH}} + \frac{1.1994}{1 + 10^{pH - 7.688}} \right) * \text{MIN} \left( \frac{6.920}{7.547 * 10^{0.028 * (20 - T)}} \right) \right]$$

Where MIN indicates the lesser of the two values separated by a comma.

(7) Table 3. Chronic Ammonia Criteria for Waters Where Freshwater Fish Early Life Stages Are Absent and Freshwater Mussels Are Absent (milligrams of nitrogen per liter). <sup>1</sup>

Temperature (°C)
------------------

pH	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	18.5	17.4	16.3	15.3	14.3	13.4	12.6	11.8	11.1	10.4	9.72	9.11	8.54	8.01	7.51	7.04	6.60	6.19	5.80	5.44	5.10	4.78	4.48	4.20
6.6	18.2	17.1	16.0	15.0	14.1	13.2	12.4	11.6	10.9	10.2	9.57	8.97	8.41	7.89	7.39	6.93	6.50	6.09	5.71	5.36	5.02	4.71	4.41	4.14
6.7	17.9	16.8	15.7	14.7	13.8	13.0	12.2	11.4	10.7	10.0	9.39	8.80	8.25	7.74	7.25	6.80	6.38	5.98	5.61	5.26	4.93	4.62	4.33	4.06
6.8	17.5	16.4	15.4	14.4	13.5	12.7	11.9	11.1	10.4	9.78	9.17	8.60	8.06	7.56	7.09	6.65	6.23	5.84	5.48	5.14	4.81	4.51	4.23	3.97
6.9	17.0	15.9	14.9	14.0	13.1	12.3	11.5	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89	6.46	6.06	5.68	5.32	4.99	4.68	4.39	4.11	3.86
7	16.4	15.4	14.4	13.5	12.7	11.9	11.1	10.5	9.80	9.19	8.61	8.07	7.57	7.10	6.65	6.24	5.85	5.48	5.14	4.82	4.52	4.24	3.97	3.73
7.1	15.7	14.8	13.8	13.0	12.2	11.4	10.7	10.0	9.40	8.81	8.26	7.74	7.26	6.81	6.38	5.98	5.61	5.26	4.93	4.62	4.33	4.06	3.81	3.57
7.2	15.0	14.0	13.2	12.3	11.6	10.8	10.2	9.53	8.94	8.38	7.85	7.36	6.90	6.47	6.07	5.69	5.33	5.00	4.69	4.40	4.12	3.86	3.62	3.40
7.3	14.1	13.2	12.4	11.6	10.9	10.2	9.58	8.98	8.42	7.89	7.40	6.94	6.50	6.10	5.72	5.36	5.03	4.71	4.42	4.14	3.88	3.64	3.41	3.20
7.4	13.1	12.3	11.6	10.8	10.2	9.52	8.93	8.37	7.85	7.36	6.90	6.47	6.06	5.69	5.33	5.00	4.69	4.39	4.12	3.86	3.62	3.39	3.18	2.98
7.5	12.1	11.4	10.7	9.99	9.36	8.78	8.23	7.72	7.24	6.78	6.36	5.96	5.59	5.24	4.91	4.61	4.32	4.05	3.80	3.56	3.34	3.13	2.93	2.75
7.6	11.0	10.4	9.70	9.10	8.53	8.00	7.50	7.03	6.59	6.18	5.79	5.43	5.09	4.78	4.48	4.20	3.94	3.69	3.46	3.24	3.04	2.85	2.67	2.51
7.7	9.94	9.32	8.73	8.19	7.68	7.20	6.75	6.33	5.93	5.56	5.21	4.89	4.58	4.30	4.03	3.78	3.54	3.32	3.11	2.92	2.74	2.57	2.41	2.26
7.8	8.84	8.29	7.77	7.28	6.83	6.40	6.00	5.63	5.28	4.95	4.64	4.35	4.08	3.82	3.58	3.36	3.15	2.95	2.77	2.60	2.43	2.28	2.14	2.01
7.9	7.77	7.28	6.83	6.40	6.00	5.63	5.28	4.95	4.64	4.35	4.08	3.82	3.58	3.36	3.15	2.95	2.77	2.60	2.43	2.28	2.14	2.01	1.88	1.76
8	6.76	6.34	5.94	5.57	5.22	4.90	4.59	4.30	4.03	3.78	3.55	3.33	3.12	2.92	2.74	2.57	2.41	2.26	2.12	1.99	1.86	1.75	1.64	1.53
8.1	5.82	5.46	5.12	4.80	4.50	4.22	3.96	3.71	3.48	3.26	3.06	2.87	2.69	2.52	2.36	2.21	2.08	1.95	1.82	1.71	1.60	1.50	1.41	1.32
8.2	4.98	4.67	4.38	4.10	3.85	3.61	3.38	3.17	2.97	2.79	2.61	2.45	2.30	2.15	2.02	1.89	1.77	1.66	1.56	1.46	1.37	1.29	1.21	1.13
8.3	4.23	3.97	3.72	3.49	3.27	3.07	2.87	2.69	2.53	2.37	2.22	2.08	1.95	1.83	1.72	1.61	1.51	1.41	1.33	1.24	1.17	1.09	1.02	0.96
8.4	3.58	3.36	3.15	2.95	2.77	2.59	2.43	2.28	2.14	2.00	1.88	1.76	1.65	1.55	1.45	1.36	1.28	1.20	1.12	1.05	0.99	0.92	0.87	0.81
8.5	3.02	2.84	2.66	2.49	2.34	2.19	2.05	1.93	1.81	1.69	1.59	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.95	0.89	0.83	0.78	0.73	0.69
8.6	2.55	2.39	2.24	2.10	1.97	1.85	1.73	1.63	1.52	1.43	1.34	1.26	1.18	1.10	1.04	0.97	0.91	0.85	0.80	0.75	0.70	0.66	0.62	0.58
8.7	2.16	2.03	1.90	1.78	1.67	1.57	1.47	1.38	1.29	1.21	1.13	1.06	1.00	0.93	0.88	0.82	0.77	0.72	0.68	0.63	0.60	0.56	0.52	0.49
8.8	1.84	1.72	1.61	1.51	1.42	1.33	1.25	1.17	1.10	1.03	0.96	0.90	0.85	0.79	0.74	0.70	0.65	0.61	0.58	0.54	0.51	0.47	0.44	0.42
8.9	1.57	1.47	1.38	1.29	1.21	1.14	1.07	1.00	0.94	0.88	0.82	0.77	0.72	0.68	0.64	0.60	0.56	0.52	0.49	0.46	0.43	0.40	0.38	0.36
9	1.35	1.27	1.19	1.11	1.04	0.98	0.92	0.86	0.81	0.76	0.71	0.66	0.62	0.58	0.55	0.51	0.48	0.45	0.42	0.40	0.37	0.35	0.33	0.31

<sup>1</sup> The freshwater chronic water quality criteria for total ammonia where fish early life stages are present but freshwater mussels are absent were calculated using the following equation, which may also be used to calculate unlisted values:

Freshwater chronic water quality criterion for ammonia (fish early life stages absent and freshwater mussels absent)=CCC=

$$\left( 0.9405 * \left( \frac{0.0278}{1 + 10^{7.688 - pH}} + \frac{1.1994}{1 + 10^{pH - 7.688}} \right) * \left( 7.547 * 10^{0.028 * (20 - \text{MAX}(T, 7))} \right) \right)$$

Where MAX indicates the greater of the two values separated by a comma.

J. Saltwater and Estuarine Acute Criteria for Ammonia. Acute numeric toxic substance criteria for ammonia to protect marine and estuarine life are shown in Table 1. In estuarine and saltwaters, the concentration of total ammonia (in milligrams/liter) may not exceed the acute criterion listed in Table 1. Milligrams per liter total ammonia in saltwater (Table 1) may be converted to milligrams of ammonia nitrogen per liter (as used in §§H and I of this regulation) by multiplying the criteria values in Table 1 by 14/17 (or 0.82353) to result in total ammonia nitrogen.

Table 1 Acute Water Quality Criteria for Saltwater Aquatic Life (milligrams per liter total ammonia).

Temperature (°C)								
	0	5	10	15	20	25	30	35
pH	Salinity = 10 parts per thousand							
7.0	270	191	131	92	62	44	29	21
7.2	175	121	83	58	40	27	19	13
7.4	110	77	52	35	25	17	12	8.3
7.6	69	48	33	23	16	11	7.7	5.6
7.8	44	31	21	15	10	7.1	5.0	3.5
8.0	27	19	13	9.4	6.4	4.6	3.1	2.3
8.2	18	12	8.5	5.8	4.2	2.9	2.1	1.5
8.4	11	7.9	5.4	3.7	2.7	1.9	1.4	1.0
8.6	7.3	5.0	3.5	2.5	1.8	1.3	0.98	0.75
8.8	4.6	3.3	2.3	1.7	1.2	0.92	0.71	0.56
9.0	2.9	2.1	1.5	1.1	0.85	0.67	0.52	0.44
pH	Salinity = 20 parts per thousand							
7.0	291	200	137	96	64	44	31	21
7.2	183	125	87	60	42	29	20	14
7.4	116	79	54	37	27	18	12	8.7
7.6	73	50	35	23	17	11	7.9	5.6
7.8	46	31	23	15	11	7.5	5.2	3.5
8.0	29	20	14	9.8	6.7	4.8	3.3	2.3

8.2	19	13	8.9	6.2	4.4	3.1	2.1	1.6
8.4	12	8.1	5.6	4.0	2.9	2.0	1.5	1.1
8.6	7.5	5.2	3.7	2.7	1.9	1.4	1.0	0.77
8.8	4.8	3.3	2.5	1.7	1.3	0.94	0.73	0.56
9.0	3.1	2.3	1.6	1.2	0.87	0.69	0.54	0.44
pH	Salinity = 30 parts per thousand							
7.0	312	208	148	102	71	48	33	23
7.2	196	135	94	64	44	31	21	15
7.4	125	85	58	40	27	19	13	9.4
7.6	79	54	37	25	21	12	8.5	6.0
7.8	50	33	23	16	11	7.9	5.4	3.7
8.0	31	21	15	10	7.3	5.0	3.5	2.5
8.2	20	14	9.6	6.7	4.6	3.3	2.3	1.7
8.4	12.7	8.7	6.0	4.2	2.9	2.1	1.6	1.1
8.6	8.1	5.6	4.0	2.7	2.0	1.4	1.1	0.81
8.8	5.2	3.5	2.5	1.8	1.3	1.0	0.75	0.58
9.0	3.3	2.3	1.7	1.2	0.94	0.71	0.56	0.46

K. Saltwater and Estuarine Chronic Criteria for Ammonia.

(1) Chronic numeric toxic substance criteria for ammonia to protect marine and estuarine life are shown in Table 1.

(2) Averaging Period. The concentration of total ammonia (in milligrams/liter) expressed as a 30-day average may not exceed the chronic criterion listed in Table 1.

(3) Milligrams per liter total ammonia in saltwater (Table 1) may be converted to milligrams of ammonia nitrogen per liter (as used in §§H and I of this regulation) by multiplying the criteria values in Table 1 by 14/17 (or 0.82353) to result in total ammonia nitrogen.

Table 1 Chronic Water Quality Criteria for Saltwater Aquatic Life (milligrams/liter total ammonia).

Temperature (°C)								
	0	5	10	15	20	25	30	35
pH	Salinity = 10 parts per thousand							
7.0	41	29	20	14	9.4	6.6	4.4	3.1
7.2	26	18	12	8.7	5.9	4.1	2.8	2.0

7.4	17	12	7.8	5.3	3.7	2.6	1.8	1.2
7.6	10	7.2	5.0	3.4	2.4	1.7	1.2	0.84
7.8	6.6	4.7	3.1	2.2	1.5	1.1	0.75	0.53
8.0	4.1	2.9	2.0	1.40	0.97	0.69	0.47	0.34
8.2	2.7	1.8	1.3	0.87	0.62	0.44	0.31	0.23
8.4	1.7	1.2	0.81	0.56	0.41	0.29	0.21	0.16
8.6	1.1	0.75	0.53	0.37	0.27	0.20	0.15	0.11
8.8	0.69	0.50	0.34	0.25	0.18	0.14	0.11	0.08
9.0	0.44	0.31	0.23	0.17	0.13	0.10	0.08	0.07
pH	Salinity = 20 parts per thousand							
7.0	44	30	21	14	9.7	6.6	4.7	3.1
7.2	27	19	13	9.0	6.02	4.4	3.0	2.1
7.4	18	12	8.1	5.6	4.1	2.7	1.9	1.3
7.6	11	7.5	5.3	3.4	2.5	1.7	1.2	0.84
7.8	6.9	4.7	3.4	2.3	1.6	1.1	0.78	0.53
8.0	4.4	3.0	2.1	1.5	1.0	0.72	0.50	0.34
8.2	2.8	1.9	1.3	0.94	0.66	0.47	0.31	0.24
8.4	1.8	1.2	0.84	0.59	0.44	0.30	0.22	0.16
8.6	1.1	0.78	0.56	0.41	0.28	0.20	0.15	0.12
8.8	0.72	0.50	0.37	0.26	0.19	0.14	0.11	0.08
9.0	0.47	0.34	0.24	0.18	0.13	0.10	0.08	0.07
pH	Salinity = 30 parts per thousand							
7.0	47	31	22	15	11	7.2	5.0	3.4
7.2	29	20	14	9.7	6.6	4.7	3.1	2.2
7.4	19	13	8.7	5.9	4.1	2.9	2.0	1.4
7.6	12	8.1	5.6	3.7	3.1	1.8	1.3	0.90
7.8	7.5	5.0	3.4	2.4	1.7	1.2	0.81	0.56
8.0	4.7	3.1	2.2	1.6	1.1	0.75	0.53	0.37
8.2	3.0	2.1	1.4	1.0	0.69	0.50	0.34	0.25
8.4	1.9	1.3	0.90	0.62	0.44	0.31	0.23	0.17

8.6	1.2	0.84	0.59	0.41	0.30	0.22	0.16	0.12
8.8	0.78	0.53	0.37	0.27	0.20	0.15	0.11	0.09
9.0	0.50	0.34	0.26	0.19	0.14	0.11	0.08	0.07