TITLE 327 WATER POLLUTION CONTROL BOARD

Proposed Rule as Preliminarily Adopted
LSA Document #06-573

DIGEST

Amends 327 IAC 2-1-6, 327 IAC 2-1.5-8, and 327 IAC 5-10-6 concerning compliance with the bacteriological criteria and the application of a single sample maximum limitation of 235 most probable number (MPN) or colony forming units (cfu)/100 ml of Escherichia coli (E. coli) bacteria in waters of the state. Effective 30 days after filing with the Publisher.

HISTORY

First Notice of Comment Period: December 20, 2006, Indiana Register (DIN: 20061220-IR-327060573FNA).

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Date of Second Hearing: November 14, 2007.

327 IAC 2-1-6
327 IAC 2-1.5-8
327 IAC 5-10-6

SECTION 1. 327 IAC 2-1-6 IS AMENDED TO READ AS FOLLOWS:

327 IAC 2-1-6 Minimum surface water quality standards
Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1; IC 14-22-9

Sec. 6. (a) The following are minimum surface water quality conditions:

(1) All surface waters at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

(A) Will settle to form putrescent or otherwise objectionable deposits.

(B) Are in amounts sufficient to be unsightly or deleterious.

(C) Produce:

(i) color;

(ii) visible oil sheen;

(iii) odor; or
(iv) other conditions;
in such degree as to create a nuisance.
(D) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to:
(i) create a nuisance;
(ii) be unsightly; or
(iii) otherwise impair the designated uses.
(E) Are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill, aquatic life, other animals, plants, or humans. To assure protection of aquatic life, concentrations of toxic substances shall not exceed the final acute value (FAV = 2 (AAC)) in the undiluted discharge or the acute aquatic criterion (AAC) outside the zone of initial dilution or, if applicable, the zone of discharge-induced mixing:
(i) for certain substances, an AAC is established and set forth in subdivision (3), Table 6-1 and subdivision (3), Table 6-2 (which table incorporates subdivision (4), Table 6-3);
(ii) for substances for which an AAC is not specified in subdivision (3), Table 6-1 or subdivision (3), Table 6-2, an AAC can be calculated by the commissioner using the procedures in section 8.2 of this rule; and
(iii) the AAC determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 8.9 of this rule.
This clause shall not apply to the chemical control of plants and animals when that control is performed in compliance with approval conditions specified by the Indiana department of natural resources as provided by IC 14-22-9.
(2) At all times, all surface waters outside of mixing zones shall be free of substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants. To assure protection against the adverse effects identified in this subdivision, the following requirements are established:
(A) A toxic substance or pollutant shall not be present in such waters in concentrations that exceed the most stringent of the following continuous criterion concentrations (CCCs):
(i) A chronic aquatic criterion (CAC) to protect aquatic life from chronic toxic effects.
(ii) A terrestrial life cycle safe concentration (TLSC) to protect terrestrial organisms from toxic effects that may result from the consumption of aquatic organisms or water from the waterbody.
(iii) A human life cycle safe concentration (HLSC) to protect human health from toxic effects that may result from the consumption of aquatic organisms or drinking water from the waterbody.
(iv) For carcinogenic substances, a criterion to protect human health from unacceptable cancer risk of greater than one (1) additional occurrence of cancer per one hundred thousand (100,000) population.
(B) For certain substances, one (1) or more of the CCCs identified in clause (A) are established and set forth in subdivision (3), Table 6-1 and subdivision (3),

Table 6-2 (which table incorporates subdivision (4), Table 6-3).
(C) For substances for which one (1) or more of the CCCs identified in clause (A) are not specified in subdivision (3), Table 6-1 or subdivision (3), Table 6-2, such criterion or criteria may be calculated by the commissioner using the corresponding procedures prescribed by sections 8.3 through 8.6 of this rule.
(D) A CCC determined under clause (B) or (C) may be modified on a site-specific basis to reflect local conditions in accordance with section 8.9 of this rule.
(E) The CAC and TLSC for a substance apply in all surface waters outside a mixing zone for a discharge of that substance. Similarly, in waters where a public water system intake is not present or is unaffected by the discharge of a substance, the HLSC and the carcinogenic criterion for that substance based on consumption of organisms from the waterbody and only incidental ingestion of water shall apply to all surface waters outside the mixing zone for a discharge of that substance. In surface waters where a public water system intake is present, the HLSC and the carcinogenic criterion for a substance based on consumption of organisms and potable water from the waterbody shall apply at the point of the public water system intake.

(3) The following establishes surface water quality criteria for specific substances:

Table 6-1
Surface Water Quality Criteria for Specific Substances

AAC (Maximum)	CCC		
	Outside of Mixing Zone		Point of Water Intake
Substances	Aquatic Life (CAC) (4-Day Average)	Human Health (30-Day Average)	Human Health (30-Day Average)
Metals (µg/l)			
(Total recoverable)			
Antimony		45,000 (T)	146 (T)
Arsenic (III)	#	#	0.175 (C)	0.022 (C)
Barium			1,000 (D)
Beryllium		1.17 (C)	0.068 (C)
Cadmium	#	#	10 (D)
Chromium (III)	#	#	3,433,000 (T)	170,000 (T)
Chromium (VI)	#	#	50 (D)
Copper	#	#	
Lead	#	#	50 (D)
Mercury$	2.4	0.012	0.15 (T)	0.14 (T)
Nickel	#	#	100 (T)	13.4 (T)
Selenium	130*	35	10 (D)
Silver	#		50 (D)
Thallium		48 (T)	13 (T)
Zinc	#	#	
Organics (µg/l)			
Acrolein		780 (T)	320 (T)
Acrylonitrile		6.5 (C)	0.58 (C)

Aldrin$	1.5*		0.00079 (C)	0.00074 (C)
Benzene			400 (C)	6.6 (C)
Benzidine			0.0053 (C)	0.0012 (C)
Carbon Tetrachloride			69.4 (C)	4.0 (C)
Chlordane$	1.2*	0.0043	0.0048 (C)	0.0046 (C)
Chlorinated Benzenes				
Monochlorobenzene				488 (T)
1,2,4,5-Tetrachlorobenzene $			48 (T)	38 (T)
Pentachlorobenzene $			85 (T)	74 (T)
Hexachlorbenzene$			0.0074 (C)	0.0072 (C)
Chlorinated Ethanes				
1,2-dichloroethane			2,430 (C)	9.4 (C)
1,1,1-trichloroethane			1,030,000 (T)	18,400 (T)
1,1,2-trichloroethane			418 (C)	6.0 (C)
1,1,2,2-tetrachloroethane			107 (C)	1.7 (C)
Hexachloroethane			87.4 (C)	19 (C)
Chlorinated Phenols				
2,4,5-trichlorophenol				2,600 (T)
2,4,6-trichlorophenol			36 (C)	12 (C)
Chloroalkyl Ethers				
bis(2-chloroisopropyl) ether			4,360 (T)	34.7 (T)
bis(chloromethyl) ether			0.018 (C)	0.000038 (C)
bis(2-chloroethyl) ether			13.6 (C)	0.3 (C)
Chloroform			157 (C)	1.9 (C)
Chlorpyrifos	0.083	0.041		
DDT$	0.55*	0.0010	0.00024 (C)	0.00024 (C)
Dichlorobenzenes			2,600 (T)	400 (T)
Dichlorobenzidine			0.2 (C)	0.1 (C)
1,1-dichloroethylene			18.5 (C)	0.33 (C)
2,4-dichlorophenol				3,090 (T)
Dichloropropenes			14,100 (T)	87 (T)
Dieldrin$	1.3*	0.0019	0.00076 (C)	0.00071 (C)
2,4-dinitrotoluene			91 (C)	1.1 (C)
Dioxin (2,3,7,8-TCDD)$			0.0000001 (C)	0.0000001 (C)
1,2-diphenylhydrazine			5.6 (C)	0.422 (C)
Endosulfan	0.11*	0.056	159 (T)	74 (T)
Endrin$	0.09*	0.0023		1.0 (D)
Ethylbenzene			3,280 (T)	1,400 (T)
Fluoranthene			54 (T)	42 (T)
Halomethanes			157 (C)	1.9 (C)
Heptachlor$	0.26*	0.0038	0.0028 (C)	0.0028 (C)
Hexachlorobutadiene$			500 (C)	4.47 (C)
Hexachlorocyclohexane (HCH)				
alpha HCH$			0.31 (C)	0.09 (C)

beta HCH$			0.55 (C)	0.16 (C)
gamma HCH (Lindane)$	1.0*	0.080	0.63 (C)	0.19 (C)
Technical HCH$			0.41 (C)	0.12 (C)
Hexachlorocyclopentadiene				206 (T)
Isophorone			520,000 (T)	5,200 (T)
Nitrobenzene				19,800 (T)
Nitrophenols				
4,6-dinitro-o-cresol			765 (T)	13.4 (T)
Dinitrophenol			14,300 (T)	70 (T)
Nitrosamines				
N-nitrosodiethylamine			12.4 (C)	0.008 (C)
N-nitrosodimethylamine			160 (C)	0.014 (C)
N-nitrosodibutylamine			5.9 (C)	0.064 (C)
N-nitrosodiphenylamine			161 (C)	49 (C)
N-nitrosopyrrolidine			919 (C)	0.16 (C)
Parathion	0.065	0.013		
Pentachlorophenol	$e^{(1.005\ [pH]-4.830)}$	$e^{(1.005\ [pH]-5.290)}$		1,000 (T)
Phenol				3,500 (T)
Phthalate Esters				
Dimethyl phthalate			2,900,000 (T)	313,000 (T)
Diethyl phthalate			1,800,000 (T)	350,000 (T)
Dibutyl phthalate			154,000 (T)	34,000 (T)
Di-2-ethylhexyl phthalate			50,000 (T)	15,000 (T)
Polychlorinated Biphenyls (PCBs)$		0.014	0.00079 (C)	0.00079 (C)
Carcinogenic Polynuclear Aromatic Hydrocarbons (PAHs)			0.31 (C)	0.028 (C)
Tetrachloroethylene			88.5 (C)	8 (C)
Toluene			424,000 (T)	14,300 (T)
Toxaphene$	0.73	0.0002	0.0073 (C)	0.0071 (C)
Trichloroethylene			807 (C)	27 (C)
Vinyl Chloride			5,246 (C)	20 (C)
<u>Other Substances</u>				
Asbestos (fibers/liter)				300,000 (C)
Chlorides (mg/l)	860	230		
Chlorine (Total Residual) (µg/l)	19	11		
Chlorine[a] (mg/l) (intermittent, total residual)		0.2		
Cyanide (Free) (µg/l)	22	5.2		
Cyanide (Total) (µg/l)				200 (D)
Nitrate-N + Nitrite-N (mg/l)				10 (D)
Nitrite-N (mg/l)				1.0 (D)

Fluoride shall not exceed two (2.0) mg/l in all surface waters outside of the mixing zone except

the Ohio River and Interstate Wabash River where it shall not exceed one (1.0) mg/l outside of the mixing zone.

Sulfates shall not exceed one thousand (1,000) mg/l in all surface waters outside of the mixing zone.

#The AAC and CAC for this substance are established in Table 6-2.

*One-half (½) of the final acute value (FAV) as calculated by procedures developed by U.S. EPA in 1980. This value would correspond to acute aquatic values calculated using IDEM procedures or U.S. EPA procedures developed in 1985 in which the calculated FAV is divided by two (2) to reduce acute toxicity.

T derived from threshold toxicity.

C derived from nonthreshold cancer risk.

D derived from drinking water standards, equal to or less than threshold toxicity.

$This substance is a bioaccumulative chemical of concern.

[a]To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours.

Table 6-2

Surface Water Quality Criteria for Specific Substances

Substances	AAC (Maximum) (µg/l)	AAC Conversion Factors	CAC (4-Day Average) (µg/l)	CAC Conversion Factors
Metals (dissolved)[1]				
Arsenic (III)	WER[2](360)	1.000	WER[2](190)	1.000
Cadmium	WER[2]($e^{(1.128 [1n(hardness)]-3.828)}$)	1.136672-[(ln hardness)(0.041 838)]	WER[2]($e^{(0.7852 [1n(hardness)]-3.490)}$)	1.101672-[(ln hardness)(0.041838)]
Chromium (III)	WER[2]($e^{(0.819 [1n(hardness)]+3.688)}$)	0.316	WER[2]($e^{(0.8190 [1n(hardness)]+1.561)}$)	0.860
Chromium (VI)	WER[2](16)	0.982	WER[2](11)	0.962
Copper	WER[2]($e^{(0.9422 [1n(hardness)]-1.464)}$)	0.960	WER[2]($e^{(0.8545 [1n(hardness)]-1.465)}$)	0.960
Lead	WER[2]($e^{(1.273 [1n(hardness)]-1.460)}$)	1.46203-[(ln hardness)(0.145 712)]	WER[2]($e^{(1.273 [1n(hardness)]-4.705)}$)	1.46203-[(ln hardness)(0.145712)]
Nickel	WER[2]($e^{(0.8460 [1n(hardness)]+3.3612)}$)	0.998	WER[2]($e^{(0.8460 [1n(hardness)]+1.1645)}$)	0.997
Silver	WER[2]($e^{(1.72 [ln(hardness)]-6.52)}/2$[3])	0.85		
Zinc	WER[2]($e^{(0.8473 [ln(hardness)]+0.8604)}$)	0.978	WER[2]($e^{(0.8473 [ln(hardness)]+0.7614)}$)	0.986

[1] The AAC and CAC columns of this table contain total recoverable metals criteria (numeric and hardness-based). The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the AAC or CAC. This dissolved AAC or CAC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limitations (WQBELs).

[2] A value of one (1) shall be used for the water-effect ratio (WER) unless an alternate value is established under section 8.9 of this rule.

[3] One-half (½) of the ~~final acute value~~ FAV as calculated by procedures developed by U.S. EPA in 1980. This value would correspond to acute aquatic values calculated using IDEM procedures or U.S. EPA procedures developed in 1985 in which the calculated FAV is divided by two (2) to reduce acute toxicity.

(4) The following establishes dissolved ~~acute aquatic criteria~~ AAC and ~~chronic aquatic criteria~~ CAC for certain metals at selected hardness values calculated from the equations and conversion factors in subdivision (3), Table 6-2 and using a value of one (1) for the WER:

Table 6-3

Metals Concentrations in Micrograms Per Liter; Hardness in Milligrams Per Liter $CaCO_3$[1]

	Arsenic (III)		Cadmium		Chromium (III)		Chromium (VI)		Copper		Lead		Nickel		Silver		Zinc	
Hardness	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC	AAC	CAC
50	360	190	1.7	0.62	310	100	16	11	8.9	6.3	30	1.2	790	87	0.52	)	64	58
100	360	190	3.7	1.0	550	180	16	11	17	11	65	2.5	1400	160	1.7	)	110	100
150	360	190	5.7	1.4	760	250	16	11	25	16	100	3.9	2000	220	3.5	)	160	150
200	360	190	7.8	1.7	970	310	16	11	33	21	140	5.3	2500	280	5.7	)	210	190
250	360	190	10	2.0	1200	380	16	11	40	25	170	6.7	3100	340	8.3	)	250	230
300	360	190	12	2.3	1300	440	16	11	48	29	210	8.1	3600	400	11	)	290	270
350	360	190	14	2.6	1500	500	16	11	55	33	240	9.5	4100	450	15	)	330	300
400	360	190	17	2.9	1700	550	16	11	63	37	280	11	4600	510	19	)	370	340
450	360	190	19	3.1	1900	610	16	11	70	41	320	12	5100	560	23	)	410	370
500	360	190	21	3.4	2100	670	16	11	78	45	350	14	5500	610	27	)	450	410

[1] The dissolved metals criteria in this table have been rounded to two (2) significant digits in accordance with subdivision (3), Table 6-2. The equations and conversion factors in subdivision (3), Table 6-2 shall be used instead of the criteria in this table when dissolved metals criteria are used as intermediate values in a calculation, such as in the calculation of ~~water quality-based effluent limitations~~ WQBELs.

(b) This subsection establishes minimum surface water quality for aquatic life. In addition to subsection (a), subdivisions (1) through (5) are established to ensure conditions necessary for the maintenance of a well-balanced aquatic community. The following are applicable at any point in the waters outside of the mixing zone:

(1) There shall be no substances that:

(A) impart unpalatable flavor to food fish; or

(B) result in offensive odors in the vicinity of the water.

(2) No pH values below six (6.0) or above nine (9.0), except daily fluctuations that:

(A) exceed pH nine (9.0); and

(B) are correlated with photosynthetic activity;

shall be permitted.

(3) Concentrations of dissolved oxygen shall:

(A) average at least five (5.0) milligrams per liter per calendar day; and ~~shall~~

(B) not be less than four (4.0) milligrams per liter at any time.

(4) The following are conditions for temperature:

(A) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.

(B) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.

(C) The maximum temperature rise at any time or place above natural temperatures shall not exceed:

(i) five (5) degrees Fahrenheit (two and eight-tenths (2.8) degrees Celsius) in streams; and

(ii) three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius) in lakes and reservoirs.

(D) Water temperatures shall not exceed the maximum limits in the following table during more than one percent (1%) of the hours in the twelve (12) month period ending with any month. At no time shall the water temperature at such locations exceed the maximum limits in the following table by more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius):

Table 6-4

	Ohio River Main Stem EF(EC)	Other Indiana Streams EF(EC)
January	50 (10.0)	50 (10.0)
February	50 (10.0)	50 (10.0)
March	60 (15.6)	60 (15.6)
April	70 (21.1)	70 (21.1)
May	80 (26.7)	80 (26.7)
June	87 (30.6)	90 (32.2)
July	89 (31.7)	90 (32.2)
August	89 (31.7)	90 (32.2)
September	87 (30.7)	90 (32.2)

October	78 (25.6)	78 (25.5)
November	70 (21.1)	70 (21.1)
December	57 (14.0)	57 (14.0)

(5) The following criteria will be used to regulate ammonia:

(A) Except for waters covered in clause (B), at all times, all surface waters outside of mixing zones shall be free of substances in concentrations that, on the basis of available scientific data, are believed to be sufficient to:

(i) injure;

(ii) be chronically toxic to; or

(iii) be carcinogenic, mutagenic, or teratogenic to;

humans, animals, aquatic life, or plants.

(B) For those waters listed in subsection (c), the following ammonia criteria will apply outside the mixing zone:

Maximum Ammonia Concentrations
(Unionized Ammonia as N)***
(mg/l)

	Temperature (EC)						
pH	0	5	10	15	20	25	30
6.5	0.0075	0.0106	0.0150	0.0211	0.0299	0.0299	0.0299
6.6	0.0092	0.0130	0.0183	0.0259	0.0365	0.0365	0.0365
6.7	0.0112	0.0158	0.0223	0.0315	0.0444	0.0444	0.0444
6.8	0.0135	0.0190	0.0269	0.0380	0.0536	0.0536	0.0536
6.9	0.0161	0.0228	0.0322	0.0454	0.0642	0.0642	0.0642
7.0	0.0191	0.0270	0.0381	0.0539	0.0761	0.0761	0.0761
7.1	0.0244	0.0316	0.0447	0.0631	0.0892	0.0892	0.0892
7.2	0.0260	0.0367	0.0518	0.0732	0.1034	0.1034	0.1034
7.3	0.0297	0.0420	0.0593	0.0837	0.1183	0.1183	0.1183
7.4	0.0336	0.0474	0.0669	0.0946	0.1336	0.1336	0.1336
7.5	0.0374	0.0528	0.0746	0.1054	0.1489	0.1489	0.1489
7.6	0.0411	0.0581	0.0821	0.1160	0.1638	0.1638	0.1638
7.7	0.0447	0.0631	0.0892	0.1260	0.1780	0.1780	0.1780
7.8	0.0480	0.0678	0.0958	0.1353	0.1911	0.1911	0.1911
7.9	0.0510	0.0720	0.1017	0.1437	0.2030	0.2030	0.2030
8.0	0.0536	0.0758	0.1070	0.1512	0.2135	0.2135	0.2135
8.1	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.2	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.3	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.4	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.5	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.6	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.7	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.8	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
8.9	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137
9.0	0.0537	0.0758	0.1071	0.1513	0.2137	0.2137	0.2137

***To calculate total ammonia, divide the number in the table by the value determined by: $1/(10^{pK_a-pH} + 1)$.

Where: pK_a = 0.09018 + (2729.92/(T + 273.2))
pH = pH of water
T = EC

24-Hour Average Ammonia Concentrations
(Unionized Ammonia as N)***
(mg/l)
Temperature (EC)

pH	0	5	10	15	20	25	30
6.5	0.0005	0.0008	0.0011	0.0015	0.0015	0.0015	0.0015
6.6	0.0007	0.0010	0.0014	0.0019	0.0019	0.0019	0.0019
6.7	0.0009	0.0012	0.0017	0.0024	0.0024	0.0024	0.0024
6.8	0.0011	0.0015	0.0022	0.0031	0.0031	0.0031	0.0031
6.9	0.0014	0.0019	0.0027	0.0038	0.0038	0.0038	0.0038
7.0	0.0017	0.0024	0.0034	0.0048	0.0048	0.0048	0.0048
7.1	0.0022	0.0031	0.0043	0.0061	0.0061	0.0061	0.0061
7.2	0.0027	0.0038	0.0054	0.0077	0.0077	0.0077	0.0077
7.3	0.0034	0.0048	0.0068	0.0097	0.0097	0.0097	0.0097
7.4	0.0043	0.0061	0.0086	0.0122	0.0122	0.0122	0.0122
7.5	0.0054	0.0077	0.0108	0.0153	0.0153	0.0153	0.0153
7.6	0.0068	0.0097	0.0136	0.0193	0.0193	0.0193	0.0193
7.7	0.0086	0.0122	0.0172	0.0242	0.0242	0.0242	0.0242
7.8	0.0092	0.0130	0.0184	0.0260	0.0260	0.0260	0.0260
7.9	0.0098	0.0138	0.0196	0.0276	0.0276	0.0276	0.0276
8.0	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.1	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.2	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.3	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.4	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.5	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.6	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.7	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.8	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
8.9	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294
9.0	0.0103	0.0146	0.0206	0.0294	0.0294	0.0294	0.0294

***To calculate total ammonia, divide the number in the table by the value determined by: $1/(10^{pK_a - pH} + 1)$.

Where: pK_a = 0.09018 + (2729.92/(T + 273.2))
pH = pH of water
T = EC

(c) This subsection establishes surface water quality for cold-water fish. In addition to subsections (a) ~~through~~ **and** (b), the following criteria are established to ensure conditions necessary for the maintenance of a well-balanced, cold-water fish community and are applicable at any point in the waters outside of the mixing zone:

(1) Waters:

(A) designated as salmonid waters; and

(B) that shall be protected for cold-water fish;

are those waters designated by the Indiana department of natural resources for put-and-take trout fishing.

(2) In the waters listed in subdivision (1), dissolved oxygen concentrations shall not be less than:

(A) six (6.0) milligrams per liter at any time; and ~~shall not be less than~~

(B) seven (7.0) milligrams per liter in areas where spawning occurs during the spawning season and in areas used for imprinting during the time salmonids are being imprinted.

(3) In those waters listed in subdivision (1), the maximum temperature rise above natural shall not exceed two (2) degrees Fahrenheit (one and one-tenth (1.1) degrees Celsius) at any time or place and, unless due to natural causes, the temperature shall not exceed the following:

(A) Seventy (70) degrees Fahrenheit (twenty-one and one-tenth (21.1) degrees Celsius) at any time.

(B) Sixty-five (65) degrees Fahrenheit (eighteen and three-tenths (18.3) degrees Celsius) during spawning and imprinting periods.

(d) This subsection establishes bacteriological quality for recreational uses **during the recreational season as follows:**

(1) The recreational season is defined as the months of April through October, inclusive.

(2) In addition to subsection (a), the criteria in this subsection are to be used to **do the following:**

(A) Evaluate waters for full body contact recreational uses. ~~to~~

(B) Establish wastewater treatment requirements. ~~and to~~

(C) Establish effluent limits during the recreational season. ~~which is defined as the months of April through October, inclusive.~~

(3) For full body contact recreational uses, E. coli bacteria ~~using membrane filter (MF) count,~~ shall not exceed **the following:**

~~(1)~~ **(A)** One hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period. ~~and~~

~~(2)~~ **(B)** Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period.

If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in ~~subdivision (2)~~ **clause (B)** must be met.

(4) For demonstrating compliance with wastewater treatment requirements, sanitary wastewater dischargers shall ensure the following:

(A) The concentration of E. coli in the undiluted discharge does not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(5) Effluent limits to implement the criteria in subdivision (3) during the recreational season shall be established in NPDES permits by incorporating the following that are to be applied to the undiluted discharge:

(A) The concentration of E. coli in the undiluted discharge shall not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(e) This subsection establishes surface water quality for public water supply. In addition to subsections (a) and (d), the following criteria are established to protect the surface water quality at the point at which water is withdrawn for treatment for public supply:

(1) The coliform bacteria group shall not exceed the following:

(A) Five thousand (5,000) per one hundred (100) milliliters as a monthly average value (either MPN or MF count).

(B) Five thousand (5,000) per one hundred (100) milliliters in more than twenty percent (20%) of the samples examined during any month.

(C) Twenty thousand (20,000) per one hundred (100) milliliters in more than five percent (5%) of the samples examined during any month.

(2) Taste and odor producing substances, other than naturally occurring, shall not interfere with the production of a finished water by conventional treatment consisting of **the following:**

(A) Coagulation.

(B) Sedimentation.

(C) Filtration. ~~and~~

(D) Disinfection.

(3) The concentrations of either chlorides or sulfates shall not exceed two hundred fifty (250) milligrams per liter unless due to naturally occurring sources.

(4) The concentration of dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter unless due to naturally occurring sources. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(5) Surface waters shall be considered acceptable for public water supply if radium-226 and strontium-90 are present in amounts not exceeding three (3) and ten (10) picocuries per liter, respectively. In the known absence of strontium-90 and alpha emitters, the water supply is acceptable when the gross beta concentrations do not exceed one thousand (1,000) picocuries per liter.

(6) Chemical constituents in the waters shall not be present in such levels as to prevent, after conventional treatment, meeting the drinking water standards contained in 327 IAC 8-2, due to other than natural causes.

(f) This subsection establishes surface water quality for industrial water supply. In addition to subsection (a), the criterion to ensure protection of water quality at the point at which

water is withdrawn for use (either with or without treatment) for industrial cooling and processing is that, other than from naturally occurring sources, the dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter at any time. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(g) This subsection establishes surface water quality for agricultural uses. The criteria to ensure water quality conditions necessary for agricultural use are the same as those in subsection (a).

(h) This subsection establishes surface water quality for limited uses. The quality of waters classified for limited uses under section 3(a)(5) of this rule shall, at a minimum, meet the following criteria:

(1) The criteria contained in subsection (a).
(2) The criteria contained in subsection (d).
(3) The criteria contained in subsection (f), where applicable.
(4) The waters must be aerobic at all times.
(5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream at the point where it becomes physically or chemically capable of supporting a higher use or at its interface with a higher use water segment shall meet the criteria that are applicable to the higher use water.

(i) This subsection establishes surface water quality for exceptional uses. Waters classified for exceptional uses warrant extraordinary protection. Unless criteria are otherwise specified on a case-by-case basis, the quality of all waters designated for exceptional use shall be maintained without degradation. *(Water Pollution Control Board; 327 IAC 2-1-6; filed Sep 24, 1987, 3:00 p.m.: 11 IR 581; filed Feb 1, 1990, 4:30 p.m.: 13 IR 1020; errata, 13 IR 1861; errata filed Jul 6, 1990, 5:00 p.m.: 13 IR 2003; filed Feb 26, 1993, 5:00 p.m.: 16 IR 1725; errata filed May 7, 1993, 4:00 p.m.: 16 IR 2189; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1348; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2047; errata filed Apr 6, 2006, 2:48 p.m.: 29 IR 2546; errata, 29 IR 3027)*

SECTION 2. 327 IAC 2-1.5-8 IS AMENDED TO READ AS FOLLOWS:

327 IAC 2-1.5-8 Minimum surface water quality criteria
Authority: IC 13-14-8; IC 13-14-9; IC 13-18-3
Affected: IC 13-18-4; IC 13-30-2-1; IC 14-22-9

Sec. 8. (a) All surface water quality criteria in this section, except those provided in subsection (b)(1), will cease to be applicable when the stream flows are less than the applicable stream design flow for the particular criterion as determined under 327 IAC 5-2-11.4.

(b) The following are minimum surface water quality conditions:

(1) All surface waters within the Great Lakes system at all times and at all places, including waters within the mixing zone, shall meet the minimum conditions of being free from substances, materials, floating debris, oil, or scum attributable to municipal,

industrial, agricultural, and other land use practices, or other discharges that do any of the following:

(A) Will settle to form putrescent or otherwise objectionable deposits.

(B) Are in amounts sufficient to be unsightly or deleterious.

(C) Produce:

(i) color;

(ii) visible oil sheen;

(iii) odor; or

(iv) other conditions;

in such degree as to create a nuisance.

(D) Are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such degree as to:

(i) create a nuisance;

(ii) be unsightly; or

(iii) otherwise impair the designated uses.

(E) Are in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill, aquatic life, other animals, plants, or humans. To assure protection of aquatic life, the waters shall meet the following requirements:

(i) Concentrations of toxic substances shall not exceed the CMC or SMC outside the zone of initial dilution or the final acute value (FAV = 2 (CMC) or 2 (SMC)) in the undiluted discharge unless, for a discharge to a receiving stream or Lake Michigan, an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), in which case, the CMC or SMC shall be met outside the applicable alternate mixing zone:

(AA) for certain substances, a CMC is established and set forth in subdivision (3), Table 8-1 (which table incorporates subdivision (4), Table 8-2);

(BB) for substances for which a CMC is not specified in subdivision (3), Table 8-1, a CMC shall be calculated by the commissioner using the procedures in section 11 of this rule, or, if the minimum data requirements to calculate a CMC are not met, an SMC shall be calculated using the procedures in section 12 of this rule; and

(CC) the CMC or SMC determined under subitem (AA) or (BB) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(ii) A discharge shall not cause acute toxicity, as measured by whole effluent toxicity tests, at any point in the waterbody. Compliance with this criterion shall be demonstrated if a discharge does not exceed one and zero-tenths (1.0) TU_a in the undiluted discharge. For a discharge into a receiving stream or Lake Michigan, for which an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), compliance with this criterion shall be demonstrated if three-tenths (0.3) TU_a is not exceeded outside the applicable alternate mixing zone.

This clause shall not apply to the chemical control of plants and animals when

that control is performed in compliance with approval conditions specified by the Indiana department of natural resources as provided by IC 14-22-9.

(2) At all times, all surface waters outside of the applicable mixing zones determined in accordance with section 7 of this rule shall be free of substances in concentrations that, on the basis of available scientific data, are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants. To assure protection against the adverse effects identified in this subdivision, a toxic substance or pollutant shall not be present in such waters in concentrations that exceed the most stringent of the following:

(A) A CCC or an SCC to protect aquatic life from chronic toxic effects as follows:

(i) For certain substances, a CCC is established and set forth in subdivision (3), Table 8-1 (which table incorporates subdivision (4), Table 8-2).

(ii) For substances for which a CCC is not specified in subdivision (3), Table 8-1, a CCC shall be calculated by the commissioner using the procedures in section 11 of this rule, or, if the minimum data requirements to calculate a CCC are not met, an SCC shall be calculated using the procedures in section 12 of this rule.

(iii) The CCC or SCC determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) To assure protection of aquatic life, a discharge shall not cause chronic toxicity, as measured by whole effluent toxicity tests, outside of the applicable mixing zone. Compliance with this criterion shall be demonstrated if the waterbody does not exceed one and zero-tenths (1.0) TU_c at the edge of the mixing zone.

(B) An HNC or HNV to protect human health from adverse noncancer effects that may result from the consumption of aquatic organisms or drinking water from the waterbody determined as follows:

(i) For certain substances, an HNC is established and set forth in subdivision (5), Table 8-3.

(ii) For substances for which an HNC is not specified in subdivision (5), Table 8-3, an HNC shall be calculated by the commissioner using the procedures in section 14 of this rule, or, if the minimum data requirements to calculate an HNC are not met, an HNV shall be calculated using the procedures in section 14 of this rule.

(iii) The HNC or HNV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) The HNC-nondrinking or HNV-nondrinking for a substance shall apply to all surface waters outside the applicable mixing zone for a discharge of that substance. The HNC-drinking or HNV-drinking shall apply at the point of the public water system intake.

(C) For carcinogenic substances, an HCC or HCV to protect human health from unacceptable cancer risk of greater than one (1) additional occurrence of cancer per one hundred thousand (100,000) population as follows:

(i) For certain substances, an HCC is established and set forth in subdivision (5), Table 8-3.

(ii) For substances for which an HCC is not specified in subdivision (5), Table 8-3, an HCC shall be calculated by the commissioner using the procedures in section 14 of this rule or, if the minimum data requirements to calculate an HCC are not met, an HCV shall be calculated using the procedures in section 14 of this rule.

(iii) The HCC or HCV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(iv) The HCC-nondrinking or HCV-nondrinking for a substance shall apply to all surface waters outside the applicable mixing zone for a discharge of that substance. The HCC-drinking or HCV-drinking shall apply at the point of the public water system intake.

(D) A WC to protect avian and mammalian wildlife populations from adverse effects that may result from the consumption of aquatic organisms or water from the waterbody as follows:

(i) For certain substances, a WC is established and set forth in subdivision (6), Table 8-4.

(ii) For substances for which a WC is not specified in subdivision (6), Table 8-4, a WC shall be calculated by the commissioner using the procedures in section 15 of this rule or, if the minimum data requirements to calculate a WC are not met, a WV may be calculated using the procedures in section 15 of this rule.

(iii) The WC or WV determined under item (i) or (ii) may be modified on a site-specific basis to reflect local conditions in accordance with section 16 of this rule.

(3) The following establishes surface water quality criteria for protection of aquatic life:

Table 8-1

Surface Water Quality Criteria for Protection of Aquatic Life[1]

CAS Number	Substances	CMC (Maximum) (µg/l)	CMC Conversion Factors	CCC (4-Day Average) (µg/l)	CCC Conversion Factors
	Metals (dissolved)[2]				
7440382	Arsenic (III)	WER[3](339.8)	1.000	WER[3](147.9)	1.000
7440439	Cadmium	WER[3]($e^{(1.128[\ln(hardness)]-3.6867)}$)	1.136672-[(ln hardness)(0.041838)]	WER[3]($e^{(0.7852[\ln(hardness)]-2.715)}$)	1.101672-[(ln hardness)(0.041838)]
7440473	Chromium (III)	WER[3]($e^{(0.819[\ln(hardness)]+3.7256)}$)	0.316	WER[3]($e^{(0.819[\ln(hardness)]+0.6848)}$)	0.860
7440473	Chromium (VI)	WER[3](16.02)	0.982	WER[3](10.98)	0.962
7440508	Copper	WER[3]($e^{(0.9422[\ln(hardness)]-1.700)}$)	0.960	WER[3]($e^{(0.8545[\ln(hardness)]-1.702)}$)	0.960

7439976	Mercury	WER[3](1.694)	0.85	WER[3](0.9081)	0.85
7440020	Nickel	WER[3]($e^{(0.846[\ln(hardness)]+2.255)}$)	0.998	WER[3]($e^{(0.846[\ln(hardness)]+0.0584)}$)	0.997
7782492	Selenium			5	0.922
7440666	Zinc	WER[3]($e^{(0.8473[\ln(hardness)]+0.884)}$)	0.978	WER[3]($e^{(0.8473[\ln(hardness)]+0.884)}$)	0.986
	Organics (total)				
60571	Dieldrin	0.24	NA	0.056	NA
72208	Endrin	0.086	NA	0.036	NA
56382	Parathion	0.065	NA	0.013	NA
87865	Pentachlorophenol [4]	$e^{(1.005[pH]-4.869)}$	NA	$e^{(1.005[pH]-5.134)}$	NA
	Other Substances				
	Chlorides (total)	860000	NA	230000	NA
	Chlorine (total residual)	19	NA	11	NA
	Chlorine (intermittent, total residual) [5]	200	NA		NA
57125	Cyanide (free)	22	NA	5.2	NA

[1] Aquatic organisms should not be affected unacceptably if the four (4) day average concentration of any substance in this table does not exceed the CCC more than once every three (3) years on the average and if the one (1) hour average concentration does not exceed the CMC more than once every three (3) years on the average, except possibly where a commercially or recreationally important species is very sensitive.

[2] The CMC and CCC columns of this table contain total recoverable metals criteria (numeric and hardness-based). The criterion for the dissolved metal is calculated by multiplying the appropriate conversion factor by the CMC or CCC. This dissolved CMC or CCC shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of water quality-based effluent limitations (WQBELs).

[3] A value of one (1) shall be used for the WER unless an alternate value is established under section 16 of this rule.

[4] A CMC and CCC calculated for pentachlorophenol using the equation in this table shall be rounded to two (2) significant digits, except when the criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

[5] To be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours.

(4) The following establishes dissolved CMCs and CCCs for certain metals at selected hardness values calculated from the equations and conversion factors in subdivision (3), Table 8-1 and using a value of one (1) for the WER, where applicable:

Table 8-2

Metals Concentrations in Micrograms Per Liter; Hardness in Milligrams Per Liter $CaCO_3$[1]

	Arsenic (III)		Cadmium		Chromium (III)		Chromium (VI)		Copper		Mercury		Nickel		Selenium		Zinc	
Hardness	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC	CMC	CCC
50	340	150	2.0	1.3	320	42	16	11	7.0	5.0	1.4	0.77	260	29	)	4.6	65	66
100	340	150	4.3	2.2	570	74	16	11	13	9.0	1.4	0.77	470	52	)	4.6	120	120
150	340	150	6.6	3.0	790	100	16	11	20	13	1.4	0.77	660	73	)	4.6	170	170
200	340	150	9.0	3.7	1,000	130	16	11	26	16	1.4	0.77	840	93	)	4.6	210	210
250	340	150	12	4.4	1,200	160	16	11	32	20	1.4	0.77	1,000	110	)	4.6	250	260
300	340	150	14	5.0	1,400	180	16	11	38	23	1.4	0.77	1,200	130	)	4.6	300	300
350	340	150	17	5.6	1,600	210	16	11	44	26	1.4	0.77	1,400	150	)	4.6	340	340
400	340	150	19	6.2	1,800	230	16	11	50	29	1.4	0.77	1,500	170	)	4.6	380	380
450	340	150	22	6.8	2,000	250	16	11	55	32	1.4	0.77	1,700	190	)	4.6	420	420
500	340	150	24	7.3	2,100	280	16	11	61	35	1.4	0.77	1,800	200	)	4.6	460	460

[1] The dissolved metals criteria in this table have been rounded to two (2) significant digits in accordance with subdivision (3), Table 8-1. The equations and conversion factors in subdivision (3), Table 8-1 shall be used instead of the criteria in this table when dissolved metals criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(5) The following establishes surface water quality criteria for protection of human health:

Table 8-3

Surface Water Quality Criteria for Protection of Human Health[1]

CAS Number	Substances	Human Noncancer Criteria (HNC) Drinking (µg/l)	Human Noncancer Criteria (HNC) Nondrinking (µg/l)	Human Cancer Criteria (HCC) Drinking (µg/l)	Human Cancer Criteria (HCC) Nondrinking (µg/l)
	Metals (total recoverable)				
7439976	Mercury (including methylmercury)	0.0018	0.0018		
	Organics (total)				
71432	Benzene	19	510	12	310
57749	Chlordane	0.0014	0.0014	0.00025	0.00025
108907	Chlorobenzene	470	3,200		
50293	DDT	0.002	0.002	0.00015	0.00015

60571	Dieldrin	0.00041	0.00041	6.5×10^{-6}	6.5×10^{-6}
105679	2,4-dimethylphenol	450	8,700		
51285	2,4-dinitrophenol	55	2,800		
118741	Hexachlorobenzene	0.046	0.046	0.00045	0.00045
67721	Hexachloroethane	6	7.6	5.3	6.7
58899	Lindane	0.47	0.5		
75092	Methylene chloride	1,600	90,000	47	2600
1336363	PCBs (class)			6.8×10^{-6}	6.8×10^{-6}
1746016	2,3,7,8-TCDD (dioxin)	6.7×10^{-8}	6.7×10^{-8}	8.6×10^{-9}	8.6×10^{-9}
108883	Toluene	5,600	51,000		
8001352	Toxaphene			6.8×10^{-5}	6.8×10^{-5}
79016	Trichloroethylene			29	370
	Other Substances				
57125	Cyanide (total)	600	48,000		

[1]The HNC and HCC are thirty (30) day average criteria.

(6) The following establishes surface water quality criteria for protection of wildlife:

Table 8-4

Surface Water Quality Criteria for Protection of Wildlife[1]

CAS Number	Substances	Wildlife Criteria (µg/l)
	Metals (total recoverable)	
7439976	Mercury (including methylmercury)	0.0013
	Organics (total)	
50293	DDT and metabolites	1.1×10^{-5}
1336363	PCBs (class)	1.2×10^{-4}
1746016	2, 3, 7, 8-TCDD (dioxin)	3.1×10^{-9}

[1]The WC are thirty (30) day average criteria.

(c) This subsection establishes minimum surface water quality criteria for aquatic life. In addition to the criteria in subsection (b), this subsection ensures conditions necessary for the maintenance of a well-balanced aquatic community. The following conditions are applicable at any point in the waters outside of the applicable mixing zone, as determined in accordance with section 7 of this rule:

(1) There shall be no substances that:

(A) impart unpalatable flavor to food fish; or

(B) result in offensive odors in the vicinity of the water.

(2) No pH values below six (6.0) or above nine (9.0), except daily fluctuations that:

(A) exceed pH nine (9.0); and

(B) are correlated with photosynthetic activity;

shall be permitted.

(3) Concentrations of dissolved oxygen shall:

(A) average at least five (5.0) milligrams per liter per calendar day; and ~~shall~~

(B) not be less than four (4.0) milligrams per liter at any time.

(4) The following are conditions for temperature:

(A) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.
(B) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.
(C) Water temperatures shall not exceed the maximum limits in the following table during more than one percent (1%) of the hours in the twelve (12) month period ending with any month. At no time shall the water temperature at such locations exceed the maximum limits in the following table by more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius):

Table 8-5
Maximum Instream Water Temperatures

Month	St. Joseph River Tributary to Lake Michigan Upstream of the Twin Branch Dam EF(EC)	All Other Indiana Streams in the Great Lakes System EF(EC)
January	50 (10)	50 (10)
February	50 (10)	50 (10)
March	55 (12.8)	60 (15.6)
April	65 (18.3)	70 (21.1)
May	75 (23.9)	80 (26.7)
June	85 (29.4)	90 (32.2)
July	85 (29.4)	90 (32.2)
August	85 (29.4)	90 (32.2)
September	84 (29.4)	90 (32.2)
October	70 (21.1)	78 (25.5)
November	60 (15.6)	70 (21.1)
December	50 (10)	57 (14.0)

(D) The following temperature criteria shall apply to Lake Michigan:
(i) In all receiving waters, the points of measurement normally shall be in the first meter below the surface at such depths necessary to avoid thin layer surface warming due to extreme ambient air temperatures, but, where required to determine the true distribution of heated wastes and natural variations in water temperatures, measurements shall be at a greater depth and at several depths as a thermal profile.
(ii) There shall be no abnormal temperature changes so as to be injurious to fish, wildlife, or other aquatic life, or the growth or propagation thereof. In addition, plume interaction with the bottom shall:
(AA) be minimized; and ~~shall~~
(BB) not injuriously affect fish, shellfish, and wildlife spawning or nursery areas.
(iii) The normal daily and seasonal temperature fluctuations that existed before the addition of heat shall be maintained.
(iv) At any time and at a maximum distance of a one thousand (1,000) foot arc inscribed from a fixed point adjacent to the discharge or as agreed upon by the commissioner and federal regulatory agencies, **the following shall apply:**
(AA) The receiving water temperature shall not be more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees

Celsius) above the existing natural water temperature. ~~and~~

(BB) Thermal discharges to Lake Michigan shall comply with the following maximum temperature requirements:

(aa) Thermal discharges to Lake Michigan shall not raise the maximum temperature in the receiving water above those listed in the following table, except to the extent the permittee adequately demonstrates that the exceedance is caused by the water temperature of the intake water:

Table 8-6
Maximum Water Temperatures

Month	EF(EC)
January	45 (7)
February	45 (7)
March	45 (7)
April	55 (13)
May	60 (16)
June	70 (21)
July	80 (27)
August	80 (27)
September	80 (27)
October	65 (18)
November	60 (16)
December	50 (10)

(bb) If the permittee demonstrates that the intake water temperature is within three (3) degrees Fahrenheit below an applicable maximum temperature under subitem (aa), Table 8-6, then ~~no~~ **not** more than a three (3) degree Fahrenheit exceedance of the maximum water temperature shall be permitted.

(v) The facilities described as follows that discharge into the open waters of Lake Michigan shall be limited to the amount essential for blowdown in the operation of a closed cycle cooling facility:

(AA) All facilities that have new waste heat discharges exceeding a daily average of five-tenths (0.5) billion British thermal units per hour. As used in this item, “new waste heat discharge” means a discharge that had not begun operations as of February 11, 1972.

(BB) All facilities with existing waste heat discharges that increase the quantity of waste heat discharged by more than a daily average of five-tenths (0.5) billion British thermal units per hour.

(vi) Water intakes shall be designed and located to minimize entrainment and damage to desirable organisms. Requirements may vary depending upon local conditions, but, in general, intakes shall:

(AA) have minimum water velocity; and ~~shall~~

(BB) not be located in spawning or nursery areas of important fishes.

Water velocity at screens and other exclusion devices shall also be at a

minimum.

(vii) Discharges other than those now in existence shall be such that the thermal plumes do not overlap or intersect.

(viii) Facilities discharging more than a daily average of five-tenths (0.5) billion British thermal units of waste heat shall:

(AA) continuously record intake and discharge temperature and flow; and

(BB) make those records available to the public or regulatory agencies upon request.

(5) The following criteria shall be used to regulate ammonia:

(A) Concentrations of total ammonia (as N) shall not exceed the CMC outside the zone of initial dilution or the final acute value (FAV = 2 (CMC)) in the undiluted discharge unless, for a discharge to a receiving stream or Lake Michigan, an alternate mixing zone demonstration is conducted and approved in accordance with 327 IAC 5-2-11.4(b)(4), in which case, the CMC shall be met outside the applicable alternate mixing zone. The CMC of total ammonia (as N) is determined using the following equation:

$$CMC = \frac{(0.822)(0.52)(10^{(pK_a - pH)} + 1)}{(FT)(FPH)(2)}$$

Where:

$FT = 10^{0.03(20-T)}$

$FPH = 1$; when: 8 # pH # 9; or

$\frac{1 + 10^{(7.4 - pH)}}{1.25}$; when: 6.5 # pH # 8

$pK_a = 0.09018 + \frac{2729}{T + 273.2}$

T = Temperature in EC

(B) The CCC of total ammonia (as N) is determined using the following equation:

$$CCC = \frac{(0.822)(0.80)(10^{(pK_a - pH)} + 1)}{(FT)(FPH)(RATIO)}$$

Where:

$FT = 10^{0.03(20-T)}$

$FPH = 1$; when: 8 # pH # 9; or

$\frac{1 + 10^{(7.4 - pH)}}{1.25}$; when: 6.5 # pH # 8

RATIO = 13.5; when: 7.7 # pH # 9; or

$\frac{(20)(10^{(7.7 - pH)})}{1 + 10^{(7.4 - pH)}}$; when: 6.5 # pH # 7.7

$pK_a = 0.09018 + \frac{2729}{T + 273.2}$

T = Temperature in EC

(C) The use of the equations in clause (A) results in the following CMCs for total ammonia (as N) at different temperatures and pHs:

Table 8-7
Criterion Maximum Concentrations for
Total Ammonia (as N)
Temperature (EC)

pH	0	5	10	15	20	25	30
6.5	28.48	26.61	25.23	24.26	23.64	23.32	23.29
6.6	27.68	25.87	24.53	23.59	22.98	22.68	22.65
6.7	26.74	24.99	23.69	22.78	22.20	21.92	21.90
6.8	25.64	23.96	22.72	21.85	21.30	21.03	21.01
6.9	24.37	22.78	21.60	20.78	20.26	20.01	20.00
7.0	22.95	21.45	20.35	19.58	19.09	18.86	18.86
7.1	21.38	19.98	18.96	18.24	17.80	17.59	17.60
7.2	19.68	18.40	17.46	16.81	16.40	16.22	16.24
7.3	17.90	16.73	15.88	15.29	14.93	14.78	14.81
7.4	16.06	15.02	14.26	13.74	13.42	13.30	13.35
7.5	14.23	13.31	12.64	12.19	11.92	11.81	11.88
7.6	12.44	11.65	11.07	10.67	10.45	10.37	10.45
7.7	10.75	10.06	9.569	9.238	9.052	9.003	9.088
7.8	9.177	8.597	8.181	7.907	7.760	7.734	7.830
7.9	7.753	7.268	6.924	6.701	6.589	6.584	6.689
8.0	6.496	6.095	5.813	5.636	5.555	5.569	5.683
8.1	5.171	4.857	4.639	4.508	4.457	4.486	4.602
8.2	4.119	3.873	3.707	3.612	3.584	3.625	3.743
8.3	3.283	3.092	2.967	2.900	2.891	2.942	3.061
8.4	2.618	2.472	2.379	2.335	2.340	2.399	2.519
8.5	2.091	1.979	1.911	1.886	1.903	1.968	2.089
8.6	1.672	1.588	1.540	1.529	1.555	1.625	1.747
8.7	1.339	1.277	1.246	1.246	1.279	1.353	1.475
8.8	1.075	1.030	1.011	1.021	1.060	1.137	1.260
8.9	0.8647	0.8336	0.8254	0.8418	0.8862	0.9650	1.088
9.0	0.6979	0.6777	0.6777	0.6998	0.7479	0.8286	0.9521

(D) The use of the equations in clause (B) results in the following CCCs for total ammonia (as N) at different temperatures and pHs:

Table 8-8
Criterion Continuous Concentrations for
Total Ammonia (as N)
Temperature (EC)

pH	0	5	10	15	20	25	30
6.5	2.473	2.310	2.191	2.106	2.052	2.025	2.022
6.6	2.473	2.311	2.191	2.107	2.053	2.026	2.023
6.7	2.473	2.311	2.191	2.107	2.054	2.027	2.025
6.8	2.473	2.311	2.192	2.108	2.055	2.028	2.027
6.9	2.474	2.312	2.193	2.109	2.056	2.030	2.030
7.0	2.474	2.312	2.193	2.110	2.058	2.033	2.033
7.1	2.475	2.313	2.195	2.112	2.060	2.036	2.037
7.2	2.475	2.314	2.196	2.114	2.063	2.040	2.043
7.3	2.476	2.315	2.198	2.116	2.066	2.044	2.050

7.4	2.477	2.317	2.200	2.119	2.070	2.050	2.058
7.5	2.478	2.319	2.202	2.123	2.075	2.058	2.069
7.6	2.480	2.321	2.206	2.128	2.082	2.067	2.082
7.7	2.450	2.294	2.181	2.106	2.063	2.052	2.071
7.8	2.092	1.959	1.865	1.802	1.769	1.763	1.785
7.9	1.767	1.657	1.578	1.527	1.502	1.501	1.525
8.0	1.481	1.389	1.325	1.285	1.266	1.269	1.295
8.1	1.179	1.107	1.057	1.027	1.016	1.022	1.049
8.2	0.9387	0.8828	0.8450	0.8232	0.8169	0.8263	0.8531
8.3	0.7481	0.7048	0.6762	0.6610	0.6589	0.6705	0.6976
8.4	0.5968	0.5634	0.5421	0.5321	0.5334	0.5468	0.5741
8.5	0.4766	0.4511	0.4357	0.4298	0.4337	0.4485	0.4760
8.6	0.3811	0.3619	0.3511	0.3485	0.3545	0.3704	0.3981
8.7	0.3052	0.2910	0.2839	0.2839	0.2916	0.3083	0.3362
8.8	0.2450	0.2347	0.2305	0.2326	0.2417	0.2591	0.2871
8.9	0.1971	0.1900	0.1881	0.1919	0.2020	0.2199	0.2480
9.0	0.1591	0.1545	0.1545	0.1595	0.1705	0.1889	0.2170

(d) This subsection establishes surface water quality for cold-water fish. The waters listed in section 5(a)(3) of this rule are designated as salmonid waters and shall be protected for cold-water fish. In addition to subsections (b) and (c), the following criteria are established to ensure conditions necessary for the maintenance of a well-balanced, cold-water fish community and are applicable at any point in the waters outside of the applicable mixing zone:

(1) Dissolved oxygen concentrations shall not be less than:

(A) six (6.0) milligrams per liter at any time; and ~~shall not be less than~~

(B) seven (7.0) milligrams per liter in areas where spawning occurs during the spawning season and in areas used for imprinting during the time salmonids are being imprinted.

Dissolved oxygen concentrations in the open waters of Lake Michigan shall not be less than seven (7.0) milligrams per liter at any time.

(2) The maximum temperature rise above natural shall not exceed two (2) degrees Fahrenheit (one and one-tenth (1.1) degrees Celsius) at any time or place and, unless due to natural causes, the temperature shall not exceed the following:

(A) Seventy (70) degrees Fahrenheit (twenty-one and one-tenth (21.1) degrees Celsius) at any time.

(B) Sixty-five (65) degrees Fahrenheit (eighteen and three-tenths (18.3) degrees Celsius) during spawning or imprinting periods.

(e) This subsection establishes bacteriological quality for recreational uses **during the recreational season** as follows:

(1) The recreational season is defined as the months of April through October, inclusive.

~~(1)~~ **(2)** In addition to subsection (b), the criteria in this subsection shall be used to **do the following:**

(A) Evaluate waters for full body contact recreational uses.

(B) Establish wastewater treatment requirements. ~~and~~

(C) Establish effluent limits during the recreational season. ~~which is defined as the months of April through October, inclusive.~~

~~(2)~~ **(3) For full body contact recreational uses,** E. coli bacteria ~~using membrane filter (MF) count,~~ shall not exceed **the following:**

(A) One hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period. ~~and~~

(B) Two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period.

If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in ~~subdivision (2)(B)~~ **clause (B)** must be met.

(4) For demonstrating compliance with wastewater treatment requirements, sanitary wastewater dischargers shall ensure the following:

(A) The concentration of E. coli in the undiluted discharge does not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(5) Effluent limits to implement the criteria in subdivision (3) during the recreational season shall be established in NPDES permits by incorporating the following that are to be applied to the undiluted discharge:

(A) The concentration of E. coli in the undiluted discharge shall not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(B) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this clause, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(f) This subsection establishes surface water quality for public water supply. In addition to subsection (b), the following criteria are established to protect the surface water quality at the point at which water is withdrawn for treatment for public supply:

(1) The coliform bacteria group shall not exceed the following:

(A) Five thousand (5,000) per one hundred (100) milliliters as a monthly average value (either MPN or MF count).

(B) Five thousand (5,000) per one hundred (100) milliliters in more than twenty percent (20%) of the samples examined during any month.

(C) Twenty thousand (20,000) per one hundred (100) milliliters in more than five percent (5%) of the samples examined during any month.

(2) Taste and odor producing substances, other than those naturally occurring, shall not interfere with the production of a finished water by conventional treatment consisting of **the following:**

(A) Coagulation.
(B) Sedimentation.
(C) Filtration. ~~and~~
(D) Disinfection.

(3) The concentrations of either chlorides or sulfates shall not exceed two hundred fifty (250) milligrams per liter unless due to naturally occurring sources.

(4) The concentration of dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter unless due to naturally occurring sources. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(5) Surface waters shall be considered acceptable for public water supply if radium-226 and strontium-90 are present in amounts not exceeding three (3) and ten (10) picocuries per liter, respectively. In the known absence of strontium-90 and alpha emitters, the water supply is acceptable when the gross beta concentrations do not exceed one thousand (1,000) picocuries per liter.

(6) The:

(A) combined concentration of nitrate-N and nitrite-N shall not exceed ten (10) milligrams per liter; and ~~the~~
(B) concentration of nitrite-N shall not exceed one (1) milligram per liter.

(7) Chemical constituents in the waters shall not be present in such levels as to prevent, after conventional treatment, meeting the drinking water standards contained in 327 IAC 8-2, due to other than natural causes.

(g) This subsection establishes surface water quality for industrial water supply. In addition to subsection (b), the criterion to ensure protection of water quality at the point at which water is withdrawn for use (either with or without treatment) for industrial cooling and processing is that, other than from naturally occurring sources, the dissolved solids shall not exceed seven hundred fifty (750) milligrams per liter at any time. A specific conductance of one thousand two hundred (1,200) micromhos per centimeter (at twenty-five (25) degrees Celsius) may be considered equivalent to a dissolved solids concentration of seven hundred fifty (750) milligrams per liter.

(h) This subsection establishes surface water quality for agricultural uses. The criteria to ensure water quality conditions necessary for agricultural use are the same as those in subsection (b).

(i) This subsection establishes surface water quality for limited uses. The quality of waters designated for limited uses under section 19(a) of this rule shall, at a minimum, meet the following criteria:

(1) The criteria contained in subsection (b).
(2) The criteria contained in subsection (e).
(3) The criteria contained in subsection (g).
(4) The waters must be aerobic at all times.
(5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream at the point where it becomes physically or chemically capable of supporting a higher use or at its interface with a higher use water segment shall meet the criteria that are applicable

to the higher use water.

(j) Additional requirements for the open waters of Lake Michigan are as follows:
(1) In addition to complying with all other applicable subsections, open waters in Lake Michigan shall meet the following criteria:

Table 8-9
Additional Criteria for Lake Michigan

Parameters	Criteria
Dissolved oxygen	Dissolved oxygen concentrations shall not be less than seven (7.0) milligrams per liter at any time at all places outside the applicable mixing zone.
pH	No pH values below six (6.0) or above nine (9.0), except daily fluctuations that exceed pH 9.0 and are correlated with photosynthetic activity, shall be permitted.
Chlorides	860 mg/l criterion maximum concentration 230 mg/l criterion continuous concentration
Phenols	See subsection (c)(1)
Sulfates	250 mg/l[1]
Total phosphorus	See 327 IAC 5-10-2
Total dissolved solids	750 mg/l[1]
Fluorides	1.0 mg/l[1]
Dissolved iron	300 µg/l[1]

[1] This criterion is established to minimize or prevent increased levels of this substance in Lake Michigan. For the purposes of establishing water quality-based effluent limitations based on this criterion, it shall be treated as a four (4) day average criterion.

(2) During each triennial review of the water quality standards, prior to preliminary adoption of revised rules, the department shall prepare a report for the water pollution control board on the monitoring data for the constituents in the following table (Table 8-10), as measured at the drinking water intakes in Lake Michigan. If these data indicate that the levels of the constituents are either increasing or exceed the levels in the table, the report shall provide available information on the known and potential causes of the increased levels of these parameters, the known and potential impacts on aquatic life, wildlife, and human health, and any recommended revisions of the criteria.

Table 8-10

Parameters	Levels
pH	7.5-8.5 s.u.
Chlorides	
Monthly average	15 mg/l
Daily maximum	20 mg/l
Sulfates	
Monthly average	26 mg/l
Daily maximum	50 mg/l
Total phosphorus	
Monthly average	0.03 mg/l
Daily maximum	0.04 mg/l
Total dissolved solids	
Monthly average	172 mg/l

Daily maximum 200 mg/l

(Water Pollution Control Board; 327 IAC 2-1.5-8; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1370; errata filed Aug 11, 1997, 4:15 p.m.: 20 IR 3376; filed Feb 14, 2005, 10:05 a.m.: 28 IR 2074; errata filed Apr 6, 2006, 2:48 p.m.: 29 IR 2546)

SECTION 3. 327 IAC 5-10-6 IS AMENDED TO READ AS FOLLOWS:

327 IAC 5-10-6 Disinfection requirements

Authority: IC 13-13-5; IC 13-14-8; IC 13-14-9; IC 13-15-1-2; IC 13-15-2-1; IC 13-18-3

Affected: IC 13-11-2; IC 13-18-4

Sec. 6. (a) Disinfection is required of all sanitary **wastewater** discharges ~~for the~~ **on an** annual **basis for the** period of April 1 through October 31 except multicelled waste stabilization ponds ~~which~~ **that** are:

(1) adequately designed and operated; ~~and are~~

(2) not either hydraulically or organically overloaded; and ~~as provided~~

(3) in ~~sections 3(b) and 4(d)~~ **compliance with the provisions of section 3(c)** of this rule.

(b) Disinfection is not required and is not expected to be practiced ~~during the~~ **on an** annual **basis for the** period of November 1 through March 31, except as necessary to comply with **one (1) or more of the following:**

(1) ORSANCO requirements (for discharges directly to the Ohio River).

(2) The requirements of other states for interstate waters. ~~or~~

(3) The provision of section ~~4(d)~~ **4(c)** of this rule.

In cases where chlorination must be practiced during this period, ~~(such as~~ **for example,** to maintain sand filters, the maximum effluent limitation ~~for chlorine~~ and monitoring requirements for ~~such~~ **chlorine** remain in effect.

(c) The following are requirements for facilities using chlorine or other halogenated compounds as a disinfectant:

(1) For those sanitary **wastewater** dischargers designated as minor facilities (generally those with a population equivalent (PE) of less than ten thousand (10,000)), the **following requirements must be met:**

(A) Residual chlorine concentration after disinfection (but prior to dechlorination) is to be maintained at a minimum of five-tenths (0.5) milligram per liter.

(B) The final effluent must comply with subsection (e).

(2) For those sanitary **wastewater** dischargers designated as major facilities (those with a PE of ten thousand (10,000) or greater), **the following requirements must be met:**

(A) No minimum residual chlorine limitation ~~is applied, so long as the final effluent complies with bacteriological standards based on 327 IAC 2-1-6 or 327 IAC 2-1.5-8.~~ **applies.**

(B) The final effluent must comply with subsection (e).

(3) **Dechlorination is to be practiced** for all:

(A) sanitary **wastewater** discharges using chlorine or bromine compounds as a disinfectant; or ~~for~~

(B) filter or other equipment maintenance at any time; ~~dechlorination is to be practiced such~~

so that the concentration of total residual chlorine (TRC) or, where bromine is used, TRO in the final effluent does not exceed water quality-based effluent limitations. If these water quality-based limitations are below the LOQ, compliance with ~~such~~ **the water quality-based effluent** limitations will be determined using the applicable procedures contained under 327 IAC 5-2-11.1 or 327 IAC 5-2-11.6.

(d) Facilities using a disinfectant other than chlorine or other halogen compounds ~~may not contain E. coli in excess of one hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean nor two hundred thirty-five (235) per one hundred (100) milliliters maximum~~ **shall ensure that the final effluent complies with subsection (e)** during the ~~disinfection~~ **applicable recreation** season **as indicated in the facility's NPDES permit.**

(e) Sanitary wastewater dischargers shall ensure the following:

(1) The concentration of E. coli in the undiluted discharge does not exceed one hundred twenty-five (125) cfu or MPN per one hundred (100) milliliters as a geometric mean of the effluent samples taken in a calendar month.

(2) Not more than ten percent (10%) of all samples when not less than ten (10) samples are taken and analyzed for E. coli in a calendar month exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters as a daily maximum. Under this subdivision, the calculation of ten percent (10%) of the samples taken shall be limited to the lowest whole number result.

(Water Pollution Control Board; 327 IAC 5-10-6; filed Feb 26, 1993, 5:00 p.m.: 16 IR 1774; filed Jan 14, 1997, 12:00 p.m.: 20 IR 1475; readopted filed Jan 10, 2001, 3:23 p.m.: 24 IR 1518)