

1.1 **Pollution Control Agency**

1.2 **Adopted Permanent Rules Relating to Water Quality**

1.3 **7050.0150 DETERMINATION OF WATER QUALITY, BIOLOGICAL AND**
1.4 **PHYSICAL CONDITIONS, AND COMPLIANCE WITH STANDARDS.**

1.5 [For text of subps 1 to 3, see M.R.]

1.6 Subp. 4. **Definitions.** For the purposes of this chapter and chapter 7053, the
1.7 following terms have the meanings given them.

1.8 [For text of items A and B, see M.R.]

1.9 C. "BOD₅" or "five-day biochemical oxygen demand" means the amount of
1.10 dissolved oxygen needed by aerobic biological organisms to break down organic material
1.11 present in a given water sample at a certain temperature over a five-day period.

1.12 D. "Chlorophyll-a" means a pigment in green plants including algae. The
1.13 concentration of chlorophyll-a, expressed in weight per unit volume of water, is a
1.14 measurement of the abundance of algae.

1.15 E. "Diel flux" means the daily change in a constituent, such as dissolved oxygen
1.16 or pH, when there is a distinct daily cycle in the measurement. Diel dissolved oxygen
1.17 flux means the difference between the maximum daily dissolved oxygen concentration
1.18 and the minimum daily dissolved oxygen concentration.

1.19 F. "Ecoregion" means an area of relative homogeneity in ecological systems
1.20 based on similar soils, land use, land surface form, and potential natural vegetation.
1.21 Minnesota ecoregions are shown on the map in part 7050.0468.

1.22 G. "Eutrophication" means the increased productivity of the biological
1.23 community in water bodies in response to increased nutrient loading. Eutrophication
1.24 is characterized by increased growth and abundance of algae and other aquatic plants,
1.25 reduced water transparency, reduction or loss of dissolved oxygen, and other chemical and

2.1 biological changes. The acceleration of eutrophication due to excess nutrient loading from
2.2 human sources and activities, called cultural eutrophication, causes a degradation of water
2.3 quality and possible loss of beneficial uses.

2.4 H. "Eutrophication standard" means the combination of indicators of
2.5 enrichment and indicators of response as described in subpart 5. The indicators upon
2.6 which the eutrophication standard for specific water bodies are based are as provided
2.7 under subparts 5a to 5c.

2.8 H.I. "Fish and other biota" and "lower aquatic biota" mean the aquatic
2.9 community including, but not limited to, game and nongame fish, minnows and other
2.10 small fish, mollusks, insects, crustaceans and other invertebrates, submerged or emergent
2.11 rooted vegetation, suspended or floating algae, substrate-attached algae, and microscopic
2.12 organisms. "Other biota" includes aquatic or semiaquatic organisms that depend on
2.13 aquatic systems for food or habitat such as amphibians and certain wildlife species.

2.14 H.J. "Hydraulic residence time" means the time water resides in a basin or,
2.15 alternately, the time it would take to fill the basin if it were empty.

2.16 H.K. "Impaired water" or "impaired condition" means a water body that
2.17 does not meet applicable water quality standards or fully support applicable beneficial
2.18 uses, due in whole or in part to water pollution from point or nonpoint sources, or any
2.19 combination thereof.

2.20 H.L. "Index of biological integrity" or "IBI" means an index developed by
2.21 measuring attributes of an aquatic community that change in quantifiable and predictable
2.22 ways in response to human disturbance, representing the health of that community.

2.23 H.M. "Lake" means an enclosed basin filled or partially filled with standing
2.24 fresh water with a maximum depth greater than 15 feet. Lakes may have no inlet or outlet,
2.25 an inlet or outlet, or both an inlet and outlet.

3.1 M N. "Lake morphometry" means the physical characteristics of the lake basin
3.2 that are reasonably necessary to determine the shape of a lake, such as maximum length
3.3 and width, maximum and mean depth, area, volume, and shoreline configuration.

3.4 N O. "Mixing status" means the frequency of complete mixing of the lake
3.5 water from surface to bottom, which is determined by whether temperature gradients are
3.6 established and maintained in the water column during the summer season.

3.7 Θ P. "Measurable increase" or "measurable impact" means a change in
3.8 trophic status that can be discerned above the normal variability in water quality data
3.9 using a weight of evidence approach. The change in trophic status does not require a
3.10 demonstration of statistical significance to be considered measurable. Mathematical
3.11 models may be used as a tool in the data analysis to help predict changes in trophic status.

3.12 P Q. "Natural causes" means the multiplicity of factors that determine the
3.13 physical, chemical, or biological conditions that would exist in a water body in the absence
3.14 of measurable impacts from human activity or influence.

3.15 Q R. "Normal fishery" and "normally present" mean the fishery and other
3.16 aquatic biota expected to be present in the water body in the absence of pollution of the
3.17 water, consistent with any variability due to natural hydrological, substrate, habitat, or
3.18 other physical and chemical characteristics. Expected presence is based on comparing
3.19 the aquatic community in the water body of interest to the aquatic community in
3.20 representative reference water bodies.

3.21 R S. "Nuisance algae bloom" means an excessive population of algae that is
3.22 characterized by obvious green or blue-green pigmentation in the water, floating mats
3.23 of algae, reduced light transparency, aesthetic degradation, loss of recreational use,
3.24 possible harm to the aquatic community, or possible toxicity to animals and humans.
3.25 Algae blooms are measured through tests for chlorophyll-a, observations of Secchi disk
3.26 transparency, and observations of impaired recreational and aesthetic conditions by the

4.1 users of the water body, or any other reliable data that identifies the population of algae
4.2 in an aquatic community.

4.3 S T. "Periphyton" means algae on the bottom of a water body. In rivers or
4.4 streams, these forms are typically found attached to logs, rocks, or other substrates, but
4.5 when dislodged the algae will become part of the seston.

4.6 F U. "Readily available and reliable data and information" means chemical,
4.7 biological, and physical data and information determined by the commissioner to meet the
4.8 quality assurance and quality control requirements in subpart 8, that are not more than ten
4.9 years old from the time they are used for the assessment. A subset of data in the ten-year
4.10 period, or data more than ten years old can be used if credible scientific evidence shows
4.11 that these data are representative of current conditions.

4.12 U V. "Reference water body" means a water body least impacted by point or
4.13 nonpoint sources of pollution that is representative of water bodies in the same ecoregion
4.14 or watershed. Reference water bodies are used as a base for comparing the quality of
4.15 similar water bodies in the same ecoregion or watershed.

4.16 V W. "Reservoir" means a body of water in a natural or artificial basin or
4.17 watercourse where the outlet or flow is artificially controlled by a structure such as a dam.
4.18 Reservoirs are distinguished from river systems by having a hydraulic residence time of at
4.19 least 14 days. For purposes of this item, residence time is determined using a flow equal
4.20 to the $122Q_{10}$ for the months of June through September.

4.21 W X. "River nutrient region" means the geographic basis for regionalizing the
4.22 river eutrophication criteria as described in Heiskary, S. and K. Parson, Regionalization
4.23 of Minnesota's Rivers for Application of River Nutrient Criteria, Minnesota Pollution
4.24 Control Agency (~~2010~~) (2013), which is incorporated by reference. The document is not
4.25 subject to frequent change and is available through the Minitex interlibrary loan system.

5.1 ~~X~~Y. "Secchi disk" means a tool that is used to measure the transparency of lake
5.2 water. A Secchi disk is an eight-inch weighted disk on a calibrated rope, either white or
5.3 with quadrants of black and white. To measure water transparency with a Secchi disk, the
5.4 disk is viewed from the shaded side of a boat. The depth of the water at the point where
5.5 the disk reappears upon raising it after it has been lowered beyond visibility is recorded.

5.6 ~~Y~~Z. "Secchi disk transparency" means the transparency of water as measured
5.7 by either a Secchi disk, a Secchi tube, or a transparency tube.

5.8 ~~Z~~AA. "Secchi tube" means a tool that is used to measure the transparency of
5.9 stream or river water. A Secchi tube is a clear plastic tube, one meter in length and 1-3/4
5.10 inch in diameter, with a mini-Secchi disk on a string. To measure water transparency, the
5.11 tube is filled with water collected from a stream or river and, looking into the tube from
5.12 the top, the weighted Secchi disk is lowered into the tube by a string until it disappears
5.13 and then raised until it reappears, allowing the user to raise and lower the disk within the
5.14 same water sample numerous times. The depth of the water at the midpoint between
5.15 disappearance and reappearance of the disk is recorded in centimeters, which are marked
5.16 on the side of the tube. If the Secchi disk is visible when it is lowered to the bottom of the
5.17 tube, the transparency reading is recorded as "greater than 100 centimeters."

5.18 ~~AA~~BB. "Seston" means particulate matter suspended in water bodies and
5.19 includes plankton and organic and inorganic matter.

5.20 ~~BB~~CC. "Shallow lake" means an enclosed basin filled or partially filled with
5.21 standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more
5.22 of the lake area shallow enough to support emergent and submerged rooted aquatic plants
5.23 (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the
5.24 summer. The quality of shallow lakes will permit the propagation and maintenance of
5.25 a healthy indigenous aquatic community and they will be suitable for boating and other
5.26 forms of aquatic recreation for which they may be usable. Shallow lakes are differentiated

6.1 from wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186,
6.2 subpart 1a.

6.3 ~~CC~~ DD. "Summer-average" means a representative average of concentrations
6.4 or measurements of nutrient enrichment factors, taken over one summer season.

6.5 ~~DD~~ EE. "Summer season" means a period annually from June 1 through
6.6 September 30.

6.7 ~~EE~~ FF. "Transparency tube" means a tool that is used to measure the
6.8 transparency of stream or river water. A transparency tube is a graduated clear plastic
6.9 tube, 24 inches or more in length by 1-1/2 inches in diameter, with a stopper at the
6.10 bottom end. The inside surface of the stopper is painted black and white. To measure
6.11 water transparency, the tube is filled with water from a surface water; the water is
6.12 released through a valve at the bottom end until the painted surface of the stopper is just
6.13 visible through the water column when viewed from the top of the tube. The depth, in
6.14 centimeters, is noted. More water is released until the screw in the middle of the painted
6.15 symbol on the stopper is clearly visible; this depth is noted. The two observed depths are
6.16 averaged to obtain a transparency measurement.

6.17 ~~FF~~ GG. "Trophic status or condition" means the productivity of a lake as
6.18 measured by the phosphorus content, algae abundance, and depth of light penetration.

6.19 ~~GG~~ HH. "Water body" means a lake, reservoir, wetland, or a geographically
6.20 defined portion of a river or stream.

6.21 Subp. 5. **Impairment of waters due to excess algae or plant growth.** In evaluating
6.22 whether the narrative standards in subpart 3, which prohibit any material increase
6.23 in undesirable slime growths or aquatic plants including algae, are being met, the
6.24 commissioner will use all readily available and reliable data and information for the
6.25 following factors of use impairment:

- 7.1 A. representative summer-average concentrations of total phosphorus and
7.2 total nitrogen measured in the water body;
- 7.3 B. representative summer-average concentrations of chlorophyll-a seston
7.4 measured in the water body;
- 7.5 C. representative summer-average measurements of Secchi disk transparency
7.6 in the water body;
- 7.7 D. representative summer-average concentrations of five-day biochemical
7.8 oxygen demand measured in rivers and streams;
- 7.9 E. representative diel dissolved oxygen flux measurements in rivers and streams
7.10 as averaged over a minimum of four consecutive days during the summer season;
- 7.11 F. representative measurements of pH in the water body during the summer
7.12 season;
- 7.13 G. representative measurements of chlorophyll-a (periphyton) on substrates on
7.14 the beds of rivers and streams during the summer season; and
- 7.15 H. any other scientifically objective, credible, and supportable factor.

7.16 **Subp. 5a. Impaired condition; lakes, shallow lakes, and reservoirs.**

- 7.17 A. For lakes, shallow lakes, and reservoirs, a finding of an impaired condition
7.18 must be supported by data showing:
- 7.19 (1) elevated levels of nutrients under subpart 5, item A; and
- 7.20 (2) at least one factor showing impaired conditions resulting from nutrient
7.21 overenrichment under subpart 5, items B and C.
- 7.22 B. The trophic status data described in subpart 5, items A to C and H, must be
7.23 assessed in light of the magnitude, duration, and frequency of nuisance algae blooms in
7.24 the water body; and documented impaired recreational and aesthetic conditions observed

8.1 by the users of the water body due to excess algae or plant growth, reduced transparency,
8.2 or other deleterious conditions caused by nutrient overenrichment.

8.3 C. Assessment of trophic status and the response of a given water body to
8.4 nutrient enrichment will take into account the trophic status of reference water bodies; and
8.5 all relevant factors that affect the trophic status of the given water body appropriate for
8.6 its geographic region, such as the temperature, morphometry, hydraulic residence time,
8.7 mixing status, watershed size, and location.

8.8 Subp. 5b. **Impaired condition; rivers and streams.** For rivers and streams, a
8.9 finding of an impaired condition must be supported by data showing:

8.10 A. elevated levels of nutrients under subpart 5, item A, and at least one factor
8.11 showing impaired conditions resulting from nutrient overenrichment under subpart 5,
8.12 item B, D, E, F, or H; or

8.13 B. elevated levels of chlorophyll-a (periphyton) under subpart 5, item G.

8.14 Subp. 5c. **Impaired condition; navigational pools.** For navigational pools, a
8.15 finding of impaired condition must be supported by data showing:

8.16 A. elevated levels of nutrients under subpart 5, item A; and

8.17 B. impaired conditions resulting from nutrient overenrichment under subpart
8.18 5, item B.

8.19 [For text of subps 6 to 8, see M.R.]

8.20 **7050.0220 SPECIFIC WATER QUALITY STANDARDS BY ASSOCIATED USE**
8.21 **CLASSES.**

8.22 [For text of subps 1 to 3, see M.R.]

8.23 Subp. 3a. **Cold water sport fish, drinking water, and associated use classes.**

8.24 Water quality standards applicable to use Classes 1B, 2A, 3A or 3B, 4A and 4B, and 5
8.25 surface waters.

9.1 A. MISCELLANEOUS SUBSTANCE, CHARACTERISTIC, OR POLLUTANT

	2A	2A	2A	1B	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	IR	AN

9.4

9.5 (1) Ammonia, un-ionized as N, µg/L

9.6 16 – – – – – – –

9.7 (2) Asbestos, >10 µm (c), fibers/L

9.8 – – – 7.0e+06 – – – –

9.9 (3) Bicarbonates (HCO₃), meq/L

9.10 – – – – – 5 – –

9.11 (4) Bromate, µg/L

9.12 – – – 10 – – – –

9.13 (5) Chloride, mg/L

9.14 230 860 1,720 250(S) 50/100 – – –

	2A	2A	2A	1B	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	IR	AN

9.17

9.18 (6) Chlorine, total residual, µg/L

9.19 11 19 38 – – – – –

9.20 (7) Chlorite, µg/L

9.21 – – – 1,000 – – – –

9.22 (8) Color, Pt-Co

9.23 30 – – 15(S) – – – –

9.24 (9) Cyanide, free, µg/L

9.25 5.2 22 45 200 – – – –

10.1 (10) *Escherichia (E.) coli* bacteria, organisms/100 mL

10.2 See — — — — — — — —
10.3 item D

10.4 **2A 2A 2A 1B 3A/3B 4A 4B 5**
10.5 **CS MS FAV DC IC IR IR AN**

10.6

10.7 (11) Eutrophication standards for lakes and reservoirs (phosphorus, total, µg/L;
10.8 chlorophyll-a, µg/L; Secchi disk transparency, meters)

10.9 See part — — — — — — — —
10.10 7050.0222,
10.11 subparts 2
10.12 and 2a

10.13 (12) Eutrophication standards for rivers, streams, and navigational pools (phosphorus,
10.14 total µg/L; chlorophyll-a (seston), µg/L; five-day biochemical oxygen demand (BOD₅),
10.15 mg/L; diel dissolved oxygen flux, mg/L; chlorophyll-a (periphyton), mg/m²)

10.16 See part — — — — — — — —
10.17 7050.0222,
10.18 subparts 2
10.19 and 2b

10.20 (13) Fluoride, mg/L

10.21 — — — 4 — — — —

10.22 (14) Fluoride, mg/L

10.23 — — — 2(S) — — — —

10.24 (15) Foaming agents, µg/L

10.25 — — — 500(S) — — — —

10.26 (16) Hardness, Ca+Mg as CaCO₃, mg/L

10.27 — — — — 50/250 — — —

	2A	2A	2A	1B	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	IR	AN
11.1								
11.2								
11.3	<hr/>							
11.4	(17) Hydrogen sulfide, mg/L							
11.5	–	–	–	–	–	–	–	0.02
11.6	(18) Nitrate as N, mg/L							
11.7	–	–	–	10	–	–	–	–
11.8	(19) Nitrite as N, mg/L							
11.9	–	–	–	1	–	–	–	–
11.10	(20) Nitrate + Nitrite as N, mg/L							
11.11	–	–	–	10	–	–	–	–
11.12	(21) Odor, TON							
11.13	–	–	–	3(S)	–	–	–	–
11.14	2A	2A	2A	1B	3A/3B	4A	4B	5
11.15	CS	MS	FAV	DC	IC	IR	IR	AN
11.16	<hr/>							
11.17	(22) Oil, µg/L							
11.18	500	5,000	10,000	–	–	–	–	–
11.19	(23) Oxygen, dissolved, mg/L							
11.20	7, as a	–	–	–	–	–	–	–
11.21	daily							
11.22	minimum							
11.23	(24) pH minimum, su							
11.24	6.5	–	–	6.5(S)	6.5/6.0	6.0	6.0	6.0
11.25	(25) pH maximum, su							

12.1	8.5	–	–	8.5(S)	8.5/9.0	8.5	9.0	9.0
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12.2 (26) Radioactive materials

12.3	See	–	–	See	–	See	See	–
12.4	item E			item E		item E	item E	

12.5	2A	2A	2A	1B	3A/3B	4A	4B	5
12.6	CS	MS	FAV	DC	IC	IR	IR	AN

12.7

12.8 (27) Salinity, total, mg/L

12.9	–	–	–	–	–	–	1,000	–
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12.10 (28) Sodium, meq/L

12.11	–	–	–	–	–	60% of	–	–
12.12						total		
12.13						cations		

12.14 (29) Specific conductance at 25°C, µmhos/cm

12.15	–	–	–	–	–	1,000	–	–
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12.16 (30) Sulfate, mg/L

12.17	–	–	–	250(S)	–	–	–	–
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12.18 (31) Sulfates, wild rice present, mg/L

12.19	–	–	–	–	–	10	–	–
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12.20	2A	2A	2A	1B	3A/3B	4A	4B	5
12.21	CS	MS	FAV	DC	IC	IR	IR	AN

12.22

12.23 (32) Temperature, °F

12.24	No material	–	–	–	–	–	–	–
12.25	increase							

12.26 (33) Total dissolved salts, mg/L

13.1	–	–	–	–	–	700	–	–
13.2	(34) Total dissolved solids, mg/L							
13.3	–	–	–	500(S)	–	–	–	–
13.4	(35) Total suspended solids (TSS), mg/L							
13.5	See part							
13.6	7050.0222,							
13.7	subpart 2							
13.8	B. METALS AND ELEMENTS							
13.9	2A	2A	2A	1B	3A/3B	4A	4B	5
13.10	CS	MS	FAV	DC	IC	IR	LS	AN
13.11	<hr/>							
13.12	(1) Aluminum, total, µg/L							
13.13	87	748	1,496	50-	–	–	–	–
13.14	200(S)							
13.15	(2) Antimony, total, µg/L							
13.16	5.5	90	180	6	–	–	–	–
13.17	(3) Arsenic, total, µg/L							
13.18	2.0	360	720	10	–	–	–	–
13.19	(4) Barium, total, µg/L							
13.20	–	–	–	2,000	–	–	–	–
13.21	(5) Beryllium, total, µg/L							
13.22	–	–	–	4.0	–	–	–	–
13.23	2A	2A	2A	1B	3A/3B	4A	4B	5
13.24	CS	MS	FAV	DC	IC	IR	LS	AN
13.25	<hr/>							
13.26	(6) Boron, total, µg/L							

15.1	(13) Iron, total, µg/L							
15.2	–	–	–	300(S)	–	–	–	–
15.3	(14) Lead, total, µg/L							
15.4	3.2	82	164	NA	–	–	–	–
15.5	Class 2A lead standards are hardness dependent. Lead values shown are for a total hardness							
15.6	of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other hardness values							
15.7	and equations to calculate lead standards for any hardness value not to exceed 400 mg/L.							
15.8	(15) Manganese, total, µg/L							
15.9	–	–	–	50(S)	–	–	–	–
15.10	2A	2A	2A	1B	3A/3B	4A	4B	5
15.11	CS	MS	FAV	DC	IC	IR	LS	AN
15.12	<hr/>							
15.13	(16) Mercury, total, in water, ng/L							
15.14	6.9	2,400*	4,900*	2,000	–	–	–	–
15.15	(17) Mercury, total in edible fish tissue, mg/kg or parts per million							
15.16	0.2	–	–	–	–	–	–	–
15.17	(18) Nickel, total, µg/L							
15.18	158	1,418	2,836	–	–	–	–	–
15.19	Class 2A nickel standards are hardness dependent. Nickel values shown are for a total							
15.20	hardness of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other hardness							
15.21	values and equations to calculate nickel standards for any hardness value not to exceed							
15.22	400 mg/L.							
15.23	(19) Selenium, total, µg/L							
15.24	5.0	20	40	50	–	–	–	–
15.25	(20) Silver, total, µg/L							
15.26	0.12	2.0	4.1	100(S)	–	–	–	–

16.1 Class 2A silver MS and FAV are hardness dependent. Silver values shown are for a
 16.2 total hardness of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other
 16.3 hardness values and equations to calculate silver standards for any hardness value not to
 16.4 exceed 400 mg/L.

16.5	2A	2A	2A	1B	3A/3B	4A	4B	5
16.6	CS	MS	FAV	DC	IC	IR	LS	AN

16.7

16.8 (21) Thallium, total, µg/L

16.9	0.28	64	128	2	–	–	–	–
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16.10 (22) Zinc, total, µg/L

16.11	106	117	234	5,000	–	–	–	–
16.12				(S)				

16.13 Class 2A zinc standards are hardness dependent. Zinc values shown are for a total hardness
 16.14 of 100 mg/L only. See part 7050.0222, subpart 2, for examples at other hardness values
 16.15 and equations to calculate zinc standards for any hardness value not to exceed 400 mg/L.

16.16 C. ORGANIC POLLUTANTS OR CHARACTERISTICS

16.17	2A	2A	2A	1B	3A/3B	4A	4B	5
16.18	CS	MS	FAV	DC	IC	IR	LS	AN

16.19

16.20 (1) Acenaphthene, µg/L

16.21	20	56	112	–	–	–	–	–
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16.22 (2) Acetochlor, µg/L

16.23	3.6	86	173	–	–	–	–	–
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16.24 (3) Acrylonitrile (c), µg/L

16.25	0.38	1,140*	2,281*	–	–	–	–	–
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16.26 (4) Alachlor (c), µg/L

16.27	3.8	800*	1,600*	2	–	–	–	–
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16.28 (5) Aldicarb, µg/L

17.1	–	–	–	3	–	–	–	–
17.2	2A	2A	2A	1B	3A/3B	4A	4B	5
17.3	CS	MS	FAV	DC	IC	IR	LS	AN

17.4

17.5 (6) Aldicarb sulfone, µg/L

17.6	–	–	–	2	–	–	–	–
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17.7 (7) Aldicarb sulfoxide, µg/L

17.8	–	–	–	4	–	–	–	–
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17.9 (8) Anthracene, µg/L

17.10	0.035	0.32	0.63	–	–	–	–	–
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17.11 (9) Atrazine (c), µg/L

17.12	3.4	323	645	3	–	–	–	–
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17.13 (10) Benzene (c), µg/L

17.14	5.1	4,487*	8,974*	5	–	–	–	–
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17.15	2A	2A	2A	1B	3A/3B	4A	4B	5
17.16	CS	MS	FAV	DC	IC	IR	LS	AN

17.17

17.18 (11) Benzo(a)pyrene, µg/L

17.19	–	–	–	0.2	–	–	–	–
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17.20 (12) Bromoform, µg/L

17.21	33	2,900	5,800	See sub-	–	–	–	–
17.22				item (73)				

17.23 (13) Carbofuran, µg/L

17.24	–	–	–	40	–	–	–	–
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17.25 (14) Carbon tetrachloride (c), µg/L

18.1	1.9	1,750*	3,500*	5	—	—	—	—
18.2	(15) Chlordane (c), ng/L							
18.3	0.073	1,200*	2,400*	2,000	—	—	—	—
18.4	2A	2A	2A	1B	3A/3B	4A	4B	5
18.5	CS	MS	FAV	DC	IC	IR	LS	AN
18.6	<hr/>							

18.7 (16) Chlorobenzene, µg/L (Monochlorobenzene)

18.8	20	423	846	100	—	—	—	—
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18.9 (17) Chloroform (c), µg/L

18.10	53	1,392	2,784	See sub-	—	—	—	—
18.11				item (73)				

18.12 (18) Chlorpyrifos, µg/L

18.13	0.041	0.083	0.17	—	—	—	—	—
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18.14 (19) Dalapon, µg/L

18.15	—	—	—	200	—	—	—	—
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18.16 (20) DDT (c), ng/L

18.17	0.11	550*	1,100*	—	—	—	—	—
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18.18	2A	2A	2A	1B	3A/3B	4A	4B	5
18.19	CS	MS	FAV	DC	IC	IR	LS	AN

18.20

18.21 (21) 1,2-Dibromo-3-chloropropane (c), µg/L

18.22	—	—	—	0.2	—	—	—	—
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18.23 (22) Dichlorobenzene (ortho), µg/L

18.24	—	—	—	600	—	—	—	—
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18.25 (23) 1,4-Dichlorobenzene (para) (c), µg/L

19.1	–	–	–	75	–	–	–	–
19.2	(24) 1,2-Dichloroethane (c), µg/L							
19.3	3.5	45,050*	90,100*	5	–	–	–	–
19.4	(25) 1,1-Dichloroethylene, µg/L							
19.5	–	–	–	7	–	–	–	–
19.6	2A	2A	2A	1B	3A/3B	4A	4B	5
19.7	CS	MS	FAV	DC	IC	IR	LS	AN
19.8	<hr/>							
19.9	(26) 1,2-Dichloroethylene (cis), µg/L							
19.10	–	–	–	70	–	–	–	–
19.11	(27) 1,2-Dichloroethylene (trans), µg/L							
19.12	–	–	–	100	–	–	–	–
19.13	(28) 2,4-Dichlorophenoxyacetic acid (2,4-D), µg/L							
19.14	–	–	–	70	–	–	–	–
19.15	(29) 1,2-Dichloropropane (c), µg/L							
19.16	–	–	–	5	–	–	–	–
19.17	(30) Dieldrin (c), ng/L							
19.18	0.0065	1,300*	2,500*	–	–	–	–	–
19.19	2A	2A	2A	1B	3A/3B	4A	4B	5
19.20	CS	MS	FAV	DC	IC	IR	LS	AN
19.21	<hr/>							
19.22	(31) Di-2-ethylhexyl adipate, µg/L							
19.23	–	–	–	400	–	–	–	–
19.24	(32) Di-2-ethylhexyl phthalate (c), µg/L							

20.1	1.9	—*	—*	6	—	—	—	—
20.2	(33) Di-n-Octyl phthalate, µg/L							
20.3	30	825	1,650	—	—	—	—	—
20.4	(34) Dinoseb, µg/L							
20.5	—	—	—	7	—	—	—	—
20.6	(35) Diquat, µg/L							
20.7	—	—	—	20	—	—	—	—
20.8	2A	2A	2A	1B	3A/3B	4A	4B	5
20.9	CS	MS	FAV	DC	IC	IR	LS	AN
20.10	<hr/>							
20.11	(36) Endosulfan, µg/L							
20.12	0.0076	0.084	0.17	—	—	—	—	—
20.13	(37) Endothall, µg/L							
20.14	—	—	—	100	—	—	—	—
20.15	(38) Endrin, µg/L							
20.16	0.0039	0.090	0.18	2	—	—	—	—
20.17	(39) Ethylbenzene (c), µg/L							
20.18	68	1,859	3,717	700	—	—	—	—
20.19	(40) Ethylene dibromide, µg/L							
20.20	—	—	—	0.05	—	—	—	—
20.21	2A	2A	2A	1B	3A/3B	4A	4B	5
20.22	CS	MS	FAV	DC	IC	IR	LS	AN
20.23	<hr/>							
20.24	(41) Fluoranthene, µg/L							

21.1	1.9	3.5	6.9	—	—	—	—	—
21.2	(42) Glyphosate, µg/L							
21.3	—	—	—	700	—	—	—	—
21.4	(43) Haloacetic acids (c), µg/L (Bromoacetic acid, Dibromoacetic acid, Dichloroacetic acid, Monochloroacetic acid, and Trichloroacetic acid)							
21.5								
21.6	—	—	—	60	—	—	—	—
21.7	(44) Heptachlor (c), ng/L							
21.8	0.10	260*	520*	400	—	—	—	—
21.9	(45) Heptachlor epoxide (c), ng/L							
21.10	0.12	270*	530*	200	—	—	—	—
21.11	2A	2A	2A	1B	3A/3B	4A	4B	5
21.12	CS	MS	FAV	DC	IC	IR	LS	AN
21.13	<hr/>							
21.14	(46) Hexachlorobenzene (c), ng/L							
21.15	0.061	—*	—*	1,000	—	—	—	—
21.16	(47) Hexachlorocyclopentadiene, µg/L							
21.17	—	—	—	50	—	—	—	—
21.18	(48) Lindane (c), µg/L (Hexachlorocyclohexane, gamma-)							
21.19	0.0087	1.0*	2.0*	0.2	—	—	—	—
21.20	(49) Methoxychlor, µg/L							
21.21	—	—	—	40	—	—	—	—
21.22	(50) Methylene chloride (c), µg/L (Dichloromethane)							
21.23	45	13,875*	27,749*	5	—	—	—	—

	2A	2A	2A	1B	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	LS	AN

22.3

22.4 (51) Metolachlor

22.5	23	271	543	—	—	—	—	—
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22.6 (52) Naphthalene, µg/L

22.7	65	409	818	—	—	—	—	—
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22.8 (53) Oxamyl, µg/L (Vydate)

22.9	—	—	—	200	—	—	—	—
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22.10 (54) Parathion, µg/L

22.11	0.013	0.07	0.13	—	—	—	—	—
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22.12 (55) Pentachlorophenol, µg/L

22.13	0.93	15	30	1	—	—	—	—
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22.14 Class 2A MS and FAV are pH dependent. Pentachlorophenol values shown are for a pH of
 22.15 7.5 only. See part 7050.0222, subpart 2, for examples at other pH values and equations to
 22.16 calculate pentachlorophenol standards for any pH value.

	2A	2A	2A	1B	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	LS	AN

22.19

22.20 (56) Phenanthrene, µg/L

22.21	3.6	32	64	—	—	—	—	—
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22.22 (57) Phenol, µg/L

22.23	123	2,214	4,428	—	—	—	—	—
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22.24 (58) Picloram, µg/L

22.25	—	—	—	500	—	—	—	—
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22.26 (59) Polychlorinated biphenyls (c), ng/L (PCBs, total)

23.1	0.014	1,000*	2,000*	500	—	—	—	—
23.2	(60) Simazine, µg/L							
23.3	—	—	—	4	—	—	—	—
23.4	2A	2A	2A	1B	3A/3B	4A	4B	5
23.5	CS	MS	FAV	DC	IC	IR	LS	AN
23.6	<hr/>							
23.7	(61) Styrene (c), µg/L							
23.8	—	—	—	100	—	—	—	—
23.9	(62) 2,3,7,8-Tetrachlorodibenzo-p-dioxin, ng/L (TCDD-dioxin)							
23.10	—	—	—	0.03	—	—	—	—
23.11	(63) 1,1,2,2-Tetrachloroethane (c), µg/L							
23.12	1.1	1,127*	2,253*	—	—	—	—	—
23.13	(64) Tetrachloroethylene (c), µg/L							
23.14	3.8	428*	857*	5	—	—	—	—
23.15	(65) Toluene, µg/L							
23.16	253	1,352	2,703	1,000	—	—	—	—
23.17	2A	2A	2A	1B	3A/3B	4A	4B	5
23.18	CS	MS	FAV	DC	IC	IR	LS	AN
23.19	<hr/>							
23.20	(66) Toxaphene (c), ng/L							
23.21	0.31	730*	1,500*	3,000	—	—	—	—
23.22	(67) 2,4,5-TP, µg/L (Silvex)							
23.23	—	—	—	50	—	—	—	—
23.24	(68) 1,2,4-Trichlorobenzene, µg/L							

24.1	—	—	—	70	—	—	—	—
24.2	(69) 1,1,1-Trichloroethane, µg/L							
24.3	329	2,957	5,913	200	—	—	—	—
24.4	(70) 1,1,2-Trichloroethane, µg/L							
24.5	—	—	—	5	—	—	—	—
24.6	2A	2A	2A	1B	3A/3B	4A	4B	5
24.7	CS	MS	FAV	DC	IC	IR	LS	AN
24.8	<hr/>							
24.9	(71) 1,1,2-Trichloroethylene (c), µg/L							
24.10	25	6,988	13,976*	5	—	—	—	—
24.11	(72) 2,4,6-Trichlorophenol, µg/L							
24.12	2.0	102	203	—	—	—	—	—
24.13	(73) Trihalomethanes, total (c), µg/L (Bromodichloromethane, Bromoform,							
24.14	Chlorodibromomethane, and Chloroform)							
24.15	—	—	—	80	—	—	—	—
24.16	(74) Vinyl chloride (c), µg/L							
24.17	0.17	—*	—*	2	—	—	—	—
24.18	(75) Xylenes, total, µg/L							
24.19	166	1,407	2,814	10,000	—	—	—	—
24.20	[For text of items D and E, see M.R.]							
24.21	Subp. 4. [Repealed, 24 SR 1105]							
24.22	Subp. 4a. Cool and warm water sport fish, drinking water, and associated use							
24.23	classes. Water quality standards applicable to use Classes 1B or 1C, 2Bd, 3A or 3B,							
24.24	4A and 4B, and 5 surface waters.							

25.1 A. MISCELLANEOUS SUBSTANCE, CHARACTERISTIC, OR POLLUTANT

	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	LS	AN

25.4

25.5 (1) Ammonia, un-ionized as N, µg/L

25.6 40 – – – – – – –

25.7 (2) Asbestos, >10 µm (c), fibers/L

25.8 – – – 7.0e+06 – – – –

25.9 (3) Bicarbonates (HCO₃), meq/L

25.10 – – – – – 5 – –

25.11 (4) Bromate, µg/L

25.12 – – – 10 – – – –

25.13 (5) Chloride, mg/L

25.14 230 860 1,720 250(S) 50/100 – – –

25.15 **2Bd** **2Bd** **2Bd** **1B/1C** **3A/3B** **4A** **4B** **5**25.16 **CS** **MS** **FAV** **DC** **IC** **IR** **LS** **AN**

25.17

25.18 (6) Chlorine, total residual, µg/L

25.19 11 19 38 – – – – –

25.20 (7) Chlorite, µg/L

25.21 – – – 1,000 – – – –

25.22 (8) Color, Pt-Co

25.23 – – – 15(S) – – – –

25.24 (9) Cyanide, free, µg/L

25.25 5.2 22 45 200 – – – –

26.1	(10) <i>Escherichia (E.) coli</i> bacteria, organisms/100 mL							
26.2	See	–	–	–	–	–	–	–
26.3	item D							
26.4	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
26.5	CS	MS	FAV	DC	IC	IR	LS	AN
26.6								
26.7	(11) Eutrophication standards for lakes, shallow lakes, and reservoirs (phosphorus, total,							
26.8	µg/L; chlorophyll-a, µg/L; Secchi disk transparency, meters)							
26.9	See part	–	–	–	–	–	–	–
26.10	7050.0222,							
26.11	subparts							
26.12	3 and 3a							
26.13	(12) Eutrophication standards for rivers, streams, and navigational pools (phosphorus,							
26.14	total µg/L; chlorophyll-a (seston), µg/L; five-day biochemical oxygen demand (BOD ₅),							
26.15	mg/L; diel dissolved oxygen flux, mg/L; chlorophyll-a (periphyton), mg/m ²)							
26.16	See part	–	–	–	–	–	–	–
26.17	7050.0222,							
26.18	subparts 3							
26.19	and 3b							
26.20	(13) Fluoride, mg/L							
26.21	–	–	–	4	–	–	–	–
26.22	(14) Fluoride, mg/L							
26.23	–	–	–	2(S)	–	–	–	–
26.24	(15) Foaming agents, µg/L							
26.25	–	–	–	500(S)	–	–	–	–
26.26	(16) Hardness, Ca+Mg as CaCO ₃ , mg/L							
26.27	–	–	–	–	50/250	–	–	–

	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
	CS	MS	FAV	DC	IC	IR	LS	AN
27.1								
27.2								
27.3	<hr/>							
27.4	(17) Hydrogen sulfide, mg/L							
27.5	–	–	–	–	–	–	–	0.02
27.6	(18) Nitrate as N, mg/L							
27.7	–	–	–	10	–	–	–	–
27.8	(19) Nitrite as N, mg/L							
27.9	–	–	–	1	–	–	–	–
27.10	(20) Nitrate + Nitrite as N, mg/L							
27.11	–	–	–	10	–	–	–	–
27.12	(21) Odor, TON							
27.13	–	–	–	3(S)	–	–	–	–
27.14	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
27.15	CS	MS	FAV	DC	IC	IR	LS	AN
27.16	<hr/>							
27.17	(22) Oil, µg/L							
27.18	500	5,000	10,000	–	–	–	–	–
27.19	(23) Oxygen, dissolved, mg/L							
27.20	See part	–	–	–	–	–	–	–
27.21	7050.0222,							
27.22	subpart 3							
27.23	(24) pH minimum, su							
27.24	6.5	–	–	6.5(S)	6.5/6.0	6.0	6.0	6.0
27.25	(25) pH maximum, su							

28.1	9.0	–	–	8.5(S)	8.5/9.0	8.5	9.0	9.0
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28.2 (26) Radioactive materials

28.3	See	–	–	See	–	See	See	–
28.4	item E			item E		item E	item E	

28.5	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
28.6	CS	MS	FAV	DC	IC	IR	LS	AN

28.7

28.8 (27) Salinity, total, mg/L

28.9	–	–	–	–	–	–	1,000	–
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28.10 (28) Sodium, meq/L

28.11	–	–	–	–	–	60% of	–	–
28.12						total		
28.13						cations		

28.14 (29) Specific conductance at 25°C, µmhos/cm

28.15	–	–	–	–	–	1,000	–	–
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28.16 (30) Sulfate, mg/L

28.17	–	–	–	250(S)	–	–	–	–
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28.18 (31) Sulfates, wild rice present, mg/L

28.19	–	–	–	–	–	10	–	–
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28.20	2Bd	2Bd	2Bd	1B/1C	3A/3B	4A	4B	5
28.21	CS	MS	FAV	DC	IC	IR	LS	AN

28.22

28.23 (32) Temperature, °F

28.24	See	–	–	–	–	–	–	–
28.25	item F							

28.26 (33) Total dissolved salts, mg/L

30.1	(5) Cyanide, free, µg/L						
30.2	5.2	22	45	—	—	—	—
30.3	2B,C&D	2B,C&D	2B,C&D	3A/3B/3C	4A	4B	5
30.4	CS	MS	FAV	IC	IR	LS	AN
30.5	<hr/>						
30.6	(6) <i>Escherichia (E.) coli</i> bacteria, organisms/100 mL						
30.7	See	—	—	—	—	—	—
30.8	item D						
30.9	(7) Eutrophication standards for lakes, shallow lakes, and reservoirs (phosphorus, total,						
30.10	µg/L; chlorophyll-a, µg/L; Secchi disk transparency, meters)						
30.11	See part	—	—	—	—	—	—
30.12	7050.0222,						
30.13	subparts						
30.14	4, 4a, and						
30.15	5						
30.16	(8) Eutrophication standards for rivers, streams, and navigational pools (phosphorus, total						
30.17	µg/L; chlorophyll-a (seston), µg/L; five-day biochemical oxygen demand (BOD ₅), mg/L;						
30.18	diel dissolved oxygen flux, mg/L; chlorophyll-a (periphyton), mg/m ²)						
30.19	See part	—	—	—	—	—	—
30.20	7050.0222,						
30.21	subparts 4						
30.22	and 4b						
30.23	(9) Hardness, Ca+Mg as CaCO ₃ , mg/L						
30.24	—	—	—	50/250/500	—	—	—
30.25	(10) Hydrogen sulfide, mg/L						
30.26	—	—	—	—	—	—	0.02
30.27	(11) Oil, µg/L						
30.28	500	5,000	10,000	—	—	—	—

31.1	2B,C&D	2B,C&D	2B,C&D	3A/3B/3C	4A	4B	5
31.2	CS	MS	FAV	IC	IR	LS	AN

31.3

31.4 (12) Oxygen, dissolved, mg/L

31.5	See part	–	–	–	–	–	–
31.6	7050.0222,						
31.7	subparts						
31.8	4 to 6						

31.9 (13) pH minimum, su

31.10	6.5	–	–	6.5/6.0/6.0	6.0	6.0	6.0
31.11	See						
31.12	item E						

31.13 (14) pH maximum, su

31.14	9.0	–	–	8.5/9.0/9.0	8.5	9.0	9.0
31.15	See						
31.16	item E						

31.17 (15) Radioactive materials

31.18	See	–	–	–	See	See	–
31.19	item F				item F	item F	

31.20 (16) Salinity, total, mg/L

31.21	–	–	–	–	–	1,000	–
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31.22	2B,C&D	2B,C&D	2B,C&D	3A/3B/3C	4A	4B	5
31.23	CS	MS	FAV	IC	IR	LS	AN

31.24

31.25 (17) Sodium, meq/L

31.26	–	–	–	–	60% of	–	–
31.27					total		
31.28					cations		

31.29 (18) Specific conductance at 25°C, μ mhos/cm

32.1	—	—	—	—	1,000	—	—
32.2	(19) Sulfates, wild rice present, mg/L						
32.3	—	—	—	—	10	—	—
32.4	(20) Temperature, °F						
32.5	See	—	—	—	—	—	—
32.6	item G						
32.7	(21) Total dissolved salts, mg/L						
32.8	—	—	—	—	700	—	—
32.9	(22) Total suspended solids (TSS), mg/L						
32.10	See part						
32.11	7050.0222,						
32.12	subpart 4	—	—	—	—	—	—

32.13 [For text of items B to G, see M.R.]

32.14 Subp. 6. [Repealed, 24 SR 1105]

32.15 Subp. 6a. **Limited resource value waters and associated use classes.**

32.16 A. WATER QUALITY STANDARDS APPLICABLE TO USE CLASSES 3C, 4A, 4B,
32.17 5, AND 7 SURFACE WATERS

32.18	7	3C	4A	4B	5
32.19	LIMITED	1C	1R	LS	AN
32.20	RESOURCE				
32.21	VALUE				

32.22 _____

32.23 (1) Bicarbonates (HCO₃), meq/L

32.24	—	—	5	—	—
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32.25 (2) Boron, µg/L

32.26	—	—	500	—	—
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33.1	(3) Chloride, mg/L				
33.2	—	250	—	—	—
33.3	(4) <i>Escherichia (E.) coli</i> bacteria, organisms/100 mL				
33.4	See item B	—	—	—	—
33.5	(5) Hardness, Ca+Mg as CaCO ₃ , mg/L				
33.6	—	500	—	—	—
33.7	7	3C	4A	4B	5
33.8	LIMITED	1C	1R	LS	AN
33.9	RESOURCE				
33.10	VALUE				
33.11	<hr/>				
33.12	(6) Hydrogen sulfide, mg/L				
33.13	—	—	—	—	0.02
33.14	(7) Oxygen, dissolved, mg/L				
33.15	See item C	—	—	—	—
33.16	(8) pH minimum, su				
33.17	6.0	6.0	6.0	6.0	6.0
33.18	(9) pH maximum, su				
33.19	9.0	9.0	8.5	9.0	9.0
33.20	(10) Radioactive materials				
33.21	—	—	See item D	See item D	—
33.22	7	3C	4A	4B	5
33.23	LIMITED	1C	1R	LS	AN
33.24	RESOURCE				
33.25	VALUE				
33.26	<hr/>				

34.1	(11) Salinity, total, mg/L				
34.2	—	—	—	1,000	—
34.3	(12) Sodium, meq/L				
34.4	—	—	60% of	—	—
34.5			total		
34.6			cations		
34.7	(13) Specific conductance at 25°C, µmhos/cm				
34.8	—	—	1,000	—	—
34.9	(14) Sulfates, wild rice present, mg/L				
34.10	—	—	10	—	—
34.11	(15) Total dissolved salts, mg/L				
34.12	—	—	700	—	—
34.13	(16) Toxic pollutants				
34.14	See item E	—	—	—	—

34.15 [For text of items B to E, see M.R.]

34.16 **Subp. 7. Site-specific modifications of standards.**

34.17 [For text of items A to C, see M.R.]

34.18 D. Through the procedures established in items A to C, the following
 34.19 site-specific reservoir eutrophication standards apply to Lake Pepin (25-0001-00) in lieu
 34.20 of the water quality standards listed in this part and part 7050.0222:

34.21	(1) Phosphorus, total	µg/L	less than or equal to 100
34.22	(2) Chlorophyll-a (seston)	µg/L	less than or equal to 28

34.23 **7050.0221 SPECIFIC WATER QUALITY STANDARDS FOR CLASS 1 WATERS**
 34.24 **OF THE STATE; DOMESTIC CONSUMPTION.**

34.25 **Subpart 1. General.**

35.1 [For text of item A, see M.R.]

35.2 B. The Class 1 standards in this part are the United States Environmental
35.3 Protection Agency primary (maximum contaminant levels) and secondary drinking water
35.4 standards, as contained in Code of Federal Regulations, title 40, parts 141 and 143, as
35.5 amended. These Environmental Protection Agency drinking water standards are adopted
35.6 and incorporated by reference with the exceptions in this item. The following standards
35.7 are not applicable to Class 1 ground waters: the primary drinking water standards for
35.8 acrylamide, epichlorohydrin, copper, and lead (treatment technique standards) and
35.9 standards in the disinfectants and disinfection by-products categories. The following
35.10 standards are not applicable to Class 1 surface waters: the primary drinking water
35.11 standards for acrylamide, epichlorohydrin, copper, lead, and turbidity (treatment technique
35.12 standards) and the standards in the disinfectants and microbiological organisms categories.

35.13 [For text of subps 2 to 6, see M.R.]

35.14 **7050.0222 SPECIFIC WATER QUALITY STANDARDS FOR CLASS 2 WATERS**
35.15 **OF THE STATE; AQUATIC LIFE AND RECREATION.**

35.16 [For text of subp 1, see M.R.]

35.17 Subp. 2. **Class 2A waters; aquatic life and recreation.** The quality of Class 2A
35.18 surface waters shall be such as to permit the propagation and maintenance of a healthy
35.19 community of cold water sport or commercial fish and associated aquatic life, and their
35.20 habitats. These waters shall be suitable for aquatic recreation of all kinds, including
35.21 bathing, for which the waters may be usable. This class of surface waters is also protected
35.22 as a source of drinking water. Abbreviations, acronyms, and symbols are explained in
35.23 subpart 1.

36.1	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
36.2							
36.6	Acenaphthene	µg/L	20	HH	56	112	Tox
36.7	Acetochlor	µg/L	3.6	Tox	86	173	Tox
36.8	Acrylonitrile (c)	µg/L	0.38	HH	1,140*	2,281*	Tox
36.9	Alachlor (c)	µg/L	3.8	HH	800*	1,600*	Tox
36.10	Aluminum, total	µg/L	87	Tox	748	1,496	Tox
36.11	Ammonia un-ionized as N	µg/L	16	Tox	–	–	NA

36.12 The percent un-ionized ammonia can be calculated for any temperature and pH by
 36.13 using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V.
 36.14 Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature.
 36.15 Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

$$36.16 \quad f = \frac{1}{10^{(pk_a - pH)} + 1} \times 100$$

36.20 where: f = the percent of total ammonia in the un-ionized state

36.21 $pk_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

36.22 T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

36.23	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
36.24							
36.28	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
36.29	Antimony, total	µg/L	5.5	HH	90	180	Tox
36.30	Arsenic, total	µg/L	2.0	HH	360	720	Tox

37.1	Atrazine (c)	µg/L	3.4	HH	323	645	Tox
37.2	Benzene (c)	µg/L	5.1	HH	4,487*	8,974*	Tox
37.3	Bromoform	µg/L	33	HH	2,900	5,800	Tox
37.4	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

37.5 The CS, MS, and FAV vary with total hardness and are calculated using the following
37.6 equations:

37.7 The CS in µg/L shall not exceed: $\exp.(0.7852[\ln(\text{total hardness mg/L})]-3.490)$

37.8 The MS in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-3.828)$

37.9 The FAV in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-3.1349)$

37.10 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

37.11 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
37.12 the standard.

37.13 Example of total cadmium standards for five hardness values:

37.14	TH in mg/L	50	100	200	300	400
37.15		<hr/>				
37.16	Cadmium, total					
37.17	CS µg/L	0.66	1.1	2.0	2.7	3.4
37.18	MS µg/L	1.8	3.9	8.6	14	19
37.19	FAV µg/L	3.6	7.8	17	27	37

37.20	Substance,						Basis
37.21	Characteristic,						for
37.22	or Pollutant			Basis			MS,
37.23	(Class 2A)	Units	CS	for CS	MS	FAV	FAV
37.24		<hr/>					

37.25	Carbon tetrachloride (c)	µg/L	1.9	HH	1750*	3500*	Tox
37.26	Chlordane (c)	ng/L	0.073	HH	1200*	2400*	Tox
37.27	Chloride	mg/L	230	Tox	860	1720	Tox
37.28	Chlorine, total residual	µg/L	11	Tox	19	38	Tox

38.1 Chlorine standard applies to conditions of continuous exposure, where continuous
 38.2 exposure refers to chlorinated effluents that are discharged for more than a total of
 38.3 two hours in any 24-hour period.

38.4	Chlorobenzene	µg/L	20	HH	423	846	Tox
38.5	(Monochlorobenzene)						
38.6	Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox
38.7	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
38.8	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

38.9 The CS, MS, and FAV vary with total hardness and are calculated using the following
 38.10 equations:

38.11 The CS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+1.561)$

38.12 The MS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+3.688)$

38.13 The FAV in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+4.380)$

38.14 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

38.15 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 38.16 the standard.

38.17 Example of total chromium +3 standards for five total hardness values:

38.18	TH in mg/L	50	100	200	300	400
38.19		<hr/>				
38.20	Chromium +3, total					
38.21	CS µg/L	117	207	365	509	644
38.22	MS µg/L	984	1,737	3,064	4,270	5,405
38.23	FAV µg/L	1,966	3,469	6,120	8,530	10,797

38.24	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
38.25							
<hr/>							

38.29	Chromium +6, total	µg/L	11	Tox	16	32	Tox
38.30	Cobalt, total	µg/L	2.8	HH	436	872	Tox

39.1	Color value	Pt/Co	30	NA	–	–	NA
39.2	Copper, total	µg/L	equation	Tox	equation	equation	Tox

39.3 The CS, MS, and FAV vary with total hardness and are calculated using the following
39.4 equations:

39.5 The CS in µg/L shall not exceed: $\exp.(0.620[\ln(\text{total hardness mg/L})]-0.570)$

39.6 The MS in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-1.464)$

39.7 The FAV in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-0.7703)$

39.8 Where: $\exp.$ is the natural antilogarithm (base e) of the expression in parenthesis.

39.9 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
39.10 the standard.

39.11 Example of total copper standards for five total hardness values:

39.12	TH in mg/L	50	100	200	300	400
39.13	<hr/>					
39.14	Copper, total					
39.15	CS µg/L	6.4	9.8	15	19	23
39.16	MS µg/L	9.2	18	34	50	65
39.17	FAV µg/L	18	35	68	100	131

39.18	Substance, 39.19 Characteristic, 39.20 or Pollutant 39.21 (Class 2A)	Units	CS	Basis 39.22 for CS	MS	FAV	Basis for MS, FAV
39.22							
39.23	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
39.24	DDT (c)	ng/L	0.11	HH	550*	1100*	Tox
39.25	1,2-Dichloroethane (c)	µg/L	3.5	HH	45,050*	90,100*	Tox
39.26	Dieldrin (c)	ng/L	0.0065	HH	1,300*	2,500*	Tox
39.27	Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	–*	–*	NA
39.28	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
39.29	Endosulfan	µg/L	0.0076	HH	0.084	0.17	Tox

40.1	Endrin	µg/L	0.0039	HH	0.090	0.18	Tox
40.2	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
40.3		below	below		below	below	
40.4	Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less						
40.5	than five samples representative of conditions within any calendar month, nor shall						
40.6	more than ten percent of all samples taken during any calendar month individually						
40.7	exceed 1,260 organisms per 100 milliliters. The standard applies only between April						
40.8	1 and October 31.						
40.9	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
40.10	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
40.11							
40.12							
40.13							
40.14	<hr/>						
40.15	Eutrophication standards for Class 2A lakes and reservoirs.						
40.16	Designated lake trout lakes in all ecoregions (lake trout lakes support natural populations						
40.17	of lake trout, <i>Salvelinus namaycush</i>):						
40.18	Phosphorus, total	µg/L	12	NA	–	–	NA
40.19	Chlorophyll-a	µg/L	3	NA	–	–	NA
40.20	Secchi disk transparency	meters	No less	NA	–	–	NA
40.21			than 4.8				
40.22	Designated trout lakes in all ecoregions, except lake trout lakes:						
40.23	Phosphorus, total	µg/L	20	NA	–	–	NA
40.24	Chlorophyll-a	µg/L	6	NA	–	–	NA
40.25	Secchi disk transparency	meters	No less	NA	–	–	NA
40.26			than 2.5				
40.27	Additional narrative eutrophication standards for Class 2A lakes and reservoirs are found						
40.28	under subpart 2a.						
40.29	Eutrophication standards for Class 2A rivers and streams.						

41.1 North River Nutrient Region:

41.2	Phosphorus, total	µg/L	less than or equal to 50
41.3	Chlorophyll-a (seston)	µg/L	less than or equal to 7
41.4	Diel dissolved oxygen flux	mg/L	less than or equal to 3.0
41.5	Biochemical oxygen demand (BOD ₅)	mg/L	less than or equal to 1.5

41.6 Central River Nutrient Region:

41.7	Phosphorus, total	µg/L	less than or equal to 100
41.8	Chlorophyll-a (seston)	µg/L	less than or equal to 18
41.9	Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
41.10	Biochemical oxygen demand (BOD ₅)	mg/L	less than or equal to 2.0

41.11 South River Nutrient Region:

41.12	Phosphorus, total	µg/L	less than or equal to 150
41.13	Chlorophyll-a (seston)	µg/L	less than or equal to 35
41.14	Diel dissolved oxygen flux	mg/L	less than or equal to 4.5
41.15	Biochemical oxygen demand (BOD ₅)	mg/L	less than or equal to 3.0

41.16 Additional narrative eutrophication standards for Class 2A rivers and streams are found
 41.17 under subpart 2b.

41.18	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
41.19							
41.20							
41.21							
41.22	<hr/>						

41.23	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
41.24	Heptachlor (c)	ng/L	0.10	HH	260*	520*	Tox
41.25	Heptachlor epoxide (c)	ng/L	0.12	HH	270*	530*	Tox
41.26	Hexachlorobenzene (c)	ng/L	0.061	HH	—*	—*	Tox
41.27	Lead, total	µg/L	equation	Tox	equation	equation	Tox

42.1 The CS, MS, and FAV vary with total hardness and are calculated using the following
 42.2 equations:

42.3 The CS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-4.705)$

42.4 The MS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-1.460)$

42.5 The FAV in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-0.7643)$

42.6 Where: $\exp.$ is the natural antilogarithm (base e) of the expression in parenthesis.

42.7 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 42.8 the standard.

42.9 Example of total lead standards for five total hardness values:

42.10	TH in mg/L	50	100	200	300	400
42.11	<hr/>					
42.12	Lead, total					
42.13	CS µg/L	1.3	3.2	7.7	13	19
42.14	MS µg/L	34	82	197	331	477
42.15	FAV µg/L	68	164	396	663	956

42.16	Substance, 42.17 Characteristic, 42.18 or Pollutant 42.19 (Class 2A)	Units	CS	Basis 42.20 for CS	MS	FAV	Basis for MS, FAV
42.21							
42.22	Lindane (c) (Hexachlorocyclohexane, 42.23 gamma-)	µg/L	0.0087	HH	1.0*	2.0*	Tox
42.24	Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
42.25	Mercury, total 42.26 in edible fish	mg/kg ppm	0.2	HH	NA	NA	NA
42.27	Methylene chloride (c) 42.28 Dichloromethane)	µg/L	45	HH	13,875*	27,749*	Tox
42.29	Metolachlor	µg/L	23	Tox	271	543	Tox
42.30	Naphthalene	µg/L	65	HH	409	818	Tox
42.31	Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox

43.1 The CS, MS, and FAV vary with total hardness and are calculated using the following
 43.2 equations:

43.3 The CS shall not exceed the human health-based standard of 297 µg/L. For waters
 43.4 with total hardness values less than 212 mg/L, the CS in µg/L is toxicity-based and
 43.5 shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+1.1645)$

43.6 The MS in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+3.3612)$

43.7 The FAV in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+4.0543)$

43.8 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

43.9 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 43.10 the standard.

43.11 Example of total nickel standards for five total hardness values:

43.12	TH in mg/L	50	100	200	300	400
43.13	<hr/>					
43.14	Nickel, total					
43.15	CS µg/L	88	158	283	297	297
43.16	MS µg/L	789	1,418	2,549	3,592	4,582
43.17	FAV µg/L	1,578	2,836	5,098	7,185	9,164

43.18	Substance, 43.19 Characteristic, 43.20 or Pollutant 43.21 (Class 2A)	Units	CS	Basis 43.22 for CS	MS	FAV	Basis for MS, FAV
43.22							

43.23	Oil	µg/L	500	NA	5,000	10,000	NA
43.24	Oxygen, dissolved	mg/L	See	NA	–	–	NA
43.25			below				

43.26 7.0 mg/L as a daily minimum. This dissolved oxygen standard requires compliance
 43.27 with the standard 50 percent of the days at which the flow of the receiving water is
 43.28 equal to the 7Q₁₀.

43.29	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
43.30	Pentachlorophenol	µg/L	0.93	HH	equation	equation	Tox

43.31 The MS and FAV vary with pH and are calculated using the following equations:

44.1 The MS in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.830)$

44.2 The FAV in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.1373)$

44.3 Where: $\exp.$ is the natural antilogarithm (base e) of the expression in parenthesis.

44.4 For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH
44.5 values greater than 9.0, 9.0 shall be used to calculate the standard.

44.6 Example of pentachlorophenol standards for five pH values:

44.7	pH su	6.5	7.0	7.5	8.0	8.5
44.8	<hr/>					
44.9	Pentachlorophenol					
44.10	CS µg/L	0.93	0.93	0.93	0.93	0.93
44.11	MS µg/L	5.5	9.1	15	25	41
44.12	FAV µg/L	11	18	30	50	82

44.13	44.14 44.15 44.16	Substance, Characteristic, or Pollutant (Class 2A)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
44.17								
44.18		pH, minimum	su	6.5	NA	–	–	NA
44.19		pH, maximum	su	8.5	NA	–	–	NA
44.20		Phenanthrene	µg/L	3.6	Tox	32	64	Tox
44.21		Phenol	µg/L	123	Tox	2,214	4,428	Tox
44.22		Polychlorinated biphenyls, total (c)	ng/L	0.014	HH	1,000*	2,000*	Tox
44.23		Radioactive materials	NA	See below	NA	See below	See below	NA

44.26 Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled
44.27 environment as permitted by the appropriate authority having control over their use.

44.28	Selenium, total	µg/L	5.0	Tox	20	40	Tox
44.29	Silver, total	µg/L	0.12	Tox	equation	equation	Tox

44.30 The MS and FAV vary with total hardness and are calculated using the following
44.31 equations:

45.1 The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$

45.2 The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$

45.3 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

45.4 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
45.5 the standard.

45.6 Example of silver standards for five total hardness values:

45.7	TH in mg/L	50	100	200	300	400
45.8	<hr/>					
45.9	Silver, total					
45.10	CS µg/L	0.12	0.12	0.12	0.12	0.12
45.11	MS µg/L	1.0	2.0	6.7	13	22
45.12	FAV µg/L	1.2	4.1	13	27	44

45.13	Substance, 45.14 Characteristic, 45.15 or Pollutant 45.16 (Class 2A)	Units	CS	Basis 45.17 for CS	MS	FAV	Basis for MS, FAV
<hr/>							
45.18	Temperature	°C or	No	NA	–	–	NA
45.19		°F	material				
45.20			increase				
45.21	1,1,2,2-Tetrachloroethane (c)	µg/L	1.1	HH	1,127*	2,253*	Tox
45.22	Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
45.23	Thallium, total	µg/L	0.28	HH	64	128	Tox
45.24	Toluene	µg/L	253	Tox	1,352	2,703	Tox
45.25	Toxaphene (c)	ng/L	0.31	HH	730*	1,500*	Tox
45.26	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
45.27	1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
45.28	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
45.29	Total suspended solids (TSS)	mg/L	10	NA	–	–	NA

46.1 TSS standards for Class 2A
 46.2 may be exceeded for no more
 46.3 than ten percent of the time.
 46.4 This standard applies April 1
 46.5 through September 30

46.6	Vinyl chloride (c)	µg/L	0.17	HH	—*	—*	NA
46.7	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
46.8	Zinc, total	µg/L	equation	Tox	equation	equation	Tox

46.9 The CS, MS, and FAV vary with total hardness and are calculated using the following
 46.10 equations:

46.11 The CS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.7615)$

46.12 The MS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$

46.13 The FAV in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$

46.14 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

46.15 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 46.16 the standard.

46.17 Example of zinc standards for five total hardness values:

46.18	TH in mg/L	50	100	200	300	400
46.19		<hr/>				
46.20	Zinc, total					
46.21	CS µg/L	59	106	191	269	343
46.22	MS µg/L	65	117	211	297	379
46.23	FAV µg/L	130	234	421	594	758

46.24 **Subp. 2a. Narrative eutrophication standards for lakes and reservoirs.**

46.25 A. Eutrophication standards for lakes and reservoirs are compared to
 46.26 summer-average data. Exceedance of the total phosphorus and either the chlorophyll-a or
 46.27 Secchi disk transparency standard is required to indicate a polluted condition.

46.28 [For text of item B, see M.R.]

47.1 C. Lakes and reservoirs with a baseline quality that is poorer than the numeric
47.2 eutrophication standards in subpart 2 must be considered to be in compliance with the
47.3 standards if the baseline quality is the result of natural causes. The commissioner shall
47.4 determine baseline quality and compliance with these standards using data and the
47.5 procedures in part 7050.0150, subpart 5.

47.6 [For text of item D, see M.R.]

47.7 E. Eutrophication standards applicable to lakes and reservoirs that lie on the
47.8 border between two ecoregions or that are in the Red River Valley (also referred to as
47.9 Lake Agassiz Plains), Northern Minnesota Wetlands, or Driftless Area Ecoregion must be
47.10 applied on a case-by-case basis. The commissioner shall use the standards applicable to
47.11 adjacent ecoregions as a guide.

47.12 Subp. 2b. **Narrative eutrophication standards for rivers and streams.**

47.13 A. Eutrophication standards for rivers and streams are compared to
47.14 summer-average data or as specified in subpart 2. Exceedance of the total phosphorus
47.15 levels and chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel
47.16 dissolved oxygen flux, or pH levels is required to indicate a polluted condition.

47.17 B. Rivers and streams that exceed the phosphorus levels but do not exceed the
47.18 chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel dissolved
47.19 oxygen flux, or pH levels meet the eutrophication standard.

47.20 C. For chlorophyll-a (periphyton), the standard is exceeded if concentrations
47.21 exceed 150 mg/m² more than one year in ten.

47.22 D. It is the policy of the agency to protect all rivers and streams from the
47.23 undesirable effects of cultural eutrophication. Rivers and streams with a baseline quality
47.24 better than the numeric eutrophication standards in subpart 3 must be maintained in that
47.25 condition through the strict application of all relevant federal, state, and local requirements

48.1 governing nondegradation, the discharge of nutrients from point and nonpoint sources,
48.2 including:

48.3 (1) the nondegradation requirements in parts 7050.0180 and 7050.0185;

48.4 (2) the phosphorus effluent limits for point sources, where applicable, in
48.5 chapter 7053;

48.6 (3) the requirements for feedlots in chapter 7020;

48.7 (4) the requirements for individual sewage treatment systems in chapter
48.8 7080;

48.9 (5) the requirements for control of storm water in chapter 7090;

48.10 (6) county shoreland ordinances; and

48.11 (7) implementation of mandatory and voluntary best management practices
48.12 to minimize point and nonpoint sources of nutrients.

48.13 E. Rivers and streams with a baseline quality that does not meet the numeric
48.14 eutrophication standards in part 7050.0150, subpart 5b, are in compliance with the
48.15 standards if the baseline quality is the result of natural causes. The commissioner must
48.16 determine baseline quality and compliance with these standards using data and the
48.17 procedures in part 7050.0150, subpart 5.

48.18 Subp. 3. **Class 2Bd waters.** The quality of Class 2Bd surface waters shall be such
48.19 as to permit the propagation and maintenance of a healthy community of cool or warm
48.20 water sport or commercial fish and associated aquatic life and their habitats. These waters
48.21 shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters
48.22 may be usable. This class of surface waters is also protected as a source of drinking
48.23 water. The applicable standards are given below. Abbreviations, acronyms, and symbols
48.24 are explained in subpart 1.

49.1	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
49.2							
49.6	Acenaphthene	µg/L	20	HH	56	112	Tox
49.7	Acetochlor	µg/L	3.6	Tox	86	173	Tox
49.8	Acrylonitrile (c)	µg/L	0.38	HH	1,140*	2,281*	Tox
49.9	Alachlor (c)	µg/L	4.2	HH	800*	1,600*	Tox
49.10	Aluminum, total	µg/L	125	Tox	1,072	2,145	Tox
49.11	Ammonia un-ionized as N	µg/L	40	Tox	–	–	NA

49.12 The percent un-ionized ammonia can be calculated for any temperature and pH by
 49.13 using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V.
 49.14 Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature.
 49.15 Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

$$49.16 \quad f = 1 / (10^{(pK_a - pH)} + 1) \times 100$$

49.17 where: f = the percent of total ammonia in the un-ionized state

49.18 $pK_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

49.19 T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

49.20	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
49.21							
49.25	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
49.26	Antimony, total	µg/L	5.5	HH	90	180	Tox
49.27	Arsenic, total	µg/L	2.0	HH	360	720	Tox
49.28	Atrazine (c)	µg/L	3.4	HH	323	645	Tox
49.29	Benzene (c)	µg/L	6.0	HH	4,487*	8,974*	Tox

50.1	Bromoform	µg/L	41	HH	2,900	5,800	Tox
50.2	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

50.3 The CS, MS, and FAV vary with total hardness and are calculated using the following
 50.4 equations:

50.5 The CS in µg/L shall not exceed: $\exp.(0.7852[\ln(\text{total hardness mg/L})]-3.490)$

50.6 The MS in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-1.685)$

50.7 The FAV in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-0.9919)$

50.8 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

50.9 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 50.10 the standard.

50.11 Example of total cadmium standards for five hardness values:

50.12	TH in mg/L	50	100	200	300	400
50.13	<hr/>					
50.14	Cadmium, total					
50.15	CS µg/L	0.66	1.1	2.0	2.7	3.4
50.16	MS µg/L	15	33	73	116	160
50.17	FAV µg/L	31	67	146	231	319

50.18	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
50.19							
50.20							
50.21							
50.22	<hr/>						

50.23	Carbon tetrachloride (c)	µg/L	1.9	HH	1,750*	3,500*	Tox
50.24	Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
50.25	Chloride	mg/L	230	Tox	860	1,720	Tox
50.26	Chlorine, total residual	µg/L	11	Tox	19	38	Tox

50.27 Chlorine standard applies to conditions of continuous exposure, where continuous
 50.28 exposure refers to chlorinated effluents that are discharged for more than a total of
 50.29 two hours in any 24-hour period.

51.1	Chlorobenzene	µg/L	20	HH	423	846	Tox
51.2	(Monochlorobenzene)						
51.3	Chloroform (c)	µg/L	53	HH	1,392	2,784	Tox
51.4	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
51.5	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

51.6 The CS, MS, and FAV vary with total hardness and are calculated using the following
 51.7 equations:

51.8 The CS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+1.561)$

51.9 The MS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+3.688)$

51.10 The FAV in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+4.380)$

51.11 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

51.12 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 51.13 the standard.

51.14 Example of total chromium +3 standards for five total hardness values:

51.15	TH in mg/L	50	100	200	300	400
51.16						
51.17	Chromium +3, total					
51.18	CS µg/L	117	207	365	509	644
51.19	MS µg/L	984	1,737	3,064	4,270	5,405
51.20	FAV µg/L	1,966	3,469	6,120	8,530	10,797

51.21	Substance,						Basis
51.22	Characteristic,			Basis			for
51.23	or Pollutant			for			MS,
51.24	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
51.25							

51.26	Chromium +6, total	µg/L	11	Tox	16	32	Tox
51.27	Cobalt, total	µg/L	2.8	HH	436	872	Tox
51.28	Copper, total	µg/L	equation	Tox	equation	equation	Tox

51.29 The CS, MS, and FAV vary with total hardness and are calculated using the following
 51.30 equations:

- 52.1 The CS in µg/L shall not exceed: $\exp.(0.620[\ln(\text{total hardness mg/L})]-0.570)$
- 52.2 The MS in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-1.464)$
- 52.3 The FAV in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-0.7703)$
- 52.4 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.
- 52.5 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
- 52.6 the standard.
- 52.7 Example of total copper standards for five total hardness values:

52.8	TH in mg/L	50	100	200	300	400
52.9	<hr/>					
52.10	Copper, total					
52.11	CS µg/L	6.4	9.8	15	19	23
52.12	MS µg/L	9.2	18	34	50	65
52.13	FAV µg/L	18	35	68	100	131

52.14	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
52.15							
52.19	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
52.20	DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
52.21	1,2-Dichloroethane (c)	µg/L	3.8	HH	45,050*	90,100*	Tox
52.22	Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
52.23	Di-2-ethylhexyl phthalate (c)	µg/L	1.9	HH	—*	—*	NA
52.24	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
52.25	Endosulfan	µg/L	0.029	HH	0.28	0.56	Tox
52.26	Endrin	µg/L	0.016	HH	0.090	0.18	Tox
52.27	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
52.28		below	below		below	below	

- 52.29 Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less
- 52.30 than five samples representative of conditions within any calendar month, nor shall
- 52.31 more than ten percent of all samples taken during any calendar month individually

53.1 exceed 1,260 organisms per 100 milliliters. The standard applies only between April
53.2 1 and October 31.

53.3	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
53.4	Substance,						Basis
53.5	Characteristic,			Basis			for
53.6	or Pollutant			for			MS,
53.7	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV

53.8

53.9 Eutrophication standards for Class 2Bd lakes, shallow lakes, and reservoirs.

53.10 Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregion

53.11	Phosphorus, total	µg/L	30	NA	–	–	NA
53.12	Chlorophyll-a	µg/L	9	NA	–	–	NA
53.13	Secchi disk transparency	meters	Not less	NA	–	–	NA
53.14			than 2.0				

53.15 Lakes and Reservoirs in North Central Hardwood Forest Ecoregion

53.16	Phosphorus, total	µg/L	40	NA	–	–	NA
53.17	Chlorophyll-a	µg/L	14	NA	–	–	NA
53.18	Secchi disk transparency	meters	Not less	NA	–	–	NA
53.19			than 1.4				

53.20 Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains
53.21 Ecoregions

53.22	Phosphorus, total	µg/L	65	NA	–	–	NA
53.23	Chlorophyll-a	µg/L	22	NA	–	–	NA
53.24	Secchi disk transparency	meters	Not less	NA	–	–	NA
53.25			than 0.9				

53.26 Shallow Lakes in North Central Hardwood Forest Ecoregion

53.27	Phosphorus, total	µg/L	60	NA	–	–	NA
53.28	Chlorophyll-a	µg/L	20	NA	–	–	NA
53.29	Secchi disk transparency	meters	Not less	NA	–	–	NA
53.30			than 1.0				

54.1 Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions

54.2	Phosphorus, total	µg/L	90	NA	–	–	NA
54.3	Chlorophyll-a	µg/L	30	NA	–	–	NA
54.4	Secchi disk transparency	meters	Not less	NA	–	–	NA
54.5			than 0.7				

54.6 Additional narrative eutrophication standards for Class 2Bd lakes, shallow lakes, and
54.7 reservoirs are found under subpart 3a.

54.8 Eutrophication standards for Class 2Bd rivers and streams.

54.9 North River Nutrient Region

54.10	Phosphorus, total			µg/L			less than or equal to 50
54.11	Chlorophyll-a (seston)			µg/L			less than or equal to 7
54.12	Diel dissolved oxygen flux			mg/L			less than or equal to 3.0
54.13	Biochemical oxygen demand (BOD ₅)			mg/L			less than or equal to 1.5

54.14 Central River Nutrient Region

54.15	Phosphorus, total			µg/L			less than or equal to 100
54.16	Chlorophyll-a (seston)			µg/L			less than or equal to 18
54.17	Diel dissolved oxygen flux			mg/L			less than or equal to 3.5
54.18	Biochemical oxygen demand (BOD ₅)			mg/L			less than or equal to 2.0

54.19 South River Nutrient Region

54.20	Phosphorus, total			µg/L			less than or equal to 150
54.21	Chlorophyll-a (seston)			µg/L			less than or equal to 35
54.22	Diel dissolved oxygen flux			mg/L			less than or equal to 4.5
54.23	Biochemical oxygen demand (BOD ₅)			mg/L			less than or equal to 3.0

54.24 Additional narrative eutrophication standards for Class 2Bd rivers and streams are found
54.25 under subpart 3b.

55.1	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
55.2							
55.6	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
55.7	Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
55.8	Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
55.9	Hexachlorobenzene (c)	ng/L	0.24	HH	—*	—*	Tox
55.10	Lead, total	µg/L	equation	Tox	equation	equation	Tox

55.11 The CS, MS, and FAV vary with total hardness and are calculated using the following
 55.12 equations:

55.13 The CS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-4.705)$

55.14 The MS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-1.460)$

55.15 The FAV in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-0.7643)$

55.16 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

55.17 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 55.18 the standard.

55.19 Example of total lead standards for five total hardness values:

55.20	TH in mg/L	50	100	200	300	400
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55.22	Lead, total					
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55.23	CS µg/L	1.3	3.2	7.7	13	19
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55.24	MS µg/L	34	82	197	331	477
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55.25	FAV µg/L	68	164	396	663	956
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55.26	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
55.27							

56.1	Lindane (c)	µg/L	0.032	HH	4.4*	8.8*	Tox
56.2	(Hexachlorocyclohexane,						
56.3	gamma-)						
56.4	Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
56.5	Mercury, total	mg/kg	0.2	HH	NA	NA	NA
56.6	in edible fish tissue	ppm					
56.7	Methylene chloride (c)	µg/L	46	HH	13,875*	27,749*	Tox
56.8	(Dichloromethane)						
56.9	Metolachlor	µg/L	23	Tox	271	543	Tox
56.10	Naphthalene	µg/L	81	Tox	409	818	Tox
56.11	Nickel, total	µg/L	equation	Tox/HH	equation	equation	Tox

56.12 The CS, MS, and FAV vary with total hardness and are calculated using the following
 56.13 equations:

56.14 The CS shall not exceed the human health-based standard of 297 µg/L. For waters
 56.15 with total hardness values less than 212 mg/L, the CS in µg/L is toxicity-based and
 56.16 shall not exceed: $\text{exp}(.0.846[\ln(\text{total hardness mg/L})]+1.1645)$

56.17 The MS in µg/L shall not exceed: $\text{exp}(.0.846[\ln(\text{total hardness mg/L})]+3.3612)$

56.18 The FAV in µg/L shall not exceed: $\text{exp}(.0.846[\ln(\text{total hardness mg/L})]+4.0543)$

56.19 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

56.20 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 56.21 the standard.

56.22 Example of total nickel standards for five total hardness values:

56.23	TH in mg/L	50	100	200	300	400
56.24		<hr/>				
56.25	Nickel, total					
56.26	CS µg/L	88	158	283	297	297
56.27	MS µg/L	789	1,418	2,549	3,592	4,582
56.28	FAV µg/L	1,578	2,836	5,098	7,185	9,164

57.1	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS			Basis for MS, FAV
57.2				57.3	57.4	57.5	

57.6	Oil	µg/L	500	NA	5,000	10,000	NA
57.7	Oxygen, dissolved	mg/L	See	NA	–	–	NA
57.8			below				

57.9 5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a
 57.10 site-specific basis according to part 7050.0220, subpart 7, except that no site-specific
 57.11 standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum.
 57.12 Compliance with this standard is required 50 percent of the days at which the flow of
 57.13 the receiving water is equal to the 7Q₁₀.

57.14	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
57.15	Pentachlorophenol	µg/L	1.9	HH	equation	equation	Tox

57.16 The MS and FAV vary with pH and are calculated using the following equations:

57.17 The MS in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.830)$

57.18 The FAV in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.1373)$

57.19 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

57.20 For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH
 57.21 values greater than 9.0, 9.0 shall be used to calculate the standard.

57.22 Example of pentachlorophenol standards for five pH values:

57.23	pH su	6.5	7.0	7.5	8.0	8.5
57.24	<hr/>					
57.25	Pentachlorophenol					
57.26	CS µg/L	1.9	1.9	1.9	1.9	1.9
57.27	MS µg/L	5.5	9.1	15	25	41
57.28	FAV µg/L	11	18	30	50	82

58.1	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
58.2							
58.6	pH, minimum	su	6.5	NA	–	–	NA
58.7	pH, maximum	su	9.0	NA	–	–	NA
58.8	Phenanthrene	µg/L	3.6	Tox	32	64	Tox
58.9	Phenol	µg/L	123	Tox	2,214	4,428	Tox
58.10	Polychlorinated biphenyls, total (c)	ng/L	0.029	HH	1,000*	2,000*	Tox
58.11	Radioactive materials	NA	See below	NA	See below	See below	NA
58.12	Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled environment as permitted by the appropriate authority having control over their use.						
58.13							
58.14	Selenium, total	µg/L	5.0	Tox	20	40	Tox
58.15	Silver, total	µg/L	1.0	Tox	equation	equation	Tox
58.16	The MS and FAV vary with total hardness and are calculated using the following equations:						
58.17	The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$						
58.18	The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$						
58.19	Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.						
58.20	For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.						
58.21	Example of total silver standards for five total hardness values:						
58.22	TH in mg/L	50	100	200	300	400	
58.23	<hr/>						
58.24	Silver, total						
58.25	CS µg/L	1.0	1.0	1.0	1.0	1.0	

59.1	MS µg/L	1.0	2.0	6.7	13	22	
59.2	FAV µg/L	1.2	4.1	13	27	44	
59.3	Substance, Characteristic, or Pollutant (Class 2Bd)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
59.4							
59.7	<hr/>						
59.8	Temperature	°F	See	NA	–	–	NA
59.9			below				
59.10	5°F above natural in streams and 3°F above natural in lakes, based on monthly						
59.11	average of the maximum daily temperatures, except in no case shall it exceed the						
59.12	daily average temperature of 86°F.						
59.13	1,1,2,2-Tetrachloroethane	µg/L	1.5	HH	1,127*	2,253*	Tox
59.14	(c)						
59.15	Tetrachloroethylene (c)	µg/L	3.8	HH	428*	857*	Tox
59.16	Thallium, total	µg/L	0.28	HH	64	128	Tox
59.17	Toluene	µg/L	253	Tox	1,352	2,703	Tox
59.18	Toxaphene (c)	ng/L	1.3	HH	730*	1,500*	Tox
59.19	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
59.20	1,1,2-Trichloroethylene (c)	µg/L	25	HH	6,988*	13,976*	Tox
59.21	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
59.22	Total suspended solids						
59.23	(TSS)						
59.24	North River Nutrient						
59.25	Region	mg/L	15	NA	-	-	NA
59.26	Central River Nutrient						
59.27	Region	mg/L	30	NA	-	-	NA
59.28	South River Nutrient						
59.29	Region	mg/L	65	NA	-	-	NA
59.30	Red River mainstem -						
59.31	headwaters to border	mg/L	100	NA	-	-	NA

60.1	TSS standards for the						
60.2	Class 2Bd North, Central,						
60.3	and South River Nutrient						
60.4	Regions and the Red						
60.5	River mainstem may be						
60.6	exceeded for no more than						
60.7	ten percent of the time.						
60.8	This standard applies April						
60.9	1 through September 30						
60.10	Total suspended solids						
60.11	(TSS), summer average						
60.12	Lower Mississippi River						
60.13	mainstem - Pools 2 through						
60.14	4	mg/L	32	NA	-	-	NA
60.15	Lower Mississippi River						
60.16	mainstem below Lake						
60.17	Pepin	mg/L	30	NA	-	-	NA

60.18 TSS standards for the Class
 60.19 2Bd Lower Mississippi
 60.20 River may be exceeded for
 60.21 no more than 50 percent
 60.22 of the time. This standard
 60.23 applies June 1 through
 60.24 September 30

60.25	Substance,						Basis
60.26	Characteristic,			Basis			for
60.27	or Pollutant			for			MS,
60.28	(Class 2Bd)	Units	CS	CS	MS	FAV	FAV
60.29	<hr/>						

60.30	Vinyl chloride (c)	µg/L	0.18	HH	—*	—*	NA
60.31	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
60.32	Zinc, total	µg/L	equation	Tox	equation	equation	Tox

60.33 The CS, MS, and FAV vary with total hardness and are calculated using the following
 60.34 equations:

61.1 The CS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.7615)$

61.2 The MS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$

61.3 The FAV in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$

61.4 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

61.5 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
61.6 the standard.

61.7 Example of total zinc standards for five total hardness values:

61.8	TH in mg/L	50	100	200	300	400
61.9	<hr/>					
61.10	Zinc, total					
61.11	CS µg/L	59	106	191	269	343
61.12	MS µg/L	65	117	211	297	379
61.13	FAV µg/L	130	234	421	594	758

61.14 Subp. 3a. **Narrative eutrophication standards for Class 2Bd lakes, shallow lakes,**
61.15 **and reservoirs.**

61.16 A. Eutrophication standards applicable to lakes, shallow lakes, and reservoirs
61.17 that lie on the border between two ecoregions or that are in the Red River Valley (also
61.18 referred to as Lake Agassiz Plains), Northern Minnesota Wetlands, or Driftless Area
61.19 Ecoregion must be applied on a case-by-case basis. The commissioner shall use the
61.20 standards applicable to adjacent ecoregions as a guide.

61.21 B. Eutrophication standards are compared to summer-average data. Exceedance
61.22 of the total phosphorus and either the chlorophyll-a or Secchi disk transparency standard
61.23 is required to indicate a polluted condition.

61.24 [For text of item C, see M.R.]

61.25 D. Lakes, shallow lakes, and reservoirs with a baseline quality that is poorer
61.26 than the numeric eutrophication standards in subpart 3 must be considered to be in
61.27 compliance with the standards if the baseline quality is the result of natural causes. The

62.1 commissioner shall determine baseline quality and compliance with these standards using
62.2 data and the procedures in part 7050.0150, subpart 5.

62.3 [For text of item E, see M.R.]

62.4 Subp. 3b. **Narrative eutrophication standards for rivers, streams, and**
62.5 **navigational pools.**

62.6 A. Eutrophication standards for rivers, streams, and navigational pools are
62.7 compared to summer-average data or as specified in subpart 3. Exceedance of the total
62.8 phosphorus levels and chlorophyll-a (seston), five-day biochemical oxygen demand
62.9 (BOD₅), diel dissolved oxygen flux, or pH levels is required to indicate a polluted condition.

62.10 B. Rivers, streams, and navigational pools that exceed the phosphorus levels but
62.11 do not exceed the chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅),
62.12 diel dissolved oxygen flux, or pH levels meet the eutrophication standard.

62.13 C. A polluted condition also exists when the chlorophyll-a (periphyton)
62.14 concentration exceeds 150 mg/m² more than one year in ten.

62.15 D. It is the policy of the agency to protect all rivers, streams, and navigational
62.16 pools from the undesirable effects of cultural eutrophication. Rivers, streams, and
62.17 navigational pools with a baseline quality better than the numeric eutrophication standards
62.18 in subpart 3 must be maintained in that condition through the strict application of all
62.19 relevant federal, state, and local requirements governing nondegradation, the discharge
62.20 of nutrients from point and nonpoint sources including:

62.21 (1) the nondegradation requirements in parts 7050.0180 and 7050.0185;

62.22 (2) the phosphorus effluent limits for point sources, where applicable, in
62.23 chapter 7053;

62.24 (3) the requirements for feedlots in chapter 7020;

63.1 (4) the requirements for individual sewage treatment systems in chapter
 63.2 7080;

63.3 (5) the requirements for control of storm water in chapter 7090;

63.4 (6) county shoreland ordinances; and

63.5 (7) implementation of mandatory and voluntary best management practices
 63.6 to minimize point and nonpoint sources of nutrients.

63.7 E. Rivers, streams, and navigational pools with a baseline quality that does
 63.8 not meet the numeric eutrophication standards in part 7050.0150, subpart 5b, are in
 63.9 compliance with the standards if the baseline quality is the result of natural causes. The
 63.10 commissioner must determine baseline quality and compliance with these standards using
 63.11 data and the procedures in part 7050.0150, subpart 5.

63.12 Subp. 4. **Class 2B waters.** The quality of Class 2B surface waters shall be such as
 63.13 to permit the propagation and maintenance of a healthy community of cool or warm
 63.14 water sport or commercial fish and associated aquatic life, and their habitats. These
 63.15 waters shall be suitable for aquatic recreation of all kinds, including bathing, for which
 63.16 the waters may be usable. This class of surface water is not protected as a source of
 63.17 drinking water. The applicable standards are given below. Abbreviations, acronyms,
 63.18 and symbols are explained in subpart 1.

63.19 Substance,							
63.20 Characteristic,			Basis				Basis
63.21 or Pollutant			for				for MS,
63.22 (Class 2B)	Units	CS	CS	MS	FAV	FAV	FAV
63.23	<hr/>						
63.24	Acenaphthene	µg/l	20	HH	56	112	Tox
63.25	Acetochlor	µg/L	3.6	Tox	86	173	Tox
63.26	Acrylonitrile (c)	µg/l	0.89	HH	1,140*	2,281*	Tox
63.27	Alachlor (c)	µg/L	59	Tox	800	1,600	Tox

64.1	Aluminum, total	µg/L	125	Tox	1,072	2,145	Tox
64.2	Ammonia un-ionized as N	µg/L	40	Tox	–	–	NA

64.3 The percent un-ionized ammonia can be calculated for any temperature and pH by
 64.4 using the following equation taken from Emerson, K., R.C. Russo, R.E. Lund, and R.V.
 64.5 Thurston, Aqueous ammonia equilibrium calculations; effect of pH and temperature.
 64.6 Journal of the Fisheries Research Board of Canada 32: 2379-2383 (1975):

64.7
$$f = 1 / (10^{(pK_a - pH)} + 1) \times 100$$

64.8 where: f = the percent of total ammonia in the un-ionized state

64.9 $pK_a = 0.09 + (2730/T)$ (dissociation constant for ammonia)

64.10 T = temperature in degrees Kelvin (273.16° Kelvin = 0° Celsius)

64.11	Substance,						
64.12	Characteristic,			Basis			Basis
64.13	or Pollutant			for			for MS,
64.14	(Class 2B)	Units	CS	CS	MS	FAV	FAV
64.15	<hr/>						

64.16	Anthracene	µg/L	0.035	Tox	0.32	0.63	Tox
64.17	Antimony, total	µg/L	31	Tox	90	180	Tox
64.18	Arsenic, total	µg/L	53	HH	360	720	Tox
64.19	Atrazine (c)	µg/L	10	Tox	323	645	Tox
64.20	Benzene (c)	µg/L	98	HH	4,487	8,974	Tox
64.21	Bromoform	µg/L	466	HH	2,900	5,800	Tox
64.22	Cadmium, total	µg/L	equation	Tox	equation	equation	Tox

64.23 The CS, MS, and FAV vary with total hardness and are calculated using the following
 64.24 equations:

64.25 The CS in µg/L shall not exceed: $\exp.(0.7852[\ln(\text{total hardness mg/L})]-3.490)$

64.26 The MS in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-1.685)$

64.27 The FAV in µg/L shall not exceed: $\exp.(1.128[\ln(\text{total hardness mg/L})]-0.9919)$

64.28 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

64.29 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 64.30 the standard.

65.1 Example of total cadmium standards for five hardness values:

65.2	TH in mg/L	50	100	200	300	400
65.3	<hr/>					
65.4	Cadmium, total					
65.5	CS µg/L	0.66	1.1	2.0	2.7	3.4
65.6	MS µg/L	15	33	73	116	160
65.7	FAV µg/L	31	67	146	231	319

65.8	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
65.9							

65.10							
65.11							
65.12	<hr/>						
65.13	Carbon tetrachloride (c)	µg/L	5.9	HH	1,750*	3,500*	Tox
65.14	Chlordane (c)	ng/L	0.29	HH	1,200*	2,400*	Tox
65.15	Chloride	mg/L	230	Tox	860	1,720	Tox
65.16	Chlorine, total residual	µg/L	11	Tox	19	38	Tox

65.17 Chlorine standard applies to conditions of continuous exposure, where continuous
 65.18 exposure refers to chlorinated effluents that are discharged for more than a total of
 65.19 two hours in any 24-hour period.

65.20	Chlorobenzene	µg/L	20	HH	423	846	Tox
65.21	(Monochlorobenzene)						
65.22	Chloroform (c)	µg/L	155	Tox	1,392	2,784	Tox
65.23	Chlorpyrifos	µg/L	0.041	Tox	0.083	0.17	Tox
65.24	Chromium +3, total	µg/L	equation	Tox	equation	equation	Tox

65.25 The CS, MS, and FAV vary with total hardness and are calculated using the following
 65.26 equations

65.27 The CS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+1.561)$

65.28 The MS in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+3.688)$

65.29 The FAV in µg/L shall not exceed: $\exp.(0.819[\ln(\text{total hardness mg/L})]+4.380)$

65.30 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

66.1 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 66.2 the standard.

66.3 Example of total chromium +3 standards for five total hardness values:

66.4	TH in mg/L	50	100	200	300	400
66.5	<hr/>					
66.6	Chromium +3, total					
66.7	CS µg/L	117	207	365	509	644
66.8	MS µg/L	984	1,737	3,064	4,270	5,405
66.9	FAV µg/L	1,966	3,469	6,120	8,530	10,797

66.10	Substance, 66.11 Characteristic, 66.12 or Pollutant (Class 2B)	Units	Basis			Basis for MS, FAV	
66.13			CS	CS	MS		FAV
66.14	<hr/>						
66.15	Chromium +6, total	µg/L	11	Tox	16	32	Tox
66.16	Cobalt, total	µg/L	5.0	Tox	436	872	Tox
66.17	Copper, total	µg/L	equation	Tox	equation	equation	Tox

66.18 The CS, MS, and FAV vary with total hardness and are calculated using the following
 66.19 equations:

66.20 The CS in µg/L shall not exceed: $\exp.(0.6200[\ln(\text{total hardness mg/L})]-0.570)$

66.21 The MS in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-1.464)$

66.22 The FAV in µg/L shall not exceed: $\exp.(0.9422[\ln(\text{total hardness mg/L})]-0.7703)$

66.23 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

66.24 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 66.25 the standard.

66.26 Example of total copper standards for five total hardness values:

66.27	TH in mg/L	50	100	200	300	400
66.28	<hr/>					
66.29	Copper, total					
66.30	CS µg/L	6.4	9.8	15	19	23

67.1	MS µg/L	9.2	18	34	50	65
67.2	FAV µg/L	18	35	68	100	131

67.3	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
67.4							
67.5							
67.6							
67.7							

67.8	Cyanide, free	µg/L	5.2	Tox	22	45	Tox
67.9	DDT (c)	ng/L	1.7	HH	550*	1,100*	Tox
67.10	1,2-Dichloroethane (c)	µg/L	190	HH	45,050*	90,100*	Tox
67.11	Dieldrin (c)	ng/L	0.026	HH	1,300*	2,500*	Tox
67.12	Di-2-ethylhexyl phthalate	µg/L	2.1	HH	—*	—*	NA
67.13	(c)						
67.14	Di-n-octyl phthalate	µg/L	30	Tox	825	1,650	Tox
67.15	Endosulfan	µg/L	0.031	HH	0.28	0.56	Tox
67.16	Endrin	µg/L	0.016	HH	0.090	0.18	Tox
67.17	<i>Escherichia (E.) coli</i>	See	See	HH	See	See	NA
67.18		below	below		below	below	

67.19 Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less
67.20 than five samples representative of conditions within any calendar month, nor shall
67.21 more than ten percent of all samples taken during any calendar month individually
67.22 exceed 1,260 organisms per 100 milliliters. The standard applies only between April
67.23 1 and October 31.

67.24	Ethylbenzene	µg/L	68	Tox	1,859	3,717	Tox
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67.25	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
67.26							
67.27							
67.28							
67.29							

67.30 Eutrophication standards for Class 2B lakes, shallow lakes, and reservoirs.

67.31 Lakes, Shallow Lakes, and Reservoirs in Northern Lakes and Forest Ecoregions

68.1	Phosphorus, total	µg/L	30	NA	–	–	NA
68.2	Chlorophyll-a	µg/L	9	NA	–	–	NA
68.3	Secchi disk transparency	meters	Not less	NA	–	–	NA
68.4			than 2.0				
68.5	Lakes and Reservoirs in North Central Hardwood Forest Ecoregion						
68.6	Phosphorus, total	µg/L	40	NA	–	–	NA
68.7	Chlorophyll-a	µg/L	14	NA	–	–	NA
68.8	Secchi disk transparency	meters	Not less	NA	–	–	NA
68.9			than 1.4				
68.10	Lakes and Reservoirs in Western Corn Belt Plains and Northern Glaciated Plains						
68.11	Ecoregions						
68.12	Phosphorus, total	µg/L	65	NA	–	–	NA
68.13	Chlorophyll-a	µg/L	22	NA	–	–	NA
68.14	Secchi disk transparency	meters	Not less	NA	–	–	NA
68.15			than 0.9				
68.16	Shallow Lakes in North Central Hardwood Forest Ecoregion						
68.17	Phosphorus, total	µg/L	60	NA	–	–	NA
68.18	Chlorophyll-a	µg/L	20	NA	–	–	NA
68.19	Secchi disk transparency	meters	Not less	NA	–	–	NA
68.20			than 1.0				
68.21	Shallow Lakes in Western Corn Belt Plains and Northern Glaciated Plains Ecoregions						
68.22	Phosphorus, total	µg/L	90	NA	–	–	NA
68.23	Chlorophyll-a	µg/L	30	NA	–	–	NA
68.24	Secchi disk transparency	meters	Not less	NA	–	–	NA
68.25			than 0.7				
68.26	Additional narrative eutrophication standards for Class 2B lakes, shallow lakes, and						
68.27	reservoirs are found in subpart 4a.						

69.1	Substance,					
69.2	Characteristic,			Basis		Basis
69.3	or Pollutant			for		for MS,
69.4	(Class 2B)	Units	CS	CS	MS	FAV
69.5						FAV
69.6	Eutrophication standards for Class 2B rivers and streams.					
69.7	North River Nutrient Region					
69.8	Phosphorus, total			µg/L		less than or equal to 50
69.9	Chlorophyll-a (seston)			µg/L		less than or equal to 7
69.10	Diel dissolved oxygen flux			mg/L		less than or equal to 3.0
69.11	Biochemical oxygen demand (BOD ₅)			mg/L		less than or equal to 1.5
69.12	Central River Nutrient Region					
69.13	Phosphorus, total			µg/L		less than or equal to 100
69.14	Chlorophyll-a (seston)			µg/L		less than or equal to 18
69.15	Diel dissolved oxygen flux			mg/L		less than or equal to 3.5
69.16	Biochemical oxygen demand (BOD ₅)			mg/L		less than or equal to 2.0
69.17	South River Nutrient Region					
69.18	Phosphorus, total			µg/L		less than or equal to 150
69.19	Chlorophyll-a (seston)			µg/L		less than or equal to 40
69.20	Diel dissolved oxygen flux			mg/L		less than or equal to 5.0
69.21	Biochemical oxygen demand (BOD ₅)			mg/L		less than or equal to 3.5
69.22	Site-specific standards for specified river reaches or other waters are:					
69.23	Mississippi River Navigational Pool 1 (river miles 854.1 to 847.7 reach from Fridley					
69.24	to Ford Dam in St. Paul)					
69.25	Phosphorus, total			µg/L		less than or equal to 100
69.26	Chlorophyll-a (seston)			µg/L		less than or equal to 35

70.1	Mississippi River Navigational Pool 2 (river miles 847.7 to 815.2 reach from Ford Dam		
70.2	to Hastings Dam)		
70.3	Phosphorus, total	µg/L	less than or equal to 125
70.4	Chlorophyll-a (seston)	µg/L	less than or equal to 35
70.5	Mississippi River Navigational Pool 3 (river miles 815.2 to 796.9 reach from Hastings		
70.6	Dam to Red Wing Dam)		
70.7	Phosphorus, total	µg/L	less than or equal to 100
70.8	Chlorophyll-a (seston)	µg/L	less than or equal to 35
70.9	Mississippi River Navigational Pool 4 (river miles 796.9 to 752.8 reach from Red Wing		
70.10	Dam to Alma Dam). Lake Pepin occupies majority of Pool 4 and Lake Pepin site-specific		
70.11	standards are used for this pool.		
70.12	Mississippi River Navigational Pools 5 to 8 (river miles 752.8 to 679.1 Alma Dam to		
70.13	Genoa Dam)		
70.14	Phosphorus, total	µg/L	less than or equal to 100
70.15	Chlorophyll-a (seston)	µg/L	less than or equal to 35
70.16	Lake Pepin		
70.17	Phosphorus, total	µg/L	less than or equal to 100
70.18	Chlorophyll-a (seston)	µg/L	less than or equal to 28
70.19	Crow Wing River from confluence of Long Prairie River to the mouth of the Crow Wing		
70.20	River at the Mississippi River		
70.21	Phosphorus, total	µg/L	less than or equal to 75
70.22	Chlorophyll-a (seston)	µg/L	less than or equal to 13
70.23	Diel dissolved oxygen flux	mg/L	less than or equal to 3.5
70.24	Biochemical oxygen demand (BOD ₅)	mg/L	less than or equal to 1.7
70.25	Crow River from the confluence of the North Fork of the Crow River and South Fork of		
70.26	the Crow River to the mouth of the Crow River at the Mississippi River		

71.1	Phosphorus, total	µg/L	less than or equal to 125
71.2	Chlorophyll-a (seston)	µg/L	less than or equal to 27
71.3	Diel dissolved oxygen flux	mg/L	less than or equal to 4.0
71.4	Biochemical oxygen demand (BOD ₅)	mg/L	less than or equal to 2.5

71.5 Additional narrative eutrophication standards for Class 2B rivers and streams are found
 71.6 in subpart 4b.

71.7	Substance,						
71.8	Characteristic,			Basis			Basis
71.9	or Pollutant			for			for MS,
71.10	(Class 2B)	Units	CS	CS	MS	FAV	FAV
71.11	<hr/>						

71.12	Fluoranthene	µg/L	1.9	Tox	3.5	6.9	Tox
71.13	Heptachlor (c)	ng/L	0.39	HH	260*	520*	Tox
71.14	Heptachlor epoxide (c)	ng/L	0.48	HH	270*	530*	Tox
71.15	Hexachlorobenzene (c)	ng/L	0.24	HH	—*	—*	Tox
71.16	Lead, total	µg/L	equation	Tox	equation	equation	Tox

71.17 The CS, MS, and FAV vary with total hardness and are calculated using the following
 71.18 equations:

71.19 The CS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-4.705)$

71.20 The MS in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-1.460)$

71.21 The FAV in µg/L shall not exceed: $\exp.(1.273[\ln(\text{total hardness mg/L})]-0.7643)$

71.22 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

71.23 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
 71.24 the standard.

71.25 Example of total lead standards for five total hardness values:

71.26	TH in mg/L	50	100	200	300	400
71.27	<hr/>					
71.28	Lead, total					
71.29	CS µg/L	1.3	3.2	7.7	13	19

72.1	MS µg/L	34	82	197	331	477
72.2	FAV µg/L	68	164	396	663	956

72.3	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis for CS	MS	FAV	Basis for MS, FAV
72.4							

72.7	<hr/>						
72.8	Lindane (c)	µg/L	0.036	HH	4.4*	8.8*	Tox
72.9	(Hexachlorocyclohexane,						
72.10	gamma-)						
72.11	Mercury, total in water	ng/L	6.9	HH	2,400*	4,900*	Tox
72.12	Mercury, total	mg/kg	0.2	HH	NA	NA	NA
72.13	in edible fish tissue	ppm					
72.14	Methylene chloride (c)	µg/L	1,940	HH	13,875	27,749	Tox
72.15	(Dichloromethane)						
72.16	Metolachlor	µg/L	23	Tox	271	543	Tox
72.17	Naphthalene	µg/L	81	Tox	409	818	Tox
72.18	Nickel, total	µg/L	equation	Tox	equation	equation	Tox

72.19 The CS, MS, and FAV vary with total hardness and are calculated using the following
72.20 equations:

72.21 The CS in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+1.1645)$

72.22 The MS in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/L})]+3.3612)$

72.23 The FAV in µg/L shall not exceed: $\exp.(0.846[\ln(\text{total hardness mg/l})]+4.0543)$

72.24 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

72.25 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
72.26 the standard.

72.27 Example of total nickel standards for five total hardness values:

72.28	TH in mg/L	50	100	200	300	400
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72.29	<hr/>					
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72.30 Nickel, total

72.31	CS µg/L	88	158	283	399	509
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73.1	MS µg/L	789	1,418	2,549	3,592	4,582
73.2	FAV µg/L	1,578	2,836	5,098	7,185	9,164

73.3	Substance, Characteristic, or Pollutant (Class 2B)	Units	CS	Basis			Basis for MS, FAV
73.4				CS	MS	FAV	

73.5							
73.6							
73.7							
73.8	Oil	µg/l	500	NA	5,000	10,000	NA
73.9	Oxygen, dissolved	mg/L	See	NA	—	—	NA
73.10			below				

73.11 5.0 mg/L as a daily minimum. This dissolved oxygen standard may be modified on a
 73.12 site-specific basis according to part 7050.0220, subpart 7, except that no site-specific
 73.13 standard shall be less than 5 mg/L as a daily average and 4 mg/L as a daily minimum.
 73.14 Compliance with this standard is required 50 percent of the days at which the flow
 73.15 of the receiving water is equal to the 7Q₁₀. This standard applies to all Class 2B
 73.16 waters except for those portions of the Mississippi River from the outlet of the Metro
 73.17 Wastewater Treatment Works in Saint Paul (River Mile 835) to Lock and Dam No. 2
 73.18 at Hastings (River Mile 815). For this reach of the Mississippi River, the standard is
 73.19 not less than 5 mg/L as a daily average from April 1 through November 30, and not
 73.20 less than 4 mg/L at other times.

73.21	Parathion	µg/L	0.013	Tox	0.07	0.13	Tox
73.22	Pentachlorophenol	µg/L	equation	Tox/HH equation	equation	equation	Tox

73.23 The CS, MS, and FAV vary with pH and are calculated using the following equations:

73.24 For waters with pH values greater than 6.95, the CS shall not exceed the human
 73.25 health-based standard of 5.5 µg/L.

73.26 For waters with pH values less than 6.96, the CS in µg/L shall not exceed the
 73.27 toxicity-based standard of $\exp.(1.005[\text{pH}]-5.290)$

73.28 The MS in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.830)$

73.29 The FAV in µg/L shall not exceed: $\exp.(1.005[\text{pH}]-4.1373)$

73.30 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

73.31 For pH values less than 6.0, 6.0 shall be used to calculate the standard and for pH
 73.32 values greater than 9.0, 9.0 shall be used to calculate the standard.

74.1 Example of pentachlorophenol standards for five pH values:

74.2 pH su 6.5 7.0 7.5 8.0 8.5

74.3

74.4 Pentachlorophenol

74.5 CS µg/L 3.5 5.5 5.5 5.5 5.5

74.6 MS µg/L 5.5 9.1 15 25 41

74.7 FAV µg/L 11 18 30 50 82

74.8 **Substance,**

74.9 **Characteristic,**

74.10 **or Pollutant**

74.11 **(Class 2B)**

Units

CS

**Basis
for
CS**

MS

FAV

**Basis
for MS,
FAV**

74.12

74.13 pH, minimum su 6.5 NA – – NA

74.14 pH, maximum su 9.0 NA – – NA

74.15 Phenanthrene µg/L 3.6 Tox 32 64 Tox

74.16 Phenol µg/L 123 Tox 2,214 4,428 Tox

74.17 Polychlorinated ng/L 0.029 HH 1,000* 2,000* Tox

74.18 biphenyls, total (c)

74.19 Radioactive materials NA See NA See See NA

74.20 below below below

74.21 Not to exceed the lowest concentrations permitted to be discharged to an uncontrolled

74.22 environment as permitted by the appropriate authority having control over their use.

74.23 Selenium, total µg/L 5.0 Tox 20 40 Tox

74.24 Silver, total µg/L 1.0 Tox equation equation Tox

74.25 The MS and FAV vary with total hardness and are calculated using the following
74.26 equations:

74.27 The MS in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-7.2156)$

74.28 The FAV in µg/L shall not exceed: $\exp.(1.720[\ln(\text{total hardness mg/L})]-6.520)$

74.29 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

74.30 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
74.31 the standard.

75.1 Example of total silver standards for five total hardness values:

75.2	TH in mg/L	50	100	200	300	400
75.3	<hr/>					
75.4	Silver, total					
75.5	CS µg/L	1.0	1.0	1.0	1.0	1.0
75.6	MS µg/L	1.0	2.0	6.7	13	22
75.7	FAV µg/L	1.2	4.1	13	27	44

75.8	Substance,			Basis			Basis
75.9	Characteristic,			for			for MS,
75.10	or Pollutant			CS	MS	FAV	FAV
75.11	(Class 2B)	Units	CS				

75.13	Temperature	°F	See	NA	–	–	NA
75.14			below				

75.15 5°F above natural in streams and 3°F above natural in lakes, based on monthly
 75.16 average of the maximum daily temperatures, except in no case shall it exceed the
 75.17 daily average temperature of 86°F.

75.18	1,1,2,2-Tetrachloroethane (c)	µg/L	13	HH	1,127	2,253	Tox
75.19	Tetrachloroethylene (c)	µg/L	8.9	HH	428	857	Tox
75.20	Thallium, total	µg/L	0.56	HH	64	128	Tox
75.21	Toluene	µg/L	253	Tox	1,352	2,703	Tox
75.22	Toxaphene (c)	ng/L	1.3	HH	730*	1,500*	Tox
75.23	1,1,1-Trichloroethane	µg/L	329	Tox	2,957	5,913	Tox
75.24	1,1,2-Trichloroethylene (c)	µg/L	120	HH	6,988	13,976	Tox
75.25	2,4,6-Trichlorophenol	µg/L	2.0	HH	102	203	Tox
75.26	Total suspended solids (TSS)						
75.27	North River Nutrient Region	mg/L	15	NA	–	–	NA
75.28	Central River Nutrient						
75.29	Region	mg/L	30	NA	–	–	NA
75.30	South River Nutrient Region	mg/L	65	NA	–	–	NA

76.1	Red River mainstem -						
76.2	headwaters to border	mg/L	100	NA	–	–	NA
76.3	TSS standards for the Class						
76.4	2B North, Central, and South						
76.5	River Nutrient Regions and						
76.6	the Red River mainstem may						
76.7	be exceeded for no more						
76.8	than ten percent of the time.						
76.9	This standard applies April 1						
76.10	through September 30						
76.11	Total suspended solids (TSS),						
76.12	summer average						
76.13	Lower Mississippi River						
76.14	mainstem - Pools 2 through 4	mg/L	32	NA	–	–	NA
76.15	Lower Mississippi River						
76.16	mainstem below Lake Pepin	mg/L	30	NA	–	–	NA
76.17	TSS standards for the Class						
76.18	2B Lower Mississippi River						
76.19	may be exceeded for no more						
76.20	than 50 percent of the time.						
76.21	This standard applies June 1						
76.22	through September 30						

76.23	Substance,						
76.24	Characteristic,			Basis			Basis
76.25	or Pollutant			for			for MS,
76.26	(Class 2B)	Units	CS	CS	MS	FAV	FAV

76.28	Vinyl chloride (c)	µg/L	9.2	HH	–*	–*	NA
76.29	Xylene, total m,p,o	µg/L	166	Tox	1,407	2,814	Tox
76.30	Zinc, total	µg/L	equation	Tox	equation	equation	Tox

76.31 The CS, MS, and FAV vary with total hardness and are calculated using the following
 76.32 equations:

76.33 The CS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.7615)$

76.34 The MS in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+0.8604)$

77.1 The FAV in µg/L shall not exceed: $\exp.(0.8473[\ln(\text{total hardness mg/L})]+1.5536)$

77.2 Where: exp. is the natural antilogarithm (base e) of the expression in parenthesis.

77.3 For hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate
77.4 the standard.

77.5 Example of total zinc standards for five total hardness values:

77.6	TH in mg/L	50	100	200	300	400
77.7	<hr/>					
77.8	Zinc, total					
77.9	CS µg/L	59	106	191	269	343
77.10	MS µg/L	65	117	211	297	379
77.11	FAV µg/L	130	234	421	594	758

77.12 Subp. 4a. **Narrative eutrophication standards for Class 2B lakes, shallow lakes,**
77.13 **and reservoirs.**

77.14 A. Eutrophication standards applicable to lakes, shallow lakes, and reservoirs
77.15 that lie on the border between two ecoregions or that are in the Red River Valley (also
77.16 referred to as Lake Agassiz Plains), Northern Minnesota Wetlands, or Driftless Area
77.17 Ecoregion must be applied on a case-by-case basis. The commissioner shall use the
77.18 standards applicable to adjacent ecoregions as a guide.

77.19 B. Eutrophication standards are compared to summer-average data. Exceedance
77.20 of the total phosphorus and either the chlorophyll-a or Secchi disk transparency standard
77.21 is required to indicate a polluted condition.

77.22 [For text of item C, see M.R.]

77.23 D. Lakes, shallow lakes, and reservoirs with a baseline quality that is poorer
77.24 than the numeric eutrophication standards in subpart 4 must be considered to be in
77.25 compliance with the standards if the baseline quality is the result of natural causes. The
77.26 commissioner shall determine baseline quality and compliance with these standards using
77.27 data and the procedures in part 7050.0150, subpart 5.

78.1 [For text of item E, see M.R.]

78.2 Subp. 4b. **Narrative eutrophication standards for Class 2B rivers and streams.**

78.3 A. Eutrophication standards for rivers and streams are compared to
78.4 summer-average data or as specified in subpart 4. Exceedance of the total phosphorus
78.5 levels and chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel
78.6 dissolved oxygen flux, or pH levels is required to indicate a polluted condition.

78.7 B. Rivers and streams that exceed the phosphorus levels but do not exceed the
78.8 chlorophyll-a (seston), five-day biochemical oxygen demand (BOD₅), diel dissolved
78.9 oxygen flux, or pH levels meet the eutrophication standard.

78.10 C. A polluted condition also exists when the chlorophyll-a (periphyton)
78.11 concentration exceeds 150 mg/m² more than one year in ten

78.12 D. It is the policy of the agency to protect all rivers, streams, and navigational
78.13 pools from the undesirable effects of cultural eutrophication. Rivers, streams, and
78.14 navigational pools with a baseline quality better than the numeric eutrophication standards
78.15 in subpart 4 must be maintained in that condition through the strict application of all
78.16 relevant federal, state, and local requirements governing nondegradation, the discharge
78.17 of nutrients from point and nonpoint sources, including:

78.18 (1) the nondegradation requirements in parts 7050.0180 and 7050.0185;

78.19 (2) the phosphorus effluent limits for point sources, where applicable in
78.20 chapter 7053;

78.21 (3) the requirements for feedlots in chapter 7020;

78.22 (4) the requirements for individual sewage treatment systems in chapter
78.23 7080;

78.24 (5) the requirements for control of storm water in chapter 7090;

79.1 (6) county shoreland ordinances; and

79.2 (7) implementation of mandatory and voluntary best management practices
79.3 to minimize point and nonpoint sources of nutrients.

79.4 E. Rivers, streams, and navigational pools with a baseline quality that does
79.5 not meet the numeric eutrophication standards in subpart 4 are in compliance with the
79.6 standards if the baseline quality is the result of natural causes. The commissioner must
79.7 determine baseline quality and compliance with these standards using data and the
79.8 procedures in part 7050.0150, subpart 5.

79.9 [For text of subps 5 to 9, see M.R.]

81.1 B. Discharges of ammonia in sewage, industrial waste, or other wastes must be
81.2 controlled so that the ammonia water quality standard is maintained at all stream flows
81.3 that are equal to or exceeded by the $30Q_{10}$ for the critical month or months.

81.4 C. Discharges of total phosphorus in sewage, industrial waste, or other wastes
81.5 must be controlled so that the eutrophication water quality standard is maintained for
81.6 the long-term summer concentration of total phosphorus, when averaged over all flows,
81.7 except where a specific flow is identified in chapter 7050. When setting the effluent limit
81.8 for total phosphorus, the commissioner shall consider the discharger's efforts to control
81.9 phosphorus as well as reductions from other sources, including nonpoint and runoff from
81.10 permitted municipal storm water discharges.

81.11 D. Allowance must not be made in the design of treatment works for low stream
81.12 flow augmentation unless the flow augmentation of minimum flow is dependable and
81.13 controlled under applicable laws or regulations.

81.14 [For text of subps 8 and 9, see M.R.]

81.15 Subp. 9a. **Water quality standard-based TSS effluent limits.**

81.16 A. When the agency establishes effluent limits to meet a total suspended solids
81.17 (TSS) water quality standard and the water quality standard of the receiving water is:

81.18 (1) less than 30 mg/L and a continuous discharger is involved; or

81.19 (2) less than 45 mg/L and either an aerated pond or a controlled discharger
81.20 is involved,

81.21 the agency shall establish an appropriate water quality-based effluent limit (WQBEL)
81.22 considering the discharger's nonvolatile suspended solids (NVSS) concentration.

81.23 B. The WQBEL shall be determined by considering all of the individual
81.24 suspended solids data points collected during the period for which the standard is designed
81.25 to be protective. WQBEL calculations shall also consider the flow and TSS concentrations

82.1 observed in the receiving water during the corresponding time period. WQBEL is
82.2 expressed as long-term, 90th percentile values (for example, April to September) to ensure
82.3 protection during the time period the standard is designed to protect.

82.4 [For text of subps 10 to 13, see M.R.]

82.5 **REPEALER.** Minnesota Rules, part 7050.0467, is repealed.