Attachment A to Resolution R23-0XX

Amendment to Chapter 3 of the Basin Plan for the Los Angeles Region

The amendment to Chapter 3 of the Basin Plan for the Los Angeles Region modifies the ammonia section of this chapter. The amendment is shown as red underlined text for added language, and as red strike-out text for deleted language.

Regional Objectives for Inland Surface Waters

Narrative or numerical water quality objectives have been developed for the following parameters (listed alphabetically) and apply to all inland surface waters and enclosed bays and estuaries (including wetlands) in the Region. *Water quality objectives are in italics.*

Ammonia

Ammonia is a pollutant routinely found in the wastewater effluent of Publicly Owned Treatment Works (POTWs), in landfill-leachate, as well as in run-off from agricultural fields where commercial fertilizers and animal manure are applied. Ammonia exists in two forms – un-ionized ammonia (NH_3) and the ammonium ion (NH_4^+). They are both toxic, but the neutral, un-ionized ammonia species (NH_3) is highly toxic to fish and other aquatic life. The ratio of toxic NH_3 to total ammonia ($NH_4^+ + NH_3$) is primarily a function of pH, but is also affected by temperature and other factors. Additional impacts can also occur as the oxidation of ammonia lowers the dissolved oxygen content of the water, further stressing aquatic organisms. Ammonia also combines with chlorine (often both are present) to form chloramines - persistent toxic compounds that extend the effects of ammonia and chlorine downstream.

Oxidation of ammonia to nitrate may lead to groundwater impacts in areas of recharge.

~~The freshwater one-hour average objective is dependent on pH and fish species (salmonids present or absent), but not temperature. It is assumed that salmonids may be present in waters designated in the Basin Plan as "COLD" or "MIGR" and that salmonids are absent in waters not designated in the Basin Plan as "COLD" or "MIGR," in the absence of additional information to the contrary. The freshwater 30-day average objective is dependent on pH temperature, and the presence or absence of early life stages of fish (ELS). Implementation of the ELS Provision is described under "Implementation" subparagraph 3. The freshwater four-day average objective is 2.5 times the 30-day average objective.~~

The freshwater one-hour average objective is determined by the presence or absence of native freshwater mussels in the Family Unionidae (hereafter referred to as mussels) and the presence or absence of salmonids. Therefore, there are four different criteria for the one-hour average objective (i.e., mussels present salmonids present, mussels present salmonids absent, mussels

absent salmonids present, and mussels absent salmonids absent). Selection of mussels absent or present criteria in the Los Angeles Region is described under "Implementation" subparagraph 2, while selection of salmonids absent or present criteria is under "Implementation" subparagraph 3.

The freshwater 30-day average objective is determined by the presence or absence of mussels. When mussels are absent, the freshwater 30-day average objective is determined by the presence or absence of early life stages of fish (ELS). Therefore, there are three different criteria for the 30-day average objective (i.e., mussels present, mussels absent fish ELS present, mussels absent fish ELS absent). Implementation of the ELS Provision is described under "Implementation" subparagraph 4. The highest freshwater four-day average objective is 2.5 times the 30-day average objective, not to be exceeded more than once in three years on average.

The objectives for inland surface waters not characteristic of freshwater are based on US EPA Ambient Water Quality Criteria for Ammonia (Saltwater) -1989. Both the one-hour average and 4-day average objectives are fixed concentrations for un-ionized ammonia, independent of pH, temperature, or salinity.

In order to protect aquatic life, ammonia concentrations in inland surface waters characteristic of freshwater ("freshwater" as determined by the provisions described herein under "IMPLEMENTATION," 1. Determination of Freshwater, Brackish Water, or Saltwater Conditions) shall not exceed the values calculated for the appropriate instream conditions shown in Tables ~~3-1 to 3-3 (per U.S. EPA's most recent criteria guidance document, "1999 Update of Ambient Water Quality Criteria for Ammonia").~~ 3-1 to 3-4 (per U.S. EPA's 2013 criteria guidance document, "Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater") when the mussels absent condition applies. When the mussels present condition applies, ammonia concentrations in inland surface waters characteristic of freshwater shall not exceed the values calculated for the appropriate instream conditions shown in Tables 3-5 to 3-7 (per U.S. EPA's 2013 criteria guidance document, "Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater").

For inland surface waters not characteristic of freshwater (as determined by the procedures in paragraph 1 of the Implementation Provisions below), the four-day average concentration of un-ionized ammonia shall not exceed 0.035 mg/L and the one-hour average concentration shall not exceed 0.233 mg/L.

~~*The water quality objectives for ammonia in freshwater may be revised to reflect local waterbody characteristics using one or more of US EPA's procedures for deriving site-specific objectives (SSOs), which include the water-effect ratio (WER) procedure, recalculation procedure, and resident species procedure. In order to establish SSOs for a waterbody, a study must be conducted that is consistent with US EPA guidelines on deriving aquatic life criteria and SSOs, and the resultant SSOs must be fully approved through the Basin Plan amendment process.*~~

In order to protect underlying groundwater basins, ammonia shall not be present at levels that when oxidized to nitrate, pose a threat to groundwater quality.

~~Table 3-1. One-hour Average Objective for Ammonia-N for Freshwaters (mg N/L)~~[1]

~~pH~~	~~Waters Designated COLD and/or MIGR~~	~~Waters Not Designated COLD and/or MIGR~~
~~6.5~~	~~32.6~~	~~48.8~~
~~6.6~~	~~31.3~~	~~46.8~~
~~6.7~~	~~29.8~~	~~44.6~~
~~6.8~~	~~28.1~~	~~42.0~~
~~6.9~~	~~26.2~~	~~39.1~~
~~7.0~~	~~24.1~~	~~36.1~~
~~7.1~~	~~22.0~~	~~32.8~~
~~7.2~~	~~19.7~~	~~29.5~~
~~7.3~~	~~17.5~~	~~26.2~~
~~7.4~~	~~15.4~~	~~23.0~~
~~7.5~~	~~13.3~~	~~19.9~~
~~7.6~~	~~11.4~~	~~17.0~~
~~7.7~~	~~9.65~~	~~14.4~~
~~7.8~~	~~8.11~~	~~12.1~~
~~7.9~~	~~6.77~~	~~10.1~~
~~8.0~~	~~5.62~~	~~8.40~~
~~8.1~~	~~4.64~~	~~6.95~~
~~8.2~~	~~3.83~~	~~5.72~~

[1] ~~*For freshwaters, the one-hour average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equations.*~~

~~*For waters designated COLD and/or MIGR:*~~

$$\text{one hour average concentration} = \frac{0.275}{1 + 10^{7.204-pH}} + \frac{39.0}{1 + 10^{pH-7.204}}$$

~~*Or for waters not designated COLD and/or MIGR:*~~

$$\text{one hour average concentration} = \frac{0.411}{1 + 10^{7.204-pH}} + \frac{58.4}{1 + 10^{pH-7.204}}$$

~~8.3~~ ~~8.4~~	~~3.15~~ ~~2.59~~	~~4.71~~ ~~3.88~~
~~8.5~~ ~~8.6~~ ~~8.7~~ ~~8.8~~ ~~8.9~~ ~~9.0~~	~~2.14~~ ~~1.77~~ ~~1.47~~ ~~1.23~~ ~~1.04~~ ~~0.885~~	~~3.20~~ ~~2.65~~ ~~2.20~~ ~~1.84~~ ~~1.56~~ ~~1.32~~

~~Reference: U.S. EPA 1999 Update of Ambient Water Quality Criteria for Ammonia~~

Table 3-1. One-hour Average Freshwater Objective for Ammonia-N for Waters subject to "Mussels Absent and Salmonids Present" condition (mg N/L)[2]

pH	Temperature, °C																
	0-14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	32.61	32.61	32.61	32.61	32.61	32.61	32.61	32.61	32.61	32.61	32.61	32.61	32.61	32.61	31.40	28.91	26.21
6.6	31.28	31.28	31.28	31.28	31.28	31.28	31.28	31.28	31.28	31.28	31.28	31.28	31.28	31.28	30.13	27.73	25.52
6.7	29.76	29.76	29.76	29.76	29.76	29.76	29.76	29.76	29.76	29.76	29.76	29.76	29.76	29.76	28.66	26.38	24.28
6.8	28.05	28.05	28.05	28.05	28.05	28.05	28.05	28.05	28.05	28.05	28.05	28.05	28.05	28.05	27.01	24.86	22.88
6.9	26.15	26.15	26.15	26.15	26.15	26.15	26.15	26.15	26.15	26.15	26.15	26.15	26.15	26.15	25.18	23.18	21.34
7.0	24.10	24.10	24.10	24.10	24.10	24.10	24.10	24.10	24.10	24.10	24.10	24.10	24.10	24.10	23.21	21.37	19.67
7.1	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.94	21.13	19.45	17.91
7.2	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.73	19.00	17.49	16.10
7.3	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	17.51	16.86	15.52	14.28
7.4	15.34	15.34	15.34	15.34	15.34	15.34	15.34	15.34	15.34	15.34	15.34	15.34	15.34	15.34	14.77	13.60	12.52
7.5	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	13.28	12.79	11.77	10.84
7.6	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	11.37	10.95	10.08	9.28
7.7	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.64	9.29	8.55	7.87
7.8	8.11	8.11	8.11	8.11	8.11	8.11	8.11	8.11	8.11	8.11	8.11	8.11	8.11	8.11	7.81	7.19	6.61
7.9	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.77	6.52	6.00	5.52
8.0	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.62	5.41	4.98	4.58
8.1	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.64	4.47	4.11	3.79
8.2	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.83	3.68	3.39	3.12
8.3	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	3.03	2.79	2.57
8.4	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.59	2.50	2.30	2.12
8.5	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.14	2.06	1.90	1.75
8.6	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.77	1.71	1.57	1.44
8.7	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.42	1.31	1.20
8.8	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.19	1.09	1.01
8.9	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.00	0.92	0.85
9.0	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.85	0.78	0.72

Reference: U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater

[2] *For freshwaters, the one-hour average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equations for water designated COLD and/or* MIGR:

$$One\ hour\ average\ concentration = MIN\left(\left(\frac{0.275}{1+10^{7.204-pH}}+\frac{39}{1+10^{pH-7.204}}\right),\left(0.7249\times\left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right)\times 62.15\times 10^{0.036\times(20-T)}\right)\right)$$

Where T = temperature expressed in °C

Table 3-2. 30-day Average Objective for Ammonia-N for Freshwaters Applicable to Waters Subject to the "Early Life Present" Condition (mg N/L)

pH	Temperature, °C																
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	6.67	6.46	6.06	5.68	5.33	4.99	4.68	4.39	4.12	3.86	3.62	3.39	3.18	2.98	2.80	2.62	2.46
6.6	6.57	6.36	5.97	5.59	5.25	4.92	4.61	4.32	4.05	3.80	3.56	3.34	3.13	2.94	2.75	2.58	2.42
6.7	6.44	6.25	5.86	5.49	5.15	4.83	4.52	4.24	3.98	3.73	3.50	3.28	3.07	2.88	2.70	2.53	2.37
6.8	6.29	6.10	5.72	5.36	5.03	4.72	4.42	4.14	3.89	3.64	3.42	3.20	3.00	2.82	2.64	2.47	2.32
6.9	6.12	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	2.25
7.0	5.91	5.73	5.37	5.04	4.72	4.43	4.15	3.89	3.65	3.42	3.21	3.01	2.82	2.64	2.48	2.32	2.18
7.1	5.67	5.49	5.15	4.83	4.53	4.25	3.98	3.73	3.50	3.28	3.08	2.88	2.70	2.53	2.38	2.23	2.09
7.2	5.39	5.22	4.90	4.59	4.31	4.04	3.78	3.55	3.33	3.12	2.92	2.74	2.57	2.41	2.26	2.12	1.99
7.3	5.08	4.92	4.61	4.33	4.06	3.80	3.57	3.34	3.13	2.94	2.76	2.58	2.42	2.27	2.13	2.00	1.87
7.4	4.73	4.59	4.30	4.03	3.78	3.55	3.32	3.12	2.92	2.74	2.57	2.41	2.26	2.12	1.98	1.86	1.74
7.5	4.36	4.23	3.97	3.72	3.49	3.27	3.06	2.87	2.69	2.53	2.37	2.22	2.08	1.95	1.83	1.72	1.61
7.6	3.98	3.85	3.61	3.39	3.18	2.98	2.79	2.62	2.45	2.30	2.16	2.02	1.90	1.78	1.67	1.56	1.47
7.7	3.58	3.47	3.25	3.05	2.86	2.68	2.51	2.36	2.21	2.07	1.94	1.82	1.71	1.60	1.50	1.41	1.32
7.8	3.18	3.09	2.89	2.71	2.54	2.38	2.23	2.10	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25	1.17
7.9	2.80	2.71	2.54	2.38	2.24	2.10	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25	1.17	1.10	1.03
8.0	2.43	2.36	2.21	2.07	1.94	1.82	1.71	1.60	1.50	1.41	1.32	1.24	1.16	1.09	1.02	0.957	0.897
8.1	2.10	2.03	1.91	1.79	1.68	1.57	1.47	1.38	1.29	1.21	1.14	1.07	1.00	0.938	0.879	0.824	0.773
8.2	1.79	1.74	1.63	1.53	1.43	1.34	1.26	1.18	1.11	1.04	0.973	0.912	0.855	0.802	0.752	0.705	0.661
8.3	1.52	1.48	1.39	1.30	1.22	1.14	1.07	1.00	0.941	0.882	0.827	0.775	0.727	0.682	0.639	0.599	0.562
8.4	1.29	1.25	1.17	1.10	1.03	0.966	0.906	0.849	0.796	0.747	0.700	0.656	0.615	0.577	0.541	0.507	0.475
8.5	1.09	1.06	0.990	0.928	0.870	0.816	0.765	0.717	0.672	0.630	0.591	0.554	0.520	0.487	0.457	0.428	0.401
8.6	0.920	0.892	0.836	0.784	0.735	0.689	0.646	0.606	0.568	0.532	0.499	0.468	0.439	0.411	0.386	0.362	0.339
8.7	0.778	0.754	0.707	0.663	0.622	0.583	0.547	0.512	0.480	0.450	0.422	0.396	0.371	0.348	0.326	0.306	0.287
8.8	0.661	0.641	0.601	0.563	0.528	0.495	0.464	0.435	0.408	0.383	0.359	0.336	0.315	0.296	0.277	0.260	0.244
8.9	0.565	0.548	0.513	0.481	0.451	0.423	0.397	0.372	0.349	0.327	0.306	0.287	0.269	0.253	0.237	0.222	0.208
9.0	0.486	0.471	0.442	0.414	0.389	0.364	0.342	0.320	0.300	0.281	0.264	0.247	0.232	0.217	0.204	0.191	0.179

* At temperatures below 14 °C, the objective is the same as that shown for 14 °C.

Reference: U.S. EPA 1999 Update of Ambient Water Quality Criteria for Ammonia[3]

[3] *For freshwaters subject to the "Early Life Stage Present" condition, the thirty-day average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equation.*

~~$$30\ day\ average\ concentration = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * MIN(2.85, 1.45 * 10^{0.028*(25-T)})$$~~

~~*Where T = temperature expressed in °C.*~~

~~*In addition, for freshwaters, the highest four-day average within the 30-day period shall not exceed 2.5 times the 30-day average objective as calculated above.*~~

Table 3-2. One-hour Average Freshwater Objective for Ammonia-N for Waters subject to "Mussels Absent and Salmonids Absent" condition (mg N/L)[4]

pH	Temperature, °C																
	0-14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	50.93	50.93	50.93	50.93	50.93	50.93	50.93	50.93	50.93	47.53	43.75	40.27	37.07	34.12	31.40	28.91	26.61
6.6	48.86	48.86	48.86	48.86	48.86	48.86	48.86	48.86	48.86	45.60	41.97	38.63	35.56	32.73	30.13	27.73	25.52
6.7	46.48	46.48	46.48	46.48	46.48	46.48	46.48	46.48	46.48	43.38	39.93	36.75	33.83	31.14	28.66	26.38	24.28
6.8	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	43.80	40.88	37.63	34.64	31.88	29.34	27.01	24.86	22.88
6.9	40.84	40.84	40.84	40.84	40.84	40.84	40.84	40.84	40.84	38.12	35.09	32.30	29.73	27.36	25.18	23.18	21.34
7.0	37.65	37.65	37.65	37.65	37.65	37.65	37.65	37.65	37.65	35.13	32.34	29.77	27.40	25.22	23.21	21.37	19.67
7.1	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	34.27	31.99	29.44	27.10	24.95	22.96	21.13	19.45	17.91
7.2	30.81	30.81	30.81	30.81	30.81	30.81	30.81	30.81	30.81	28.75	26.47	24.36	22.42	20.64	19.00	17.49	16.10
7.3	27.34	27.34	27.34	27.34	27.34	27.34	27.34	27.34	27.34	25.52	23.49	21.62	19.90	18.32	16.86	15.52	14.28
7.4	23.96	23.96	23.96	23.96	23.96	23.96	23.96	23.96	23.96	22.36	20.58	18.95	17.44	16.05	14.77	13.60	12.52
7.5	20.75	20.75	20.75	20.75	20.75	20.75	20.75	20.75	20.75	19.36	17.82	16.40	15.10	13.90	12.79	11.77	10.84
7.6	17.77	17.77	17.77	17.77	17.77	17.77	17.77	17.77	17.77	16.92	15.26	14.05	12.93	11.90	10.95	10.08	9.28
7.7	15.06	15.06	15.06	15.06	15.06	15.06	15.06	15.06	15.06	14.06	12.94	11.91	10.96	10.09	9.29	8.55	7.87
7.8	12.66	12.66	12.66	12.66	12.66	12.66	12.66	12.66	12.66	11.82	10.88	10.01	9.22	8.48	7.81	7.19	6.61
7.9	10.57	10.57	10.57	10.57	10.57	10.57	10.57	10.57	10.57	9.86	9.08	8.36	7.69	7.08	6.52	6.00	5.52
8.0	8.77	8.77	8.77	8.77	8.77	8.77	8.77	8.77	8.77	8.18	7.53	6.93	6.38	5.87	5.41	4.98	4.58
8.1	7.25	7.25	7.25	7.25	7.25	7.25	7.25	7.25	7.25	6.76	6.23	5.73	5.27	4.86	4.47	4.11	3.79
8.2	5.97	5.97	5.97	5.97	5.97	5.97	5.97	5.97	5.97	5.81	5.13	4.72	4.35	4.00	3.68	3.39	3.12
8.3	4.92	4.92	4.92	4.92	4.92	4.92	4.92	4.92	4.92	4.59	4.22	3.89	3.58	3.29	3.03	2.79	2.57
8.4	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	4.05	3.78	3.48	3.20	2.95	2.71	2.50	2.30	2.12
8.5	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.34	3.12	2.87	2.64	2.43	2.24	2.06	1.90	1.75
8.6	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.77	2.58	2.38	2.19	2.01	1.85	1.71	1.57	1.44
8.7	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.15	1.98	1.82	1.67	1.54	1.42	1.31	1.20
8.8	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.91	1.65	1.52	1.40	1.29	1.19	1.09	1.01
8.9	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.51	1.39	1.28	1.18	1.09	1.00	0.92	0.85
9.0	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.29	1.19	1.09	1.01	0.93	0.85	0.78	0.72

Reference: U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater

[4] *For freshwaters, the one-hour average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equations for water NOT designated COLD and/or MIGR:*

$$one\ hour\ average\ concentration = 0.7249 \times \left(\frac{0.0114}{1+10^{7.204-pH}} + \frac{1.6181}{1+10^{pH-7.204}}\right) \times MIN(51.93, (62.15 \times 10^{0.036\times(20-T)}))$$

Where T = temperature expressed in ºC.

Table 3-3. 30-day Average Objective for Ammonia-N for Freshwaters applicable to Waters Subject to the "Early Life Stage Absent" Condition (mg N/L)

pH	Temperature, °C								
	0-7	8	9	10	11	12	13	14	15*
6.5	10.8	10.1	9.51	8.92	8.36	7.84	7.35	6.89	6.46
6.6	10.7	9.99	9.37	8.79	8.24	7.72	7.24	6.79	6.36
6.7	10.5	9.81	9.20	8.62	8.08	7.58	7.11	6.66	6.25
6.8	10.2	9.58	8.98	8.42	7.90	7.40	6.94	6.51	6.10
6.9	9.93	9.31	8.73	8.19	7.68	7.20	6.75	6.33	5.93
7.0	9.60	9.00	8.43	7.91	7.41	6.95	6.52	6.11	5.73
7.1	9.20	8.63	8.09	7.58	7.11	6.67	6.25	5.86	5.49
7.2	8.75	8.20	7.69	7.21	6.76	6.34	5.94	5.57	5.22
7.3	8.24	7.73	7.25	6.79	6.37	5.97	5.60	5.25	4.92
7.4	7.69	7.21	6.76	6.33	5.94	5.57	5.22	4.89	4.59
7.5	7.09	6.64	6.23	5.84	5.48	5.13	4.81	4.51	4.23
7.6	6.46	6.05	5.67	5.32	4.99	4.68	4.38	4.11	3.85
7.7	5.81	5.45	5.11	4.79	4.49	4.21	3.95	3.70	3.47
7.8	5.17	4.84	4.54	4.26	3.99	3.74	3.51	3.29	3.09
7.9	4.54	4.26	3.99	3.74	3.51	3.29	3.09	2.89	2.71
8.0	3.95	3.70	3.47	3.26	3.05	2.86	2.68	2.52	2.36
8.1	3.41	3.19	2.99	2.81	2.63	2.47	2.31	2.17	2.03
8.2	2.91	2.73	2.56	2.40	2.25	2.11	1.98	1.85	1.74
8.3	2.47	2.32	2.18	2.04	1.91	1.79	1.68	1.58	1.48
8.4	2.09	1.96	1.84	1.73	1.62	1.52	1.42	1.33	1.25
8.5	1.77	1.66	1.55	1.46	1.37	1.28	1.20	1.13	1.06
8.6	1.49	1.40	1.31	1.23	1.15	1.08	1.01	0.951	0.892
8.7	1.26	1.18	1.11	1.04	0.976	0.915	0.858	0.805	0.754
8.8	1.07	1.01	0.944	0.885	0.829	0.778	0.729	0.684	0.641
8.9	0.917	0.86	0.806	0.756	0.709	0.664	0.623	0.584	0.548
9.0	0.790	0.740	0.694	0.651	0.610	0.572	0.536	0.503	0.471

* At 15 °C and above, the 30-day average objective for waters subject to the "Early Life Stage Absent" conditions is the same as that for waters subject to the "Early Life Present" condition

Reference: U.S. EPA 1999 Update of Ambient Water Quality Criteria for Ammonia[5]

[5] *For freshwaters subject to the "Early Life Stage Absent" condition, the thirty-day average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equation.*

Table 3-3. 30-day Average Freshwater Objective for Ammonia-N for Waters Subject to the "Mussels Absent and Early Life Present" Condition (mg N/L)[6]

pH	Temperature, °C																
	0-14	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	7.04	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	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	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	6.65	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	6.46	6.06	5.68	5.32	4.99	4.68	4.39	4.11	3.86
7.0	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	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	5.69	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	5.36	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	5.00	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	4.61	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	4.20	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	3.78	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	3.36	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	2.95	2.77	2.60	2.43	2.28	2.14	2.01	1.88	1.76
8.0	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	2.21	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	1.89	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	1.61	1.51	1.41	1.33	1.24	1.17	1.09	1.02	0.96

~~$$30\ day\ average\ concentration = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}}\right) * 1.45 * 10^{0.028*(25-MAX(T,7))}$$~~

~~*Where T = temperature expressed in °C.*~~

~~*In addition, for freshwaters, the highest four-day average within the 30-day period shall not exceed 2.5 times the 30-day average objective as calculated above.*~~

[6] *For freshwaters subject to the "Early Life Stage Present" condition, the thirty-day average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equation:*

$$30\ day\ average\ concentration = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\ (6.920, (7.547 \times 10^{0.028\times(20-T)})$$

Where T = temperature expressed in °C. In addition, for freshwaters, the highest four-day average within the 30-day period shall not exceed 2.5 times the 30-day average objective as calculated above, more than once in three years on average.

8.4	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	1.15	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	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	0.82	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	0.70	0.65	0.61	0.58	0.54	0.51	0.47	0.44	0.42
8.9	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	0.36
9.0	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

Reference: U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater

Table 3-4. 30-day Average Freshwater Objective for Ammonia-N for Waters Subject to the "Mussels Absent and Early Life Stage Absent" Condition (mg N/L)[7]

pH	Temperature, °C																
	0-7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23*
6.5	18.51	17.36	16.27	15.26	14.30	13.41	12.57	11.79	11.05	10.36	9.72	9.11	8.54	8.01	7.51	7.04	6.60
6.6	18.23	17.09	16.03	15.03	14.09	13.21	12.38	11.61	10.88	10.21	9.57	8.97	8.41	7.89	7.39	6.93	6.50
6.7	17.89	16.77	15.73	14.74	13.82	12.96	12.15	11.39	10.68	10.01	9.39	8.80	8.25	7.74	7.25	6.80	6.38
6.8	17.48	16.39	15.37	14.41	13.51	12.66	11.87	11.13	10.44	9.78	9.17	8.60	8.06	7.56	7.09	6.65	6.23
6.9	16.99	15.93	14.93	14.00	13.13	12.31	11.54	10.82	10.14	9.51	8.92	8.36	7.84	7.35	6.89	6.46	6.06
7.0	16.41	15.39	14.43	13.52	12.68	11.89	11.15	10.45	9.80	9.19	8.61	8.07	7.57	7.10	6.65	6.24	5.85
7.1	15.74	14.75	13.83	12.97	12.16	11.40	10.69	10.02	9.40	8.81	8.26	7.74	7.26	6.81	6.38	5.98	5.61
7.2	14.97	14.03	13.16	12.33	11.56	10.84	10.17	9.53	8.94	8.38	7.85	7.36	6.90	6.47	6.07	5.69	5.33
7.3	14.10	13.22	12.39	11.62	10.89	10.21	9.58	8.98	8.42	7.89	7.40	6.94	6.50	6.10	5.72	5.36	5.03
7.4	13.15	12.32	11.56	10.83	10.16	9.52	8.93	8.37	7.85	7.36	6.90	6.47	6.06	5.69	5.33	5.00	4.69
7.5	12.12	11.36	10.65	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
7.6	11.04	10.35	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
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
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
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
8.0	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
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
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
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
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
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
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
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
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
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
9.0	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

* At 23 °C and above, the 30-day average objective for waters subject to the "Early Life Stage Absent" conditions is the same as that for waters subject to the "Early Life Present" condition

Reference: U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater

[7] *For freshwaters subject to the "Early Life Stage Absent" condition, the thirty-day average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equation:*

$$30\,day\,average\,concentration = 0.9405 \times \left(\frac{0.0278}{1 + 10^{7.688-pH}} + \frac{1.1994}{1 + 10^{pH-7.688}}\right) \times \left(7.547 \times 10^{0.028\times(20-MAX(T,7))}\right)$$

Where T = temperature expressed in ºC. In addition, for freshwaters, the highest four-day average within the 30-day period shall not exceed 2.5 times the 30-day average objective as calculated above, more than once in three years on average.

Table 3-5. One-hour Average Freshwater Objective for Ammonia-N for Waters subject to "Mussels Present and Salmonids Present" Condition (mg N/L)[8]

pH	Temperature, °C																
	0-14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	32.61	32.61	31.59	29.08	26.76	24.63	22.67	20.87	19.21	17.68	16.28	14.98	13.79	12.69	11.68	10.75	9.90
6.6	31.28	31.28	30.30	27.89	25.67	23.63	21.75	20.02	18.43	16.96	15.61	14.37	13.23	12.18	11.21	10.32	9.50
6.7	29.76	29.76	28.83	26.54	24.43	22.48	20.69	19.05	17.53	16.14	14.85	13.67	12.59	11.58	10.66	9.81	9.03
6.8	28.05	28.05	27.17	25.01	23.02	21.19	19.50	17.95	16.52	15.21	14.00	12.88	11.86	10.92	10.05	9.25	8.51
6.9	26.15	26.15	25.33	23.32	21.46	19.76	18.18	16.74	15.41	14.18	13.05	12.01	11.06	10.18	9.37	8.62	7.94
7.0	24.10	24.10	23.35	21.49	19.78	18.21	16.76	15.43	14.20	13.07	12.03	11.07	10.19	9.38	8.64	7.95	7.32
7.1	21.94	21.94	21.26	19.57	18.01	16.58	15.26	14.05	12.93	11.90	10.95	10.08	9.28	8.54	7.86	7.24	6.66
7.2	19.73	19.73	19.11	17.59	16.19	14.90	13.72	12.63	11.62	10.70	9.85	9.06	8.34	7.68	7.07	6.51	5.99
7.3	17.51	17.51	16.96	15.61	14.37	13.22	12.17	11.20	10.31	9.49	8.74	8.04	7.40	6.81	6.27	5.77	5.31
7.4	15.34	15.34	14.86	13.68	12.59	11.59	10.67	9.82	9.04	8.32	7.66	7.05	6.49	5.97	5.50	5.06	4.66
7.5	13.28	13.28	12.87	11.84	10.90	10.03	9.24	8.50	7.83	7.20	6.63	6.10	5.62	5.17	4.76	4.38	4.03
7.6	11.37	11.37	11.02	10.14	9.34	8.59	7.91	7.28	6.70	6.17	5.68	5.23	4.81	4.43	4.08	3.75	3.45
7.7	9.64	9.64	9.34	8.60	7.92	7.29	6.71	6.17	5.68	5.23	4.81	4.43	4.08	3.75	3.46	3.18	2.93
7.8	8.11	8.11	7.85	7.23	6.65	6.12	5.64	5.19	4.78	4.40	4.05	3.72	3.43	3.16	2.90	2.67	2.46
7.9	6.77	6.77	6.55	6.03	5.55	5.11	4.70	4.33	3.99	3.67	3.38	3.11	2.86	2.63	2.42	2.23	2.05
8.0	5.62	5.62	5.44	5.01	4.61	4.24	3.90	3.59	3.31	3.04	2.80	2.58	2.37	2.19	2.01	1.85	1.70
8.1	4.64	4.64	4.50	4.14	3.81	3.51	3.23	2.97	2.73	2.52	2.32	2.13	1.96	1.81	1.66	1.53	1.41
8.2	3.83	3.83	3.71	3.41	3.14	2.89	2.66	2.45	2.25	2.07	1.91	1.76	1.62	1.49	1.37	1.26	1.16
8.3	3.15	3.15	3.05	2.81	2.58	2.38	2.19	2.02	1.86	1.71	1.57	1.45	1.33	1.23	1.13	1.04	0.96
8.4	2.59	2.59	2.51	2.31	2.13	1.96	1.80	1.66	1.53	1.41	1.29	1.19	1.10	1.01	0.93	0.86	0.79
8.5	2.14	2.14	2.07	1.91	1.76	1.62	1.49	1.37	1.26	1.16	1.07	0.98	0.90	0.83	0.77	0.71	0.65
8.6	1.77	1.77	1.72	1.58	1.45	1.34	1.23	1.13	1.04	0.96	0.88	0.81	0.75	0.69	0.63	0.58	0.54
8.7	1.47	1.47	1.43	1.31	1.21	1.11	1.02	0.94	0.87	0.80	0.73	0.68	0.62	0.57	0.53	0.49	0.45
8.8	1.23	1.23	1.19	1.10	1.01	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37
8.9	1.04	1.04	1.01	0.93	0.85	0.79	0.72	0.67	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.32
9.0	0.88	0.88	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37	0.34	0.32	0.29	0.27

[8] *For freshwaters, the one-hour average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equations for water designated COLD and/or MIGR*

$$one\ hour\ average\ concentration = MIN\left(\left(\frac{0.275}{1+10^{7.204-pH}}+\frac{39}{1+10^{pH-7.204}}\right),\left(0.7249\times\left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right)\times\left(23.12\times 10^{0.036\times(20-T)}\right)\right)\right)$$

Where T = temperature expressed in °C

Reference: U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater

Table 3-6. One-hour Freshwater Average Objective for Ammonia-N for Waters subject to "Mussels Present and Salmonids Absent" condition (mg N/L)[9]

pH	Temperature, °C																				
	0-10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6.5	50.93	47.81	44.01	40.51	37.28	34.32	31.59	29.08	26.76	24.63	22.67	20.87	19.21	17.68	16.28	14.98	13.79	12.69	11.68	10.75	9.90
6.6	48.86	45.87	42.22	38.86	35.77	32.92	30.30	27.89	25.67	23.63	21.75	20.02	18.43	16.96	15.61	14.37	13.23	12.18	11.21	10.32	9.50
6.7	46.48	43.64	40.17	36.97	34.03	31.32	28.83	26.54	24.43	22.48	20.69	19.05	17.53	16.14	14.85	13.67	12.59	11.58	10.66	9.81	9.03
6.8	43.80	41.12	37.85	34.84	32.07	29.52	27.17	25.01	23.02	21.19	19.50	17.95	16.52	15.21	14.00	12.88	11.86	10.92	10.05	9.25	8.51
6.9	40.84	38.34	35.29	32.49	29.90	27.52	25.33	23.32	21.46	19.76	18.18	16.74	15.41	14.18	13.05	12.01	11.06	10.18	9.37	8.62	7.94
7.0	37.65	35.34	32.53	29.94	27.56	25.37	23.35	21.49	19.78	18.21	16.76	15.43	14.20	13.07	12.03	11.07	10.19	9.38	8.64	7.95	7.32
7.1	34.27	32.18	29.62	27.26	25.09	23.10	21.26	19.57	18.01	16.58	15.26	14.05	12.93	11.90	10.95	10.08	9.28	8.54	7.86	7.24	6.66
7.2	30.81	28.92	26.62	24.51	22.56	20.76	19.11	17.59	16.19	14.90	13.72	12.63	11.62	10.70	9.85	9.06	8.34	7.68	7.07	6.51	5.99
7.3	27.34	25.67	23.63	21.75	20.02	18.42	16.96	15.61	14.37	13.22	12.17	11.20	10.31	9.49	8.74	8.04	7.40	6.81	6.27	5.77	5.31
7.4	23.96	22.49	20.70	19.06	17.54	16.15	14.86	13.68	12.59	11.59	10.67	9.82	9.04	8.32	7.66	7.05	6.49	5.97	5.50	5.06	4.66
7.5	20.75	19.48	17.93	16.50	15.19	13.98	12.87	11.84	10.90	10.03	9.24	8.50	7.83	7.20	6.63	6.10	5.62	5.17	4.76	4.38	4.03
7.6	17.77	16.68	15.35	14.13	13.01	11.97	11.02	10.14	9.34	8.59	7.91	7.28	6.70	6.17	5.68	5.23	4.81	4.43	4.08	3.75	3.45
7.7	15.06	14.14	13.02	11.98	11.03	10.15	9.34	8.60	7.92	7.29	6.71	6.17	5.68	5.23	4.81	4.43	4.08	3.75	3.46	3.18	2.93
7.8	12.66	11.89	10.94	10.07	9.27	8.53	7.85	7.23	6.65	6.12	5.64	5.19	4.78	4.40	4.05	3.72	3.43	3.16	2.90	2.67	2.46
7.9	10.57	9.92	9.13	8.40	7.74	7.12	6.55	6.03	5.55	5.11	4.70	4.33	3.99	3.67	3.38	3.11	2.86	2.63	2.42	2.23	2.05
8.0	8.77	8.23	7.58	6.98	6.42	5.91	5.44	5.01	4.61	4.24	3.90	3.59	3.31	3.04	2.80	2.58	2.37	2.19	2.01	1.85	1.70
8.1	7.25	6.80	6.26	5.76	5.31	4.88	4.50	4.14	3.81	3.51	3.23	2.97	2.73	2.52	2.32	2.13	1.96	1.81	1.66	1.53	1.41
8.2	5.97	5.61	5.16	4.75	4.37	4.03	3.71	3.41	3.14	2.89	2.66	2.45	2.25	2.07	1.91	1.76	1.62	1.49	1.37	1.26	1.16
8.3	4.92	4.62	4.25	3.91	3.60	3.31	3.05	2.81	2.58	2.38	2.19	2.02	1.86	1.71	1.57	1.45	1.33	1.23	1.13	1.04	0.96
8.4	4.05	3.80	3.50	3.22	2.97	2.73	2.51	2.31	2.13	1.96	1.80	1.66	1.53	1.41	1.29	1.19	1.10	1.01	0.93	0.86	0.79
8.5	3.34	3.14	2.89	2.66	2.45	2.25	2.07	1.91	1.76	1.62	1.49	1.37	1.26	1.16	1.07	0.98	0.90	0.83	0.77	0.71	0.65
8.6	2.77	2.60	2.39	2.20	2.02	1.86	1.72	1.58	1.45	1.34	1.23	1.13	1.04	0.96	0.88	0.81	0.75	0.69	0.63	0.58	0.54
8.7	2.30	2.16	1.99	1.83	1.68	1.55	1.43	1.31	1.21	1.11	1.02	0.94	0.87	0.80	0.73	0.68	0.62	0.57	0.53	0.49	0.45
8.8	1.92	1.81	1.66	1.53	1.41	1.30	1.19	1.10	1.01	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37
8.9	1.62	1.52	1.40	1.29	1.19	1.09	1.01	0.93	0.85	0.79	0.72	0.67	0.61	0.56	0.52	0.48	0.44	0.40	0.37	0.34	0.32
9.0	1.38	1.30	1.19	1.10	1.01	0.93	0.86	0.79	0.73	0.67	0.62	0.57	0.52	0.48	0.44	0.41	0.37	0.34	0.32	0.29	0.27

[9] *For freshwaters, the one-hour average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equations for water designated COLD and/or MIGR*

$$one\ hour\ average\ concentration = 0.7249 \times \left(\frac{0.0114}{1+10^{7.204-pH}} + \frac{1.6181}{1+10^{pH-7.204}}\right) \times MIN(51.93, 23.12 \times 10^{0.036\times(20-T)})$$

Where T = temperature expressed in °C.

Reference: U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater

Table 3-7. 30-day Average Freshwater Objective for Ammonia-N for Waters Subject to the "Mussels Present" Condition (mg N/L)[10]

pH	Temperature, °C																							
	0-7	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
7.0	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
8.0	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	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

[10] *For freshwaters subject to the "Early Life Stage Absent" condition, the thirty-day average concentration of total ammonia as nitrogen (in mg N/L) shall not exceed the values described by the following equation:*

$$30\,day\,average\,concentration = 0.8876 \times \left(\frac{0.0278}{1 + 10^{7.688-pH}} + \frac{1.1994}{1 + 10^{pH-7.688}}\right) \times \left(2.126 \times 10^{0.028\times(20-MAX(T,7))}\right)$$

Where T = temperature expressed in °C. In addition, for freshwaters, the highest four-day average within the 30-day period shall not exceed 2.5 times the 30-day average objective as calculated above, more than once in three years on average.

Reference: U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia - Freshwater

~~*For the following waterbodies, the 30-day average water quality objective for ammonia shall be calculated as set forth below. In addition, the highest four-day average within the 30-day period shall not exceed 2.5 times the 30-day average objective shown in Table 3-4 "Site-specific 30-day Average Objectives for Ammonia by Waterbody Reach". The regional one-hour average objective for ammonia-N for freshwaters, specified in Table 3-1, remains the applicable one-hour objective for these waterbodies.*~~

Notwithstanding the provisions below, regulatory actions, including but not limited to TMDLs and Waste Discharge Requirements, to achieve ~~applicable site-specific~~ the objectives described in Tables 3-1 to 3-7 must ensure that downstream standards will also be achieved and downstream beneficial uses will also be protected as far as the discharges' impacts may be experienced.

As described in "Implementation", "3. Selection of 30-day Average Objective – Early Life Stage Provision", below, these waterbodies are subject to site-specific ELS provisions as set forth in Table ~~3-4~~ 3-8 "~~Site-specific~~ Seasonal 30-day Average Objectives for Ammonia by Waterbody Reach", which incorporate seasonality of early life stages of fish.

~~*Where deemed necessary, additional receiving water monitoring shall be required of dischargers subject to SSOs to ensure that the SSOs are as protective of beneficial uses as the regional objectives are intended to be and downstream standards are achieved. This additional monitoring shall be required through the discharger's NPDES permit monitoring and reporting program or other Board required monitoring programs. If monitoring indicates toxicity due to ammonia or a change in the waterbody that could impact the calculation or application of the SSOs, including either its chemical characteristics or the aquatic species present, including early life stages of fish, the Regional Board may reconsider the SSOs.*~~

Table ~~3-4~~ 3-8. ~~Site-Specific~~ Seasonal 30-day Average Objectives for Ammonia by Waterbody Reach

WATERBODY	30-DAY AVERAGE OBJECTIVE
Los Angeles River, Reach 5 (Sepulveda Basin)	**ELS Present (from April 1 – September 30)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * MIN(2.85, 2.85 * 10^{0.028*(25-T)})$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 2.85 * 10^{0.028*(25-MAX(T,7))}$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$
Los Angeles River, Reach 4 (Sepulveda Dam to Riverside Drive)	~~**ELS Absent (year round)**~~ ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 2.85 * 10^{0.028*(25-MAX(T,7))}$~~ **ELS Present (from April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$
Los Angeles River, Reach 3 (Riverside Drive to Figueroa Street)	**ELS Present (from April 1 – September 30)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * MIN(2.85, 2.85 * 10^{0.028*(25-T)})$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 2.85 * 10^{0.028*(25-MAX(T,7))}$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$
Burbank Western Wash (Burbank Water Reclamation Plant to confluence with LA River)	~~**ELS Absent (year round)**~~ ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.92 * 2.03 * 10^{0.028*(25-MAX(T,7))}$~~ **ELS Present (from April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$

WATERBODY	30-DAY AVERAGE OBJECTIVE
San Gabriel River, Reaches 2 and 3 (Confluence with San Jose Creek to Firestone Blvd.) (including all San Jose Creek WRP discharges)	**ELS Present (from April 1 – September 30)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.89 * MIN(2.85, 2.37 * 10^{0.028*(25-T)})$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.89 * 2.37 * 10^{0.028*(25-MAX(T,7))}$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$
San Gabriel River, Reach 1 (Firestone Blvd. to Willow St. or start of estuary)	~~**ELS Absent (year round)**~~ ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 3.34 * 10^{0.028*(25-MAX(T,7))}$~~ **ELS Present (from April 1 – September 30)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$

WATERBODY	30-DAY AVERAGE OBJECTIVE
Santa Clara River, Reach 6 (Bouquet Canyon Rd. Bridge to West Pier Hwy 99)	**ELS Present (from February 1 – September 30)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * MIN(2.85, 3.24 * 10^{0.028*(25-T)})$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – January 31)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 3.24 * 10^{0.028*(25-MAX(T,7))}$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$
Santa Clara River, Reach 5 (West Pier Hwy 99 to Blue Cut gauging station)	**ELS Present (from February 1 – September 30)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * MIN(2.85, 3.20 * 10^{0.028*(25-T)})$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – January 31)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 3.20 * 10^{0.028*(25-MAX(T,7))}$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$
San Jose Creek (Pomona WRP to confluence with San Gabriel River)	**ELS Present (from April 1 – September 30)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.92 * MIN(2.85, 2.02 * 10^{0.028*(25-T)})$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.92 * 2.02 * 10^{0.028*(25-MAX(T,7))}$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$
Rio Hondo (Upstream of Whittier Narrows Dam)	**ELS Present (from April 1 – September 30)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * MIN(2.85, 3.04 * 10^{0.028*(25-T)})$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ **ELS Absent (from October 1 – March 31)** ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 3.04 * 10^{0.028*(25-MAX(T,7))}$~~ $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$

WATERBODY	30-DAY AVERAGE OBJECTIVE
Coyote Creek (Long Beach WRP to confluence with San Gabriel River)	~~ELS Absent (year round)~~ ~~$CCC = \left(\frac{0.0676}{1+10^{7.688-pH}} + \frac{2.912}{1+10^{pH-7.688}}\right) * 0.854 * 2.96 * 10^{0.028*(25-MAX(T,7))}$~~ ELS Present (from April 1 – September 30) $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times MIN\,(6.920, (7.547 \times 10^{0.028\times(20-T)})$ ELS Absent (from October 1 – March 31) $CCC = 0.9405 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times (7.547 \times 10^{0.028\times(20-MAX(T,7)})$

Implementation

Implementation Provisions for the Application of Ammonia Objectives to Inland Surface Waters in the Los Angeles Region

1. Determination of Freshwater, Brackish Water or Saltwater Conditions[11]

(1) For inland surface waters in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the applicable objectives are the freshwater objectives, based on the US EPA "1999 Update of Ambient Water Quality Criteria for Ammonia." (2) For waters in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, the applicable objectives are a 4-day average concentration of 0.035 mg un-ionized NH_3/L and a one-hour average concentration of 0.233 mg un-ionized NH_3/L. (3) For waters in which the salinity is between 1 and 10 parts per thousand, the applicable objectives are the more stringent of the freshwater or saltwater objectives. (a) However, the Regional Board may by adoption of a resolution approve the use of either freshwater or saltwater objectives for an enclosed bay, wetland or estuary with findings that scientifically defensible information and data demonstrate that on a site-specific basis the biology of the water body is dominated by freshwater aquatic life and that freshwater objectives are more appropriate; or conversely, the biology of the water body is dominated by saltwater aquatic life and that saltwater objectives are more appropriate. When determining the biotic dominance of a water body, the following factors shall be considered: the nature of the conditions causing the dominance (e.g., natural vs. anthropogenic), the historical conditions of the water body, and the reversibility of the existing conditions.

2. Selection of Ammonia Objective – Mussels Absent vs. Mussels Present

The mussels absent condition shall be implemented in all water body reaches in the Los Angeles Region. The Regional Board will consider and weigh the breadth and depth of scientific evidence in determining whether to shift from a mussels absent to mussels present condition in a water body. If, in the future, new data and information are submitted to the Regional Board that provide substantial evidence showing mussels are present in a water body and/or the characteristics of a water body have changed due to restoration efforts such that there is habitat suitable for mussels to be present, in that water body or the adjacent or downstream water bodies, the Regional Board

[11] *The procedure described in this section to determine which objectives should be applied is the same method employed in the California Toxics Rule (Title 40, Code of Federal Regulations, § 131.38(c)(3)).*

shall implement the mussels present condition to ensure protection of mussels in the respective water body. The Regional Board will use the record to support a Basin Plan amendment to designate the waterbody subject to the mussels present condition.

3. Selection of One-hour Average Objective – Salmonids Present vs. Salmonids Absent

It is assumed that salmonids may be present in waters designated in the Basin Plan as "COLD" or "MIGR" and that salmonids are absent in waters not designated in the Basin Plan as "COLD" or "MIGR," in the absence of additional information to the contrary.

4. Selection of 30-day Average Objective – Early Life Stage (ELS) Provision

Early life stages of fish are presumptively present and must be protected at all times of the year unless the water body is listed in Table ~~3-5~~ 3-8 or unless a site-specific study is conducted, which justifies applying the ELS absent condition or a seasonal ELS present condition. Any change in the implementation provision for the ELS present/absent condition, including the assignment of water bodies, must be approved through the Basin Plan Amendment process.

~~*If recent data and information are submitted to the Regional Board that provide substantial evidence that the physical conditions of a water body listed in Table 3-5 have changed due to restoration efforts such that there is habitat suitable for Early Life Stages of fish and one or more fish species that reproduce below 15 degrees Celsius is known to be present, in that or the adjacent water bodies, the Regional Board shall reconsider this implementation provision to ensure protection of Early Life Stages of fish in the water body.*~~

To justify the ELS absent provision, information regarding fish species distributions, spawning periods, nursery periods and the duration of early life stages found in the water body must be presented. Expert opinions from fisheries biologists and other scientists will be considered. Where it can be obtained, a consensus opinion from a diverse body of experts would carry significant weight in determining the presence or absence of the ELS. Information on water body temperature, including spatial, seasonal and inter-annual variability will also be considered. The determination of the time frame during the year when early life stages are most likely not to be present in numbers that, if chronic toxicity did occur, would affect the long-term success of the fish populations, should include adequate scientific justification. The Regional Board will use the record supporting a Basin Plan amendment as the basis upon which to ~~approve or disapprove~~

~~changes to these implementation provisions for the 30-day average ammonia objective~~ specify a water body with an ELS absent condition. The record should clearly explain all the factors and information considered in arriving at the determination. The Regional Board will consider and weigh the breadth and depth of scientific evidence in determining whether to remove the early life stage specification of a water body.

~~Where there is a site-specific ammonia objective for the water body, and the water body is not identified as ELS absent due to physical characteristics of the water body, separate implementation provisions to protect Early Life Stages of fish may apply, since the temperature threshold at which ELS are more sensitive than invertebrates may change based on these site-specific conditions. The potential for seasonality for all ELS present water bodies will be considered before the ELS provision is applied to water bodies with a site-specific objective.~~

Notwithstanding anything to the contrary herein, a watershed may have some reaches and tributaries with ELS present conditions and others with ELS absent conditions. Implementation actions to achieve applicable ammonia objectives must implement downstream objectives.

~~Table 3-5. Water Bodies Subject to 30-day Average Objective Applicable to "ELS Absent" Condition~~[*]

~~HUC 12 No.~~	~~Waterbody~~
~~CALLEGUAS-CONEJO CREEK WATERSHED~~	
~~180701030107~~	~~Calleguas Creek Reach 2 (Estuary to Potero Road)~~
~~180701030106~~	~~Revolon Slough (Calleguas Creek Rch 2 to Pleasant Valley Rd.)~~
~~180701030107~~	~~Revolon Slough (Pleasant Valley Rd. to Central Ave.)~~
~~180701030106~~	~~Reach 5 – Beardsley Channel (above Central Ave.)~~
~~180701030105~~	~~Conejo Creek~~
~~180701030107~~	~~Arroyo Conejo (Conejo Creek to North Fork Arroyo Conejo)~~
~~180701030104~~	~~Arroyo Conejo (above confl. with North Fork Arroyo Conejo)~~
~~180701030105~~	~~Arroyo Las Posas (Calleguas Creek Rch 3 to Long Canyon)~~
~~180701030103~~	~~Arroyo Las Posas (Long Canyon to Hitch Rd.)~~
~~180701030103~~	~~Arroyo Simi (Hitch Rd. to Happy Camp Canyon)~~
~~180701030102~~	~~Arroyo Simi (Happy Camp Canyon to Alamos Canyon)~~
~~180701030102~~	~~Arroyo Simi (Alamos Canyon to Tapo Canyon Creek)~~
~~180701030101~~	~~Arroyo Simi (above Tapo Canyon Creek)~~
~~MALIBU CREEK WATERSHED~~	
~~180701040104~~	~~Cold Creek~~
~~180701040102~~	~~Medea Creek Reach 1 (Malibou Lake to Lindero Creek Reach 1)~~
~~180701040102~~	~~Medea Creek Reach 2 (above Lindero Creek Reach 1)~~

HUC 12 No.	Waterbody
180701040104	Triunfo Creek Reach 1 (Malibou Lake to Lobo Canyon)
180701040101	Triunfo Creek Reach 2 (Lobo Canyon to Westlake Lake)
BALLONA CREEK WATERSHED	
180701040300	Ballona Creek Reach 2 (Estuary to National Blvd.)
180701040300	Ballona Creek Reach 1 (above National Blvd.)
DOMINGUEZ CHANNEL WATERSHED	
180701060102	Dominguez Channel (Estuary to 135th St.)
180701060101	Dominguez Channel (above 135th St)
LOS ANGELES RIVER WATERSHED	
180701050402	Los Angeles River Reach 1 (Estuary to Carson St.)
180701050402	Los Angeles River Reach 2 (Carson St. to Rio Hondo Reach 1)
180701050401	Los Angeles River Reach 2 (Rio Hondo Reach 1 to Figueroa St.)
180701050210	Los Angeles River Reach 3 (Figueroa St. to Riverside Dr.)
180701050208	Los Angeles River Reach 4 (Riverside Dr. to Sepulveda Dam)
180701050208	Los Angeles River Reach 5 (Sepulveda Dam to Balboa Blvd.)
180701050208	Los Angeles River Reach 6 (above Balboa Blvd.)
180701050303	Rio Hondo Reach 1 (Los Angeles River Reach 2 to Santa Ana Fwy)
180701050303	Rio Hondo Reach 2 (Santa Ana Fwy to Whittier Narrows Dam)
180701050302	Rio Hondo Reach 3 (except from Whittier Narrows to 4 miles north)
180701050209	Arroyo Seco Reach 3 (above Devils Gate Dam)
180701050208	Tujunga Wash
180701050402	Compton Creek
180701050209	Arroyo Seco Reach 1 (Los Angeles River Reach 2 to Holly St.)
180701050209	Arroyo Seco Reach 2 (Holly St. to Devils Gate Dam)
180701050208	Burbank Western Channel
180701050206	Pacoima Wash
SAN GABRIEL RIVER WATERSHED	
180701060606	San Gabriel River Reach 1 (San Gabriel River Estuary to Firestone Blvd.)
180701060606	San Gabriel River Reach 2 (Firestone Blvd. to Whittier Narrows Dam)
180701060601	San Gabriel River Reach 3 (Whittier Narrows Dam to San Jose Creek)
180701060601	San Gabriel River Reach 3 (San Jose Creek to Ramona Blvd.)
180701060601	San Gabriel River Reach 4 (Ramona Blvd. to Santa Fe Dam)
180701060601	San Gabriel River Reach 5 (Santa Fe Dam to Huntington Dr.)
180701060601	San Gabriel River Reach 5 (Huntington Dr. to Van Tassel Canyon)
180701060506	Coyote Creek (San Gabriel River Estuary to La Cañada Verde Creek)
180701060603	Coyote Creek (above La Cañada Verde Creek)
180701060502	San Jose Creek Reach 1 (San Gabriel River Reach 3 to Temple Ave.)
180701060501	San Jose Creek Reach 2 (Temple Ave. to Thompson Wash)

*Notes:

1) All wetlands/estuaries and lagoons are assumed to have ELS.

~~HUC 12 No.~~	~~Waterbody~~

~~2) Whittier Narrows flood control basin is listed separately in the Basin Plan~~

~~3) Based on published literature and expert opinion, fish species known to reproduce in significant numbers below 15 degrees Celsius are absent in these water bodies, or the water bodies are known to have physical conditions that preclude reproduction and early development of these species in significant numbers. These species include: steelhead/rainbow trout, three-spine stickleback, brown trout, prickly sculpin, staghorn sculpin, striped mullet, starry flounder, arrow goby, and Pacific lamprey.~~

5. Existence of Threatened or Endangered Species

Where the Regional Board determines that endangered or threatened species in the Los Angeles Region are more sensitive to a pollutant than the species upon which the objectives are based, more stringent, site-specific modifications of the objectives shall be performed using U.S. EPA approved methods.[12] *Temperature and pH must be adjusted to match the conditions used to calculate the objectives. Tests to determine site-specific objectives for threatened and endangered species can be conducted in site water or laboratory water.*

6. Translation of Objectives into Effluent Limits[13]

If the Regional Board determines that water quality based effluent limitations are necessary to control ammonia in a discharge, the permit shall contain effluent limitations for ammonia using one of the following methods:

1. *Use the following procedure based on a steady-state model:*

   Step 1: Identify the applicable water quality objectives for ammonia for the receiving water immediately downstream of the discharge.

   Step 2a: For each water quality objective, calculate the effluent concentration allowance (ECA) using the following steady-state mass balance model:

   If a mixing zone has not been authorized by the Regional Board, or when WQO $\leq$ B:

[12] *U.S. EPA. 1985. "Guidance for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and their Uses". U.S. EPA. 1994. "Water Quality Standards Handbook, Second Edition", Chapter 3, Section 3.7.4 "The Recalculation Procedure".*

[13] *The method whereby objectives are translated to effluent limits is similar to the method contained in the "Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California" (2000). The method is also consistent with that outlined in the U.S. EPA "Technical Support Document for Water Quality-based Toxics Control (1991).*

ECA = WQO

If a mixing zone has been authorized by the Regional Board:[14]

ECA = WQO + D (WQO - B) when WQO > B

Where: WQO = water quality objective (adjusted as described in Step 2b, if necessary, for temperature, pH, and salinity.)

D = dilution credit

B = ambient background concentration

The dilution credit (D) shall be derived taking into account water body characteristics and the type of discharge (i.e. completely-mixed or incompletely-mixed with the receiving water), using established procedures in the "Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California" (2000) or other appropriate U.S. EPA approved methodologies. The resulting dilution credit must be approved by the Executive Officer.

The ambient background concentration shall be the observed maximum as determined in accordance with procedures in the "Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California" (2000) or other appropriate U.S. EPA approved methodologies. The resulting ambient background concentration must be approved by the Executive Officer.

Step 2b: In order to adjust the un-ionized saltwater ammonia objective to an ECA expressed as total ammonia, the following equation shall be used:

$$[NH_4^+]+[NH_3] = [NH_3] + [NH_3]*10 \text{ ^ } (pK_a^s + 0.0324\ (298-T) + 0.0415\ P/T - pH)$$

Where: P = 1 atm

T = temperature (^{o} K)

*pK_a^s = 0.116 * i + 9.245, the stoichiometric acid hydrolysis constant of ammonium ions in saltwater based on i*

[14] *Mixing zones may be authorized on a discharge-by-discharge basis per the mixing zone provision in Chapter 4 of the Basin Plan.*

i = 19.9273 S (1000-1.005109 S) $^{-1}$, the molal ionic strength of saltwater based on S

S = salinity

(Per U.S. EPA Ambient Water Quality Criteria for Ammonia (Saltwater)-1989)

Step 3: For each ECA calculated in Step 2, determine the long-term average discharge condition (LTA) by multiplying the ECA with a factor (multiplier) that adjusts for effluent variability. The multiplier shall be calculated as described below, or shall be found in Table 3-6. To use Table 3-6, the coefficient of variation (CV)[15] for the effluent ammonia concentration must first be calculated. If (a) the number of effluent data points is less than 10, or (b) at least 80 percent of the effluent data are reported as not detected, then the CV shall be set equal to 0.6. When calculating the CV in this procedure, if a data point is below the detection limit in an effluent sample, one-half the detection limit shall be used as the value in the calculation. Multipliers for one-hour average, four-day average, and 30-day average objectives for ammonia that correspond to the CV can be found in Table 3-6.

ECA Multipliers:

ECA multiplier$_{1\text{-}hour99}$ = $e^{(0.5s^2 - zs)}$

ECA multiplier$_{4\text{-}day99}$ = $e^{(0.5s_4^2 - zs_4)}$

ECA multiplier$_{30\text{-}day99}$ = $e^{(0.5s_{30}^2 - zs_{30})}$

Where *s = standard deviation*

$$s = [ln(CV^2 + 1)]^{0.5}$$

$$s^2 = ln(CV^2 + 1)$$

$$s_4 = [ln(CV^2/4 + 1)]^{0.5}$$

$$s_4^2 = ln(CV^2/4 + 1)$$

$$s_{30} = [ln(CV^2/30 + 1)]^{0.5}$$

$$s_{30}^2 = ln(CV^2/30 + 1)$$

[15] *The coefficient of variation (CV) is a measure of the data variability and is calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.*

z = 2.326 for 99th percentile probability basis

LTA Equations:

*$LTA_{1\text{-}hour99}$ = $ECA_{1\text{-}hour}$ * $ECA\ multiplier_{1\text{-}hour99}$*
*$LTA_{4\text{-}day99}$ = $ECA_{4\text{-}day}$ * $ECA\ multiplier_{4\text{-}day99}$*
*$LTA_{30\text{-}day99}$ = $ECA_{30\text{-}day}$ * $ECA\ multiplier_{30\text{-}day99}$*

Step 4: Select the lowest (most limiting) of the LTAs derived in Step 3 (LTA_{min}).

Step 5: Calculate water quality based effluent limitations (a maximum daily effluent limitation, MDEL, and an average monthly effluent limitation, AMEL) by multiplying LTA_{min} (as selected in Step 4) with a factor (multiplier) that adjusts the averaging period and exceedance frequency of the objective, and the effluent monitoring frequency, as follows:

MDEL and AMEL Equations:

*MDEL = LTA_{min} * $MDEL\ multiplier_{99}$*
*AMEL = LTA_{min} * $AMEL\ multiplier_{95}$*

The MDEL and AMEL multipliers shall be calculated as described below, or shall be found in Table 3-7 using the previously calculated CV and monthly sampling frequency (n) of ammonia in the effluent. If the LTA_{min} selected in Step 4 is $LTA_{4\text{-}day99}$ and the sampling frequency is four times per month or less, then n shall be set equal to 4. If the LTA_{min} selected in Step 4 is $LTA_{30\text{-}day99}$ and the sampling frequency is 30 times per month or less, then n shall be set equal to 30.

MDEL and AMEL Multipliers:

$MDEL\ multiplier_{99}$ = $e^{(zs-0.5s^2)}$

Where *z = 2.326 for 99th percentile probability basis*

$$s = [ln(CV^2 + 1)]^{0.5}$$

$$s^2 = ln(CV^2 + 1)$$

$AMEL\ multiplier_{95}$ = $e^{(zs_n-0.5s_n^2)}$

Where *z = 1.645 for 95th percentile probability basis*

$$s_n = [ln(CV^2/n + 1)]^{0.5}$$

$$s_n^2 = ln(CV^2/n + 1)$$

n = number of samples per month

2. *Apply a dynamic model approved by the Regional Board.*

3. *If a Total Maximum Daily Load (TMDL) for ammonia is in effect, the permit shall contain effluent limitations for ammonia that are based on the waste load allocation for ammonia in the TMDL.*

Table 3-6 - Effluent Concentration Allowance (ECA)
Multipliers for Calculating Long-Term Averages (LTAs)

Coefficient of Variation (CV)	One-hour Multiplier	4-day Multiplier	30-day Multiplier
	99th Percentile Occurrence Probability	99th Percentile Occurrence Probability 4 day	99th Percentile Occurrence Probability 30 day
0.1	0.797	0.891	0.959
0.2	0.643	0.797	0.919
0.3	0.527	0.715	0.882
0.4	0.440	0.643	0.846
0.5	0.373	0.581	0.812
0.6	0.321	0.527	0.78
0.7	0.281	0.481	0.75
0.8	0.249	0.440	0.721
0.9	0.224	0.404	0.693
1.0	0.204	0.373	0.667
1.1	0.187	0.345	0.642
1.2	0.174	0.321	0.619
1.3	0.162	0.300	0.596
1.4	0.153	0.281	0.575
1.5	0.144	0.264	0.555
1.6	0.137	0.249	0.535
1.7	0.131	0.236	0.517
1.8	0.126	0.224	0.5
1.9	0.121	0.214	0.483
2.0	0.117	0.204	0.468
2.1	0.113	0.195	0.453
2.2	0.110	0.187	0.438
2.3	0.107	0.180	0.425
2.4	0.104	0.174	0.412
2.5	0.102	0.168	0.4
2.6	0.100	0.162	0.388
2.7	0.098	0.157	0.377
2.8	0.096	0.153	0.366
2.9	0.094	0.148	0.356
3.0	0.093	0.144	0.346
3.1	0.091	0.141	0.337
3.2	0.090	0.137	0.328
3.3	0.089	0.134	0.32
3.4	0.088	0.131	0.312
3.5	0.087	0.128	0.304
3.6	0.086	0.126	0.297
3.7	0.085	0.123	0.29
3.8	0.084	0.121	0.283
3.9	0.083	0.119	0.277
4.0	0.082	0.117	0.271

Table 3-7 - Long-Term Average (LTA) Multipliers for Calculating Effluent Limitations

Coefficient of Variation	MDEL Multiplier	AMEL Multiplier		
	99th Percentile Occurrence Probability	95th Percentile Occurrence Probability		
(CV)		n=4	n=8	n=30
0.1	1.25	1.08	1.06	1.03
0.2	1.55	1.17	1.12	1.06
0.3	1.90	1.26	1.18	1.09
0.4	2.27	1.36	1.25	1.12
0.5	2.68	1.45	1.31	1.16
0.6	3.11	1.55	1.38	1.19
0.7	3.56	1.65	1.45	1.22
0.8	4.01	1.75	1.52	1.26
0.9	4.46	1.85	1.59	1.29
1.0	4.90	1.95	1.66	1.33
1.1	5.34	2.04	1.73	1.36
1.2	5.76	2.13	1.80	1.39
1.3	6.17	2.23	1.87	1.43
1.4	6.56	2.31	1.94	1.47
1.5	6.93	2.40	2.00	1.50
1.6	7.29	2.48	2.07	1.54
1.7	7.63	2.56	2.14	1.57
1.8	7.95	2.64	2.20	1.61
1.9	8.26	2.71	2.27	1.64
2.0	8.55	2.78	2.33	1.68

6. Receiving Water Compliance Determination

Per Implementation Provision No. 1, the following methods for determining compliance with proposed objectives shall be used:

If salinity sampled at a particular receiving water station indicates saline conditions (equal to or greater than 10 ppt), then saltwater objectives shall apply.

If salinity sampled at a particular receiving water station indicates freshwater conditions (equal to or less than 1 ppt), then freshwater objectives shall apply.

If salinity sampled at a particular receiving water station indicates brackish conditions (greater than 1 but less than 10 ppt), then the more stringent of the freshwater or saltwater objectives shall apply except where the Regional Board, by adoption of a resolution, approves the use of either freshwater or saltwater objectives per Implementation Provision 1(3)(a).