
TITLE 327 WATER POLLUTION CONTROL DIVISION**SECOND NOTICE OF COMMENT PERIOD**

LSA Document #14-58

AQUATIC LIFE AND HUMAN HEALTH AMBIENT WATER QUALITY CRITERIA FOR METALS**PURPOSE OF NOTICE**

The Indiana Department of Environmental Management (IDEM) is soliciting public comment on amendments to rules at [327 IAC 2-1-6](#) and [327 IAC 2-1.5-8](#) to revise Indiana's aquatic life and human health ambient water quality criteria (WQC) for select metals. Revisions to criteria reflect updates based on current science and many are National Recommended Water Quality Criteria (NRWQC) at Section 304(a) of the Clean Water Act (CWA). This rulemaking is being conducted to evaluate the need to update or revise these criteria in order to remain consistent with state and federal laws and to ensure that Indiana's WQC for metals continue to reflect the best available science and support sound water quality management policies to improve and protect the water resources of the state. Based on the latest scientific knowledge, updated aquatic life and human health ambient WQC for these metals may become more or less stringent than current criteria. IDEM seeks comment on the affected citations listed and any other provisions of Title 327 that may be affected by this rulemaking.

HISTORY

First Notice of Comment Period: March 5, 2014, Indiana Register (DIN: [20140305-IR-327140058FNA](#)).

CITATIONS AFFECTED: [327 IAC 2-1-6](#); [327 IAC 2-1.5-8](#).

AUTHORITY: [IC 13-14-8-2](#); [IC 13-14-8-3](#); [IC 13-18-4-3](#).

SUBJECT MATTER AND BASIC PURPOSE OF RULEMAKING**Basic Purpose and Background**

The CWA requires the states to periodically review and update their water quality standards (WQS) as appropriate. This rulemaking proposes updates to Indiana's WQS. Many of the proposed revisions to these metal criteria reflect updates to NRWQC at Section 304(a) of the CWA. The criteria to be revised are located in [327 IAC 2-1-6](#) for waters not within the Great Lakes System and [327 IAC 2-1.5-8](#) for waters within the Great Lakes System.

Indiana has delegation from the federal government to conduct the state's water quality programs, including the National Pollutant Discharge Elimination System (NPDES) program, that establishes wastewater discharge permit limitations based on the established water quality criteria. WQC form the basis for the maximum allowable concentrations of chemical pollutants and are used as the regulatory targets for permitting, compliance, enforcement, monitoring, assessing state water quality, and the development of Total Maximum Daily Loads (TMDLs). This rulemaking will update both acute and chronic criteria for select metals to reflect current science. For details on the proposed update and impact, please refer to the IDEM website at: <http://in.gov/idem/cleanwater/2329.htm> under the "Active Projects" heading for a document of tables containing the proposed revisions.

IDEM seeks comment on the affected citations listed, including suggestions for specific language, any other provisions of Title 327 that may be affected by this rulemaking, and alternative ways to achieve the purpose of the rulemaking.

[IC 13-14-9-4](#) Identification of Restrictions and Requirements Not Imposed under Federal Law

No element of the draft rule imposes either a restriction or a requirement on persons to whom the draft rule applies that is not imposed under federal law.

Potential Fiscal Impact

The proposed revisions to the metals criteria are based on current science and many are nationally recommended at Section 304(a) of the CWA. If the state does not revise the metals criteria, the United States Environmental Protection Agency (U.S. EPA) could impose its own standard in place of the state's rules or object to NPDES permits with limits not based on updated criteria. This rulemaking to revise metals criteria has no potential fiscal impact beyond federal requirements.

Public Participation and Work Group Information

At this time, no work group is planned for the rulemaking. If you feel that a work group or other informal discussion on the rule is appropriate, please contact MaryAnn Stevens, Rules Development Branch, Office of Legal Counsel at (317) 232-8635 or (800) 451-6027 (in Indiana).

SUMMARY/RESPONSE TO COMMENTS FROM THE FIRST COMMENT PERIOD

IDEM requested public comment from March 5, 2014, through April 4, 2014, on alternative ways to achieve

the purpose of the rule and suggestions for the development of draft rule language. IDEM received no comments in response to the First Notice of Comment Period.

REQUEST FOR PUBLIC COMMENTS

This notice requests the submission of comments on the draft rule language, including suggestions for specific revisions to language to be contained in the draft rule. Comments may be submitted in one of the following ways:

(1) By mail or common carrier to the following address:

LSA Document #14-58 Metals Criteria Revisions
MaryAnn Stevens
Rules Development Branch
Office of Legal Counsel
Indiana Department of Environmental Management
Indiana Government Center North
100 North Senate Avenue
Indianapolis, IN 46204-2251

(2) By facsimile to (317) 233-5970. Please confirm the timely receipt of faxed comments by calling the Rules Development Branch at (317) 232-8922.

(3) By electronic mail to mstevens@idem.in.gov. To confirm timely delivery of submitted comments, please request a document receipt when sending the electronic mail. **PLEASE NOTE: Electronic mail comments will NOT be considered part of the official written comment period unless they are sent to the address indicated in this notice.**

(4) Hand delivered to the receptionist on duty at the thirteenth floor reception desk, Office of Legal Counsel, Indiana Government Center North, 100 North Senate Avenue, Indianapolis, Indiana.

Regardless of the delivery method used, to properly identify each comment with the rulemaking action it is intended to address, each comment document must clearly specify the LSA document number of the rulemaking.

COMMENT PERIOD DEADLINE

All comments must be postmarked, faxed, or time stamped not later than January 2, 2018. Hand-delivered comments must be delivered to the appropriate office by 4:45 p.m. on the above-listed deadline date.

Additional information regarding this action may be obtained from MaryAnn Stevens, Rules Development Branch, Office of Legal Counsel, (317) 232-8635 or (800) 451-6027 (in Indiana) or Eileen Hack, Technical Environmental Specialist, Office of Water Quality, (317) 234-7914 or (800) 451-6027 (in Indiana).

DRAFT RULE

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 13-14-8-2](#); [IC 13-14-8-3](#); [IC 13-18-4-3](#)

Affected: [IC 13-11-2-258](#); [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 a~~ mixing zone, ~~shall meet the minimum conditions of being~~ **must be** 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~~ **Occur** 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~~ **an extent that creates** a nuisance.

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

- (i) create a nuisance;
- (ii) be unsightly; or
- (iii) otherwise impair the designated uses **of the surface waters.**

(E) ~~Are~~ **Occur** in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill, aquatic life, other animals, plants, or humans. To ~~assure~~ **ensure** protection of aquatic life, concentrations of toxic substances ~~shall~~ **must** 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. **The following apply where applicable:**

(i) For certain substances, an AAC is ~~established and set forth~~ **specified in:**

(AA) subdivision (3), Table 6-1;

(BB) subdivision (3), Table 6-2, which ~~table~~ incorporates subdivision (4), Table 6-3; and

(CC) subdivision (5).

(ii) ~~for substances for which an AAC is not specified in subdivision (3), Table 6-1, subdivision (3), Table 6-2, or subdivision (5),~~ An AAC ~~can~~ **may** be calculated by the commissioner using the procedures in section 8.2 of this rule ~~and~~ **for substances for which an AAC is not specified in:**

(AA) subdivision (3), Table 6-1;

(BB) subdivision (3), Table 6-2; or

(CC) subdivision (5).

(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~~

(F) Clause ~~shall~~ **(E) does** 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~~ **must** 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 to ensure protection against the adverse effects identified in this subdivision are established: as follows:**

(A) A toxic substance or pollutant ~~shall~~ **must** not be present in ~~such~~ **surface waters outside of mixing zones** 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~~ **specified in:**

(i) subdivision (3), Table 6-1;

(ii) subdivision (3), Table 6-2, which ~~table~~ incorporates subdivision (4), Table 6-3;

(iii) subdivision (3), Table 6-2a; and

(iv) subdivision (5).

(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, subdivision (3), Table 6-2, or subdivision (5),~~ 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 **for substances for which one (1) or more of the CCCs identified in clause (A) are not specified in:**

(i) subdivision (3), Table 6-1;

(ii) subdivision (3), Table 6-2;

(iii) subdivision (3), Table 6-2a; or

(iv) subdivision (5).

(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 ~~of~~ a mixing zone for a discharge of that substance. ~~Similarly,~~

(F) In **surface** 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 ~~of~~ the mixing zone for a discharge of that substance.

(G) 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 **are as follows:**

Table 6-1
Surface Water Quality Criteria for Specific Substances

| Substances | AAC (Maximum) | | CCC | |
|-------------------------------|------------------|------------------|------------------------------------|----------------------------------|
| | | | Outside of Mixing Zone | Point of Water Intake |
| | | | Aquatic Life (CAC) (4-Day Average) | Human Health (30-Day Average) |
| Metals (µg/l) | | | | |
| (Total recoverable) | | | | |
| Aluminum | # | # | | |
| Antimony | | | 45,000 640 (T) | 146 5.6 (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 | # | # | | 1,300(D) |
| Lead | # | # | | 50 (D) |
| Mercury\$ | 2.4 | 0.012 | 0.15 (T) | 0.14 (T) |
| Nickel | # | # | 100 4,600 (T) | 13.4 610 (T) |
| Selenium | 130 * | 35 ## | 4,200 (T) | 10 (D) 170 (T) |
| Silver | # | | | 50 (D) |
| Thallium | | | 48 (T) | 13 (T) |
| Zinc | # | # | 26,000 (T) | 7,400(T) |
| 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) |

Indiana Register

| | | | | |
|---|--------------------------|--------------------------|---------------|---------------|
| 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) |
| Other Substances | | | | |
| Asbestos (fibers/liter) | | | | 300,000 (C) |
| Chloride (mg/l) | ** | ** | | |
| 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 **must** not exceed two (2.0) mg/l in all surface waters outside of the a mixing zone except the Ohio River and Interstate Wabash River where it shall **must** not exceed one (1.0) mg/l outside of the a mixing zone.

Sulfate shall **must** not exceed the criteria established **specified** in subdivision (6) in all surface waters outside of the a mixing zone.

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

Selenium CAC are specified in Table 6-2a.

*One-half (1/2) 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 **of the department** or U.S. EPA procedures developed in 1985 in which the calculated FAV is divided by two (2) to reduce acute toxicity.

The AAC and CAC for this substance are established **specified in subdivision (5).

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.

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

Table 6-2
Surface Water Quality Criteria for ~~Specific Substances~~ **Select Metals**^[1]

| Substances | AAC (Maximum) (µg/l) | AAC Conversion Factors | CAC (4-Day Average) (µg/l) | CAC Conversion Factors |
|--|---|-------------------------------------|--|-------------------------------------|
| Metals (dissolved) ^[4] | | | | |
| Aluminum (total recoverable) ^[2] | WER^[3](e^{(1.3695 [ln(hardness)]+1.8308)}) | | WER^[3](e^{(1.3695 [ln(hardness)]+0.9161)}) | |
| Arsenic (##) (dissolved) ^[4] | WER^{[2][3]}(360) (340) | 1.000 | WER^{[2][3]}(490) (150) | 1.000 |
| Cadmium (dissolved) ^[4] | WER^{[2][3]}(e^{(-4.128 [ln(hardness)]-3.828)}) (e^{(0.9789 [ln(hardness)]-3.866)}) | 1.136672-[(ln hardness) (0.041838)] | WER^{[2][3]}(e^{(-0.7852 [ln(hardness)]-3.490)}) (e^{(0.7977 [ln(hardness)]-3.909)}) | 1.101672-[(ln hardness) (0.041838)] |
| Chromium (III) (dissolved) ^[4] | WER^{[2][3]}(e^{(-0.819 [ln(hardness)]+3.688)}) (e^{(0.819 [ln(hardness)]+3.7256)}) | 0.316 | WER^{[2][3]}(e^{(-0.8190 [ln(hardness)]+1.561)}) (e^{(0.819 [ln(hardness)]+0.6848)}) | 0.860 |
| Chromium (VI) (dissolved) ^[4] | WER^{[2][3]}(16) | 0.982 | WER^{[2][3]}(11) | 0.962 |
| Copper (dissolved) ^[4] | WER^{[2][3]}(e^{(-0.9422 [ln(hardness)]-1.464)}) (e^{(0.9422 [ln(hardness)]-1.700)}) | 0.960 | WER^{[2][3]}(e^{(-0.8545 [ln(hardness)]-1.465)}) (e^{(0.8545 [ln(hardness)]-1.702)}) | 0.960 |
| Lead (dissolved) ^[4] | WER^{[2][3]}(e^{(-1.273 [ln(hardness)]-1.460)}) (e^{(1.273 [ln(hardness)]-1.055)}) | 1.46203-[(ln hardness) (0.145712)] | WER^{[2][3]}(e^{(-1.273 [ln(hardness)]-4.705)}) (e^{(1.273 [ln(hardness)]-3.557)}) | 1.46203-[(ln hardness) (0.145712)] |
| Nickel (dissolved) ^[4] | WER^{[2][3]}(e^{(-0.8460 [ln(hardness)]+3.3612)}) (e^{(0.846 [ln(hardness)]+2.255)}) | 0.998 | WER^{[2][3]}(e^{(-0.8460 [ln(hardness)]+1.1645)}) (e^{(0.846 [ln(hardness)]+0.0584)}) | 0.997 |
| Silver (dissolved) ^[4] | WER^{[2][3]}(e^{(-1.72 [ln(hardness)]-6.52)/2^[3]) (e^{(1.72 [ln(hardness)]-6.59)})} | 0.85 | | |
| Zinc (dissolved) ^[4] | WER^{[2][3]}(e^{(-0.8473 [ln(hardness)]+0.8604)}) (e^{(0.8473 [ln(hardness)]+0.884)}) | 0.978 | WER^{[2][3]}(e^{(-0.8473 [ln(hardness)]+0.7614)}) (e^{(0.8473 [ln(hardness)]+0.884)}) | 0.986 |

^[1] The AAC and CAC columns of **With the exception of aluminum, the hardness values used in the equations in this table contain total recoverable metals must be no greater than 400 mg/l calcium carbonate (CaCO₃), and the 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 at a hardness of 400 mg/l CaCO₃ are used for water hardnesses above 400 mg/l CaCO₃. For aluminum, the hardness values must be no greater than 220 mg/l CaCO₃, and the criteria at a hardness of 220 mg/l CaCO₃ are used for water hardnesses above 220 mg/l CaCO₃.**

^[2] **Aluminum is expressed as total recoverable metal. The applicable pH range for determining the aluminum criterion is within 6.5 and 9.0. The total AAC or CAC shall must 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]^[3] **A value of one (1) shall must be used for the water-effect ratio (WER) unless an alternate value is established under section 8.9 of this rule.**

^[3] **One-half (1/2) of the 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] **Aquatic life criteria for these metals are expressed in terms of dissolved metal in the water column. 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 must 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.**

**Table 6-2a
Surface Water Quality Aquatic Life Criteria for Selenium**

| CAC | | | | | |
|--------------------------------|----------------------|-----------------------------------|-------------------------------|-------------------------------|---|
| Fish Tissue (mg/kg dry weight) | | | Water Column (µg/L) | | |
| Egg or ovary | Whole-body | Muscle (skinless, boneless filet) | Lentic aquatic systems | Lotic aquatic systems | Short term, intermittent lentic and lotic aquatic systems |
| 15.1 ^[1,2] | 8.5 ^[2,3] | 11.3 ^[2,3] | 1.5 (30 day) ^[4,5] | 3.1 (30 day) ^[4,5] | Intermittent exposure equation ^[4,5,6,7] |

^[1] **Egg or ovary supersedes any whole-body, muscle, or water column element when fish egg or ovary concentrations are measured. Duration: Instantaneous measurement.**

^[2] **Frequency: Not to be exceeded.**

^[3] **Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured. Duration: Instantaneous measurement.**

^[4] **Water column values are based on dissolved total selenium in water (includes all oxidation states, for example, selenite, selenate, organic selenium, and any other forms) and are derived from fish tissue values via bioaccumulation modeling.**

^[5] **Frequency: Not to be exceeded more than once in three (3) years on average.**

^[6] **Intermittent Exposure Equation is as follows:**

$$\frac{WQC_{30\text{-day}} - C_{\text{bkgnd}} (1 - f_{\text{int}})}{f_{\text{int}}}$$

Where: $WQC_{30\text{-day}}$ is the water column monthly element for either lentic or lotic waters;
 C_{bkgnd} is the average background selenium concentration; and
 f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to one (1) day).

[7] Duration: Number of days per month with an elevated concentration.

(4) The following establishes dissolved AAC and 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 are as follows:

Table 6-3

Metals Concentrations in Micrograms Per Liter; Hardness in Milligrams Per Liter CaCO₃¹

| Hardness | Aluminum (Total) | | Arsenic (III) (Dissolved) | | Cadmium (Dissolved) | | Chromium (III) (Dissolved) | | Chromium (VI) (Dissolved) | | Copper (Dissolved) | | | |
|----------|-------------------|------------------|---------------------------|----------------|---------------------|-----------------|----------------------------|----------------|---------------------------|----------------|--------------------|---------------|----------------|----------------|
| | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | | |
| 50 | 1,300 | 530 | 360 | 490 | 4.7 | 0.62 | 340 | 320 | 400 | 42 | 16 | 11 | 8.9 | 6.3 |
| | | | 340 | 150 | 0.94 | 0.43 | | | | | | | 7.0 | 5.0 |
| 100 | 3,400 | 1,400 | 360 | 490 | 3.7 | 1.0 | 550 | 570 | 480 | 74 | 16 | 11 | 17 | 13 |
| | | | 340 | 150 | 1.8 | 0.72 | | | | | | | 14 | 9.0 |
| 150 | 6,000 | 2,400 | 360 | 490 | 5.7 | 1.4 | 760 | 790 | 250 | 100 | 16 | 11 | 25 | 20 |
| | | | 340 | 150 | 2.6 | 0.97 | | | | | | | 20 | 13 |
| 200 | 8,800 | 3,500 | 360 | 490 | 7.8 | 1.7 | 970 | 340 | 16 | 11 | 33 | 26 | 24 | 16 |
| | | | 340 | 150 | 3.4 | 1.2 | 1,000 | 130 | | | | | 26 | 16 |
| 250 | 10,000 | 4,000 | 360 | 490 | 10.4 | 2.0 | 1200 | 380 | 16 | 11 | 40 | 32 | 25 | 20 |
| | | | 340 | 150 | | 1.4 | | | | | | | 32 | 20 |
| 300 | 10,000 | 4,000 | 360 | 490 | 12.5 | 2.3 | 1300 | 440 | 16 | 11 | 48 | 38 | 29 | 23 |
| | | | 340 | 150 | | 1.6 | 1,400 | 180 | | | | | 38 | 23 |
| 350 | 10,000 | 4,000 | 360 | 490 | 14.5 | 2.6 | 1500 | 500 | 16 | 11 | 55 | 44 | 33 | 26 |
| | | | 340 | 150 | | 1.8 | 1,600 | 210 | | | | | 44 | 26 |
| 400 | 10,000 | 4,000 | 360 | 490 | 17.6 | 2.9 | 1700 | 550 | 16 | 11 | 63 | 50 | 37 | 29 |
| | | | 340 | 150 | | 2.0 | 1,800 | 230 | | | | | 50 | 29 |
| 450 | | | 360 | 490 | 19 | 3.1 | 1900 | 610 | 16 | 11 | 70 | 41 | | |
| | | | | | | | | | | | | | 41 | |
| 500 | | | 360 | 490 | 21 | 3.4 | 2100 | 670 | 16 | 11 | 78 | 45 | | |
| | | | | | | | | | | | | | 45 | |

| Hardness | Lead (Dissolved) | | Nickel (Dissolved) | | Silver (Dissolved) | | Zinc (Dissolved) | | |
|----------|------------------|----------------|--------------------|----------------|--------------------|-----------------|------------------|----------------|----------------|
| | AAC | CAC | AAC | CAC | AAC | CAC | AAC | CAC | |
| 50 | 30 | 45 | 790 | 87 | 29 | 0.52 | -- | 64 | 65 |
| | | | 260 | | 29 | 0.98 | | 65 | 66 |
| 100 | 65 | 97 | 1400 | 160 | 4.7 | -- | 140 | 120 | 400 |
| | | | 470 | 52 | 3.2 | | | 120 | |
| 150 | 100 | 3.9 | 2000 | 220 | 3.5 | -- | 160 | 170 | 450 |
| | | | 660 | 73 | 6.5 | | | 170 | |
| 200 | 140 | 5.3 | 25000 | 280 | 5.7 | 11 | -- | 210 | 490 |
| | | | 840 | 93 | | | | 210 | |
| 250 | 170 | 6.7 | 3100 | 340 | 8.3 | 16 | -- | 250 | 230 |
| | | | 1,000 | 110 | | | | 260 | |
| 300 | 210 | 8.1 | 3600 | 400 | 11 | 21 | -- | 290 | 300 |
| | | | 1,200 | 130 | | | | 300 | |
| 350 | 240 | 9.5 | 4100 | 450 | 15 | 28 | -- | 330 | 340 |
| | | | 1,400 | 150 | | | | 340 | |
| 400 | 280 | 11 | 4600 | 510 | 19 | 35 | -- | 370 | 380 |
| | | | 1,500 | 170 | | | | 380 | |
| 450 | 320 | 12 | 5100 | 560 | 23 | -- | 410 | 370 | |
| | | | | | | | | 370 | |
| 500 | 350 | 14 | 5500 | 610 | 27 | -- | 450 | 410 | |
| | | | | | | | | 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 **must** be used instead of the criteria in this table when dissolved metals **these** 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 chloride for protection of aquatic life are as follows:

(A) ~~The following provides the AAC for chloride as a function of hardness (in mg/l as (CaCO₃)) and sulfate (in mg/l) in surface waters~~ **is calculated using the following formula:**

$$C = 287.8 (\text{hardness})^{0.205797} (\text{sulfate})^{-0.07452}$$

Where: C = chloride AAC (maximum) in mg/l.

(B) ~~The following provides the CAC for chloride as a function of hardness (in mg/l as CaCO₃) and sulfate (in mg/l) in surface waters~~ **is calculated using the following formula:**

$$C = 177.87 (\text{hardness})^{0.205797} (\text{sulfate})^{-0.07452}$$

Where: C = chloride CAC (4-day average) in mg/l.

(C) ~~The following~~ **This clause** applies to the AAC and CAC for chloride provided in this subdivision, **as follows:**

(i) Chloride criteria may only be established based on a sulfate concentration greater than the water quality criterion for sulfate, as established under subdivision (6), where the water quality criterion for sulfate has been modified on a site-specific basis in accordance with either the:

(AA) variance provisions under section 8.8 of this rule; or the

(BB) site-specific criteria provisions under section 8.9 of this rule.

(ii) The AAC and CAC for chloride calculated from the equations in this subdivision ~~shall~~ **must** be rounded to the nearest whole numbers, except when the criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(D) ~~The following establishes the AAC for chloride in mg/l at selected concentrations of hardness and sulfate with the understanding that the equation in clause (A) shall be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs:~~ **is shown in the following table:**

Table 6-3a^[1]

| Sulfate (mg/l) | Hardness (mg/l) | | | | | | | | | |
|----------------|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
| 15 | 526 | 607 | 660 | 700 | 733 | 761 | 785 | 807 | 827 | 845 |
| 20 | 515 | 594 | 646 | 685 | 717 | 745 | 769 | 790 | 809 | 827 |
| 25 | 506 | 584 | 635 | 674 | 705 | 732 | 756 | 777 | 796 | 813 |
| 50 | 481 | 555 | 603 | 640 | 670 | 695 | 718 | 738 | 756 | 773 |
| 100 | 457 | 527 | 573 | 608 | 636 | 660 | 682 | 701 | 718 | 734 |
| 150 | 443 | 511 | 556 | 589 | 617 | 641 | 661 | 680 | 697 | 712 |
| 200 | 434 | 500 | 544 | 577 | 604 | 627 | 647 | 665 | 682 | 697 |
| 250 | 427 | 492 | 535 | 567 | 594 | 617 | 637 | 654 | 671 | 685 |
| 300 | 421 | 485 | 528 | 560 | 586 | 609 | 628 | 646 | 661 | 676 |
| 350 | 416 | 480 | 522 | 553 | 579 | 602 | 621 | 638 | 654 | 668 |
| 400 | 412 | 475 | 516 | 548 | 574 | 596 | 615 | 632 | 647 | 662 |
| 450 | 408 | 471 | 512 | 543 | 569 | 590 | 609 | 626 | 642 | 656 |
| 500 | 405 | 467 | 508 | 539 | 564 | 586 | 605 | 622 | 637 | 651 |

^[1]**The equation in clause (A) must be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.**

(E) ~~The following establishes the CAC for chloride in mg/l at selected concentrations of hardness and sulfate with the understanding that the equation in clause (B) shall be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs:~~ **is shown in the following table:**

Table 6-3b^[1]

| Sulfate (mg/l) | Hardness (mg/l) | | | | | | | | | |
|----------------|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
| 15 | 325 | 375 | 408 | 433 | 453 | 470 | 485 | 499 | 511 | 522 |
| 20 | 318 | 367 | 399 | 423 | 443 | 460 | 475 | 488 | 500 | 511 |
| 25 | 313 | 361 | 392 | 416 | 436 | 453 | 467 | 480 | 492 | 503 |
| 50 | 297 | 343 | 373 | 395 | 414 | 430 | 444 | 456 | 467 | 477 |
| 100 | 282 | 326 | 354 | 375 | 393 | 408 | 421 | 433 | 444 | 453 |
| 150 | 274 | 316 | 343 | 364 | 381 | 396 | 409 | 420 | 430 | 440 |
| 200 | 268 | 309 | 336 | 357 | 373 | 388 | 400 | 411 | 421 | 431 |

| | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 250 | 264 | 304 | 331 | 351 | 367 | 381 | 394 | 404 | 414 | 423 |
| 300 | 260 | 300 | 326 | 346 | 362 | 376 | 388 | 399 | 409 | 418 |
| 350 | 257 | 297 | 322 | 342 | 358 | 372 | 384 | 394 | 404 | 413 |
| 400 | 255 | 294 | 319 | 339 | 355 | 368 | 380 | 391 | 400 | 409 |
| 450 | 252 | 291 | 316 | 336 | 351 | 365 | 377 | 387 | 397 | 405 |
| 500 | 250 | 289 | 314 | 333 | 349 | 362 | 374 | 384 | 394 | 402 |

^[1] The equation in clause (B) must be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(6) The following establishes Surface water quality criteria for sulfate that shall ~~shall~~ **must** not be exceeded in all ~~any surface waters water~~ outside of the a mixing zone ~~are as follows~~:

(A) The following provides surface water quality criteria for sulfate in mg/l for the specified ranges of hardness (in mg/l as CaCO₃) or chloride (in mg/l), or both, ~~are as follows~~:

(i) If the hardness concentration of surface waters is greater than or equal to one hundred (100) mg/l but less than or equal to five hundred (500) mg/l, and if the chloride concentration of surface waters is greater than or equal to five (5) mg/l but less than twenty-five (25) mg/l, then:

$$C = [-57.478 + 5.79 (\text{hardness}) + 54.163 (\text{chloride})] \times 0.65$$

Where: C = sulfate criterion in mg/l.

(ii) If the hardness concentration of surface waters is greater than or equal to one hundred (100) mg/l but less than or equal to five hundred (500) mg/l, and if the chloride concentration of surface waters is greater than or equal to twenty-five (25) mg/l but less than or equal to five hundred (500) mg/l, then:

$$C = [1276.7 + 5.508 (\text{hardness}) - 1.457 (\text{chloride})] \times 0.65$$

Where: C = sulfate criterion in mg/l.

(iii) If the hardness concentration of surface waters is less than one hundred (100) mg/l and the chloride concentration of surface waters is less than or equal to five hundred (500) mg/l, the sulfate criterion is five hundred (500) mg/l.

(iv) If the hardness concentration of surface waters is greater than five hundred (500) mg/l and the chloride concentration of surface waters is greater than or equal to five (5) mg/l, but less than or equal to five hundred (500) mg/l, the sulfate criterion shall be ~~is~~ calculated using a hardness concentration of five hundred (500) mg/l and the equation in item (i) or (ii) that applies to the chloride concentration.

(v) If the chloride concentration of surface waters is less than five (5) mg/l, the sulfate criterion is five hundred (500) mg/l.

(B) ~~The following~~ **This clause** applies to the surface water quality criteria for sulfate provided in clause (A), ~~as follows~~:

(i) Sulfate criteria may only be established based on a chloride concentration greater than the CAC for chloride established under subdivision (5) where the CAC for chloride has been modified on a site-specific basis in accordance with either the:

(AA) variance provisions under section 8.8 of this rule; or the

(BB) site-specific criteria provisions under section 8.9 of this rule.

(ii) The surface water quality criteria for sulfate calculated from equations in clause (A) shall ~~shall~~ **must** be rounded to the nearest whole numbers, except when the criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(C) ~~The following establishes~~ surface water quality criteria for sulfate in mg/l at selected concentrations of hardness and chloride ~~with the understanding that the equations in clause (A) shall be used instead of the criteria in this clause when sulfate criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs~~: **shown in the following table**:

Table 6-3c^[1]

| Chloride (mg/l) | Hardness (mg/l) | | | | | | | | | | |
|-----------------|-----------------|------|------|------|------|------|------|------|------|------|------|
| | <100 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | >500 |
| <5 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 |
| 5 | 500 | 515 | 703 | 891 | 1080 | 1268 | 1456 | 1644 | 1832 | 2020 | 2020 |
| 10 | 500 | 691 | 879 | 1067 | 1256 | 1444 | 1632 | 1820 | 2008 | 2196 | 2196 |
| 15 | 500 | 867 | 1055 | 1243 | 1432 | 1620 | 1808 | 1996 | 2184 | 2372 | 2372 |
| 20 | 500 | 1043 | 1231 | 1419 | 1608 | 1796 | 1984 | 2172 | 2360 | 2549 | 2549 |
| 25 | 500 | 1164 | 1343 | 1522 | 1701 | 1880 | 2059 | 2238 | 2417 | 2596 | 2596 |
| 50 | 500 | 1141 | 1320 | 1499 | 1678 | 1857 | 2036 | 2215 | 2394 | 2573 | 2573 |
| 100 | 500 | 1093 | 1272 | 1451 | 1630 | 1809 | 1988 | 2167 | 2346 | 2525 | 2525 |
| 150 | 500 | 1046 | 1225 | 1404 | 1583 | 1762 | 1941 | 2120 | 2299 | 2478 | 2478 |

| | | | | | | | | | | | |
|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| 200 | 500 | 998 | 1177 | 1356 | 1535 | 1715 | 1894 | 2073 | 2252 | 2431 | 2431 |
| 250 | 500 | 951 | 1130 | 1309 | 1488 | 1667 | 1846 | 2025 | 2204 | 2383 | 2383 |

[1] **The equations in clause (A) must be used instead of the criteria in this clause when sulfate criteria are used as intermediate values in a calculation, such as in the calculation of 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 the following minimum conditions necessary for the maintenance of a well-balanced aquatic community. The following are applicable at any point in the surface waters outside of the a mixing zone to ensure conditions necessary for the maintenance of a well-balanced aquatic community:~~

- (1) There shall ~~be~~ **must** be no substances ~~substance~~ that:
 - (A) ~~impart~~ **imparts** unpalatable flavor to food fish; or
 - (B) ~~result~~ **results** in offensive odors in the vicinity of the water.
- (2) No pH values below six (6.0) or above nine (9.0) **are permitted**, 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~~: **must**:
 - (A) average at least five (5.0) milligrams per liter per calendar day; and
 - (B) not be less than four (4.0) milligrams per liter at any time.
- (4) ~~The following are~~ Conditions for temperature **are as follows**:
 - (A) ~~There shall be no~~ Abnormal temperature changes that may adversely affect aquatic life **are prohibited** 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~~ **must** be maintained.
 - (C) The maximum temperature rise at any time or place above natural temperatures ~~shall~~ **must** 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~~ **must** not exceed the maximum limits in ~~the following~~ Table 6-4 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~~ **the** locations **must not** 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 °F(°C) | Other Indiana Streams °F(°C) |
|-----------|-----------------------------|------------------------------|
| 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~~ **must** be used to regulate ammonia:
 - (A) Except for waters covered in clause (B), ~~at all times, all~~ surface waters outside of mixing zones ~~shall~~ **must** 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:
 - (i)** humans;
 - (ii)** animals;
 - (iii)** aquatic life; or
 - (iv)** plants.
 - (B) For ~~these~~ waters listed in subsection (c), the following ammonia criteria ~~will~~ apply outside ~~the~~ **of a** mixing zone:

Table 6-5

Maximum Ammonia Concentrations (Unionized Ammonia as N)***

| pH | (mg/l) Temperature (°C) | | | | | | |
|-----|-------------------------|--------|--------|--------|--------|--------|--------|
| | 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 6-5 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 = °C

Table 6-6

24-Hour Average Ammonia Concentrations (Unionized Ammonia as N)***

| pH | (mg/l) Temperature (°C) | | | | | | |
|-----|-------------------------|--------|--------|--------|--------|--------|--------|
| | 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 6-6 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
 $T =$ °C

(c) ~~This subsection establishes surface water quality~~ **Waters designated by the Indiana department of natural resources for put-and-take trout fishing are designated as salmonid waters and must be protected** for cold-water fish. In addition to subsections (a) 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 surface waters outside of the a mixing zone **to ensure conditions necessary for the maintenance of a well-balanced, cold-water fish community:**

(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),

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

(A) six (6.0) milligrams per liter at any time; and

(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 these waters listed in subdivision (1),~~ (2) The maximum temperature rise above natural shall **must** 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 **must** 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 is~~ 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.

(B) Establish wastewater treatment requirements.

(C) Establish effluent limits during the recreational season.

(3) For full body contact recreational uses, E. coli bacteria shall **must** not exceed the following:

(A) One hundred twenty-five (125) **colony forming units (cfu) or most probable number (MPN)** 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.

(B) Two hundred thirty-five (235) **cfu or MPN** per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, except that, in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters where the:

(i) E. coli exceedances are incidental and attributable solely to E. coli resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at [IC 13-11-2-258](#); and

(ii) criterion in clause (A) is met.

However, a single sample ~~shall be~~ **is** used for making beach notification and closure decisions.

If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in 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~~ **must** be limited to the lowest whole number result.

(5) Effluent limits to implement the criteria in subdivision (3) during the recreational season ~~shall~~ **must** 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~~ **must** 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 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~~ **must** 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 water supply are as follows:~~

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

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

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

(C) Twenty thousand (20,000) **cfu or MPN** 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~~ **must** not interfere with the production of a finished water by conventional treatment consisting of the following:

(A) Coagulation.

(B) Sedimentation.

(C) Filtration.

(D) Disinfection.

(3) The concentrations of either chloride or sulfate ~~shall~~ **must** not exceed two hundred fifty (250) milligrams per liter unless due to naturally occurring sources.

(4) The concentration of dissolved solids ~~shall~~ **must** 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~~ **are** 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 must not exceed ten (10) milligrams per liter; and

(B) concentration of nitrite-N must not exceed one (1) milligram per liter.

~~(6) (7) Chemical constituents in the waters shall~~ **must** not be present ~~in such~~ **at** levels ~~as to~~ **that** 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~~ **must** not exceed seven hundred fifty (750) milligrams per liter at any time **other than from**

naturally occurring sources to ensure protection of water quality at the point at which surface water is withdrawn for use, either with or without treatment, for industrial cooling and processing. 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 **surface** 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 **surface** waters classified **designated** for limited uses under section ~~3(a)(5)~~ **11(a)** of this rule shall, **must**, 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), and where applicable, (4) The waters must~~ **subsection (f), and be aerobic at all times. (5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream** **However, the water must meet the criteria that are applicable to the higher use water** at the point where it **a limited use water:**

(1) becomes physically or chemically capable of supporting a higher use; or at its interface

(2) interfaces with a higher use water segment. ~~shall meet the criteria that are applicable to the higher use water.~~

(Water Pollution Control Division; [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; filed Mar 18, 2008, 2:26 p.m.: [20080416-IR-327060573FRA](#); filed May 22, 2008, 10:40 a.m.: [20080618-IR-327070185FRA](#); filed Jul 9, 2012, 2:54 p.m.: [20120808-IR-327110320FRA](#); filed Nov 10, 2014, 1:51 p.m.: [20141210-IR-327130290FRA](#))

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 13-14-8-2](#); [IC 13-14-8-3](#); [IC 13-18-4-3](#)

Affected: [IC 13-11-2-258](#); [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~~ **are not** 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 **a** mixing zone, ~~shall meet the minimum conditions of being~~ **must be** 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~~ **Occur** 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~~ **an extent that creates** a nuisance.

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

- (i) create a nuisance;
- (ii) be unsightly; or
- (iii) otherwise impair the designated uses **of the surface waters**.

(E) ~~Are~~ **Occur** in amounts sufficient to be acutely toxic to, or to otherwise severely injure or kill, aquatic life, other animals, plants, or humans. To ~~assure~~ **ensure** protection of aquatic life, the **surface** waters shall

must meet the following requirements:

(i) Concentrations of toxic substances ~~shall~~ **must** 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~~ **must** be met outside the applicable alternate mixing zone. **The following apply where applicable:**

(AA) For certain substances, a CMC is ~~established and set forth~~ **specified** in:

(aa) subdivision (3), Table 8-1, which ~~table~~ incorporates subdivision (4), Table 8-2; and

(bb) subdivision (5).

(BB) For substances for which a CMC is not specified in subdivision (3), Table 8-1, or subdivision (5):

(aa) a CMC ~~shall~~ **must** be calculated by the commissioner using the procedures in section 11 of this rule; or

(bb) if the minimum data requirements to calculate a CMC are not met, an SMC ~~shall~~ **must** 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~~ **must** not cause acute toxicity, as measured by whole effluent toxicity tests, at any point in the waterbody. Compliance with this criterion ~~shall be~~ **is** demonstrated if a discharge does not exceed one and zero-tenths (1.0) TU_c 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~~ **is** demonstrated if three-tenths (0.3) TU_c is not exceeded outside the applicable alternate mixing zone. ~~This~~

(F) Clause ~~shall~~ **(E)** ^a**does** 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~~ **must** 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~~ **ensure** protection against the adverse effects identified in this subdivision, a toxic substance or pollutant ~~shall~~ **must** not be present in ~~such~~ **surface** waters **outside of the applicable mixing zones determined in accordance with section 7 of this rule** 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~~ **specified** in:

(AA) subdivision (3), Table 8-1, which ~~table~~ incorporates subdivision (4), Table 8-2;

(BB) **subdivision (3), Table 8-1a**; and

(CC) subdivision (5).

(ii) For substances for which a CCC is not specified in subdivision (3), Table 8-1 **or Table 8-1a**, or subdivision (5):

(AA) a CCC ~~shall~~ **must** be calculated by the commissioner using the procedures in section 11 of this rule; or

(BB) if the minimum data requirements to calculate a CCC are not met, an SCC ~~shall~~ **must** 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~~ **ensure** protection of aquatic life, a discharge ~~shall~~ **must** not cause chronic toxicity, as measured by whole effluent toxicity tests, outside of the applicable mixing zone. Compliance with this criterion ~~shall be~~ **is** 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~~ **specified** in subdivision (6), Table 8-3.

(ii) For substances for which an HNC is not specified in subdivision (6), Table 8-3:

(AA) an HNC ~~shall~~ **must** be calculated by the commissioner using the procedures in section 14 of this rule; or

(BB) if the minimum data requirements to calculate an HNC are not met, an HNV ~~shall~~ **must** 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 **for nondrinking water** or HNV **for nondrinking water** for a substance ~~shall apply~~ **applies** to all surface waters outside the applicable mixing zone for a discharge of that substance. The HNC **for**

drinking **water** or HNV **for drinking water** shall apply **water for a substance applies** 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~~ **specified** in subdivision (6), Table 8-3.

(ii) For substances for which an HCC is not specified in subdivision (6), Table 8-3:

(AA) an HCC ~~shall~~ **must** be calculated by the commissioner using the procedures in section 14 of this rule; or

(BB) if the minimum data requirements to calculate an HCC are not met, an HCV ~~shall~~ **must** 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 **for nondrinking water** or HCV **for nondrinking water** for a substance ~~shall apply~~ **applies** to all surface waters outside the applicable mixing zone for a discharge of that substance. The HCC **for drinking water** or HCV **for drinking water** ~~shall apply~~ **applies** 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~~ **specified** in subdivision (7), Table 8-4.

(ii) For substances for which a WC is not specified in subdivision (7), Table 8-4:

(AA) a WC ~~shall~~ **must** be calculated by the commissioner using the procedures in section 15 of this rule; or

(BB) 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 **are as follows:**

Table 8-1
Surface Water Quality Criteria for Protection of Aquatic Life^{[1][2]}

| CAS Number | Substances | CMC (Maximum) (µg/l) | CMC Conversion Factors | CCC (4-Day Average) (µg/l) | CCC Conversion Factors |
|-----------------------------------|---|---|--|---|--|
| Metals (dissolved) ^[2] | | | | | |
| 7429905 | Aluminum (total recoverable) ^[3] | $WER^{[4]}(e^{(1.3695[\ln(\text{hardness})]+1.8308)})$ | | $WER^{[4]}(e^{(1.3695[\ln(\text{hardness})]+0.9161)})$ | |
| 7440382 | Arsenic (III) (dissolved) ^[5] | $WER^{[3][4]}(339.8) (340)$ | 1.000 | $WER^{[3][4]}(147.9) (150)$ | 1.000 |
| 7440439 | Cadmium (dissolved) ^[5] | $WER^{[3][4]}(e^{(1.128[\ln(\text{hardness})]-3.6867)}) (e^{(0.9789[\ln(\text{hardness})]-3.866)})$ | $1.136672-[(\ln(\text{hardness})) (0.041838)]$ | $WER^{[3][4]}(e^{(0.7852[\ln(\text{hardness})]-2.745)}) (e^{(0.7977[\ln(\text{hardness})]-3.909)})$ | $1.101672-[(\ln(\text{hardness})) (0.041838)]$ |
| 7440473 | Chromium (III) (dissolved) ^[5] | $WER^{[3][4]}(e^{(0.819[\ln(\text{hardness})]+3.7256)})$ | 0.316 | $WER^{[3][4]}(e^{(0.819[\ln(\text{hardness})]+0.6848)})$ | 0.860 |
| 7440473 | Chromium (VI) (dissolved) ^[5] | $WER^{[3][4]}(16.02) (16)$ | 0.982 | $WER^{[3][4]}(10.98) (11)$ | 0.962 |
| 7440508 | Copper (dissolved) ^[5] | $WER^{[3][4]}(e^{(0.9422[\ln(\text{hardness})]-1.700)})$ | 0.960 | $WER^{[3][4]}(e^{(0.8545[\ln(\text{hardness})]-1.702)})$ | 0.960 |
| 7439921 | Lead (dissolved) ^[5] | $WER^{[4]}(e^{(1.273[\ln(\text{hardness})]-1.055)})$ | $1.46203-[(\ln(\text{hardness})) (0.145712)]$ | $WER^{[4]}(e^{(1.273[\ln(\text{hardness})]-3.557)})$ | $1.46203-[(\ln(\text{hardness})) (0.145712)]$ |
| 7439976 | Mercury (dissolved) ^[5] | $WER^{[3][4]}(1.694)$ | 0.85 | $WER^{[3][4]}(0.9081)$ | 0.85 |
| 7440020 | Nickel (dissolved) ^[5] | $WER^{[3][4]}(e^{(0.846[\ln(\text{hardness})]+2.255)})$ | 0.998 | $WER^{[3][4]}(e^{(0.846[\ln(\text{hardness})]+0.0584)})$ | 0.997 |
| 7782492 | Selenium (dissolved) | | | 5 Table 8-1a | 0.922 |
| 7440666 | Zinc (dissolved) ^[5] | $WER^{[3][4]}(e^{(0.8473[\ln(\text{hardness})]+0.884)})$ | 0.978 | $WER^{[3][4]}(e^{(0.8473[\ln(\text{hardness})]+0.884)})$ | 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][6]} | $e^{(1.005[pH]-4.869)}$ | NA | $e^{(1.005[pH]-5.134)}$ | NA |
| | Other Substances | | | | |
| | Chloride | ^[6] [7] | NA | ^[6] [7] | NA |
| | Chlorine (total residual) | 19 | NA | 11 | NA |
| | Chlorine (intermittent, total residual) ^{[6][8]} | 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] With the exception of aluminum, the hardness values used in the equations in this table must be no greater than 400 mg/l calcium carbonate (CaCO₃), and the criteria at a hardness of 400 mg/l CaCO₃ are used for water hardnesses above 400 mg/l CaCO₃. For aluminum, the hardness values must be no greater than 220 mg/l CaCO₃, and the criteria at a hardness of 220 mg/l CaCO₃ are used for water hardnesses above 220 mg/l CaCO₃.

^[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

^[3] Aluminum is expressed as total recoverable metal. The applicable pH range for determining the aluminum criterion is within 6.5 and 9.0. The total CMC or CCC shall must 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][4]} A value of one (1) shall must be used for the WER unless an alternate value is established under section 16 of this rule.

^[5] Aquatic life criteria for these metals are expressed in terms of dissolved metal in the water column. 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 must 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.

^{[4][6]} A CMC and CCC calculated for pentachlorophenol using the equation in this table shall must 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.

^[6] 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.

^{[6][7]} The CMC and CCC for this substance are established specified in subdivision (5).

^[8] To be considered an intermittent discharge, total residual chlorine must not be detected in the discharge for a period of more than forty (40) minutes in duration, and the periods must be separated by at least five (5) hours.

Table 8-1a

| CCC | | | | | |
|--------------------------------|----------------------|-----------------------------------|-------------------------------|-------------------------------|---|
| Fish Tissue (mg/kg dry weight) | | | Water Column (µg/L) | | |
| Egg or ovary | Whole-body | Muscle (skinless, boneless filet) | Lentic aquatic systems | Lotic aquatic systems | Short term, intermittent lentic and lotic aquatic systems |
| 15.1 ^[1,2] | 8.5 ^[2,3] | 11.3 ^[2,3] | 1.5 (30 day) ^[4,5] | 3.1 (30 day) ^[4,5] | Intermittent exposure equation ^[4,5,6,7] |

^[1] Egg or ovary supersedes any whole-body, muscle, or water column element when fish egg or ovary concentrations are measured. Duration: Instantaneous measurement.

[2]Frequency: Not to be exceeded.

[3]Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured. Duration: Instantaneous measurement.

[4]Water column values are based on dissolved total selenium in water (includes all oxidation states, for example, selenite, selenate, organic selenium, and any other forms) and are derived from fish tissue values via bioaccumulation modeling.

[5]Frequency: Not to be exceeded more than once in three (3) years on average.

[6]Intermittent Exposure Equation is as follows:

$$\frac{WQC_{30\text{-day}} - C_{\text{bkgrnd}} (1 - f_{\text{int}})}{f_{\text{int}}}$$

Where: $WQC_{30\text{-day}}$ is the water column monthly element for either lentic or lotic waters;
 C_{bkgrnd} is the average background selenium concentration; and
 f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥ 0.033 (corresponding to one (1) day).

[7]Duration: Number of days per month with an elevated concentration.

(4) The following establishes dissolved The 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, are as follows:

Table 8-2

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

| Hardness | Aluminum (Total) | | Arsenic (III) (Dissolved) | | Cadmium (Dissolved) | | Chromium (III) (Dissolved) | | Chromium (VI) (Dissolved) | | Copper (Dissolved) | | | |
|----------|------------------|-------|---------------------------|-----|---------------------|------|----------------------------|------|---------------------------|-----|--------------------|-----|-----|-----|
| | CMC | CCC | CMC | CCC | CMC | CCC | CMC | CCC | CMC | CCC | CMC | CCC | | |
| 50 | 1,300 | 530 | 340 | 150 | 2.0 | 0.94 | 4.3 | 0.43 | 320 | 42 | 16 | 11 | 7.0 | 5.0 |
| 100 | 3,400 | 1,400 | 340 | 150 | 4.3 | 1.8 | 2.2 | 0.72 | 570 | 74 | 16 | 11 | 13 | 9.0 |
| 150 | 6,000 | 2,400 | 340 | 150 | 6.6 | 2.6 | 3.0 | 0.97 | 790 | 100 | 16 | 11 | 20 | 13 |
| 200 | 8,800 | 3,500 | 340 | 150 | 9.0 | 3.4 | 3.7 | 1.2 | 1,000 | 130 | 16 | 11 | 26 | 16 |
| 250 | 10,000 | 4,000 | 340 | 150 | 12 | 4.2 | 4.4 | 1.4 | 1,200 | 160 | 16 | 11 | 32 | 20 |
| 300 | 10,000 | 4,000 | 340 | 150 | 14 | 5.0 | 5.0 | 1.6 | 1,400 | 180 | 16 | 11 | 38 | 23 |
| 350 | 10,000 | 4,000 | 340 | 150 | 17 | 5.8 | 5.6 | 1.8 | 1,600 | 210 | 16 | 11 | 44 | 26 |
| 400 | 10,000 | 4,000 | 340 | 150 | 19 | 6.5 | 6.2 | 2.0 | 1,800 | 230 | 16 | 11 | 50 | 29 |
| 450 | | | 340 | 150 | 22 | | 6.8 | | 2,000 | 250 | 16 | 11 | 55 | 32 |
| 500 | | | 340 | 150 | 24 | | 7.3 | | 2,100 | 280 | 16 | 11 | 61 | 35 |

| Hardness | Lead (Dissolved) | | Mercury (Dissolved) | | Nickel (Dissolved) | | Selenium | | Zinc (Dissolved) | |
|----------|------------------|-----|---------------------|------|--------------------|-----|----------|-----|------------------|-----|
| | CMC | CCC | CMC | CCC | CMC | CCC | CMC | CCC | CMC | CCC |
| 50 | 45 | 3.7 | 1.4 | 0.77 | 260 | 29 | - | 4.6 | 65 | 66 |
| 100 | 97 | 7.9 | 1.4 | 0.77 | 470 | 52 | - | 4.6 | 120 | 120 |
| 150 | 150 | 12 | 1.4 | 0.77 | 660 | 73 | - | 4.6 | 170 | 170 |
| 200 | 200 | 17 | 1.4 | 0.77 | 840 | 93 | - | 4.6 | 210 | 210 |
| 250 | 260 | 21 | 1.4 | 0.77 | 1,000 | 110 | - | 4.6 | 250 | 260 |
| 300 | 310 | 26 | 1.4 | 0.77 | 1,200 | 130 | - | 4.6 | 300 | 300 |
| 350 | 370 | 30 | 1.4 | 0.77 | 1,400 | 150 | - | 4.6 | 340 | 340 |
| 400 | 420 | 34 | 1.4 | 0.77 | 1,500 | 170 | - | 4.6 | 380 | 380 |
| 450 | | | 1.4 | 0.77 | 1,700 | 190 | - | 4.6 | 420 | 420 |
| 500 | | | 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 **must** be used instead of the criteria in this table when ~~dissolved metals~~ **these** 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 chloride for protection of aquatic life **are as follows:**

(A) ~~The following provides the~~ CMC for chloride as a function of hardness (in mg/l as CaCO₃) and sulfate (in mg/l) in surface waters **is calculated using the following formula:**

$$C = 287.8 (\text{hardness})^{0.205797} (\text{sulfate})^{-0.07452}$$

Where: C = chloride CMC (maximum) in mg/l.

(B) ~~The following provides the~~ CCC for chloride as a function of hardness (in mg/l as CaCO₃) and sulfate (in mg/l) in surface waters **is calculated using the following formula:**

$$C = 177.87 (\text{hardness})^{0.205797} (\text{sulfate})^{-0.07452}$$

Where: C = chloride CCC (4-Day Average) in mg/l.

(C) The CMC and CCC for chloride calculated from the equations in this subdivision shall **must** be rounded to the nearest whole numbers, except when the criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(D) ~~The following establishes the~~ CMC for chloride in mg/l at selected concentrations of hardness and sulfate ~~with the understanding that the equation in clause (A) shall be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs:~~ **is shown in the following table:**

Table 8-2a^[1]
Hardness (mg/l)

| Sulfate (mg/l) | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 15 | 526 | 607 | 660 | 700 | 733 | 761 | 785 | 807 | 827 | 845 |
| 20 | 515 | 594 | 646 | 685 | 717 | 745 | 769 | 790 | 809 | 827 |
| 25 | 506 | 584 | 635 | 674 | 705 | 732 | 756 | 777 | 796 | 813 |
| 50 | 481 | 555 | 603 | 640 | 670 | 695 | 718 | 738 | 756 | 773 |
| 100 | 457 | 527 | 573 | 608 | 636 | 660 | 682 | 701 | 718 | 734 |
| 150 | 443 | 511 | 556 | 589 | 617 | 641 | 661 | 680 | 697 | 712 |
| 200 | 434 | 500 | 544 | 577 | 604 | 627 | 647 | 665 | 682 | 697 |
| 250 | 427 | 492 | 535 | 567 | 594 | 617 | 637 | 654 | 671 | 685 |
| 300 | 421 | 485 | 528 | 560 | 586 | 609 | 628 | 646 | 661 | 676 |
| 350 | 416 | 480 | 522 | 553 | 579 | 602 | 621 | 638 | 654 | 668 |
| 400 | 412 | 475 | 516 | 548 | 574 | 596 | 615 | 632 | 647 | 662 |
| 450 | 408 | 471 | 512 | 543 | 569 | 590 | 609 | 626 | 642 | 656 |
| 500 | 405 | 467 | 508 | 539 | 564 | 586 | 605 | 622 | 637 | 651 |

^[1] **The equation in clause (A) must be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.**

(E) ~~The following establishes the~~ CCC for chloride in mg/l at selected concentrations of hardness and sulfate ~~with the understanding that the equation in clause (B) shall be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs:~~ **is shown in the following table:**

Table 8-2b^[1]
Hardness (mg/l)

| Sulfate (mg/l) | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
|----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 15 | 325 | 375 | 408 | 433 | 453 | 470 | 485 | 499 | 511 | 522 |
| 20 | 318 | 367 | 399 | 423 | 443 | 460 | 475 | 488 | 500 | 511 |
| 25 | 313 | 361 | 392 | 416 | 436 | 453 | 467 | 480 | 492 | 503 |
| 50 | 297 | 343 | 373 | 395 | 414 | 430 | 444 | 456 | 467 | 477 |
| 100 | 282 | 326 | 354 | 375 | 393 | 408 | 421 | 433 | 444 | 453 |
| 150 | 274 | 316 | 343 | 364 | 381 | 396 | 409 | 420 | 430 | 440 |
| 200 | 268 | 309 | 336 | 357 | 373 | 388 | 400 | 411 | 421 | 431 |

| | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 250 | 264 | 304 | 331 | 351 | 367 | 381 | 394 | 404 | 414 | 423 |
| 300 | 260 | 300 | 326 | 346 | 362 | 376 | 388 | 399 | 409 | 418 |
| 350 | 257 | 297 | 322 | 342 | 358 | 372 | 384 | 394 | 404 | 413 |
| 400 | 255 | 294 | 319 | 339 | 355 | 368 | 380 | 391 | 400 | 409 |
| 450 | 252 | 291 | 316 | 336 | 351 | 365 | 377 | 387 | 397 | 405 |
| 500 | 250 | 289 | 314 | 333 | 349 | 362 | 374 | 384 | 394 | 402 |

^[1] The equation in clause (B) must be used instead of the criteria in this clause when chloride criteria are used as intermediate values in a calculation, such as in the calculation of WQBELs.

(6) The following establishes Surface water quality criteria for protection of human health **are as follows:**

Table 8-3
Surface Water Quality Criteria for Protection of Human Health^[1]

| CAS Number | Substances | Human Noncancer Criteria (HNC) | | Human Cancer Criteria (HCC) | |
|----------------------------|-----------------------------------|--------------------------------|--------------------------|-----------------------------|--------------------------|
| | | Drinking Water (µg/l) | Nondrinking Water (µg/l) | Drinking Water (µg/l) | Nondrinking Water (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.

(7) The following establishes Surface water quality criteria for protection of wildlife **are as follows:**

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~~ **the following minimum** conditions necessary for the maintenance of a well-balanced aquatic community. The following conditions are applicable at any point in the surface waters outside of the applicable mixing zone, as determined in accordance with section 7 of this rule, **to ensure conditions necessary for the maintenance of a well-balanced aquatic community:**

- (1) There shall ~~must~~ be no ~~substances~~ **substance** that:
 - (A) ~~impart~~ **imparts** unpalatable flavor to food fish; or
 - (B) ~~result~~ **results** in offensive odors in the vicinity of the water.
- (2) No pH values below six (6.0) or above nine (9.0) **are permitted** 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~~: **must**:
 - (A) average at least five (5.0) milligrams per liter per calendar day; and
 - (B) not be less than four (4.0) milligrams per liter at any time.

(4) ~~The following are~~ Conditions for temperature **are as follows:**

- (A) ~~There shall be no~~ Abnormal temperature changes that may adversely affect aquatic life **are prohibited** 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~~ **must** be maintained.
- (C) Water temperatures ~~shall~~ **must** not exceed the maximum limits in ~~the following~~ Table 8-5 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~~ **the** locations **must not** 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 °F(°C) | All Other Indiana Streams in the Great Lakes System °F(°C) |
|-----------|--|--|
| 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~~ **must** 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~~ **must** 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 **are prohibited**. In addition, plume interaction with the bottom ~~shall~~: **must**:
 - (AA) be minimized; and
 - (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~~ **must** 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~~ **must** not be more than three (3) degrees Fahrenheit (one and seven-tenths (1.7) degrees Celsius) above the existing natural water temperature.

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

(aa) Thermal discharges to Lake Michigan ~~shall~~ **must** 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 | °F(°C) |
|-----------|---------|
| 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 not more than a three (3) degree Fahrenheit exceedance of the maximum water temperature ~~shall be~~ **is** permitted.

(v) The **following** facilities ~~described as follows~~ that discharge into the open waters of Lake Michigan ~~shall~~ **be** ~~be~~ **are** 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 **any** 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~~ **must** be designed and located to minimize entrainment and damage to desirable organisms. Requirements may vary depending upon local conditions, but, in general, intakes ~~shall~~ **must**:

(AA) have minimum water velocity; and

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

Water velocity at screens and other exclusion devices ~~shall also~~ **must** be at a minimum.

(vii) Discharges other than those ~~new~~ in existence ~~shall be such that the~~ **on or before February 11, 1972, must not have** thermal plumes ~~do not~~ **that** overlap or intersect.

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

(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~~ **must** be used to regulate ammonia:

(A) Concentrations of total ammonia (as N) ~~shall~~ **must** 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~~ **must** 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: $8 \leq pH \leq 9$; or
 $\frac{1 + 10^{(7.4 - pH)}}{1.25}$; when: $6.5 \leq pH \leq 8$
 $pK_a = 0.09018 + \frac{2729}{T + 273.2}$
 $T =$ Temperature in °C

(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: $8 \leq pH \leq 9$; or
 $\frac{1 + 10^{(7.4 - pH)}}{1.25}$; when: $6.5 \leq pH \leq 8$
 $RATIO = 13.5$; when: $7.7 \leq pH \leq 9$; or
 $\frac{(20)(10^{(7.7 - pH)})}{1 + 10^{(7.4 - pH)}}$; when: $6.5 \leq pH \leq 7.7$
 $pK_a = 0.09018 + \frac{2729}{T + 273.2}$
 $T =$ Temperature in °C

(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 (°C)

| 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

| pH | Criterion Continuous Concentrations for Total Ammonia (as N) Temperature (°C) | | | | | | |
|-----|---|--------|--------|--------|--------|--------|--------|
| | 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~~ **must** 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 surface waters outside of the applicable mixing zone, as determined in accordance with section 7 of this rule, to ensure conditions necessary for the maintenance of a well-balanced, cold-water fish community:~~

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

(A) six (6.0) milligrams per liter at any time; and

(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~~ **must** not be less than seven (7.0) milligrams per liter at any time.

(2) The maximum temperature rise above natural ~~shall~~ **must** 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~~ **must** 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 ~~is~~ as follows:

- (1) The recreational season is defined as the months of April through October, inclusive.
- (2) In addition to subsection (b), the criteria in this subsection ~~shall~~ **are to** be used to do the following:
 - (A) Evaluate waters for full body contact recreational uses.
 - (B) Establish wastewater treatment requirements.
 - (C) Establish effluent limits during the recreational season.
- (3) For full body contact recreational uses, E. coli bacteria ~~shall~~ **must** not exceed the following:
 - (A) One hundred twenty-five (125) **colony forming units (cfu) or most probable number (MPN)** 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.
 - (B) Two hundred thirty-five (235) **cfu or MPN** per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period, except that, in cases where there are at least ten (10) samples at a given site, up to ten percent (10%) of the samples may exceed two hundred thirty-five (235) cfu or MPN per one hundred (100) milliliters where **the**:
 - (i) ~~the~~ E. coli exceedances are incidental and attributable solely to E. coli resulting from the discharge of treated wastewater from a wastewater treatment plant as defined at [IC 13-11-2-258](#); and
 - (ii) ~~the~~ criterion in clause (A) is met.

However, a single sample ~~shall be~~ **is** used for making beach notification and closure decisions.

If a geometric mean cannot be calculated because five (5) equally spaced samples are not available, then the criterion stated in 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~~ **must** be limited to the lowest whole number result.
- (5) Effluent limits to implement the criteria in subdivision (3) during the recreational season ~~shall~~ **must** 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~~ **must** 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 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~~ **must** 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 ~~water~~ supply ~~are as follows~~:

- (1) The coliform bacteria group ~~shall~~ **must** not exceed the following:
 - (A) Five thousand (5,000) **cfu or MPN** per one hundred (100) milliliters as a monthly average value (either MPN or **membrane filter (MF)** count).
 - (B) Five thousand (5,000) **cfu or MPN** per one hundred (100) milliliters in more than twenty percent (20%) of the samples examined during any month.
 - (C) Twenty thousand (20,000) **cfu or MPN** 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~~ **must** not interfere with the production of a finished water by conventional treatment consisting of the following:
 - (A) Coagulation.
 - (B) Sedimentation.
 - (C) Filtration.
 - (D) Disinfection.
- (3) The concentrations of either chloride or sulfate ~~shall~~ **must** not exceed two hundred fifty (250) milligrams per liter unless due to naturally occurring sources.
- (4) The concentration of dissolved solids ~~shall~~ **must** 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~~ **are** 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~~ **must** not exceed ten (10) milligrams per liter; and
- (B) concentration of nitrite-N ~~shall~~ **must** not exceed one (1) milligram per liter.

(7) Chemical constituents in the waters ~~shall~~ **must** not be present ~~in such~~ **at** levels ~~as to~~ **that** 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~~ **must** not exceed seven hundred fifty (750) milligrams per liter at any time **other than from naturally occurring sources to ensure protection of water quality at the point at which surface water is withdrawn for use, either with or without treatment, for industrial cooling and processing.** 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~~ **surface** 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~~ **surface** waters designated for limited uses under section 19(a) of this rule ~~shall~~ **must**, at a minimum, meet the ~~following~~ criteria ~~(1) The criteria contained in subsection~~ **subsections** (b), ~~(2) The criteria contained in subsection (e), (3) The criteria contained in subsection~~ **and** (g), ~~(4) The waters must~~ **and** be aerobic at all times. ~~(5) Notwithstanding subdivisions (1) through (4), the quality of a limited use stream~~ **However, the water must meet the criteria that are applicable to the higher use water** at the point where it ~~is~~ **a limited use water:**

- ~~(1) becomes physically or chemically capable of supporting a higher use; or at its interface~~
- ~~(2) interfaces 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~~ **must** meet the following criteria:

Table 8-9
Additional Criteria for Lake Michigan

| Parameters | Criteria |
|------------------------|--|
| Dissolved oxygen | Dissolved oxygen concentrations shall must 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) are permitted except daily fluctuations that exceed pH 9.0 and are correlated with photosynthetic activity. shall be permitted. |
| Chloride | 250 mg/l ^[1] |
| Phenols | See The criteria in subsection (c)(1) |
| Sulfate | 250 mg/l ^[1] |
| Total phosphorus | See The requirements in 327 IAC 5-10-2 |
| Total dissolved solids | 750 mg/l ^[1] |
| Fluoride | 1.0 mg/l ^[1] |
| Dissolved iron | 300 µg/l ^[1] |

^[1] This criterion ~~is established to minimize or prevent~~ **minimizes or prevents** increased levels of this substance in

Lake Michigan. For the purposes of establishing water quality-based effluent limitations based on this criterion, it shall **must** 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 **following must occur**:

(A) The department shall prepare a report for the ~~water pollution control board~~ on the monitoring data for the ~~constituents~~ **parameters** in the following table Table 8-10, as measured at the drinking water intakes in Lake Michigan.

(B) If ~~these~~ **the monitoring data in clause (A)** indicate that the levels of the ~~constituents~~ **parameters** are either increasing or exceed the levels in the Table **8-10**, the report ~~shall for the board~~ **must** 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. |
| Chloride | |
| Monthly average | 15 mg/l |
| Daily maximum | 20 mg/l |
| Sulfate | |
| 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 Division; [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; filed Mar 18, 2008, 2:26 p.m.: [20080416-IR-327060573FRA](#); filed Jul 9, 2012, 2:54 p.m.: [20120808-IR-327110320FRA](#))

[Notice of Public Hearing](#)

Posted: 11/15/2017 by Legislative Services Agency
An [html](#) version of this document.