Minnesota Pollution Control Agency

STATEMENT OF NEED AND REASONABLENESS

BOOK I of III

**In the Matter of Proposed Revisions
Of Minnesota Rules Chapter 7050,
Relating to the Classification and
Standards for Waters of the State;**

**The Proposed Addition of a New Rule,
Minnesota Rules Chapter 7053,
Relating to Point and Nonpoint Source Treatment Requirements; and**

The Repeal of Minn. R. Chapters 7056 and 7065

BOOK I

1. Separation of Minn. R. 7050 into two rules, Minn. R. ch. 7050 and 7053.
2. Language changes needed to facilitate the separation of Minn. R. ch. 7050.
3. Language changes needed to clarify and consolidate the rules.
4. Reformatting and housekeeping changes.
5. Eight major or substantive proposed changes to language in Minn. R. ch. 7050.
6. Repeal of Minn. R. ch. 7056 and 7065.

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BOOK I
Contents

TABLES

ACRONYMS AND ABBREVIATIONS USED IN THE SONAR

ACR	Acute to chronic ratio
Agency	Minnesota Pollution Control Agency
ASTM	American Society for Testing and Materials
AWWDF	Average [monthly] wet weather design flow
BAF	Bioaccumulation factor
BAP	Bioavailable phosphorus
BCF	Bioconcentration factor
BEACH	Beach Environmental Assessment and Coastal Health (BEACH) Act
Bio-P	Biological phosphorus removal treatment technologies
BMP	Best management practice
BOD_5	Biochemical oxygen demand; BOD_5 is BOD measured over a 5-day period
BWCAW	Boundary Waters Canoe Area Wilderness
CAS	Chemical abstract services registry number
$CBOD_5$	Carbonaceous biochemical oxygen demand; $CBOD_5$ is CBOD measured over a 5-day period
CESARS	Chemical Evaluation Search and Retrieval System database
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu	colony-forming units
CGMC	Coalition of Greater Minnesota Cities
ch.	Chapter
Chl-a	Chlorophyll-a
CLMP	Citizens Lake Monitoring Program
CS	Chronic standard
CSF	Cancer slope factor
CSMP	Citizens Stream Monitoring Program
CWA	Clean Water Act
CWP	Clean Water Partnership
DMR	Discharge monitoring report
DO	Dissolved oxygen
DOC	Dissolved organic carbon
DWS	Drinking Water Standards
EC20, EC50	Effect concentration; concentration of chemical that has a significant effect on 20 percent and 50 percent of the test organisms in a specified time period, respectively
ECOTOX	Ecotoxicology database
EPA	U.S. Environmental Protection Agency
Ex.	Exhibit
EU	Eutrophication
FAV	Final Acute Value
FPE	fullest practicable extent
FTE	Full time equivalent – measurement of staff resources
g/d	grams per day
GLI	Great Lakes Water Quality Initiative
IBI	Index of Biotic Integrity
IEPA	Illinois Environmental Protection Agency
HBV	Health based value
HH	Human health-based standard
HRL	Health risk limit
IRIS	Integrated Risk Information System
L	Liter
LAP	Lake Assessment Program
LC50	Lethal concentration; concentration of chemical that results in death of 50 percent of the test organisms in a specified time period
LOEC	Lowest observable effect concentration
M	meter or meters
MATC	Maximum acceptable toxicant concentration
MCEA	Minnesota Center for Environmental Advocacy
MCES	Metropolitan Council, Environmental Services
MCL	Maximum contaminant levels (EPA drinking water standards)
MDA	Minnesota Department of Agriculture

MDEP	Massachusetts Department of Environmental Protection
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MeHg	Methylmercury
MESERB	Minnesota Environmental Science and Economic Review Board
MFCA	Minnesota Fish Consumption Advice or Advisory
µg/L	microgram per liter or parts per billion
Mg/kg	Milligram per kilogram or parts per million
Mg/L	Milligram per liter or parts per million
Mgd	million gallons per day
µm	micron, one millionth of a meter
MPCA	Minnesota Pollution Control Agency
Minn. R. ch.	Minnesota Rules chapter
Minn. Stat. ch.	Minnesota Statutes chapter
MS	Maximum standard
NA or na	Not applicable or not available
NALMS	North American Lake Management Society
NCHF	North Central Hardwood Forest Ecoregion
NE	No effect concentration
ng/L	nanogram per liter or parts per trillion
NGP	Northern Glaciated Plains Ecoregion
NLF	Northern Lakes and Forest Ecoregion
NHD	National Hydrography Data
NOEC	No observable effect concentration
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
OPP	Office of Pesticide and Planning, EPA
ORVW	Outstanding Resource Value Water
P Rule	Existing Minn. R. 7050.0211, subp. 1a; proposed Minn. R. 7053.0255
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PMP	Phosphorus management plan
POTW	Publicly owned treatment works
ppm	parts per million
RfD	Reference dose
RSC	Relative Source Contribution Factor
SCV	Species chronic value
SD	Secchi depth or Secchi transparency
SDS	Minnesota State Disposal System permits
SONAR	Statement of Need and Reasonableness
SR	Minnesota *State Register*
SSS	Site-specific standard
STORET	EPA water quality data storage and retrieval system
su	standard units, units for pH measurements
TBEL	Technology-based effluent limit (limit = limitation)
TMDL	Total Maximum Daily Load
TSI	Carlson Trophic State Index
Tox	Toxicity-based standard
TP	Total phosphorus or phosphorus
TSS	Total suspended solids
UAA	Use attainability analysis
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VOC	Volatile organic carbon
WCBP	Western Corn Belt Plains Ecoregion
WDNR	Wisconsin Department of Natural Resources
WQBEL	Water quality- [standard] based effluent limit
WQS	Water quality standard
WWTP	Wastewater treatment plant

Table I-A. Reader's Guide to Location of Major Topics in SONAR Book I.

ITEMS	SECTIONS AND PAGE NUMBERS			
Section in SONAR:	Introduction, Background I - IV	Need V, VI	Reasonable-ness VII - X	Economics, etc. XI - XV
Major Topics				
What's being proposed in this rulemaking	1, 3			
What's in SONAR Books I, II and III	3			
Triennial review	13			
Beneficial uses	6, 8			
Water quality standards	7			
Water quality assessment process and TMDLs	11			
Rulemaking required by Minn. Laws 2003 ch. 128 § 156	2			
State and federal authority for amending rules	13, 25			
Petitions to Agency for rulemaking		26		
Public involvement	16			
Differences between Agency proposals and EPA regulations or guidance			123	
Split of 7050 into two rules and creation of new rule, Minn. R. ch. 7053		27	129	
Language changes associated with the split		30, 36	129	
Language changes not associated with the split		52	131	
Housekeeping changes		81	131	
Major or substantive changes covered in SONAR Book I:				
1. Definitions		87	133	
2. Nondegradation for all waters		93	141	
3. Variance review period		95	142	
4. Pretreatment and 5 mg/L TSS limit		97	143	
5. Drinking water standards		98	145	
6. Removal of Class 1D		106	149	
7. Site-specific modification of standards		107	153	
8. Minimum hardness for metal standards		110	155	
9. Repeal of Minn. R. ch. 7056 and 7065		111	160	
Economic impact				167
Conclusions		86, 116	164	

I. INTRODUCTION

A. SCOPE [I. introduction]

The Minnesota Pollution Control Agency (Agency) is proposing to amend Minn. R. ch. 7050 and to establish a new rule, Minn. R. ch. 7053. In addition, the Agency is proposing to repeal two outdated rules, Minn. R. ch. 7056 and 7065.

The major proposed additions and revisions the Agency is proposing in this rulemaking are as follows:

1. The addition of eutrophication (phosphorus, chlorophyll-a and Secchi depth) standards for lakes, shallow lakes and reservoirs.
2. The extension of the current 1 mg/L phosphorus effluent limit to new or expanding dischargers that discharge more than 1,800 pounds of phosphorus per year.
3. Adoption of a fish tissue standard for mercury.
4. Adoption of Class 2 standards for acetochlor and metolachlor.
5. Adoption of revised Class 2 standards for benzene and naphthalene.
6. Adoption of *E. coli* to replace the Class 2 fecal coliform standard.
7. Change the default classification for industrial use from Class 3B to 3C, which will relax the industrial use chlorides and hardness standards for most surface waters.
8. Update lists of trout waters and Class 1 waters and make other improvements to classification sections.
9. Proposed adoption of 12 new limited resource value water segments.
10. Separate Minn. R. ch. 7050 into two rules, a revised Minn. R. ch. 7050 and a new Minn. R. ch. 7053.
11. Numerous changes to clarify language in Minn. R. ch. 7050 and 7053 without changing the meaning.
12. Eight major or substantive changes to rule language in Minn. R. ch. 7050.
13. Repeal of Minn. R. ch. 7056 and 7065.
14. Numerous housekeeping changes.

As noted in number 10 in the list above, the Agency is proposing to split Minn. R. ch. 7050 into two rules by moving some provisions in existing Minn. R. ch. 7050 into a proposed new rule, Minn. R. ch. 7053, such that:

- The revised Minn. R. ch. 7050 will include the beneficial use classifications, numeric and narrative water quality standards, nondegradation, methods for determination of site-specific criteria and other provisions related to ambient water quality standards.
- The new Minn. R. ch. 7053 will contain treatment requirements for discharges of sewage, industrial wastes and other wastes, effluent limits, requirements for aquaculture facilities and related provisions.

The intent of splitting Minn. R. ch. 7050 into two rules is to make the statewide water quality rules shorter and easier to use and understand.

The Agency proposes to move into Minn. R. ch. 7053 the important provisions of two otherwise outdated rules, Minn. R. ch. 7056 and 7065. The two rules with their remaining mostly redundant and outdated provisions can then be repealed. The important parts of Minn. R. ch. 7056 are the prohibitions that apply to discharges to the Mississippi River and its tributaries from the mouth of the Rum River to St. Anthony Falls. These prohibitions are intended to protect the Minneapolis and St. Paul drinking water, which is withdrawn from the river in this reach. The important part of Minn. R. ch. 7065 is the 1 mg/L phosphorus effluent limit dischargers must meet if they discharge to certain designated waterbodies or watersheds (see Sections VI.J.3 and X.J).

All the proposed changes to rule language in Minn. R. ch. 7050 and 7053 are shown in Exhibit A-15a and A-15b, respectively. References to Minn. R. ch. 7050 and 7053 throughout the SONAR are to the **proposed rules** rather than the existing rules, unless noted otherwise.[1]

B. RULEMAKING REQUIRED BY SESSION LAW [I. introduction]

The Agency originally planned as part of this triennial review of water quality standards to add rule language to comply with requirements in Minn. laws 2003 ch. 128, art. 1, § 156, as amended by Minn. Laws 2005 ch. 1, art. 2, § 151 (Exhibits A-37a and A-37b). The 2005 amendment set a deadline of October 1, 2006, to adopt the required rules. The delay in completing the requirements for promulgating this triennial review meant that the Agency would miss the October 1, 2006, deadline for just the part pertaining to the Session Law. The Agency decided to separate the amendments required by the Session Law from the larger package and proceed with the former independently. These plans were described in the Agency's water quality standards revision Web page on May 11, 2006, notice of which was sent to interested parties on the e-mail contact list on May 19, 2006.

The proposed amendments were published in the *State Register* on June 19, 2006, (30 SR 1369). A public hearing was held on August 9, 2006. The Administrative Law Judge found the proposed rules to be reasonable and necessary (report dated September 21, 2006), and the Agency Board adopted the rule amendments on October 24, 2006. The Statement of Need and Reasonableness for this rulemaking is Exhibit A-4.

The amendments required by the Session Law are limited in scope and included the following:

1. Define two sets of terms that appear in existing narrative water quality standards in Minn. R. 7050.0150, subp. 3. The definitions are in Minn. R. 7050.0150, subp. 4. The terms in the first set are: "altered materially," "material increase," "material manner," "seriously impaired," and "significant increase." These terms all have essentially the same meaning, just different contexts in the narrative standard; and they are defined together. The second set of terms is "normal

[1] Throughout the SONAR, some words or phrases are in **bold** for emphasis.

fishery" and "normally present." These terms refer to the fish community one would expect to find living in a relatively unpolluted lake, river or stream. They are also defined together.

2. Include language stating that when assessing surface waters for the exceedance of water quality standards and the identification of a possible polluted condition, the Agency must consider the actual or potential loss of attainable or existing beneficial uses. This language is in Minn. R. 7050.0150, subp. 1.

3. Include an administrative process that allows any person to petition the Agency to request a review of the beneficial uses assigned to a given waterbody. This language is in Minn. R. 7050.0405.

4. Include temperature and hydraulic detention time among the factors the Agency will consider when assessing lakes, reservoirs or rivers for impairments due to excess nutrients. This language is in Minn. R. 7050.0150, subp. 5.

The Session Law amendments are shown in the draft rules as existing language (Exhibits A-15a and A-15b). The final amendments were published in the *State Register* on February 26, 2007 (31 SR 1168).

C. STATEMENT OF NEED AND REASONABLENESS [I. introduction]

This Statement of Need and Reasonableness (SONAR) contains the Agency's affirmative presentation of facts on the need for and reasonableness of the proposed rule amendments. It also addresses all the statutory requirements associated with proposed administrative rules. The Agency is required by the Administrative Procedures Act (Minn. Stat. ch. 14) to address certain questions or issues in this SONAR. As a result, most proposed changes or additions must be discussed in several parts of the SONAR, or at least in both the *need* and *reasonableness* sections. Also, the scope of this rulemaking includes a range of rather diverse topics. To make it easier for the reader to navigate through the SONAR and to minimize some of the inevitable redundancies, the Agency has organized this SONAR into three "SONAR Books"; i.e., three SONAR volumes that make up the overall SONAR for this rulemaking.[2]

The major elements of the proposed amendments are arranged into the three SONAR Books as follows:

BOOK I

1. Separation of Minn. R. 7050 into two rules, Minn. R. ch. 7050 and 7053
2. Language changes needed to facilitate the splitting of Minn. R. ch. 7050
3. Language changes needed to clarify and consolidate the rules
4. Reformatting and housekeeping changes
5. Eight major or substantive proposed changes to language in Minn. R. ch. 7050
6. Repeal of Minn. R. ch. 7056 and 7065

[2] When "SONAR" is referenced in the text without specifically citing Book I, II, or III, the SONAR as a whole is being implied.

SONAR Book I also includes information under the following major headings relevant to the whole SONAR, most of which is not repeated in SONAR Books II and III:

1. Introduction.
2. Background information on use classifications and water quality standards.
3. Notification of the public.
4. Agency's statutory authority.
5. Originally planned amendments postponed.

BOOK II

1. Numeric eutrophication standards for lakes, shallow lakes and reservoirs.
2. Requirement for new or expanding dischargers to meet a 1 mg/L phosphorus effluent limit if they discharge more than 1,800 pounds of total phosphorus per year.

BOOK III

1. Addition of fish tissue water quality standard for mercury.
2. Adoption of standards for two herbicides, acetochlor and metolachlor.
3. Update the human health-based water quality standards for benzene and naphthalene.
4. Adopt an *E. coli* standard to replace the current fecal coliform standard for protection of swimming and other forms of water recreation.
5. Change the default industrial use classification from 3B to 3C, which will relax Class 3 standards for chlorides and hardness for most waters.
6. Changes related to use classifications: update Class 2A and Class1 lists, correct and improve the use class listings.
7. Addition of new Class 1 surface waters and update list of trout waters (Class 2A).
8. Propose 12 use classification changes for 12 waterbodies, including new limited resource value water segments (Class 7 waters).

Approximately 325 exhibits pertinent to the proposed amendments are cited throughout the SONAR. The complete list of exhibits is attached at the end of each SONAR book. Exhibits have been catalogued in an Access file for ease of tracking, sorting and numbering. The prefixes used to identify categories of exhibits and label the exhibits are shown in Table I-1. Most exhibits will be available from the Agency's Web pages but some very large exhibits will not be available from this source. Also, due to the large number of exhibits and large size of some, exhibits will not be included with the rulemaking packages sent to some parties with administrative responsibilities for rulemaking, such as to the Governor's Office. Any exhibit can be made available upon request for the cost of reproduction.

Table I-1. Prefixes for Categories of Numbered Exhibits.

Prefix to Exhibit Number	**Category of Exhibits**
A	Administrative, legal authority, Board appearances, rule language changes, public comments, etc.
EU	Eutrophication standards for lakes and reservoirs
PL	Phosphorus effluent limit
M	Mercury standard
HH	Human health-based and drinking water standards
H	Standards for herbicides acetochlor and Metolachlor
EC	*E. coli* standard
UC	Use classification changes: Class 1-Domestic Consumption, Class 2-Aquatic Life and Recreation, Class 3-Industrial Consumption, and Class 7-Limited Resource Value Waters.

The SONAR has been assigned the following exhibit numbers:

- SONAR Book I is Exhibit A-1
- SONAR Book II is Exhibit A-2
- SONAR Book III is Exhibit A-3
- A complete list of all exhibits is Exhibit A-5

The organization hierarchy of the SONAR is:

1. Roman numerals, major sections
2. Capital letters, sections
3. Numbers, subsections
4. Small letters, minor sections

Throughout the text the reader is referred to relevant sections elsewhere in the SONAR. The references are to sections rather than page numbers. Sections in all levels in the hierarchy shown above are call "Sections" in the text. To assist the reader in locating the cited sections, section headings are followed [in brackets] by the Roman numeral and capital letter, if needed, that identifies the location of that section. Also in the same brackets as an aid to the reader is an abbreviated name of the major section. For example, a heading in the next Section is: "Introduction and Beneficial Use Classification [II.B. background]."

This SONAR can be made available in other formats, including Braille, large print and audio tape. TTY users may call the Agency teletypewriter at 651-282-5332 or 800-657-3864. The Agency will make the *State Register* notice, the SONAR and the proposed rule available during the public comment period on the Agency's Public Notices Web site: http://www.pca.state.mn.us/news/data/index.cfm?PN=1

II. BACKGROUND

A. WATER QUALITY RULES [II. background]

The current Minn. R. ch. 7050 contains statewide provisions that protect Minnesota's surface and ground water resources from pollution. The major provisions in this rule include:

- A classification system of designated beneficial uses for both surface and ground waters (e.g., drinking water, aquatic life and recreation, etc.), and a listing of specifically classified waterbodies.
- Numeric and narrative water quality standards that protect the beneficial uses.
- Nondegradation provisions.
- Provisions for the protection of wetlands.
- Methods for the determination of site-specific criteria for toxic pollutants.
- Treatment requirements and effluent limits for discharges of municipal, industrial and other wastewater.
- Provisions pertaining to aquaculture and feedlot activities.
- Other provisions related to the protection of surface and ground water from point and nonpoint source pollution.

Another important water quality rule is Minn. R. ch. 7052, which contains provisions similar to Minn. R. ch. 7050. But, this rule, known as the Great Lakes Water Quality Initiative (GLI), applies only to the waters in the Lake Superior basin in Minnesota. Minnesota R. ch. 7052 focuses on reducing the influx of persistent and bioaccumulative chemicals into the Great Lakes ecosystems from point sources. Minnesota R. ch. 7052, and the counterparts promulgated by the other seven states bordering the Great Lakes, were adopted in the late 1990s under a federal mandate (Clean Water Act, § 118(c)(2)). The Agency is proposing no changes to Minn. R. ch. 7052 in this rulemaking.

The federal Clean Water Act, § 303 (c) (1), requires the states and authorized Indian tribes, to review and amend as appropriate their water quality standards. Because of the three-year review cycle, such revisions are called "triennial reviews" (see Section II.D).

B. BENEFICIAL USES AND WATER QUALITY STANDARDS [II. background]

1. <u>Introduction and Beneficial Use Classifications</u> [II.B. background]

People rely on surface and ground water resources to provide many beneficial uses such as recreation and drinking. Each state and authorized Indian tribe assigns beneficial uses to their water resources and then develops water quality standards to protect those uses. In Minnesota all ground water is protected as an actual or potential source of drinking water (Class 1). Minnesota has identified seven beneficial uses associated with waters of the state. These uses are designated as Class 1 through Class 7, and they are described in Minn. R. 7050.0140. The use classes are listed below. The numbers 1 – 7 do not imply a priority rank to the use classes.

Use Class	Beneficial Use
Class 1	Drinking water
Class 2	Aquatic life and recreation
Class 3	Industrial use and cooling
Class 4A	Agricultural use, irrigation
Class 4B	Agricultural use, livestock and wildlife watering
Class 5	Aesthetics and navigation
Class 6	Other uses
Class 7	Limited resource value waters (not fully protected for aquatic life due to lack of water, lack of habitat or extensive physical alterations)

All surface waters are protected for aquatic life and recreation (Class 2), unless the waterbody has been individually assessed and re-classified, through rulemaking, as a limited resource value water (Class 7). Both Class 2 and Class 7 waters (i.e., all surface waters of the state) are also designated Class 3, 4A, 4B, 5 and 6, and are protected for the associated beneficial uses, as listed above (Minn. R. 7050.0400 to 7050.0470).

Minnesota R. 7050.0470 is a listing, by major watershed, of individual waters and their associated use classifications. Only a limited subset of all waters is listed in Minn. R. 7050.0470. For example, waters that are individually listed include trout waters, surface waters protected for drinking, outstanding resource value waters, and limited resource value waters. All waters **not listed** in Minn. R. 7050.0470 are assigned multiple beneficial uses by "default," including aquatic life and recreation, under Minn. R. 7050.0425 and 7050.0430 (Class 2, and Classes 3, 4A, 4B, 5 and 6). The beneficial uses most pertinent to this proposed rulemaking are Classes 1, 2, 3 and 7.

2 Water Quality Standards [II.B. background]

The term "water quality standards" is commonly used in both a broad and narrow sense. Broadly speaking, water quality standards include all the legal requirements in water quality rules, including minimum wastewater treatment requirements and effluent limits for point source dischargers, as well as numeric and narrative water quality standards that apply to surface and ground waters. In the more narrow sense, water quality standards are restricted to the latter; i.e., the beneficial uses and specific numeric and narrative water quality standards that define acceptable conditions for the protection of the uses we make of waters of the state. Nondegradation provisions are included in the more narrow scope. The term "water quality standards" is used in the more narrow sense throughout this SONAR.

Water quality standards apply to all waters of the state. The term "waters of the state" is defined in Minn. Stat. § 115.01, subd. 22. Waters of the state includes ground water and all types of surface waters, such as lakes, reservoirs, rivers, streams, wetlands, ponds and ditches, both natural and man-made. The major exception is artificial waterbodies created specifically as part of a treatment system, which are not waters of the state[3]. Water quality standards in the narrow

[3] Existing Minn. R. 7050.0130, item A.

sense are often called "ambient" standards, because they apply in the "surrounding" water. It is important to clarify the distinction between ambient water quality standards and effluent limits. Effluent limits are specified in the discharger's NPDES[4] or State Disposal System permit, and they define the allowable concentration and mass (e.g., kilograms per day) of pollutants that can be discharged to the receiving stream. Ambient water quality standards apply to the receiving stream and waters of the state in general. For a more complete discussion of water quality standards see this Web site: http://www.pca.state.mn.us/water/standards/index.html.

A numeric water quality standard is the concentration of a pollutant in water, associated with a specific beneficial use, which will protect that use. Numeric standards are contained in both Minn. R. ch. 7050 and 7052. The former rule applies state-wide and the latter applies only to the waters in the Lake Superior basin.

A narrative water quality standard is a descriptive statement that prohibits unacceptable conditions in or upon the water. For example, a narrative standard that states: "*there shall be no material increase in undesirable slime growths or aquatic plants, including algae…*"[5] can be the basis for limiting the influx of excess nutrients into waterbodies that will cause undesirable algae growth. Both narrative and numeric water quality standards are the fundamental benchmarks used to assess the quality of all surface waters. In general, if numeric and narrative water quality standards are met, the associated beneficial uses will be protected.

3. Class 1 Waters [II.B. background]

Class 1 waters are protected for actual, or potential, use as a supply of drinking water. As stated previously, all ground water in Minnesota is protected for use as drinking water. In addition, certain surface waters are protected as a supply of drinking water. Examples include Lake Superior, Mississippi River from Fort Ripley to Minneapolis, and the Red River of the North. All Class 1 surface waters are specifically listed in Minn. R. 7050.0470.

The drinking waters standards applicable to Class 1 waters are the U.S. Environmental Protection Agency (EPA) primary and secondary drinking water standards. Drinking water standards are promulgated by EPA and, therefore, have the force of law when final. They are incorporated by reference into Minn. R. 7050.0221.

4. Class 2 Waters [II.B. background]

Protection of aquatic life means maintaining water quality conditions suitable to sustain a healthy, viable aquatic community; and maintaining fish that are safe for people and wildlife to eat. A game fishery or any fish community is not a necessary component of a healthy aquatic community. Many unpolluted Class 2 waters do not support fish, such as most wetlands, for example. Recreation means all types of water-related recreation, including canoeing, boating, water skiing, and swimming. Swimming in the traditional sense may not be suitable or desirable in some Class 2 waters, but other forms of aquatic recreation can expose individuals to the

[4] NPDES means National Pollutant Discharge Elimination System.
[5] Minn. R. 7050.0150, subp. 3.

inadvertent ingestion of small amounts of water. All Class 2 waters are protected for "swimming" use, where it is attainable. Recreational uses and the bacteriological standards that protect those uses are discussed in more detail in Book III, Section VII.A.1. (A similar discussion is in Exhibit A-4, page 5).

Class 2 waters are divided into the following subclasses:

- Class 2A, cold water fisheries such as trout and salmon; also protected for drinking
- Class 2Bd, warm and cool water fisheries; also protected for drinking
- Class 2B, warm and cool water fisheries
- Class 2C, indigenous community of fish and other aquatic organisms
- Class 2D, wetlands

The numeric aquatic life standards for toxic substances have three parts as follows:

Chronic standard – concentration of a pollutant that will have no or very slight effects over long-term exposure.
Maximum standard – concentration of a pollutant that will result in the death of a few (1 to 10 percent) of the individuals in a sensitive population; used to prevent short-term spikes in concentrations.
Final Acute Value – concentration of a pollutant that will result in the death of about half of the individuals in a sensitive population; used to prevent acutely toxic conditions in effluents and mixing zones.

The standards for acetochlor and metolachlor in µg/L or parts per billion, proposed as part of this rulemaking (Section V of SONAR Book III), illustrate the Class 2 three-part numeric standards.

	Chronic Standard	Maximum Standard	Final Acute Value
Acetochlor, µg/L	1.7	86	173
Metolachlor, µg/L	23	271	543

Finally, Class 2 **chronic** standards for toxic substances are identified by the basis for the standard, which is always one of the following:

- Toxicity-based. The standard protects the aquatic community from direct toxic effects of the substance.
- Human health-based. The standard protects humans that eat sport-caught fish, and where designated, use the same surface water as a source of drinking water.
- Wildlife-based. The standard protects wildlife that eat aquatic organisms, such as mink, otters and loons (currently the only wildlife-based standards are in Minn. R. ch. 7052).

The chronic standards for acetochlor and metolachlor in the example above are both toxicity-based. The Agency typically calculates a toxicity-based and a human health-based chronic criterion for each pollutant, and the lower of the two becomes the applicable standard, which is the case for the two proposed herbicide standards. The basis for each adopted standard is noted in Minn. R. 7050.0222 by a "Tox." or "HH" notation. Calculation of a wildlife-based criterion is not considered necessary for most pollutants; the “Tox” or “HH” criteria will be protective of wildlife, except possibly when the pollutant is very bioaccumulative. In Minn. R. ch. 7050 only the lower of the Tox or HH criteria is adopted, and only that value appears in the rule. In Minn. R. ch 7052, all the calculated criteria (toxicity, human health and wildlife-based) appear in the rule, but the lowest is designated as the applicable standard (Minn. R. 7052.0100).

The maximum standards and the final acute values are always toxicity-based.

5. Class 3 Waters [II.B. background]

All surface waters of the state carry the Class 3 designation. Class 3 standards protect surface waters for use in industrial applications such as process or cooling water. The standards are intended to protect industrial equipment and piping from scaling or corrosion. Class 3 has standards for just three water quality characteristics: chlorides, total hardness and pH.

Most surface waters are classified as 3B “by default” (Minn. R. 7050.0430). The Agency is proposing to change the default classification from Class 3B to 3C for most waters of the state. This will have the effect of relaxing the chlorides and hardness standards for most surface waters. The Agency believes that any environmental negatives resulting from this change will be negligible (SONAR Book III, Section VIII).

6. Class 4, 5 and 6 Waters [II.B. background]

All surface waters of the state carry the Class 4 designation. There are three subclasses of Class 4 waters, Class 4A, 4B and 4C. The Class 4A standards define the concentrations of certain pollutants to be met to protect the use of surface waters for agricultural irrigation without harm to the crops. The Class 4B standards define the concentrations of certain pollutants to be met to protect water for drinking by livestock and wildlife. The Class 4C standards protect wetlands for both the Class 4A and 4B uses. The Agency is proposing no changes to the Class 4 standards.

All surface waters of the state are also classified as Class 5 (navigation and aesthetics) and Class 6 (other uses) waters. No changes are proposed to these classifications.

7. Class 7 Waters [II.B. background]

Limited resource value or Class 7 waters are surface waters able to support only a very limited aquatic community, and offer only very limited opportunities for water recreation. Most are headwater channelized ditches or short stream segments that often have little or no flow in dry years. They range in length from less than a mile to about 20 miles.

The potential reclassification of a waterbody from Class 2 to Class 7 is usually initiated by a request from an outside party asking to have a specific reach assessed. These parties are usually a city or industry that either currently discharges or proposes to discharge to the reach. Candidate reaches are individually assessed, and if the waterbody meets the Class 7 criteria, the Agency will propose the reclassification in rulemaking. The Agency must have input from the Minnesota Department of Natural Resources in the assessment process. The Agency is proposing the reclassification of 12 reaches to the limited resource category in this rulemaking (SONAR Book III, Section XI).

8. How Water Quality Standards are Used [II.B. background]

Numeric and narrative water quality standards are used for a variety of purposes by the Agency and outside parties (see list below). Outside parties that routinely use water quality standards include other state agencies, local governmental entities such as counties, cities and watershed districts, as well as consulting firms and environmental groups.

Primary uses of water quality standards are:

1. Protect beneficial uses,
2. Assess the quality of the state's water resources,
3. Identify waters that are polluted or impaired,
4. Help establish priorities for the allocation of treatment resources and clean up efforts, and
5. Set effluent limits and treatment requirements for discharge permits and cleanup activities.

The identification of waterbodies that do not meet water quality standards and support designated beneficial uses (no. 3 above) is a function of water quality standards that has received a great deal of attention in the last 10 years. The assessment process and listing of impaired waters is briefly described in the next section.

C. ASSESSMENT OF WATER QUALITY CONDITION AND TMDLS [II. background]

It is helpful to provide some background information on the water quality assessment process and Total Maximum Daily Load (TMDL) studies because these activities will come up often in the discussion of some aspects of the proposed amendments.

The Clean Water Act (CWA) requires the Agency to assess the water quality of Minnesota's rivers, streams and lakes, and to submit periodic reports on the quality of surface waters to the EPA. Water chemistry data, aquatic biological data and related information from a variety of sources is used by the Agency to make the assessments. Assessments are used to prepare the 305(b) report and the 303(d) list, both so named from the section of the CWA that requires the activity. Both must be submitted every two years.

The 305(b) report lists the condition of all assessed surface waters (i.e., all those for which we have data) including waterbodies meeting standards as well as those not meeting standards. The 305(b) reports from each state represent "self-prepared report cards" to Congress and the EPA on the progress states are making toward meeting the water quality goals of the CWA. There are no regulatory consequences for waterbodies listed in the 305(b) report.

The 303(d) list includes waterbodies that have been determined to be in violation of one or more applicable water quality standard. Such waters are considered "impaired". Placement of a waterbody on the 303(d) impaired waters list has potential regulatory consequences. A TMDL study will need to be carried out for the impaired waterbodies on the list. The TMDL implementation plan may require reductions in pollutant loading from point and nonpoint sources to bring the waterbody back into compliance with water quality standards. The Agency's 2006 list was approved by EPA in June 2006 (Exhibit A-6). The federal requirements for TMDLs are spelled out in 40 CFR 130, plus accompanying EPA guidance.

The basic steps in the assessment process are very clear-cut:

1. Beneficial uses are assigned to waters of the state (by Minn. R. 7050).
2. Standards are developed that protect these uses.
3. The water quality and biological health of lakes, rivers and streams is monitored.
4. The monitoring data is compared to the standards using accepted procedures.
5. Waters not meeting standards are identified and listed.

In practice, the determination that a numeric standard has been exceeded is often as straightforward as outlined above. In general, if available water quality or biological data of sufficient quality and quantity, show a numeric standard is not being met, the waterbody is considered impaired. In some cases, an impairment decision requires additional evaluation and review by a professional judgment committee of experts, which makes an impairment or no-impairment recommendation to Agency managers. The number of assessments that can be done is limited by the availability of monitoring data. The Agency has data on just 14 percent of all the state's lakes larger than 10 acres and only about eight percent of the state's 92,000 miles of rivers and streams.

Because narrative standards are non-quantitative, the determination that a narrative standard has been exceeded usually requires an evaluation of a variety of information. This often requires a "weight of evidence" approach to data analysis. The weight of available evidence should lead most unbiased scientists to the same conclusion regarding impairment. Historically the Agency has used a weight of evidence approach when interpreting narrative standards, and numeric standards as well, particularly in "borderline" situations.

Currently the assessment of waterbodies impaired due to mercury in fish is based on a narrative standard[6]. Starting with the 2002 303(d) list, the Agency has used an impairment criterion or trigger of 0.2 milligram per kilogram (mg/kg; or parts per million, ppm) mercury in fish.[7] This amount of mercury is the quantitative interpretation of the narrative standard. This is the same value the Agency is proposing in this rulemaking to adopt as a mercury standard. About 59 percent of all the impaired waters on the 2006 list are due to exceedance of the 0.2 ppm mercury threshold in fish.

[6] Minn. R. 7050.0150, subp. 7.

[7] Both a criterion and standard represent concentrations of a substance that is safe for aquatic life, humans or wildlife. The difference is that a criterion has not gone through the rulemaking process and is not in administrative rules; standards have been adopted into rules.

Similar to mercury, the Agency has been assessing lakes for potential impairment due to excess nutrients based on a narrative standard. The numeric translators of the narrative standard are the precursors to the proposed eutrophication standards.[8]

Potentially all the revised or new water quality standards proposed in this rulemaking could be part of a future 303(d) assessment and future TMDLs, if the standard is determined to be exceeded. We can say with confidence that the proposed mercury and eutrophication standards will be part of future water quality assessments, because the Agency is doing those assessments now using essentially the same values. Also, the Agency assesses waters for exceedances of the existing fecal coliform standard, and the Agency will continue these assessments using the proposed *E. coli* standard. It is likely that a small number of streams will be assessed based on the proposed new standards for acetochlor and metolachlor (SONAR Book III, Section V).

The methods the Agency uses to compare monitoring data to the standards and to determine an impaired condition is described in detail in the 2006 Water Quality Assessment Guidance Manual (Exhibit A-7). The Guidance Manual is available at this Web site: http://www.pca.state.mn.us/publications/manuals/tmdl-guidancemanual04.pdf

D. TRIENNIAL REVIEW AND CLEAN WATER ACT [II. background]

The proposed rule amendments are intended to fulfill the Agency's obligation to review and revise, if necessary, the state's water quality standards every three years (triennial review) as required by the Clean Water Act (Section 303(c)(1)). The last amendments to Minn. R. ch. 7050 are the "Session Law" amendments (Section I.B). Prior to that the Agency completed the "assessment factor" rulemaking on February 3, 2003 (27 S.R. 1217, January 27, 2003). Neither rulemaking is considered a "triennial review" because of the very limited scope of both. The most recent revisions of Minn. R. ch. 7050 that qualified as a triennial review were completed in 2000 **(**24 S.R. 1105, January 31, 2000). The Agency is obviously behind the CWA three-year schedule with these proposed amendments. The EPA Regional Administrator must approve all changes to state water quality standards (40 CFR 131.5).

E. PREVIOUSLY PROPOSED AMENDMENTS POSTPONED [II. background]

Early in the rulemaking process the Agency had considered several proposed changes that have been set aside for this triennial review. Because these proposed changes were mentioned in earlier meetings with stakeholders, public notices and solicitations for comments in the *State Register*, the Agency's reasons for postponing their adoption will be briefly described here.

1. Revision of the Class 2 Un-ionized Ammonia Standard [II.E. background]

The Agency had proposed to revise the current Class 2 ammonia standard in Minn. R. 7050.0220 and 7050.0222. The revised standard was to be based on an up-dated EPA ammonia criterion

[8] Minn. R. 7050.0150, subp. 5.

published in 1999[9]. In 2004 the Agency postponed plans to revise the ammonia standard after a series of four papers, published in *Environmental Toxicology and Chemistry*, indicated that freshwater mussels (clams) could be very sensitive to the toxic effects of ammonia. The concentrations of ammonia causing acute toxicity (death) for several mussel species reported in these papers were lower (in some cases, far lower), than acutely toxic concentrations for sensitive aquatic species tested up to this time. In response to this new information, the Agency convened a meeting of local and regional experts in mussel toxicology and biology on March 25, 2004 to discuss the implication of these new data on the Agency's proposed revised standard (Exhibits A-44a, A-44b and A-44c).

In general, the conclusion from this meeting was that, while the new mussel data had not been sufficiently replicated and verified by others to use as the basis for a more stringent proposed standard (with substantial implications for increased treatment costs), it was certainly compelling enough to cast doubt on the adequacy of the original proposed standard. Some of the tested mussel species are native to Minnesota, and some are related to species on federal or state endangered species lists. Subsequently, the EPA announced plans in the *Federal Register* to review all the available mussel data and possibly issue a new revised ammonia criterion (Exhibit A-45). For these reasons, the Agency felt it was unwise to proceed with proposing a change to the ammonia standard until these questions could be resolved.

2. <u>Revision of Human Health-based Standards and Use of Adjustment Factors to Provide Additional Protection for Children</u> [II.E. background]

The Agency had proposed to revise as many of 19 human health-based water quality standards, and to use "adjustment factors" in the calculation of the revised standards. The Agency has postponed for now its plans to revise these standards, and has postponed plans to use "adjustment factors" in the calculation of standards for this revision. The Agency is proposing instead the revision of just two human health-based standards, benzene and naphthalene, without the use of adjustment factors (see SONAR Book III, Section VI).

The "adjustment factors" being considered are designed to provide protection to infants and children who, as a subpopulation:

- Are likely to have greater exposure to contaminants in water than adults because they ingest more water on a per body weight basis that adults;
- Are likely to have greater exposure to contaminants in fish tissue than adults because they ingest more fish on a per body weight basis that adults; and
- They have a greater sensitivity to some carcinogenic or mutagenic chemicals, which may be expressed as cancers later in life.

The adjustment factors considered by the Agency ranged from one (no factor) to six depending on the uses being protected, the toxicology of the chemical, and how bioaccumulative the chemical is in fish (see Exhibits A-20 and A-21). Thus, if all other variables remain the same,

[9] EPA 1999. 1999 update of ambient water quality criteria for ammonia. U.S. Environmental Protection Agency, Office of Water. 147 p.

use of the adjustment factors would make the resulting human health-based standards more stringent by a factor of one (no change) to six. The factors for water ingestion by infants and children, and the factors for the early exposure to carcinogens which could increase the probability of latent cancers, are based on extensive research performed by staff of the Minnesota Department of Health (MDH). The MDH proposed to use the water ingestion and cancer potency adjustment factors in the calculation of revised Health Risk Limits (HRL), which protect ground water for drinking water use. Determination of an adjustment factor for fish consumption was being researched by Agency staff, since, unlike the HRLs, human health-based surface water standards need to account for exposure through fish consumption.

In March 2005, in response to written comments from several Minnesota Legislators and others, the MDH commissioner decided to postpone promulgation of the revised Health Risk Limits, including use of the adjustment factors, and ask for a review of the proposal by an advisory panel. The advisory panel was asked to review the science and policy issues surrounding the protection of children (Exhibit A-52). Because the Agency's use of adjustment factors in the calculation of human health-based standards was so closely tied to the work of MDH, the Agency decided it had no choice but to postpone its own plans to revise the human health-based standards using adjustment factors.

The advisory panel met on November 16 and 17, 2005, and their recommendations have been made available.[10] In general the panel felt that MDH's approach offered prudent and reasonable public health protection to the most vulnerable segment of the population, infants and children. The Agency believes, however, that for us to resume plans to adopt adjustment factors now would cause an unacceptable delay in this rulemaking. The Agency is going ahead with plans to revise the human health-based standards for benzene and naphthalene because new data indicate these standards should be lowered without use of adjustment factors.

The Agency originally planned to up-date and revise the human health-based standards in Minn. R. ch. 7052 to match the changes to the same standards in Minn. R. ch. 7050. When the Agency decided not to revise these standards using the adjustment factors, we also abandoned plans to make any changes to Minn. R. ch. 7052 in this rulemaking.

3. Designation of New Outstanding Resource Value Waters [II.E. background]

The Agency considered proposing to add several calcareous fens and possibly some new Scientific and Natural Areas to the list of Outstanding Resource Value Waters (Exhibit A-12). However, the Agency abandoned these plans due a lack of time and resources to complete the work.

[10] http://www.health.state.mn.us/divs/eh/groundwater/hrlgw/panel/index.html

III. NOTIFICATION OF THE PUBLIC

A. INTRODUCTION [III. notification]

The Agency has made a genuine and committed effort to involve the public in this rulemaking. Significant changes to the proposed rule have been made in response to comments and feedback from interested parties. The proposed rule has benefited substantially from this public input. The additional notification requirements specified in Minn. Stat. § 14.131 are discussed in Section VIII.J.

B. MEETINGS WITH INTERESTED PARTIES [III. notification]

Beginning as early as the winter of 2003 Agency staff began meeting with interested parties to discuss plans for the revision of water quality standards. These meetings were often one-on-one meetings between Agency staff and a single interested party. In some instances meetings were between Agency staff and multiple interested parties such as the meetings with representatives on a water quality committee of the Minnesota Chamber of Commerce. In other cases the "meetings" were presentations by staff at professional meetings or conferences. Table I-2 provides a list of these meetings and conference presentations. Agency staff that work on lakes also presented information about the Agency's plans to adopt eutrophication standards at several conferences; these are not included in Table I-2.

The Agency received two comment letters during this period of informal discussions about the triennial review with stakeholders (Exhibits A-8a and A-8b).

Table I-2. List of Meetings with Interested Parties and Conference Presentations.

Date	Interested Party, Organization or Conference and Location	Major Topic(s) Discussed
2-11-03	MN Chamber of Commerce, St. Paul	Scope and schedule for planned rulemaking
3-28-03 and 4-2-03	Flaherty and Hood, P.A., Coalition of Greater MN Cities (CGMC)	Definitions for narrative standards
5-21-03	MN Center for Environmental Advocacy, St. Paul	Scope and schedule for rulemaking
6-12-03	Metropolitan Council, Environmental Services	Major aspects of planned revision*
6-25-03	MN Department of Agriculture and Monsanto	Standards for pesticides
7-9-03	MN Department of Natural Resources (MDNR), St. Paul	Major aspects of planned revision
7-16-03	Minnehaha Creek Watershed District, Hennepin Co. Minneapolis Park and Rec. Board, Reps from cities along Minnehaha Creek	Change from fecal coliform to *E. coli*
7-29-03	Flaherty and Hood, CGMC and MN Environmental Science and Economic Review Board (MESERB), St. Paul	Major aspects of planned revision
8-19-03	Implementing TMDLs, Conference at Concordia Univ., St. Paul	Eutrophication standards for lakes
9-3-03	MN Chamber of Commerce	Major aspects of planned revision
9-9-03	Meeting of all MDNR area fisheries supervisors, Cloquet	Eutrophication standards for lakes and ammonia standard
9-22-03	Red River Basin Water Quality Team, Moorhead	Major aspects of planned revision
10-24-03	MESERB fall meeting, New Ulm	Major aspects of planned revision
11-3 to 11-5-03	Federal-State Toxicology and Risk Analysis Committee, Emeryville, CA	Revised mercury standard Change from fecal coliform to *E. coli*
1-26-04	Metropolitan Council, Environmental Services	Eutrophication standards for lakes
2-26-04	American Water Works Conference, Bloomington	Change from fecal coliform to *E. coli*
3-24-04	MN Water Conference, Minneapolis	Change from fecal coliform to *E. coli*
5-11-04	Flaherty and Hood, CGMC and MESERB, St. Paul	Change to phosphorus effluent limit
7-9-04	Governor's Water Initiative, North Central Lakes Pilot Project stakeholders meeting, McGregor, MN	Eutrophication standards for lakes
7-13-04	MN Department of Health stakeholder meeting on revision of Health Risk Limits	Short Agency presentation on plans to use safety factors in calculation of human health-based standards to protect children
8-4-04	MN Department of Health	Review plans to use "safety factors" in calculation of human health-based standards to protect children
9-15-04	Itasca Co. Coalition of Lake Associations	Eutrophication standards for lakes
9-24-04	MESERB Fall meeting, Alexandria	Change to phosphorus effluent limit
12-16-04	Crow River Organization of Water (CROW) committee, Hutchinson	Change from fecal coliform to *E. coli*
3-23-05	MN Department of Natural Resources (MDNR), St. Paul	Major aspects of planned revision
4-1-05	Flaherty and Hood, CGMC and MESERB, St. Paul	Change to phosphorus effluent limit; Eutrophication standards for lakes
9-22-05	Beach Water Quality Monitoring, Metro area city governments, park boards, etc responsible for monitoring swimming beaches for bacteria	Change from fecal coliform to *E. coli*
10-13-05	Flaherty and Hood, CGMC and MESERB, St. Paul	Change to phosphorus effluent limit; Eutrophication standards for lakes
3-6-06	69th Annual Wastewater Operators Conference	Change to phosphorus effluent limit; Eutrophication standards for lakes; costs
3-28-07	70th Annual Wastewater Operators Conference	Change from fecal coliform to *E. coli*

*Major aspects of planned revision included proposed eutrophication standards for lakes, revised mercury and ammonia standards (before ammonia was postponed), revision of human health-based standards including better protection of children, adoption of *E. coli* standard. At later meetings the plan to extend the phosphorus effluent limit to new and expanding dischargers was added.

C. NOTICE TO SOLICIT OUTSIDE OPINION [III. notification]

The Agency published two notices in the *State Register* asking for comments and opinions on the Agency's planned amendments to water quality standards.

The first notice was published on November 10, 2003, (28 SR 614, Exhibit A-9). This notice listed the major items under consideration by the Agency for the revision and invited any person to comment on these plans. Comments were also solicited on any aspect of Minn. R. ch. 7050 and 7052. The public comment period associated with this notice ran from Nov. 10 to Dec. 31, 2003. Copies of the *State Register* notice with a general cover letter were mailed to about 60 parties on the triennial review interested party list (Exhibit A-10). The Agency received seven comment letters during this comment period (Exhibits A-11a to A-11g) and exchanged e-mails with one commentor (Exhibit A-11g to A-11l).

The second notice in the *State Register* was published on May 17, 2004, (28 SR 1464, Exhibit A-12). This notice narrowed the scope of the planned revision and described those plans in more detail. It also announced the Agency's plans to hold a series of informal public meetings around the state. The dates, times and locations of seven public meetings planned for June, 2004, were published in this notice. These meetings are discussed in the next Section. The comment period associated with this notice ran from May 17 through June 30, 2004. Copies of the *State Register* notice with a general cover letter were mailed to about 60 parties on the triennial review interested party list (Exhibit A-13). Comment letters were received from 13 parties (Exhibits A-14a to A-14m, A-32a and A-32b).

D. PUBLIC INFORMATIONAL MEETINGS [III. notification]

The Agency scheduled and hosted a series of public meetings in June, 2004, to provide interested members of the public an opportunity to learn about the proposed revision, and to provide comments and ask questions. The meetings were held at the Agency's five Regional Offices and in St. Paul. The public was informed about the meetings through the notice published in the *State Register* (28 SR 1464, Exhibit A-12, discussed above), by the mailing associated with that notice, posting on the Agency's water quality standards revision Web page, and by a news release (Exhibit A-16). Also, Agency regional staff were asked to promote the meetings at opportunities available to them. In spite of these efforts, turnout at these meetings was low (Table I-3). Partly because of the low attendance at the meetings, Agency staff again sought opportunities to present relevant proposed changes at meetings already scheduled by interested parties and organizations rather than at meetings arranged by the Agency. Examples are the presentations given at the meetings listed in Table I-2 after June 2004. Table I-3 is a summary of the June public meetings showing locations, dates and number of attendees that signed the rosters (roster counts do not include Agency staff that attended the meetings).

Table I-3. Summary of June 2004 Public Informational Meetings.

Meeting Location	Date 6-2004	Time	Number of People Signing Roster
Greater Minnesota			
Duluth, Agency Office	7	7 – 9 PM	8
Brainerd, Agency Office	8	1:30 – 4 PM	2
Detroit Lakes, Agency Office	9	1:30 – 4 PM	9
Marshall, Agency Office	10	1:30 – 4 PM	6
Rochester, Agency Office	16	1:30 – 4 PM	15
Metro			
St. Paul, Agency Office	14	1:30 – 4 PM	18
St. Paul, Agency Office	15	7 – 9 PM	3
TOTAL			61

E. RESPONSE TO COMMENTS OUTSIDE THE SCOPE OF AMMENDMENTS [III. notification]

In this section of SONAR Book I, the Agency provides a brief response to public comments and suggestions that are outside the scope of the Agency's proposed amendments. This response is to comments received through the end of the comment period noticed in the second request for comments, (June 31, 2004, 28 SR 1464). In general, comments on issues within the scope of the amendments are addressed as part of the *need* and *reasonableness* discussions for the individual proposals.

The United States Steel Corporation (U.S. Steel) in two letters (September 22 and December 12, 2003, Exhibits A-8a and A-11a) asked the Agency to revise the Class 4A sulfate standard of 10 mg/L. This standard applies to waters supporting stands of wild rice. The Agency understands that this standard is not well substantiated and may be overly protective in some locations. The Agency has reviewed at least some of the limited information on the toxicity of sulfate to wild rice, for the purpose of revising the standard. Agency staff concluded from this preliminary work that there is insufficient information to propose and support an alternative sulfate standard. To continue to research sulfate toxicity would require resources far beyond the priority the Agency has attached to the need to revise this standard. Also, the Agency does not wish to propose repeal of the current standard. Proposed removal is likely to require almost as much supportive information as needed to propose a replacement standard.

An alternative for U.S. Steel and others, in lieu of waiting for the potential revision of the 10 mg/L sulfate standard and other Class 4 standards, is the proposal in this rulemaking to establish the authority for the Agency to modify an existing standard for any use class on a site-specific basis. If this proposed change is adopted, site-specific modification of the sulfate standard provides an option for the Agency to determine an alternative and still protective local sulfate standard (see Sections VI.H and X.H).

The Minnesota Environmental Science and Economic Review Board (MESERB) provided comments on a range of issues in October 31 and December 31, 2003, letters (Exhibits A-8b and A-11b). Most of the comments in these two letters have been reiterated, sometimes in more detail, in subsequent MESERB comment letters. The December 31, 2003, letter asked the Agency to update the dissolved oxygen "criteria" (standards). A review and potential revision of the Class 2 dissolved oxygen standards would be a very large undertaking. The Agency decided to devote its resources to other priorities such as the proposed eutrophication standards. The December 31, 2003, MESERB letter also addresses provisions in Minn. Laws 2003 ch. 128 art. 1, § 156 in some detail. The rulemaking to meet the requirements of the Session Law was completed in 2006 (see Section I.B). Other MESERB issues are discussed where relevant elsewhere in the SONAR.

The Agency received comments on a range of topics in response to the November 10, 2003, *State Register* request (Exhibits A-11c – A-11l). All the comments in these letters are addressed elsewhere in this SONAR, except for the following requests for changes that the Agency decided not to pursue.

The Minnesota Chamber of Commerce (Exhibit A-11e) suggested that Minn. R. ch. 7050 should explicitly state that mixing zones and intake credits be allowed, and that Minn. R. ch. 7052 allow intake credits for mercury. Mixing zones are allowed in the current rule and the proposed amendments do not impact existing mixing zone provisions or guidance. The term "intake credit" refers to the concept of giving a discharger "credit" for the levels of pollutants already in water that is withdrawn for industrial proposes, so that the discharger is not held responsible for pollutant levels in the intake water that passes through in their discharge. The Agency addresses intake pollutant levels now when it evaluates the need for effluent limits and is not proposing any "intake credit" language in this rulemaking. Again, this decision is based largely on lack of staff resources and other rulemaking priorities.

The Minnesota Department of Natural Resources (MDNR) suggested that the Agency revise its cobalt standard (Exhibit A-11f). Typically cobalt is a pollutant of concern only in a few localized situations in Minnesota (usually associated with mining). A site-specific standard could be developed, if needed to address a specific situation (existing Minn. R. 7050.0222, subp. 8). The Agency felt that the resources needed to revise the cobalt standard was better spent on other standards, such as the proposed new standards for acetochlor and metolachlor. The MDNR also suggested that the Agency revise a portion of the nondegradation language in Minn. R. 7050.0185, subp. 4 to address cumulative impacts of existing point sources, and to remove the exemption from nondegradation granted to limited resource value waters (Minn. R. 7050.0185, subp. 2, item G). The Agency understands the importance of these issues to the MDNR. However, the Agency is not proposing to follow these suggestions. The nondegradation to all waters provisions in Minn. R. 7050.0185 appropriately addresses potential water quality degradation from "significant" new or expanding discharges. As a minimum, permitted loading from discharges is established by the Agency so that it does not contribute to a violation of water quality standards downstream of the discharge. A review of nondegradation provisions is underway by the Agency, which may lead to future revisions of these provisions.

A proposal to make nondegradation for all waters applicable to limited resource value waters could be a very significant rule change with unknown economic implications, not only to potential dischargers, but to the Agency as well. The Agency is not compelled by MDNR's suggestions that such a change is needed and reasonable (Exhibit A-11f); but regardless, the Agency is not prepared to undertake such a major change at this time. Existing provisions in proposed Minn. R. 7053.0245, subp. 3 address the protection of Class 2 waters downstream from limited resource value (Class 7) waters. The Agency is proposing to reinforce this provision, without changing the overall substance of the "protection of downstream Class 2-waters" concept, with the proposed addition of language to Minn. R. 7053.0235 (see Section V.E.9).

Syngenta, the primary registrant for the herbicide atrazine, sent e-mails to the Agency reminding us of recent EPA assessments of atrazine toxicity, in anticipation of possible Agency plans to revise the current atrazine standard (Exhibit A-11g and A-11h – A11l). Syngenta is also the primary registrant for metolachlor. The Agency has decided not to review the current atrazine standard at this time for several reasons. First, the EPA atrazine criterion is still in draft form (as of January 1, 2007), and the draft EPA atrazine chronic criterion is tied to a toxicity model that is not available to states or the public. Also, there is extensive disagreement and controversy in the scientific community over the role atrazine plays (if any) in the wide-spread decline in amphibian populations and possible hormonal impacts on wildlife. With this many unresolved questions, this is not the time to be proposing a revision of the atrazine standard.

The Agency received comments from about 13 parties in response to the second request for comments on the planned rulemaking published in the *State Register* on May 17, 2004. Again, only comments not addressed elsewhere in this SONAR are discussed here.

The Mississippi River Revival environmental organization asked the Agency to update the standards for all priority pollutants for which the Agency has an existing water quality standard, and to add standards for all priority pollutants for which no standards currently exist in Minn. R. ch. 7050 (Exhibit A-14m).[11] They base this request on Section 303(c)(2)(B) of the Clean Water Act. The Agency has compared its current standards to the latest lists of EPA aquatic life and recreation criteria and determined that updates of the mercury, benzene and naphthalene standards, and replacing fecal coliform standard with *E. coli*, are the most important changes that need to be made to standards. As explained in Section II.E.2 above, the Agency is not able to proceed with the recalculation of human health-based standards using "adjustment factors" at this time.

F. AGENCY BOARD RULE ADOPTION AND VARIANCES COMMITTEE [III. notification]

The Agency briefed the Rule Adoption and Variances Committee of the Agency Citizens' Board about the proposed rule amendments on four occasions. Prior to each meeting a memorandum was sent to the Board members that outlined the proposed amendments or selected aspects of the proposed amendments. A copy of the memo was sent to people on the list of interested parties.

[11] Priority pollutants are defined in Section 307(a)(1) of the Clean Water Act.

In addition, the Board agenda is mailed to about 400 people before each meeting. During each meeting a PowerPoint presentation was made to the Board members.

The first informational briefing took place on September 23, 2003. The memo and a copy of the cover letter sent to the Board members and interested parties, and the list of 59 interested parties that received the memo, is Exhibit A-17. The copy of the PowerPoint presentation is Exhibit A-18. At this meeting Board members expressed interest in learning more about plans to provide better protection to infants and children, and they requested that staff from the Minnesota Department of Health address the Board about their plans to use children's exposure rates in the revision of the Health Risk Limits.

The second informational briefing took place on August 24, 2004. As requested by the Board, this briefing was devoted mostly to the Agency's consideration of applying adjustment factors in the calculation of human health-based water quality standards to provide enhanced protection of children. The Agency invited staff from the Minnesota Department of Health (MDH) to make a short presentation about the basis for their proposed adjustment factors in the calculation of proposed revised Health Risk Limits. As explained in Section II.E.2, the Agency postponed its plans to use adjustment factors in the calculation on human health-based water quality standards.

The memo and a copy of the cover letter sent to the Board members and interested parties, and the list of 72 interested parties that received the memo, is Exhibit A-19. The copy of the Agency's PowerPoint presentation is Exhibit A-20. There was insufficient time at this meeting to present the other key aspects of the proposed revision, and the Board members requested that the staff return the following month to cover those items.

At the August 24, 2004, Board meeting two representatives from the Minnesota Department of Transportation presented oral and written comments to the Board in which they repeated their request, first made in a comment letter dated June 29, 2004, for the Agency to revise the Class 2 chloride standard. The MDOT provided copies of their June 29 comment letter with attachments to the Board members (Exhibit A-14j). The Agency replied by letter to MDOT's request on September 24, 2004 (Exhibit A-22). This letter explains why the Agency decided not to revise the Class 2 chloride standard during this triennial review, which is primarily a lack of staff resources to carry out the needed research for a revised standard. As a partial alternative, the Agency is proposing to change the default Class 3 classification, which will make the chloride standard applicable to most surface waters in Minnesota less stringent (see SONAR Book III, Section VIII).

The third informational briefing of the Board Rule Adoption and Variance Committee took place on September 28, 2004. The memo with attachments 1 and 2 and the cover letter sent to the Board members and interested parties is Exhibit A-23. The list of 72 interested parties that received the memo is the same list that received information on the second Board briefing (Exhibit A-19). The copy of the Agency's PowerPoint presentation is Exhibit A-24.

Attachments 1 and 2 to the memo are excerpts from preliminary drafts of proposed rule language. Attachment 1 includes the draft numeric and narrative eutrophication standards for lakes, reservoirs and shallow lakes. Attachment 2 is the draft extension of the 1 mg/L phosphorus effluent limit to new and expanding discharges that discharge more than 1,800 pounds of phosphorus per year (SONAR Book II). Due to the importance of these two proposed additions and changes involving lakes and phosphorus, the Agency wanted to make this draft rule language available to the public early and use the Board appearance as a means to increase the public's exposure to these plans. These drafts of the proposed rules have undergone further revision in response to comments.

The fourth appearance before the Board Rule and Variances Committee was on January 24, 2006. The purpose of this appearance was to update the Board on changes to the scope of the revision, the proposed standards for acetochlor and metolachlor, and changes to some of the proposed rule language. Exhibit A-64a is the memo with one attachment sent to the Board and the mailing list of interested parties that received the memo; Exhibit A-64b is the PowerPoint presentation to the Board.

G. NOTIFICATION OF GOVERNOR'S OFFICE [III. notification]

Under Minn. Stat. § 14.05, subd. 6, the Governor may veto adopted administrative rules. To keep the Governor's Office apprised of the Agency's plans, the Agency sends information about the amendments to the Governor's Office on two occasions prior to the final request for approval. The first notification serves to alert the Governor of the Agency's plans and the reasons behind the proposals. The second notification provides more detail on the proposed rule amendments and a status of the Agency's progress. This notification coincides with the completion of the SONAR and proceeds the notification of the proposed amendments in the *State Register*.

The third notification asks for the Governor's approval of the final rule, and is sent to the Governor's Office after the Agency Board has approved the proposed rules.

In 2003 the Governor's Office streamlined this notification process by creating three standardized forms, which the Agency completes and forwards to the Governor's Office. The first form with a short cover memorandum was sent to the Governor's Office on October 31, 2003 (Exhibit A-25).

H. AGENCY WEB PAGE [III. notification]

The Agency created a Web page devoted to the proposed amendments in June of 2003.[12] The first version of this page summarized the standards and other items the Agency was proposing to change or add, provided a tentative schedule, and it told the public how to send comments. The Web page encourages the public to submit comments or questions at any time.

In December, 2004, the Web page was substantially expanded and updated to include more detailed information about the Agency's proposals (Exhibit A-46a). Highlighted were the plans for adoption of eutrophication standards for lakes, extension of the 1 mg/L phosphorus effluent

[12] http://www.pca.state.mn.us/water/standards/rulechange.html.

limit to new and expanding discharges above a certain size (SONAR Book II), and the proposal to use adjustment factors in the calculation of human health-based standards to protect children (now postponed). A link to a PDF file was included in this version of the Web page, which included a preliminary draft of the eutrophication standards and the proposed extension of the phosphorus effluent limit (Exhibit A-46b). Exhibit A-46b is similar to attachments 1 and 2 to the September 21, 2004, memorandum sent to the Agency Board (Exhibit A-23).

Subsequently the Web page has been periodically updated to inform interested parties about changes to the planned revision. The Agency updated the Web page a second time on June 16, 2005, (Exhibit A-47), and again on August 9, 2005, (Exhibit A-48a) and December 27, 2005. The August update included PDF files for the revised Minn. R. ch. 7050 (minus part 7050.0470), and the new proposed Minn. R. 7053 (referred to as ch. 7055 at that time) were attached (Exhibits A-48b and A-48c, respectively). A January 26, 2006, update (Exhibit A-49a) included the proposed numeric standards for acetochlor and metolachlor, and a PDF file that describes in detail how the chronic standards were developed (Exhibit A-49d). The January version also included newer versions (dated January 1, 2006) of the proposed rules (Exhibits A-49b and A-49c), which reflected changes to the proposed extension of the phosphorus effluent limit to new and expanded discharges above a certain size.

The water quality standards revision Web page was updated in May and June 2006 to announce the separation of the proposed Session Law amendments from the triennial review (Exhibit A-65a). The last update of the Web page prior to the publication of the proposed amendments in the *State Register* was in June 2007 (Exhibit A-65b). The Web page will be updated again when the proposed rule amendments are published in the *State Register* and the schedule of public hearings is known.

I. ADVISORY COMMITTEE NOT NEEDED [III. notification]

Minnesota Stat. § 14.101, subd. 2, quoted below, allows the Agency to form an advisory committee to provide advice and recommendations on proposed rules. The Agency decided that for this rulemaking the formation of an advisory committee was not necessary. The Agency has targeted potentially affected and interested parties in its communications with the public, as described in this Section. Several aspects of the proposed amendments have had a great deal of exposure to the public for several years. For example, the precursors to the proposed eutrophication standards, the nutrient criteria, were a major topic of discussion in the assessment factor rulemaking completed in 2003. Other proposed changes, such as the proposed fish tissue mercury and *E. coli* standards have also received widespread exposure for several years.

> [Minn. Stat. § 14.101] Subd. 2. **Advisory committees.** Each agency may also appoint committees to comment, before publication of a notice of intent to adopt or a notice of hearing, on the subject matter of a possible rulemaking under active consideration within the agency.

IV. AGENCY’S STATUTORY AUTHORITY

The Agency’s authority to adopt water quality standards and to classify waters of the state is found in Minn. Stat. § 115.03 (2006), particularly subdivisions 1(b) and 1(c). Subdivision 1(b) authorizes the Agency to classify waters, while subdivision 1(c) authorizes the Agency:

> To establish and alter such reasonable pollution standards for any waters of the state in relation to the public use to which they are or may be put as it shall deem necessary for the purposes of this chapter and, with respect to the pollution of waters of the state, chapter 116;

Additional authority for adopting standards is established under Minn. Stat. § 115.44, subd. 2 and 4. Subdivision 2 authorizes the Agency to:

> …group the designated waters of the state into classes, and adopt classifications and standards of purity and quality therefor. …

Subdivision 4 authorizes the Agency to:

> …adopt and design standards of quality and purity for each classification necessary for the public use or benefit contemplated by the classification. The standards shall prescribe what qualities and properties of water indicate a polluted condition of the waters of the state which is actually or potentially deleterious, harmful, detrimental, or injurious to the public health, safety, or welfare; to terrestrial or aquatic life or to its growth and propagation; or to the use of the waters for domestic, commercial and industrial, agricultural, recreational, or other reasonable purposes, with respect to the various classes established…

Finally, the Agency is authorized under Minn. Stat. § 115.03, subd. 5 to perform any and all acts minimally necessary, including the establishment and application of standards and rules, for the Agency’s ongoing participation in the National Pollutant Discharge Elimination System (NPDES) permitting program.

Under these statutory provisions, the Agency has the necessary authority to adopt the proposed rules.

The adoption of administrative rules is regulated under Minn. Stat. ch. 14. This statute and Minn. R. ch. 1400 lay out the rulemaking process, and obligations of the Agency to, for example, involve the public, consider the impact of the rules amendments on certain subsets of Minnesotans, and assess the economic impact of the proposed amendments. They also serve to assure fairness and openness in the process.

The proposed rule will be enforced in accordance with the authority provided to the Agency by Minn. Stat. ch. 116 and 115. The Agency has general authority to enforce its rules under these statutes. If approved, the changes to the existing rule will be enforceable by the Agency.

V. NEED FOR PROPOSED RULE AMENDMENTS, RULE SEPARATION AND NON-SUBSTANTIVE CHANGES

A. INTRODUCTION [V. need]

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the need for and the reasonableness of the rules as proposed. In general terms, "need" means that the Agency must present the reasons for making the proposed changes to Minn. R. ch. 7050, and for the proposed the new Minn. R. ch. 7053. Also, need implies that a problem exists that needs to be fixed or dealt with through administrative attention.

This Section of SONAR Book I will discuss why the following proposed changes are needed.

1. Division of Minn. R. ch. 7050 into two rules and the creation of the new rule, Minn. R. ch. 7053;
2. Rule language changes associated with the separation of Minn. R. ch. 7050 into two rules;
3. Language changes not directly associated with the separation but needed to clarify and consolidate the rules; and
4. Reformatting and housekeeping changes.

For the most part the proposed amendments and language changes are shown in the *need* sections and are not repeated when the same topic is discussed in the *reasonableness* sections. Due to the number of minor editorial changes to both Minn. R. ch. 7050 and the sections moved into Minn. R. ch. 7053 there may be minor discrepancies between the Office of the Revisor of Statutes (Revisor's Office) version, the Agency's version and the portions quoted in the SONAR. If discrepancies are noted, the Revisor's Office version should be considered the correct version.

B. PETITIONS TO ADOPT RULES [V. need]

Over the course of preparing for these amendments the Agency received two formal petitions for rulemaking and one data practices act request. One petition was from the Coalition of Greater Minnesota Cities (CGMC), the Minnesota Environmental Science and Economic Review Board (MESERB), League of Minnesota Cities, and the Minnesota Association of Small Cities. The second petition was from the Minnesota Center for Environmental Advocacy (MCEA), both pertain to the 1 mg/L phosphorus effluent limit currently in Minn. R. 7050.0211, subp. 1a. The CGMC/MESERB petition and cover letter from Flaherty & Hood, P.A. dated December 15, 2003, is Exhibit A-28. The Agency's response letter dated January 13, 2004 is Exhibit A-29. The MCEA petition and cover letter dated July 27, 2004, is Exhibit A-30. The Agency's response letter dated August 18, 2004, is Exhibit A-31. Because both petitions deal with suggested changes to the phosphorus effluent limit, they will be discussed in more detail in the *need* portions of SONAR Book II (Section VII.B of Book II).

The CGMC and MESERB sent a data practices act request to the Agency on June 30, 2004, and a supplement to this request on July 16, 2004 (Exhibits A-14k and A-14l). In the Agency's response dated August 5, 2004, the Agency indicated that the information requested would be compiled and summarized as part of the demonstration of need and reasonableness for this rulemaking, and that information would be forwarded to CGMC and MESERB as soon as it was completed (Exhibit A-33). All the requested information is included in SONAR Book II and the relevant exhibits.

C. DIVISION OF MINN. R. CH. 7050 INTO TWO RULES, MINN. R. CH. 7050 AND 7053 [V. need]

Since the first statewide water quality standards and wastewater treatment requirements (WPC 14 and 15) were adopted in 1967, Minnesota's water quality rules have grown and expanded substantially. The 1967 rules are the foundation for the present-day Minn. R. ch. 7050 and some provisions have never been changed. However, with each revision over this time span many standards, effluent limits and other provisions have been added. Each addition has not only increased the size of the rule but tended to make it more complicated as well. Table I-4 lists the major changes and additions to the state-wide water quality standards since they were first adopted almost 40 years ago.

Table I-4. Year Water Quality Rules were Revised and Major Amendments or Additions.

Year	Rule	Major Provisions Changed or Added
1967	WPC 14 and 15	1. Classification system of beneficial uses for waters of the states (still in place today) 2. Basic narrative water quality standards (most still in place today) 3. Numeric standards for Class 2, 3, 4 and 5 uses (most Class 3, 4 and 5 standards have not changed) 4. Primary treatment established as minimum technology-based treatment for domestic wastewater
1971	WPC 25	1. Classifications of **interstate** waters of Minnesota
1973	WPC 24	1. Classifications of **interstate** waters of Minnesota
1973	WPC 14 and 15	1. Secondary treatment established as minimum technology-based treatment for domestic wastewater 2. 1 mg/L phosphorus limit applies when discharge is to or affects a lake 3. General nondegradation provisions
1981	6 MCAR §4.8014, 4.8015, 4.8024 & 4.8025	1. Revised numeric standards for dissolved oxygen, ammonia and chlorine 2. Limited resource value waters, class 7
1984	Minn. R. ch. 7050	1. Designation of Outstanding Resource Value Waters (ORVW) and nondegradation provisions for ORVWs
1988	Minn. R. ch. 7050	1. Nondegradation provisions for all waters 2. Feedlot requirements 3. Some effluent limits for trickling filter plants and ponds updated
1990	Minn. R. ch. 7050	1. Numeric standards for about 58 toxic pollutants 2. Procedures for calculating Class 2 criteria
1994	Minn. R. ch. 7050	1. Standards for wetlands 2 All numeric standards applicable to 4 common groupings of beneficial uses listing in one place
1994	Minn. R. ch. 7050	1. Aquaculture requirements
1998	Minn. R. ch. 7052	Great Lakes Initiative – applies only to Lake Superior basin
2000	Minn. R. ch. 7050	1. Several changes based on recommendation from a Water Quality Standards Advisory Committee that met from 9/1996 to 12/1997 2. Allow an annual average limit for phosphorus in some cases
2003	Minn. R. ch. 7050	1. Detailed narrative standards for assessing trophic status of lakes, biological community and contaminates in fish tissue
2006	Minn. R. ch. 7050	Fulfill requirements of 2003 Session Laws ch. 128, art. 1, § 156.

Some of the expansion of the rule is due to the natural advancements in the science of water quality standards in general, and the need to updated existing standards and add new standards to reflect these advances. Particularly significant are advancements in aquatic life, human health and wildlife toxicology, which led to improvements in the methodologies used to set water quality standards. Over the years EPA has published numerous aquatic life criteria, which are the basis for most state standards[13]. Also, there have been changes and advancements in the area of treatment requirements and effluent limits. In general, as science advances water quality rules need to become more technical and detailed to keep pace.

[13] Aquatic life criteria required by Clean Water Act Section 304(a).

Minnesota R. ch. 7050 has expanded as new water quality programs have come along and rule language was needed to implement them. In some cases additions were in response to federal requirements. For example, Congress amended the Clean Water Act in 1987 to require all states to adopt standards for toxic pollutants. The Agency complied with that requirement with the comprehensive amendments in 1990. In other cases changes are due to pollution issues that arose in Minnesota that created a need for new rules. An example of the latter is the promulgation in 1994 of provisions to regulate aquaculture.

Petitions for rule changes or additions from outside parties and actions by the State Legislature are another source of added language and longer rules. The last three water quality standards rulemakings were in response to public requests (2000 and 2003) and legislative mandates (2006). The end result of all the amendments is not only a very long water quality rule, but also one that has become increasingly difficult to use (Minn. R. ch. 7050). What started in 1967 as about 16 pages of water quality standards and treatment requirements has grown to about 108 pages in 2005[14]. This does not include the roughly 70 pages of beneficial use classifications for individually listed waters (Minn. R. 7050.0470).

Size alone, however, is not the primary reason the current Minn. R. ch. 7050 is difficult and confusing to use. As new standards, definitions, requirements, rule language, etc. have been added, provisions that logically belong together may have been separated and scattered throughout the rule. Besides making it more difficult for a user to find all the relevant provisions of interest, it has resulted in some unnecessary redundancy in portions of the rule. Simply stated, it has become increasingly difficult to use and navigate the rule.

Based on the types of questions about Minn. R. ch. 7050 Agency staff repeatedly get from our own staff, the staff of other state agencies and outside parties, the problems with the current rule typically fall into these categories:

- Users are confused about which beneficial use classes are assigned to a waterbody of interest.
- Users are confused about the multiple uses assigned to all surface waters.
- Users are not sure which standards apply to the waterbody of interest.
- Users cannot find all the standards or rule language that is relevant to the issue they are interested in, and important provisions are easily overlooked.
- Users find the formatting of the standards and the rule in general to be difficult and frustrating to use.

To ameliorate these problems, the Agency is proposing a number of changes, as discussed in this Book of the SONAR. The most obvious is the proposed split of Minn. R. ch. 7050 into two rules. In general, the overall content of Minn. R. ch. 7050 falls conveniently into two categories, which logically suggests how best to divide the rule into two parts. The two categories are:

1. The beneficial use classification system, numeric and narrative water quality standards, nondegradation, and other items related to ambient standards.

[14] Number of pages varies depending on rule formatting.

2. Wastewater treatment requirements, effluent limits, mixing zones and other items related to wastewater treatment and point source discharges.

It is proposed to retain the items listed in number 1 above in Minn. R. ch. 7050, and move the items listed in number 2 into a new rule, Minn. R. ch. 7053.

As stated, some of the more pressing problems the proposed split is intended to ameliorate is the scattered location of some related items, and the redundancy of some rule language. Thus, along with the splitting of the rule, the Agency is proposing to consolidate and rearrange some of the existing rule language. At the same time, the Agency is aware that when considering moving provisions, it is advantageous to maintain the overall organization of the current rule as much as possible. Also, the Agency's goal when moving language from one part of the rule to another, unless clearly stated otherwise, is to **retain unchanged the original language and meaning of the rule**. The same goal applies to rule language that is being changed only to clarify its meaning, to remove outdated terms or phases, or to comply with changes suggested by the Revisor's Office. While remote, there is always a possibility that relocating a provision or clarifying language might inadvertently result in an unforeseen change in meaning. In proposing these changes, the Agency is making a concerted effort to avoid inadvertently changing the meaning of the words. **If questions arise in the future** about the meaning of language that has been moved or simply clarified, it should be assumed that the meaning the language had prior to the move or clarification is the correct meaning, unless it is specifically stated in this SONAR that a change in meaning was intended.

The Agency does not claim that the proposed separation of existing Minn. R. ch. 7050 into two rules and the rearrangement of some rule language will solve all the problems people have using the water quality rules, but we firmly believe that it will go a long way to making the rules more "user friendly."

D. MINN. R. CH. 7050, CHANGES TO RULE LANGUAGE ASSOCIATED WITH THE DIVISION INTO TWO RULES [V. need]

1. <u>Introduction</u> [V.D. 7050 separation, need]

While the Agency believes that the content of Minn. R. ch. 7050 lends itself well to separation into two parts, a few provisions in the current rule do not fall perfectly into either one rule or the other. Some non-substantive language changes will be needed and some portions of Minn. R. ch. 7050 will need to be duplicated in Minn. R. ch. 7053 to be sure both rules make sense, are complete, and can "stand on their own".

In this part of SONAR Book I we discuss the changes in rule language that are needed as part of the separation of Minn. R. ch. 7050 into two rules. The distinction between changes associated, or not associated, with the split is not always clear cut. We have tried to limit the contents of this Section to those items clearly linked to the split, and include the other non-substantive changes to Minn. R. ch. 7050 in Section V.F.

None of the rule language changes associated with the separation changes the basic meaning of the original language in Minn. R. ch. 7050. These changes are not intended to make the rule either more stringent or more lenient. In this sense, none of these changes are substantive.

2. Minn. R. 7050.0110. Scope [V.D. 7050 separation, need]

Not surprisingly, the scope of Minn. R. 7050 needs to be re-worded to remove references to "*standards for dischargers of sewage, industrial and other wastes*". These provisions will be moved to Minn. R. ch. 7053.

The Agency is proposing to add to the scope a more descriptive list of the primary contents of the proposed new Minn. R. ch. 7050. This includes the classification system for beneficial uses, narrative and numeric water quality standards, nondegradation language, and the use-class listings for specific waterbodies.

A reference to the proposed new Minn. R. ch. 7053 is included so the reader knows where to find effluent limits and treatment requirements. The proposed language is shown below:

> *7050.0110. SCOPE.*
>
> *Parts 7050.0130 to 7050.0227 apply to all waters of the state, both surface and underground~~, and include general provisions applicable to the maintenance of water quality and aquatic habitats; definitions of water use classes; standards for dischargers of sewage, industrial, and other wastes; and standards of quality and purity for specific water use classes~~. This chapter includes a classification system of beneficial uses applicable to waters of the state, narrative and numeric water quality standards that protect specific beneficial uses, nondegradation provisions, and other provisions to protect the physical, chemical, and biological integrity of waters of the state. Parts 7050.0400 to 7050.0470 classify all surface waters within or bordering Minnesota and designate the beneficial uses for which these waters are protected. This chapter ~~shall apply~~ applies to point source and nonpoint source discharges and to the physical alterations of wetlands. Other water quality rules of general or specific application that include any more stringent water quality ~~or effluent~~ standards or prohibitions are preserved.*
>
> *Effluent limits and treatment requirements for discharges of sewage, industrial wastes, and other wastes are located in chapter 7053.*

3. Minn. R. 7050.0130, subp. 2, Terms Defined in Statute [V.D. 7050 separation, need]

Minnesota R. 7050.0130 includes definitions broadly applicable to water quality standards, and Minn. R. 7050.0130, subp. 2 references definitions in Minn. Stat. § 115.01. The Agency is proposing to substitute different example terms defined in statute that are more relevant to the subject of water quality standards than the existing example terms. The existing terms focus on point source discharges, more relevant now to proposed Minn. R. ch. 7053. Example terms proposed to be removed are: "sewage," "industrial waste," and "other wastes," which will be replaced with “ground water,” “water pollution,” and “toxic pollutants.” The latter relate directly to the protection of waters from pollution and water quality standards. All the terms are already defined in statute and the proposed change will have no impact. The changes shown below are needed only to make the cited terms more relevant and comply with Revisor Office recommendations.

> [Minn. R. 7050.0130] *Subp. 2*. ***Terms defined in statute.*** *The terms "waters of the state,"* ~~“sewage,” “industrial wastes,” and “other wastes,”~~ “ground water,” "water pollution," and "toxic pollutants," *as well as any other terms for which definitions are given in the pollution control statutes, as used herein have the meanings* ~~*ascribed to*~~ *given to them in Minnesota Statutes, sections 115.01 and 115.41, with the exception that disposal systems or treatment works operated under permit or certificate of compliance of the agency* ~~*shall*~~ *are not* ~~*be construed to be*~~ *"waters of the state."*

4. Minn. R. 7050.0185, subp. 3, Minimum Treatment [V.D. 7050 separation, need]

This part of the existing nondegradation for all waters provision states that whether or not the discharge is “significant” as defined in Minn. R. 7050.0185, all other effluent requirements are applicable, and that water quality standards and existing beneficial uses shall be maintained. This language needs to be reworded without changing the meaning to reflect the move of effluent limits to Minn. R. ch. 7053.

In addition, the Agency is proposing to add language dealing with nonpoint sources. The proposed language, quoted below, is needed as a reminder that nondegradation for all waters applies to nonpoint as well as point sources, as stated now in existing Minn. R. 7050.0185, subp. 1. Nearly all the nondegradation requirements in Minn. R. ch. 7050 focus on controlling pollutants from point sources. The proposed addition of a reference to existing rules that deal with aspects of nonpoint source pollution and implementation of voluntary best management practices, is needed to inform readers that these provisions are relevant when considering nondegradation protection for all waters. The proposed language does not add any new authority to the Agency to control nonpoint source pollution; it simply highlights other existing federal or state rules that deal with aspects of nonpoint source pollution control.

>]Minn. R. 7050.0185] *Subp. 3.* ***Minimum treatment****. Any person authorized to maintain a new or expanded discharge of sewage, industrial waste, or other waste, whether or not the discharge is significant, shall comply with applicable water quality standards of this chapter and effluent* ~~*limitations and water quality standards of this chapter and shall maintain all existing, beneficial uses in the receiving waters*~~ *limits in chapter 7053 and other applicable federal and state point source treatment requirements. Nonpoint sources of pollution shall be controlled as required by this chapter, chapters 7020 and 7080, and any other applicable federal or state requirements. All existing beneficial uses shall be maintained in the receiving waters.*

5. Minn. R. 7050.0210, General Standards [V.D. 7050 separation, need]

The existing Minn. R. 7050.0210 contains a number of general pollution control requirements in 15 subparts pertaining to both point source effluent limits and water quality standards. The Agency proposes to include modified versions of existing Minn. R. 7050.0210 in both the revised Minn. R. ch. 7050 and the new Minn. R. ch. 7053.

Minnesota R. 7050.0210, subp. 13a is proposed for repeal, leaving 14 subparts. Eight of the 14 subparts pertain exclusively to dischargers of sewage, industrial or other wastes and logically belong in Minn. R. 7053. Six others deal with water quality conditions or water quality standards and the appropriately revised versions need to remain in Minn. R. 7050 (Table I-5).

Table I-5. Proposed Changes to the Subparts in Minn. R. 7050.0210, *General Standards for Dischargers to Waters of the State*.

Subpart:	Proposal	Subpart	Proposal
1. Untreated sewage	Move to 7053	11. Repealed, 12 SR 1810	na
2. Nuisance conditions prohibited	Amended versions in 7050 and 7053	12. Liquid substances	Move to 7053
3. Inadequate treatment	Move to 7053	13. Pollution prohibited	Stays in 7050
4. Highest levels of water quality	Amended versions in 7050 and 7053	13a. Wetland pollution prohibited	Repeal, contents moved to 7050.0186
5. Mixing zones	Some provisions in both rules	14. Repealed, 15 SR 1057	na
6c. Other requirements preserved	In both rules	15. Point source discharges must report to agency	Move to 7053
7. Minimum stream flow	Some provisions in both rules	16. Renumbered, 7050.0214	na
9. Water quality based effluent limits	Move to 7053	17. Compliance with permit conditions	Move to 7053
10. Alternative waste treatment	Move to 7053	18. Water quality standard based ammonia effluent limits	Move to 7053

Subpart 4 "*Highest levels of water quality*" pertains to both wastewater treatment and the maintenance of water quality conditions for protection of beneficial uses. The version of this subpart retained in Minn. R. 7050.0210 needs little change – in fact the only changes are two editorial changes suggested by the Revisor's Office. Subpart 4 is shown below. Proposed Minn. R. 7053.0205, subp 4 is discussed in Section V.E.5.

> [Minn. R. 7050.0210] *Subp. 4.* ***Highest levels of water quality.*** *The highest levels of water quality, including, but not limited to, dissolved oxygen, ~~which~~ that are attainable in the waters of the state by continuous operation at ~~their~~ the maximum capability of all primary and secondary units of treatment works or their equivalent, discharging effluents into the waters of the state, ~~shall~~ must be maintained in order to enhance conditions for the specified uses.*

6. Minn. R. 7050.0210, subp. 5, Mixing Zones [V.D. 7050 separation, need]

A mixing zone is that part of a receiving stream where a discharge of treated wastewater mixes with, and is diluted by, the receiving stream. Mixing zones must comply with certain conditions, such as the final acute value must be met inside a mixing zone and chronic standards must be met at the outer edge of a mixing zone. Mixing zones are probably the best example of the blending of ambient water quality standards and point source discharges in the same provision. For this reason there is a need for some duplication of the existing mixing zone language in the two rules, the proposed revised Minn. R. ch. 7050 and the new Minn. R. ch. 7053.

Minnesota R. 7050.0210, subp. 5 includes both requirements and general guidance for mixing zones characteristics. A basic requirement is that the concentrations of toxic pollutants must be below levels that are acutely toxic in all parts of the mixing zone. The general guidelines include such things as: mixing zones should be as small as possible, they should not intersect swimming beaches or fish spawning areas, and they should not block the movement of fish up and down stream.

The proposed language changes to the parts to be left in the revised Minn. R. ch. 7050 are:

- Necessary changes to the citations to parts of the rule that are slated to be moved to Minn. R. ch. 7053 (existing 7050.0211 and 7050.0212).
- A necessary change to the citation for the part of the rule dealing with allowable dilution (Minn. R. 7053.0205, subp. 7).
- Addition of a statement that mixing zones must be consistent with applicable water quality standards, including the nondegradation requirements. This change is needed as a reminder that nondegradation provisions apply; it does not change the rule substantively.
- Relocation of the sentence that allows a mixing zone when a Class 7 water enters a Class 2 water. The move is needed to place this provision closer to related language.

These changes are needed to accommodate the separation of the mixing zone part of Minn. R. ch. 7050 into two rules. The proposed language is shown below:

> [Minn. R. 7050.0210] *Subp. 5.* ***Mixing zones.*** *Reasonable allowance will be made for dilution of the effluents, which are in compliance with ~~part 7050.0211 or 7050.0212,~~ <u>this chapter and chapter 7053</u>, as applicable, following discharge into waters of the state. The agency, by allowing dilution, ~~may~~ <u>will</u> consider the effect on all uses of the waters of the state into which the effluents are discharged. The extent of dilution allowed regarding any specific discharge as specified in <u>part 7053.0205,</u> subpart 7~~,~~ shall not violate the applicable water quality standards~~. Means for expediting mixing and dispersion of sewage, industrial waste, or other waste effluents in the receiving waters are to be provided so far as practicable when deemed necessary by the agency to maintain the quality of the receiving waters in accordance with applicable standards~~ <u>in this chapter and chapter 7052, including the nondegradation requirements contained in those chapters. This subpart also applies in cases where a Class 7 water is tributary to a Class 2 water</u>.*

7. Minn. R. 7050.0210, subp. 6c, Other Requirements Preserved [V.D. 7050 separation, need]

This part of existing Minn. R. 7050.0210 includes the standard severability provisions common in rules. The language says that if conflicts occur between this rule and any other state or federal rule, the more stringent requirement applies. The specific references to point source treatment requirements will be moved to Minn. R. ch. 7053. The addition of the second "*this chapter*" replaces the references to the point source requirements but does not change the overall meaning of this subpart.

> [Minn. R. 7050.0210] *Subp. 6c.* ***Other requirements preserved****. The requirements of this chapter ~~and specifically the requirements in parts 7050.0211 to 7050.0212~~ are in addition to any requirement imposed ~~on a discharge~~ by the Clean Water Act, United States Code, title 33, sections 1251 et seq., and its implementing regulations. In the case of a conflict between the requirements of ~~parts 7050.0110 to 7050.0220~~ this chapter and the requirements of the Clean Water Act or its implementing regulations, the more stringent requirement controls.*

8. Minn. R. 7050.0210, subp. 7, Minimum Stream Flow [V.D. 7050 separation, need]

Most of this part in the current Minn. R. ch. 7050 is essentially a definition of the seven-day, 10-year low flow ($7Q_{10}$) low flow. The Agency is proposing to clarify the definition and move it to Minn. R. 7050.0130, subp. 3 to join other broadly applicable definitions. The $7Q_{10}$ is a statically derived low flow event, more specifically the lowest seven-day average low-flow with a once in 10-year recurrence interval. The Agency proposes to include the definition of $7Q_{10}$ in both rules, Minn. R. 7050.0130, subp. 3, and Minn. R. 7053.0135, subp. 3 (see Sections V.E.3 and V.E.6).

The first part of the current language in Minn. R. 7050.0210, subp. 7 is a statement that point source discharges will be controlled so that water quality standards will be maintained at all flows equal to and greater than the $7Q_{10}$ low flow[15]. This provision is needed in both the proposed revised Minn. R. ch. 7050 and the new Minn. R. 7053 because it deals with both ambient standards, and point and nonpoint sources. The Agency is proposing a general reference to point and nonpoint sources for the revised Minn. R. ch. 7050.0210, subp. 7 (see below); i.e., that they should be controlled such that water quality standards will be maintained at all flow equal to or greater than the $7Q_{10}$. This change is needed to restate this important provision in the context of the revised Minn. R. ch. 7050. Again, this is not a new provision. Other parts of the current Minn. R. ch. 7050 apply the whole rule to point and nonpoint sources (e.g., Minn. R. 7050.0110).

> [Minn. R. 7050.0210] *Subp. 7.* ***Minimum stream flow.*** *~~Dischargers of sewage, industrial waste, or other wastes~~ Point and nonpoint sources of water pollution shall be controlled so that the water quality standards will be maintained at all stream flows that are equal to or greater than ~~exceeded by 90 percent of the seven consecutive daily~~*

[15] This provision has been interpreted to mean that water quality standards do not apply when river flow drops below the 7Q10; that such unusually low flows and drought conditions represent "acts of God", beyond the responsibility of point and nonpoint sources.

> ~~*average flows of record (the lowest weekly flow with a once in ten-year recurrence interval) for the critical month(s) , except for the purpose of setting ammonia effluent limits. Dischargers of ammonia in sewage, industrial waste, or other wastes shall be controlled so that the ammonia water quality standard will be maintained at all stream flows which are equal to or exceeded by 90 percent of the 30 consecutive daily average flows of record (the lowest 30-day flow with a once in ten-year recurrence interval) for the critical month(s). The period of record for determining the specific flow for the stated recurrence interval, where records are available, shall include at least the most recent ten years of record, including flow records obtained after establishment of flow regulation devices, if any. The calculations shall not be applied to lakes and their embayments which have no comparable flow recurrence interval. Where stream flow records are not available, the flow may be estimated on the basis of available information on the watershed characteristics, precipitation, run-off, and other relevant data.*~~ *the $7Q_{10}$ for the critical month or months, unless another flow condition is specifically stated as applicable in this chapter.*

The reference to "critical months" in this provision (existing language) has been interpreted for decades as the months or seasons during which the lowest flows are likely to occur, such as late summer or winter. Effluent limits must be set to achieve water quality standards during these "critical" times of the year.

Existing Minn. R. 7050.0210, subp. 7 includes the paragraph quoted below. This paragraph is not needed in the proposed amended Minn. R. ch. 7050 but will be retained in the new Minn. R. ch. 7053.

> *Allowance shall not be made in the design of treatment works for low stream flow augmentation unless the flow augmentation of minimum flow is dependable and controlled under applicable laws or regulations.*

9. Minn. R. 7050.0218, subp. 3, item O, Definition of "Final Acute Value" [V.D. 7050 separation, need]

The Agency needs to change the references to parts of Minn. R. ch. 7050 in the existing definition of "Final acute value" in Minn. R. 7050.0218, subp. 3, item O, to the corresponding parts of the proposed new rule, Minn. R. ch. 7053. There are three proposed citation changes in this definition (not shown).

E. MINN R. CH. 7053, CHANGES TO RULE LANGUAGE ASSOCIATED WITH THE DIVISION OF MINN. R. CH. 7050 INTO TWO RULES [V. need]

1. Introduction and Part Numbers for Minn. R. ch. 7053 [V.E. 7053 separation, need]

A new rule, Minn. R. ch. 7053, is being proposed to include effluent limits, treatment requirements and related provisions now in Minn. R. ch. 7050[16]. The Agency believes this separation of the contents of Minn. R. ch. 7050 is needed for the following reasons.

- Minn. R. ch. 7050 has become a very large over its history and is difficult to use.
- A byproduct of the increase in size is the separation or scattering of some related provisions in the rule that increases the chance relevant provisions will be unnoticed.
- The rule naturally separates into two parts, one for ambient water quality standards and one for effluent limits/wastewater treatment requirements.
- The organization and formatting of the rule can be improved as part of the separation
- Generally improve the usability of the rule.

As stated in Section V.D.1, not all the provisions in the current Minn. R. ch. 7050 can be separated into either one rule or the other without some changes to the rule language. Some duplication of language is needed also to be sure both rules make sense and can function well independently. This Section of the SONAR deals with the changes and additions needed to facilitate the move of some provisions in existing Minn. R. ch. 7050 into Minn. R. ch. 7053. Some proposed changes involve a change in terminology to make the provision more relevant to effluent limits (e.g., see Section V.E.5), or the addition of a phrase to remind the reader of relevant provisions elsewhere in the rule (e.g., see Sections V.E.4, 7 and 9). However, **none** of these changes are intended to change the basic meaning of the original language in Minn. R. ch. 7050.

The proposed extension of the phosphorus effluent limit to new and expanding dischargers above a certain size is discussed in SONAR Book II (also see Section V.E.10 in this book).

It is the Agency's intent in assigning part numbers to proposed Minn. R. ch. 7053 to follow a logical pattern and to retain as much consistency with the current rule as possible (Table I-6). The rationale for assignment of part numbers is discussed in the *reasonableness* section (Section IX.B).

Table I-6. Proposed Part Numbers for the New Minn. R. ch. 7053 Compared to the Current Part Numbers in Minn. R. ch. 7050.

Rule Parts	**Part no. in proposed new Minn. R. ch. 7053**	**Part no. in existing Minn. R. ch. 7050, or Minn. R. ch. 7056 & 7065**
Similar or common to both Minn. R ch. 7050 and 7053		
Scope	7053.0115	7050.0110
Definitions	7053.0135	7050.0130
Compliance	7053.0155	7050.0150
Variance	7053.0195	7050.0190
General Requirements	7053.0205	7050.0210

[16] Originally the Agency intended to call the new rule Minn. R. ch. 7055, but because the number 7055 had been applied to a preexisting rule which was repealed, the Revisor's Office recommended not using 7055.

Moved to 7053 essentially intact		
Discharges of sewage	7053.0215	7050.0211
Industrial discharges	7053.0225	7050.0212
Advanced wastewater treatment	7053.0235	7050.0213
Discharges to Class 7 Waters	7053.0245	7050.0214
Effluent limits for phosphorus (this part is new; it contains existing and proposed new phosphorus limits)	7053.0255	7050.0211, 0212, 0213 and ch. 7065
Discharges to Miss. R.	7053.0265	ch. 7056
Antibacksliding	7053.0275	7050.0211, 0212, 0213
Requirements for feedlots	7053.0305	7050.0215
Requirements for aquaculture facilities	7053.0405	7050.0216

The convention in rulemaking is to underline any proposed new language, including any language that is being moved to a new location but not being changed. By this convention, all of the language in the proposed new Minn. R. ch 7053 is "new" and should be underlined[17]. However, most of Minn. R. ch. 7053 is not really "new," but is simply being moved verbatim from Minn. R. ch 7050 to 7053. To make the distinction between truly new or amended language and "moved only" language, only the truly new language will be underlined when quoted in the SONAR. This same convention is followed in Exhibit A-15b, the proposed new Minn. R. ch. 7053. **This is important so the reader can identify the parts of the rule that are proposed for change or proposed as new**. The Revisor's Office version of Minn. R. ch. 7053 is all underlined. Of course, all parts of the rule being moved and not underlined were adopted as part of one or more previous rulemakings.

2. <u>Minn. R. 7053.0115 New Title and Scope</u> [V.E. 7053 separation, need]

The proposed new rule will need a title and the Agency is proposing: "*Effluent Limits and Treatment Requirements for Discharges to Waters of the State*"

The scope of the proposed new Minn. R. ch 7053 is outlined in this part. It also includes a reference to the ambient standards in Minn. R. ch. 7050 and 7052, and a statement that if any other regulations include more stringent effluent limits than what is found in Minn. R. ch. 7053, the more stringent applies. All aspects of the "scope" are standard rule language and are needed.

> *<u>7053.0115 SCOPE</u>.*
>
> *<u>Parts 7053.0135 to 7053.0405 apply to all discharges of sewage, industrial, and other wastes to all waters of the state, both surface and underground. This chapter applies to point source and nonpoint source discharges. Other regulations of general or specific application that include any more stringent effluent limits or prohibitions are preserved</u>.*
>
> *<u>Water quality standards applicable to waters of the state are in chapter 7050. Water quality standards applicable to waters in the Lake Superior basin are in chapter 7052.</u>*

[17] The whole official Revisor's version of proposed Minn. R. ch. 7053 is underlined.

3. Minn. R. 7053.0135 General Definitions, $7Q_{10}$ and $30Q_{10}$ [V.E. 7053 separation, need]

The Agency is proposing to add a "Subpart 1" ("*Scope*," shown below) to the general definitions, which is needed to introduce the definitions that follow; and to place the individual definitions in separate subparts, rather than separate items. This is consistent with the long-standing organizational hierarchy used in Minn. R. ch. 7050 "chapter," followed by "part," "subpart," "item" and "subitem."

The Agency is proposing to duplicate a revised version of existing Minn. R. 7050.0130, subp. 2 in Minn. R. ch. 7053. This subpart lists examples of terms defined in Minn. Stat. § 115.01. The Agency is proposing to add "point source" to the list of examples of statutory definitions because Minn. R ch. 7053 deals largely with point sources. Also, the Revisor's Office suggested minor language changes to eliminate some archaic wording (shown below). The language in the two subparts, Minn. R. 7053.0135, subp. 2 and Minn. R. 7050.0130, subp. 2, will be parallel (see Section V.D.3).

The current definition of $7Q_{10}$ in existing Minn. R. 7050.0210, subp. 7 has been the source of confusion for many years, both in what a $7Q_{10}$ is exactly and how it is determined. In particular the words, "… *exceeded by 90 percent of the seven consecutive daily average flows*…" misled people on both counts. A clarification of the definition is needed. The context of the other changes provided a good opportunity to do so. No aspect of how the $7Q_{10}$ is calculated and how it is used in actual application is changing.

The definition of "$7Q_{10}$" has been revised to make it more accurate, complete and descriptive. The proposed definition is a composite of several definitions in U.S. Geological Survey documents.[18] The new wording more accurately describes the $7Q_{10}$. Also, the proposed definition describes in brief how the $7Q_{10}$ is calculated. The definition retains some of the existing wording about how to estimate a $7Q_{10}$ in the absence of a continuous flow data. An improved definition is needed to reduce the confusion over this important low flow parameter. The Agency proposes to add an abbreviated but parallel definition for **30**Q_{10} that refers back to the definition of $7Q_{10}$ for details.

7053.0135 GENERAL DEFINITIONS.

*Subpart 1. **Scope.** For the purposes of this chapter, the following terms have the meanings given them.*

*Subp. 2. **Terms defined in statute.** The terms "waters of the state," "point source," "sewage," "industrial wastes," and "other wastes," as well as any other terms for which definitions are given in the pollution control statutes, ~~as used herein~~ have the meanings*

[18] USGS. 1997. Water resources data for Minnesota. U.S. Geological Survey. St. Paul, MN.
USGS. 1987. Low-flow-frequency characteristics for continuous-record streamflow stations in Minnesota. U.S. Geological Survey, Water-Resources Investigative Report 86-4353. St. Paul, MN.

~~ascribed to~~ given them in Minnesota Statutes, sections 115.01 and 115.41, with the exception that disposal systems or treatment works operated under permit or certificate of compliance of the agency are ~~shal~~l not ~~be construed to be~~ "waters of the state."

Subp. 3. ***Seven-day ten-year low flow or 7Q$_{10}$.***

A. "Seven-day ten-year low flow" or "7Q$_{10}$" means the lowest average seven-day flow with a once in ten-year recurrence interval. A 7Q$_{10}$ is derived by identifying the lowest average flow for a seven-consecutive-day period from daily flow records for each year of record, from a continuous flow gauging station. The seven-day average low flow values for each year are arrayed in order of magnitude and fitted to a probability distribution. The 7Q$_{10}$ is the stream or river flow that is equal to or exceeded by 90 percent of the values in the distribution.

B. The period of record for determining the specific flow for the stated recurrence interval, where records are available, shall include at least the most recent ten years of record, including flow records obtained after establishment of flow regulation devices, if any. Where stream flow records are not available, the flow may be estimated on the basis of available information on the watershed characteristics, precipitation, runoff, and other relevant data. The calculations shall not be applied to lakes and their embayments which have no comparable flow recurrence interval.

Subp. 4. ***Thirty-day ten-year low flow or 30Q$_{10}$.*** *"Thirty-day ten-year low flow" or "30Q$_{10}$" means the lowest average 30-day flow with a once in ten-year recurrence interval. A 30Q$_{10}$ is derived using the same methods used to derive a 7Q$_{10}$, and the guidelines regarding period of record for flow data and estimating a 7Q$_{10}$ apply equally to determining a 30Q$_{10}$, as described in subpart 3. The calculations shall not be applied to lakes and their embayments which have no comparable flow recurrence interval.*

4. Minn. R. 7053.0155, Determination of Compliance [V.E. 7053 separation, need]

The Agency proposes to reword this provision so the language in Minn. R. ch. 7053 relates only to determining compliance with effluent limits rather than addressing compliance with both water quality standards and effluent limits. To this end, some of the specific references to compliance with water quality standards are removed. The Agency is also proposing the addition of language related to determining compliance with nonpoint source reduction measures. This addition is needed to emphasize that Minn. R. ch. 7053 (and Minn. R. ch. 7050 as well) deals with both point and nonpoint source pollution. Ascertaining the effectiveness of best management practices adopted to reduce nonpoint source pollution is as important as ascertaining compliance with point source effluent limits.

The proposed addition of the reference to 7050.0140, clarifies that beneficial uses will be defined in a separate rule. The Agency proposes to remove the last sentence regarding records. This sentence, added to the rule in 2003, will be retained in Minn. R. 7050.0150. It is not needed in the Minn. R. ch. 7053 counterpart.

The Revisor's Office recommended changing *"from the viewpoint of adequately reflecting"* to *"to adequately reflect."*

7053.0155 DETERMINATION OF COMPLIANCE.

In making tests or analyses of the waters of the state, sewage, industrial wastes, or other wastes to determine ~~compliance with the standards and water quality condition~~ water quality condition and compliance with effluent limits and nonpoint source reduction measures, samples ~~shall~~ must be collected in a manner and place, and of such type, number, and frequency, as may be considered necessary by the agency *~~from the viewpoint of~~ to adequately reflect~~ing~~ the condition of the waters, the composition of the effluents, and the effects of the pollutants upon the uses specified in part 7050.0140 ~~specified uses~~. The samples ~~shall~~ must be collected, preserved, and analyzed following accepted quality control and quality assurance methods, and according to the procedures in Code of Federal Regulations, title 40, part 136. The agency may accept or may develop other methods, procedures, guidelines, or criteria for collecting, and analyzing effluent samples and measuring water quality characteristics. ~~The commissioner will retain a record of all impairment decisions using the factors in this part, including all supporting data, for a minimum of eight years.~~*

For a discussion of proposed changes to the variance provision, Minn. R. 7053.0195, see Sections VI.D and X.D.

5. Minn. R. 7053.0205, General Requirements for Dischargers to Waters of the State [V.E. 7053 separation, need]

This part of proposed Minn. R. ch. 7053 will contain general narrative provisions pertaining to minimum levels of wastewater treatment for point sources established to avoid nuisance conditions and pollution of the waters of the state. These provisions are now in existing Minn. R. 7050.0210. All but two of the subparts in this part are being moved essentially unchanged to Minn. R. ch. 7053, except for the need to change citations to other parts of the rules and to clarify language consistent with the new locations of these provisions. These proposed changes are discussed here and in the next two sections (also see Table I-6).

The Agency is proposing relatively more extensive changes to two of the subparts being moved from existing Minn. R. ch. 7050 to Minn. R. ch. 7053. The first is Minn. R. 7053.0205, subp. 4 (shown below). The Agency is proposing to revise this provision so it pertains more exclusively to wastewater treatment and less to ambient water quality conditions. Thus, "effluent quality," will replace "water quality," and "five-day carbonaceous biochemical oxygen demand" ($CBOD_5$) will replace "dissolved oxygen." Dissolved oxygen (DO) is used in the current provision as an example of an important water quality condition in surface waters; and the effluent characteristic most closely associated with receiving stream DO is $CBOD_5$. Therefore, it is logical to replace DO with $CBOD_5$ as the appropriate example in the context of the new Minn. R ch. 7053. These changes do not change the main requirement of the existing Minn. R. 7050.0210, subp. 4, which is wastewater treatment plants should be operated to provide the best level of treatment reasonably possible to protect receiving stream water quality. The proposed revised Minn. R. 7050.0210, subp. 4 is discussed in Section V.D.5.

The Revisor's Office recommended changing the word "their" to "the" in the fourth line and the Agency agrees that this makes the rule clearer. The reference to which "their" refers has been obscured as the rule has been amended over the years.

> [Minn. R. 7053.0205] *Subp. 4.* ***Highest levels of ~~water quality~~ <u>effluent quality</u>***. *The highest levels of ~~water quality~~ <u>effluent quality</u>, including, but not limited to, ~~dissolved oxygen~~ <u>five-day carbonaceous biochemical oxygen demand</u>, ~~which~~ <u>that</u> are attainable ~~in the waters of the state by~~ <u>through</u> continuous operation at ~~their~~ <u>the</u> maximum capability of all primary and secondary units of treatment works or their equivalent~~,~~ discharging effluents into the waters of the state~~,~~ ~~shall~~ <u>must</u> be maintained in order to enhance conditions for the specified uses.*

The Agency is also proposing some changes to the mixing zone provision which will be in Minn. R. 7053.0205, subp. 5. The proposed language below is shown as all new (underlined) due to the organizational changes; in fact, very little of the actual language has changed. Included are minor changes in language recommended by the Revisor's Office that are not shown. The Agency is proposing to split the first part of the language in existing Minn. R. 7050.0210, subp. 5 from one paragraph into three, and the Revisor recommended making these paragraphs items, which are shown below. The splitting into paragraphs and items is needed to make the subpart easier to read and to make it easier to cite specific provisions. Other changes are needed so the cross references to other parts of the rule are consistent with their new locations.

The first proposed change is to add "*and compliance with water quality standards*" to the title. This indicates that the provision not only grants dischargers dilution, but that the discharge must be controlled to meet downstream water quality standards. The references to existing Minn. R. 7050.0211 and 7050.0212 in "… *in compliance with part* 7050.0211 or 7050.0212" are being replaced with a reference to the new chapter 7053. This change is needed not only because the Minn. R. 7050.0211 and 7050.0212 are being moved, but because Minn. R. 7053.0205, subp. 5 is applicable to other parts of the proposed Minn. R. ch. 7053. A more inclusive reference is needed.

Similarly, the references to "… *the applicable water quality standards*" and "… *applicable standards.*" in the first and second paragraphs need to be more explicit because the applicable water quality standards will be in a different rule. A reference to the standards in Minn. R. ch. 7052 needs to be added as well because the water quality standards in the Great Lakes Initiative rule are also "*applicable.*"

> ~~*Subp. 5.* ***Mixing zones.*** *Reasonable allowance will be made for dilution of the effluents, which are in compliance with part 7050.0211 or 7050.0212, as applicable, following discharge into waters of the state. The agency, by allowing dilution, may consider the effect on all uses of the waters of the state into which the effluents are discharged. The extent of dilution allowed regarding any specific discharge as specified*~~

~~*in subpart 7 shall not violate the applicable water quality standards. Means for expediting mixing and dispersion of sewage, industrial waste, or other waste effluents in the receiving waters are to be provided so far as practicable when deemed necessary by the agency to maintain the quality of the receiving waters in accordance with applicable standards. Mixing zones must be established by the agency on an individual basis, with primary consideration being given to the following guidelines:*~~

[Minn. R. 7053.0205] *Subp. 5.* ***Mixing zones <u>and compliance with water quality standards</u>***.

<u>*A. Reasonable allowance must be made for dilution of the effluents that are in compliance with this chapter, following discharge into waters of the state. The agency, by allowing dilution, shall consider the effect on all uses of the waters of the state into which the effluents are discharged. The extent of dilution allowed regarding any specific discharge as specified in subpart 7 must not violate the applicable water quality standards in chapters 7050 and 7052, including the nondegradation requirements contained in those chapters. This subpart also applies in cases where a Class 7 water is tributary to a Class 2 water.*</u>

<u>*B. Means for expediting mixing and dispersion of sewage, industrial waste, or other waste effluents in the receiving waters must be provided so far as practicable when deemed necessary by the agency to maintain the quality of the receiving waters according to chapters 7050 and 7052.*</u>

The last sentence in the first paragraph of the existing language in Minn. R. 7050.0210, subp. 5, plus existing items A to F are proposed to be moved into the new item "C." Items A to F, which provide guidelines on mixing zone characteristics, are not being changed except that the items will become subitems in item "C." The introductory sentence to item "C" is show below but the subitems are not shown.

<u>C</u>. Mixing zones must be established by the agency on an individual basis, with primary consideration being given to the following guidelines:

6. <u>Minn. R. 7053.0205, subp. 7, Minimum Stream Flow</u> [V.E. 7053 separation, need]

This provision specifies the stream flow that is used to calculate effluent limits when dilution is not adequate to protect downstream water quality standards. For most pollutants, this flow is the $7Q_{10}$. It also specifies that water quality standards are to be met at all river and stream flows that equal or exceed the $7Q_{10}$. These basic provisions, in existing Minn. R. 7050.0210, subp. 7, are not being changed.

As noted, the Agency is proposing to include an expanded and more detailed definition of the $7Q_{10}$ (plus the $30Q_{10}$ and $122Q_{10}$) in Minn. R. 7053.0135 (Section V.E.3, also Section V.D.8). This allows the Agency to remove the confusing and less detailed definition in this part of the rule and to replace it with a citation to the new definition(s). This change is needed, consistent with the need to improve the definition of $7Q_{10}$, and to move that definition to join other definitions of general applicability in Minn. R. 7053.0135. The Revisor's Office recommended using items "A" and "B" for the two paragraphs and changing "critical month(s)" to "critical month or months."

[Minn. R. 7053.0205] *Subp. 7. **Minimum stream flow**.*

A. Dischargers of sewage, industrial waste, or other wastes ~~shall~~ must be controlled so that the water quality standards ~~will be~~ are maintained at all stream flows ~~which~~ that are equal to or greater than the $7Q_{10}$ for the critical month or months, except for the purpose of setting ammonia effluent limits. ~~90 percent of the seven consecutive daily average flows of record (the lowest weekly flow with a once in ten-year recurrence interval) for the critical month(s), except for the purpose of setting ammonia effluent limits.~~ Dischargers of ammonia in sewage, industrial waste, or other wastes ~~shall~~ must be controlled so that the ammonia water quality standard ~~will be~~ is maintained at all stream flows ~~which~~ that are equal to or exceeded by the $30Q_{10}$ flow for the critical month or months. ~~90 percent of the 30 consecutive daily average flows of record (the lowest 30-day flow with a once in ten-year recurrence interval) for the critical month(s). The period of record for determining the specific flow for the stated recurrence interval, where records are available, shall include at least the most recent ten years of record, including flow records obtained after establishment of flow regulation devices, if any. The calculations shall not be applied to lakes and their embayments which have no comparable flow recurrence interval. Where stream flow records are not available, the flow may be estimated on the basis of available information on the watershed characteristics, precipitation, run-off, and other relevant data.~~

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

7. Minn. R. 7053.0205, subp. 8, Water Quality-based Effluent Limits [V.E. 7053 separation, need]

The Agency is proposing to include the words " *including the nondegradation requirements contained in those chapters*." along with the new citation (see below). The Agency feels this phrase is needed to highlight nondegradation in the context of setting effluent limits and defining treatment requirements. The current nondegradation provisions in Minn. R. 7050.0180 and 7050.0185, while addressing both point and nonpoint source pollution, clearly emphasize the control of pollutants from point sources. A reference back to the relevant parts of Minn. R. ch. 7050 is needed as a reminder. The proposed addition is merely a statement of fact and is not a change in emphasis as to where nondegradation priorities should be placed.

[Minn. R. 7053.0205] *Subp. 8. **Water quality based effluent limits**. Notwithstanding parts ~~7050.0213~~ 7053.0235 and ~~7050.0214~~ 7053.0245, the agency may require a specific discharger to meet effluent ~~limitations~~ limits for specific pollutants or whole effluent toxicity ~~which~~ that are necessary to maintain the water quality of the receiving water at the standards ~~of quality and purity~~ established ~~by this chapter~~ in chapters 7050*

<u>and 7052, including, the nondegradation requirements contained in those chapters.</u> Any effluent ~~limitation~~ <u>limit</u> determined to be necessary under this ~~section~~ <u>subpart and part 7053.0235</u> ~~shall~~ <u>may</u> only be required of a discharger after the discharger has been given notice of the specific effluent ~~limitations~~ <u>limits</u> and an opportunity for public hearing provided that compliance with the requirements of chapter 7001 regarding notice of national pollutant discharge elimination system and state disposal system permits ~~shall satisfy~~ <u>satisfies</u> the notice and opportunity for hearing requirements of this subpart.

As elsewhere, references need to be changed consistent with the separation of the Minn. R. ch. 7050 into two rules.

As part of the change from referencing the standards in "*this chapter*", to referencing chapters 7050 and 7052, the Agency is removing the words "*of quality and purity*", consistent with the changes described in Section V.F.2.

The subparts of Minn. R. 7053.0205 are proposed to be re-numbered consecutively as needed.

8. <u>Changes to Citations to Other Parts of Minn. R. ch. 7053 and to Other Rules Cited in Minn. R. 7053</u> [V.E. 7053 separation, need]

The parts of Minn. R. ch. 7050 that are being proposed to be moved to Minn. R. ch. 7053 include approximately 44 citations to other parts within the current Minn. R. ch. 7050. All these citations need to be changed to match the new locations of provisions in the proposed revised Minn. R. ch. 7050 and new 7053. These 44 citations are existing language and do not include several citations added as part of proposed all new language in Minn. R. ch. 7053.

Existing Minn. R. 7050.0212 to 7050.0216 include approximately 36 (out of the 44 total) citations to other parts of Minn. R. 7050. These are the parts of Minn. R. ch. 7050 being moved essentially intact to Minn. R. ch. 7053 (proposed Minn. R. 7053.0225 to 7053.0405). Again, the citations must to be changed to match the new locations of provisions in the proposed revised Minn. R. ch. 7050 and 7053. Proposed Minn. R. 7053.0115 to 7053.0205, which are the parts of the new Minn. R. ch. 7053 with the most new language, contain the remaining eight existing citations that need to be changed.

In three places in Minn. R. 7053 (shown below) the proposed new citation is more inclusive. All of Minn. R ch. 7053 (*this chapter*) and all of Minn. R. ch. 7050 are proposed to be cited instead of a citation to just certain parts of existing Minn. R. ch. 7050 (addition of cite to Minn. R. ch. 7052 is discussed below). The existing references to the parts of Minn. R. ch. 7050 include the bulk of the current chapter 7050.[19] Thus, little of substance is added by citing the entire chapter, and the entire chapter is applicable regardless under the severability provisions. In all these cases the Agency's intent is that none of the proposed citation changes, adds or subtracts any applicable provisions, or affect any substantive aspect of the rules.

[19] The current citations leave out the narrative parts of the ambient standards in Minn. 7050.0221 – 7050.0227 and the listing of specific use classifications in the first example, and the requirements for feedlots and the listing of specific use classifications in the second example.

[Minn. R. 7053.0205] *Subp. 6.* ***Other requirements preserved.*** *The requirements of this chapter, and specifically the requirements in parts ~~7050.0211 to 7050.0212~~ 7053.0215 and 7053.0225, are in addition to any requirement imposed on a discharge by the Clean Water Act, United States Code, title 33, sections 1251 et seq., and its implementing regulations. In the case of a conflict between the requirements of ~~parts~~ **~~7050.0110 to 7050.0220~~ this chapter, chapters 7050 and 7052**, and the requirements of the Clean Water Act or its implementing regulations, the more stringent requirement controls*. (emphasis added)

[Minn. R. 7053.0205] *Subp. 11 ~~12~~.* ***Liquid substances.*** *Liquid substances ~~which~~ that are not commonly considered to be sewage or industrial waste, but ~~which~~ that could constitute a pollution hazard, ~~shall~~ must be stored ~~in accordance with~~ according to chapter 7151. Other wastes as defined by law or other substances ~~which~~ that could constitute a pollution hazard, including substances from nonpoint sources and households, ~~shall~~ must not be deposited in any manner such that the same may be likely to gain entry into any waters of the state in excess of or contrary to any of the standards ~~herein adopted,~~ **in this chapter and chapters 7050 and 7052** or cause pollution as defined by law.* (emphasis added)

[Minn. R. 7053.0405] *Subp. 4.* ***Additional requirements.*** *Except as expressly excluded in this part, the construction, operation, and maintenance of a concentrated aquatic animal production facility shall comply with the requirements of ~~parts 7050.0110 to 7050.0214 and 7050.0217 to 7050.0227~~* ***this chapter and chapters 7050 and 7052***. (emphasis added)

In seven additional locations in Minn. R. ch. 7053 the Agency is proposing to add a reference to Minn. R. ch. 7050 (and Minn. R. ch. 7052, discussed below). The citation of the specific rules will replace a reference to "applicable water quality standards" in general. This change does not have the effect of expanding these eight citations because the reference to "water quality standards" includes all the standards in Minn. R. ch. 7050 (and 7052) even though the rules are not explicitly cited. This change is needed because of the separation of Minn. R. ch. 7050 into two rules. The location of these eight citations is listed below and Minn. R. 7053.0275, subp. 2 is shown as an example.

- 7053.0115 (shown in Section V.E.2)
- 7053.0205, subp. 5 items A and B (shown in Section V.E.5)
- 7053.0205, subp. 8 (shown in Section V.E.7)
- 7053.0205, subp. 13 (not shown)
- 7053.0235, subp. 1 (not shown)
- 7053.0275, subp. 2 (shown below)

[Minn. R. 7053.0275, subp. 2] *E. In all cases, the beneficial uses and the water quality standards in chapters 7050 and 7052 ~~shall~~ must be maintained in the receiving water.*

The addition of the citation to Minn. R. ch. 7052 in the proposed new Minn. R. ch. 7053 is an important change. But this addition serves only to update the rule. The citations in the current rule proposed for change predate the adoption of Minn. R. ch. 7052. Minnesota R. ch. 7052 contains water quality standards and other provisions applicable only to the Lake Superior basin. This rule is applicable regardless of whether or not it is specifically cited. The Agency is proposing to cite Minn. R. ch. 7052 to update the rule, and to remind readers that Minn. R. ch. 7052 is applicable and should be consulted if the waterbody, discharge, or activity of interest is located in the Lake Superior basin. It changes nothing as far as the applicability of Minn. ch. 7052, how it is currently implemented or how it will be implemented in the future.

As part of the change from referencing the standards in "*this chapter*", to referencing chapters 7050 and 7052, the Agency is removing the words "*of quality and purity*", consistent with the changes described in Section V.F.2.

In conclusion, the Agency's intent with all the proposed changes to rule citations, including those shown above, is to direct the reader to the proper provision in the rule and not affect any substantive aspect of the rules.

9. Minn. R. 7053.0235, Protection of Class 2 Waters Downstream from Class 7 Waters [V.E. 7053 separation, need]

Existing Minn. R. 7050.0214, subp. 1 establishes an effluent limit of 15 mg/L carbonaceous biochemical oxygen demand ($CBOD_5$) for discharges to limited resource value waters (Class 7). Subpart 3 of the same part says that more stringent effluent limits may be imposed, if needed to protect water quality standards in the Class 2 water downstream from the Class 7 reach.

Existing Minn. R. 7050.0213 establishes a 5 mg/L $CBOD_5$ limit for dischargers to Class 2 waters, to protect Class 2 standards in very low flow receiving streams. The 5 mg/L $CBOD_5$ limit does not apply to Class 7 waters, except when the downstream Class 2 water is at risk. The Agency is not proposing to change this exception for Class 7 waters, but is proposing to add a clause to Minn. R. 7053.0235 that references the provisions of Minn. R. 7053.0245, subp. 3. The clause, shown below, is needed to remind the reader that effluent limits more stringent than 15 $CBOD_5$ may be needed. The proposed addition simply cites existing requirements and will not impact any regulated party's effluent limits.

> [Minn. R. 7053.0235] *Subp. 1.* ***Inadequate dilution.*** *…The five milligram per liter limit shall not apply to discharges to surface waters classified as limited resource value waters~~,~~ pursuant to parts ~~7050.0200~~ 7050.0140, subpart 8, and 7050.0400 to 7050.0470~~,~~ except as may be needed to comply with part 7053.0245, subpart 3.*

10. Minn. R. 7053.0255, Consolidation and Reorganization of Phosphorus Effluent Limits [V.E. 7053 separation, need]

The Agency is proposing to reorganize and consolidate the phosphorus effluent (TP) limits in a newly created subpart of Minn. R. 7053.0255. This change will bring all the provisions that include TP limits, including the proposed extension of TP limits to new or expanded facilities above a certain size, into one place in the new rule. Currently, TP limits are found in two rules, Minn. R. ch. 7050, and 7065. The separation of Minn. R. ch. 7050 into two rules provides an ideal time to consolidate the TP limits into one place and to repeal the outdated Minn. R. ch. 7065 (see Sections VI.J and X.J). Proposed Minn. R. 7053.0255 follows:

7053.0255 PHOSPHORUS EFFLUENT LIMITS FOR POINT SOURCE DISCHARGES OF SEWAGE, INDUSTRIAL, AND OTHER WASTES.

*Subpart 1. **Scope**. The phosphorus effluent limits in this part are in addition to the effluent limits specified elsewhere in this chapter. In the event of any conflict between this part and other applicable regulations, the more stringent requirement applies.*

*Subp. 2. **Definitions.** For the purposes of this part the following definitions apply. Other relevant definitions are found in part 7050.0150, subpart 4.*

A. "122-day ten-year low flow" or "$122Q_{10}$" means the lowest average 122-day flow with a once in ten-year recurrence interval. A $122Q_{10}$ is derived using the same methods used to derive a $7Q_{10}$, and the guidelines regarding period of record for flow data and estimating a $7Q_{10}$ apply equally to determining a $122Q_{10}$ as described in part 7053.0135, subpart 3.

B. "Affects" means a measurable increase in the adverse effects of phosphorus loading as determined by monitoring or modeling, including, but not limited to, an increase in chlorophyll-a concentrations, a decrease in water transparency, or an increase in the frequency or duration of nuisance algae blooms, from an individual point source discharge.

C. "Expanded discharge" means a disposal system that after May 1, 2008 discharges more than 1,800 pounds of total phosphorus per year to a surface water on an annual average basis, and increases in wastewater treatment capacity as indicated by an increase in the:
(1) design average wet weather flow for the wettest 30-day period for point source dischargers of sewage with a continuous discharge, typically a mechanical facility;
(2) design average wet weather flow for the wettest 180-day period for point source dischargers of sewage with a controlled discharge, typically a pond facility; or
(3) design average daily flow rate for dischargers of industrial or other wastes.

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

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

F. "New discharge" means a discharge that was not in existence before May 1, 2008 and discharges more than 1,800 pounds of total phosphorus per year.

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

H. "Shallow lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of 15 feet or less, or with 80 percent or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the summer. The quality of shallow lakes will permit the propagation and maintenance of a healthy indigenous aquatic community, and they will be suitable for boating and other forms of aquatic recreation for which they may be usable. For purposes of this chapter, shallow lakes will be differentiated from wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186, subpart 1a.

Subp. 3. ***Total phosphorus effluent limits****.*

A. Phosphorus removal to one milligram per liter is required when subitem (1), (2), or (3) applies:

(1) the discharge of effluent is directly to or affects a lake, shallow lake, or reservoir;

(2) the discharge is to the specific basins and water bodies designated in subpart 5; or

(3) the discharge is new or expanded as defined in subpart 2 except when the discharger can demonstrate to the commissioner that the discharger qualifies for an alternative phosphorus limit as provided in subpart 4.

B. ~~In addition,~~ If a phosphorus effluent limit is required under item A, removal of nutrients from all wastes ~~shall~~ must be provided to the fullest practicable extent wherever sources of nutrients are considered to be actually or potentially detrimental to preservation or enhancement of the designated water uses. Dischargers required to control nutrients ~~by~~ under this ~~subpart~~ part are subject to the variance provisions of ~~part~~ parts 7000.7000 and 7053.0195.

Subp. 4. ***Alternative phosphorus effluent limits for new or expanded discharges.*** *New or expanded discharges subject to a one milligram per liter phosphorus effluent limit in subpart 3, item A, subitem (3) may request an alternative limit or no limit if one or more of items A to C apply. New or expanded discharges are defined in subpart 2. The exemptions in this subpart do not apply to facilities that discharge directly to or affect a lake, shallow lake, or reservoir or to discharges to the waters listed in subpart 5. Dischargers seeking an alternative limit due to very high per capita treatment costs or economic hardship must apply for a variance under parts 7000.7000 and 7053.0195.*

The information submitted to the commissioner for consideration of an alternative limit must include, at a minimum, a description of the treatment technology used, influent and effluent total phosphorus concentrations, a phosphorus management plan for the facility, descriptions of any measures already taken to reduce phosphorus sources to the facility, and expected reductions in phosphorus concentrations following implementation of the phosphorus management plan. The discharger may qualify for an alternative total phosphorus limit or no limit if it can demonstrate:

A. the discharge is to or upstream of a water body listed on the applicable impaired water list (section 303(d) of the Clean Water Act) and the total maximum daily load study is complete and approved by the United States Environmental Protection Agency at the time the new or expanding facility is in the planning and design phase. In this case the total maximum daily load will determine the applicable phosphorus effluent limit. The total maximum daily load study must have considered impacts from phosphorus loading on the impaired water body. In this case the total maximum daily load study will determine the applicable phosphorus effluent limit;

B. the environmental benefits to be achieved by meeting a phosphorus limit are outweighed or negated by the environmental harm caused by meeting a limit; or

C. the treatment works, regardless of the type of treatment technology, must use chemical addition to achieve compliance with the one milligram per liter limit, and the discharge is to a receiving stream in a watershed listed in subitems (1) to (3). In this case the discharger may be granted a seasonal one milligram per liter limit, applicable from May 1 through September 30 and not applicable from October 1 through April 30:

(1) the lower Mississippi River and its tributaries from the mouth of the Chippewa River in Wisconsin to the Minnesota border;
(2) the Bois de Sioux and Red Rivers and their tributaries from the southern end of Lake Traverse at Browns Valley to the Canadian border; and
(3) the Missouri, Des Moines, and Cedar Rivers and their tributaries in Minnesota.

Subp. 5. ***Designated waters****. The one milligram phosphorus limit established in subpart 3 applies to the waters designated in items A to F.*

A. All intrastate waters lying within the drainage basin of Lake Superior in the counties of Aitkin, Carlton, Cook, Itasca, Lake, Pine, and St. Louis (Townships 45 to 65 North, Ranges 7 East to 23 West).

B. The interstate waters of Lake St. Croix in Washington County (Townships 26 to 30 North, Range 20 West).

C. The St. Louis River from its source at Seven Beaver Lake (Township 58 North, Range 12 West) to and including St. Louis Bay (Townships 49 and 50 North, Ranges 14 and 15 West) and Superior Bay (Townships 49 and 50 North, Ranges 13 and 14 West).

D. The Mississippi River from its source to the Blandin Dam at the outlet of Paper Mill Reservoir in the city of Grand Rapids approximately 400 feet upstream from the bridge on U.S. Highway 169 including Lake Andrusia (Township 146 North, Range 31 West), Lake Bemidji (Townships 146 and 147 North, Range 33 West), Cass Lake (Townships 145 and 146 North, Ranges 30 and 31 West), Lake Itasca (Township 143 North, Range 36 West), Pokegama Lake (Townships 54 and 55 North, Ranges 25 and 26 West), and Winnibigoshish Lake (Townships 145, 146, and 147 North, Ranges 27, 28, and 29 West).

E. The Little Minnesota River and Big Stone Lake from the South Dakota border crossing to the outlet of Big Stone Lake at the dam immediately upstream from the U.S. Highway 12 bridge in Ortonville.

F. Albert Lea Lake (Township 102 North, Ranges 20 and 21 West) in Freeborn County.

*Subp. 6. A**veraging period for phosphorus limit**. The phosphorus limit required under subpart 3 must be a calendar month arithmetic mean unless the commissioner finds, after considering the criteria listed in items A and B, that a different averaging period is acceptable. In no case shall the one milligram limit exceed a moving mean of 12 monthly values reported on a monthly basis, or a simple mean for a specified period, not to exceed 12 months. Calendar month effluent limits in effect ~~on~~ as of February 7, 2000, must remain in effect unless an assessment of the criteria listed in items A and B indicate a different averaging period is acceptable. An ~~different~~ averaging period other than monthly is acceptable when:*

A. ~~the effects of the phosphorus loading from the facility on the receiving water or downstream water resources is generally not measurable.~~ there is no measurable or predictable difference in the adverse effects of the phosphorus loading from the facility on the receiving water or downstream water resources compared to the loading that would result using a 30-day average limit; and

B. the treatment technologies being considered offer environmental, financial, or other benefits.

Subpart 1 of Minn. R 7053.0255 is a brief statement of the scope of this part, followed by eight pertinent definitions in subpart 2. The definitions are for terms, listed below, that are used in Minn. R. 7053.0255.

- $122Q_{10}$
- Affects
- Expanded discharge
- Lake
- Measurable increase or measurable impact
- New discharge
- Reservoir
- Shallow lake

Subpart 3 contains the 1 mg/L TP limit for three categories of waterbodies or situations. First (item A), a TP limit is applicable, if the discharge is directly to or affects a lake, shallow lake or reservoir. This is the existing TP limit which has been in Minn. R. ch. 7050 at least since 1973. The term "shallow lake" has been added to the language because the Agency plans to make a distinction between "shallow" and "deep" lakes in the proposed eutrophication standards. The application of existing Minn. R. 7050.0211, subp. 1a has not distinguished lakes by depth in the past. This addition is needed to be sure the existing TP limit continues to be applicable to all lakes, both deep and shallow, as has been the case since 1973. This addition does not change the existing TP limit or how it is applied.

Second (item B), a TP limit is applicable if the discharge is to any of the specific waterbodies to which a TP limit applies, as listed in the existing Minn. R. ch. 7065. The Agency proposes to move these applicable TP limits from Minn. R. ch. 7065 to Minn. R. 7053.0255, subp. 5. This will consolidate the TP limits in one place and allow the repeal of Minn. R. ch. 7065.

Third (item C, proposed), a TP limit is applicable to new or expanding discharges that discharge more than 1,800 pounds of TP per year. Subpart 4 is part of the proposed extension of the TP limit to new or expanding facilities. This proposed change to the rules will be discussed in detail in SONAR Book II. Also discussed in Book II are the proposed changes to Minn. R. 7053.0255 subp. 3, item B (treatment to best practicable extent), and Minn. R. 7053.0255, subp. 6 (averaging periods for TP limits).

In summary, the consolidation of the TP limits in one place is needed. This will simplify application of TP limits as they become more commonplace in permits. A reorganization of the TP limits is needed to accommodate the proposed extension of the TP limit and the proposed move of the waterbody-specific limits (now in Minn. R. ch. 7065) into Minn. R. 7053.0255.

F. MINN. R. CH. 7050, NON-SUBSTANTIVE CHANGES TO RULE LANGAUGE NOT ASSOCIATED WITH THE DIVISION INTO TWO RULES [V. need]

1. <u>Introduction</u> [V.F. 7050 non-substantive, need]

The proposed changes discussed in this Section have a purpose other than to support the rule separation and are generally minor but more comprehensive than "housekeeping." They range from the removal of outdated, redundant or confusing language; the addition of language to clarify meaning; the reformatting of some parts to improve the usability; and changes to reduce common errors made in the interpretation of the rules. In some cases, the changes being proposed are long overdue. Some of the proposed changes discussed in this Section are "prompted" by the division of the Minn. R. ch. 7050 into two rules, in the sense that the changes required to achieve the separation provide an opportunity to accomplish some other non-substantive changes to the water quality rule language mostly unrelated to the split.

Included with the discussion of some of the changes may be some very minor wording changes being proposed in the same part of the rule. These "housekeeping" changes are included here as a convenience and to save space by avoiding having to re-introduce the same part of the rule to cover the housekeeping change. The other proposed housekeeping changes are discussed in Section V.H.

Proposed changes are addressed in the order they appear in the revised Minn. R. ch. 7050. All of the proposed changes discussed in this Section deal with the revision of Minn. R. ch. 7050. None is intended to change the overall meaning of the rule. They are non-substantive in this sense. Proposed non-substantive changes to provisions dealing with use classifications are discussed all in one place in SONAR Book III, Section IX. The proposed substantive changes in use classification for specific waterbodies, including the proposed new limited resource value waters, are discussed in SONAR Book III, Sections X and XI.

2. Minn. R. ch. 7050, New Title [V.F. 7050 non-substantive, need]

The Agency is proposing to update the title of Minn. R. ch. 7050 to make it more consistent with the contents of the rule, as shown below. The Agency is also proposing to remove the antiquated phrase, "*quality and purity*" from the title and throughout Minn. R. ch. 7050

> *WATER QUALITY STANDARDS FOR PROTECTION OF ~~QUALITY AND PURITY~~ WATERS OF THE STATE*

3. Minn. R. 7050.0130, subp. 3, and Minn. R. 7053.0135, subp. 3, Seven-day Ten-year Low Flow or $7Q_{10}$ [V.F. 7050 non-substantive, need]

The addition of the definition of the $7Q_{10}$ to Minn. R. 7050.0130 is attributed to the split of Minn. R. ch. 7050 into two rules, but is mentioned again in this Section because the concept of the $7Q_{10}$ low flow is important to both water quality standards and the setting of effluent limits. The $7Q_{10}$ is defined in the current Minn. R. ch. 7050 in a part proposed to be moved to the new Minn. R. ch. 7053. The Agency believes it is important to have the definition in both rules as a convenience to the reader, and this provides the opportunity to improve the definition. The need for the improved definition is discussed in Section V.E.3.

4. Minn. R. 7050.0130, Wetland-related Definitions Moved, and Other Changes to This Part [V.F. 7050 non-substantive, need]

Minnesota R. 7050.0130 contains general definitions. The Agency proposes to add a subpart 1 to this part called "scope" to introduce the definitions or references to definitions that follow (see below). This is analogous to the proposed subpart 1 in Minn. R. 7053.0135 discussed in Section V.E.3. Each definition is being assigned its own subpart. This change is needed to maintain the long-standing "chapter", "part", "subpart", "item" hierarchy of administrative rule organization used in Minn. R. ch. 7050. The current rule skips the "subpart" step and goes directly from "part" to "item."

7050.0130 <u>GENERAL</u> DEFINITIONS.

*<u>Subpart 1. **Scope.** For the purposes of this chapter, the following terms have the meanings given them.</u>*

Existing Minn. R. 7050.0130, subp. 2 lists examples of terms defined in Minn. Stat. § 115.01; the Agency is retaining this subpart but proposing to add "point source" to the list of examples because the term is used in the definition of nonpoint source that follows (Minn. R. 7050.0130, subp. 5). Also, "point source" is proposed to be added to the analogues subpart in Minn. R. ch. 7053 (Minn. R. 7053.0135, subp. 2). This will retain parallel language between the two subparts in the two rules. Finally, the Revisor's Office suggested minor language changes to eliminate some archaic wording (shown in Section V.E.3).

The Agency is proposing to move the definitions of "physical alterations" and "wetlands" from existing Minn. R. 7050.0130 to Minn. R. 7050.0186 with no changes (shown in Section V.F.8). Minnesota R. 7050.0186 is the main part of the rule that deals with wetland protection. A new subpart, 1a, is being created for these definitions in Minn. R. 7050.0186. This move will help consolidate the all the wetland-related provisions into one part of the rule. The move is needed to make it easier for readers to locate provisions covering wetland protection.

Finally, the Agency proposes to add a clause to Minn. R. 7050.0130, subp. 7 to inform readers that other definitions are found throughout the rule. This subpart, shown below, is needed so readers know that only definitions of a general nature are in Minn. R. 7050.0130, and that many definitions are located throughout the rule, in the part where they are used and most relevant. The Revisor's Office recommended removing "at hand" as unneeded.

*~~G~~ <u>Subp. 7</u>. **Other terms**. Other terms and abbreviations used ~~herein~~ <u>in this chapter are defined in the part in which they are used</u>. <u>Terms and abbreviations used in this chapter</u> which are not specifically defined in applicable federal or state law shall be construed in conformance with the context, and in relation to the applicable section of the statutes pertaining to the matter ~~at hand~~, and current professional usage.*

5. Minn. R. 7050.0140, Use Classification for Waters of the State [V.F. 7050 non-substantive, need]

The current rule introduces the general concept of a use classification system in Minn. R. 7050.0140 and then outlines the classification system in more detail in Minn. R. 7050.0200. This is an unnecessary redundancy and the Agency is proposing to consolidate these two parts into one, Minn. R. 7050.0140. Portions of the introductory sentence in existing Minn. R. 7050.0140 is not needed and is proposed to be deleted. The relevant parts of the first sentence, the reference to statutes and the statement about priority, are incorporated into subpart 1 of the proposed Minn. R. 7040.0140. Otherwise, the use class descriptions in existing Minn. R. 7050.0200 are moved intact into the new Minn. R. 7050.0140. This change, shown below, is needed to simplify and consolidate the rule.

7050.0140 ~~USES OF~~ USE CLASSIFICATIONS FOR WATERS OF THE STATE.

~~The classifications are listed separately in accordance with the need for water quality protection, considerations of best use in the interest of the public, and other considerations, as indicated in Minnesota Statutes, section 115.44.~~

Subpart 1. ***Introduction****. Based on considerations of best usage and the need for water quality protection in the interest of the public, and in conformance with the requirements of Minnesota Statutes, section 115.44, the waters of the state are grouped into one or more of the classes in subparts 2 to 8. The classifications are listed in parts 7050.0400 to 7050.0470. The classifications should not be construed to be ~~an~~ in order of priority, nor considered to be exclusive or prohibitory of other beneficial uses.*

In Minn. R. 7050.0140, subp. 8 "*Class 7 Limited resource value waters*," the reference to the $7Q_{10}$ low flow has been shortened as follows: "*Water quantities in these waters are intermittent or less than one cubic foot per second at the ~~once in ten year, seven-day low flow~~ $7Q_{10}$ flow as defined in part ~~7050.0210, subpart 7~~ 7050.0130, subpart 3*." This change is needed to reflect the enhanced definition of $7Q_{10}$.

6. Minn. R. 7050.0150, Change in Heading [V.F. 7050 non-substantive, need]

The heading for Minn. R. 7050.0150 is proposed for change to more explicitly describe the contents of this part. The current heading is: "*Determination of compliance with water quality standards and water quality condition*". The proposed new heading is: "*Determination of water quality, biological and physical conditions, and compliance with standards*". This change is needed to make the heading of this part better reflect its contents.

7. Minn. R. 7050.0185, Nondegradation for All Waters [V.F. 7050 non-substantive, need]

Consistent with the addition of the expanded definition of $7Q_{10}$, the sentence quoted below can be shortened.

[7050.0185, subp. 2, item G, subitem (3)] *(b) the entire ~~once in ten year, seven-day~~ 7Q_{10} ~~low~~ flow of the receiving water as defined in part ~~7050.0210~~ 7050.0130, subpart 3 ~~7~~; and*

8. Minn. R. 7050.0186, Wetland Standards [V.F. 7050 non-substantive, need]

The Agency is proposing to change the title of this part from "*wetland mitigation*" to "*wetland standards and mitigation*". The new title will better match the contents of this subpart, which are more inclusive than just provisions dealing with the wetland mitigation sequence. Existing Minn. R. 7050.0186 includes general water quality standards for the protection of wetlands now; and, with the proposed consolidation of wetland-related provisions in this part, it will be somewhat broader in scope than it is now.

Minnesota R. 7050.0186 was added to Minn. R. ch. 7050 in 1994. At the same time, "wetland-related" language was added to several other parts of the rule; for example:

- Minn. R. 7050.0130 – wetland relevant definitions.
- Minn. R. 7050.0210, subp. 13a – wetland pollution prohibited and description of uses.

The Agency is proposing to move the wetland-related definitions (Section V.F.4, above) and the description of wetland uses from existing Minn. R. 7050.0210, subp. 13a into Minn. R. 7050.0186. This change is needed so that most of the wetland-related provisions are in one place; it will make finding wetland-related provisions considerably easier.

Existing Minn. R. 7050.0210, subp. 13a lists several beneficial uses for which wetlands are protected. The listed uses can be consolidated with other wetland provisions. Proposed Minn. R. 7050.0186, subp. 1 will incorporate the "beneficial use" language currently in Minn. R. 7050.0210, subp. 13a. Also, the title of the current Minn. R. 7050.0210, subp. 13a, "*Wetland pollution prohibited*" while potentially misleading as to its full contents, provides broad-based protection to wetlands from pollution in general, separate from the provisions of existing Minn. R. 7050.0185, subp. 9. The Agency is proposing to add the phrase "*and wetland beneficial uses*" to the title of subpart 1 to reflect its content. Minnesota R. 7050.0210, subp. 13a (below) is proposed for repeal as it is no longer needed after its contents have been moved.

7050.0186 WETLAND STANDARDS AND MITIGATION

*Subpart 1. **Policy and wetland beneficial uses**. It is the policy of the state to protect wetlands, ~~from~~ and prevent significant adverse impacts on wetland beneficial uses caused by chemical, physical, biological or radiological changes. ~~Wetland mitigation maintains nondegradation of wetland designated uses.~~ The quality of wetlands shall be maintained to permit the propagation and maintenance of a healthy community of aquatic and terrestrial species indigenous to wetlands, preserve wildlife habitat, and support biological diversity of the landscape. In addition, these waters shall be suitable for boating and other forms of aquatic recreation as specified in part 7050.0222, subpart 6; general industrial use as specified in part 7050.0223, subpart 5; irrigation, use by wildlife and livestock, erosion control, groundwater recharge, low flow augmentation,* *stormwater retention, and stream sedimentation as specified in part 7050.0224, subpart 4; and aesthetic enjoyment as specified in part 7050.0225, subpart 2.*

Below is the current Minn. R. 7050.0210, subp. 13a, which is proposed for repeal.

> [Minn. R. 7050.0210] ~~*Subp. 13a.* **Wetland pollution prohibited.** *Wetland conditions shall be protected from chemical, physical, biological, or radiological changes to prevent significant adverse impacts to the following designated uses: maintaining biological diversity, preserving wildlife habitat, and providing recreational opportunities as specified in part 7050.0222, subpart 6; erosion control, groundwater recharge, low flow augmentation, stormwater retention, and stream sedimentation as specified in part 7050.0224, subpart 4; and aesthetic enjoyment as specified in part 7050.0225, subpart 2.*~~

As part of these changes to Minn. R. 7050.0186, the Agency is proposing to move the following sentence, "*Wetland mitigation maintains nondegradation of wetland designated uses.*" from subpart 1 to subpart 2 (not shown). Minnesota R. 7050.0186, subp. 2 deals with wetland mitigation and is a more appropriate context for this sentence.

To complete the consolidation of listing of wetland beneficial uses the Agency is proposing to add references to the wetland industrial use standards (Minn. R. 7050.0223, subp. 5), agricultural use standards (Minn. R. 7050.0224, subp. 4) and aesthetics (Minn. R. 7050.0225, subp. 2). These parts of the rule list the uses pertinent to the uses being protected in each part.

9. Minn. R. 7050.0217, Objectives for Protection of Surface Waters from Toxic Pollutants [V.F. 7050 non-substantive, need]

This part of the rule serves to introduce the part that follows, Minn. R. 7050.0218, which outlines in detail how Class 2 site-specific criteria are determined. In addition, Minn. R. 7050.0217 specifies the level of protection water quality standards and criteria are designed to achieve.

The Agency is proposing to correct two defects that exist in the current language in Minn. R. 7050.0217, subp. 1. The first is the clear inference by the inclusion of "parts 7050.0221 to 7050.0227" that the criteria development methods in Minn. R. 7050.0218 include methods for developing criteria for protection of drinking water (Class 1), industrial, agricultural, aesthetic and navigation uses. This is not the case. The methods in Minn. R. 7050.0218 are limited to developing criteria for aquatic life and recreational uses (Class 2) and limited resource value waters (Class 7). This inaccuracy needs to be corrected.

The second defect is more subtle. While the methods in Minn. R. 7050.0218 do not include methods for developing Class 1 drinking water standards *per se*, independent of other uses, the methods **do** address the development of Class 2 human health-based criteria that can include protection of surface waters for use as a drinking water supply. Human health-based Class 2 standards are calculated to protect people that eat fish taken from a waterbody, **and** people that use the same water as a source of drinking water, if that surface water is designated as a drinking water source. The proposed change in wording is designed to make this more clear; i.e., that the protection of drinking water through the development of Class 2 "7050.0218 criteria" is only in association with the protection of fish consumption, and not for water consumption alone. The wording changes are shown below.

7050.0217. OBJECTIVES FOR PROTECTION OF SURFACE WATERS FROM TOXIC POLLUTANTS.

Subpart 1. ***Purpose and applicability****. The purpose of parts 7050.0217 and 7050.0218 are to establish methods for developing site-specific water quality criteria for toxic pollutants in the absence of ~~numerical~~ numeric standards listed in parts 7050.0220, 7050.0222, and ~~7050.0221 to~~ 7050.0227. The site-specific ~~numerical~~ numeric criteria established by these methods protect ~~Class 1 surface waters for public and private domestic consumption and~~ Class 2 waters for the propagation and maintenance of fish and aquatic life, the consumption of fish and edible aquatic life by humans, the use of surface waters for public and private domestic consumption where applicable, and the consumption of aquatic organisms by wildlife. These criteria also protect the uses assigned to Class 7, limited resource value, waters as described in parts 7050.0140 and 7050.0227. ~~7050.0221 to~~*

10. Minn. R. 7050.0218, Methods for Determination of Criteria for Toxic Pollutants, for which Numeric Standards Not Promulgated [V.F. 7050 non-substantive, need]

The Agency is proposing to reword the title of this subpart to make it more accurately reflect its contents, as shown below.

7050.0218. METHODS FOR ~~PROTECTION OF SURFACE WATERS FROM~~ DETERMINATION OF CRITERIA FOR TOXIC POLLUTANTS~~,~~ FOR WHICH ~~NUMERICAL~~ NUMERIC STANDARDS NOT PROMULGATED.

The other changes proposed for Minn. R. 7050.0218, subparts 1 and 2 reflect the changes discussed in the Section immediately prior to this one, that the references to criteria for use classes 1, 3, 4 and 5 need to be changed to more accurately reflect the fact that the methods are limited to criteria for Class 2 and 7 uses. Thus, the existing references to parts "7050.0221 to 7050.0227" is being restricted to, "7050.0220, 7050.0222 and 7050.0227". Proposed changes are shown below.

[Minn. R. 7050.0218] *Subpart 1.* ***Purpose****. The Class 2 and Class 7 ~~numerical~~ numeric water quality standards for toxic pollutants in parts 7050.0220, 7050.0222, and 7050.0227 ~~7050.0221 to 7050.0227~~ do not address all pollutants which may be discharged to surface waters and cause toxic effects. Therefore, methods are established in this part to address on a site-by-site and case-by-case basis the discharge into surface waters of toxic pollutants not listed in parts 7050.0220, 7050.0222, and 7050.0227 ~~7050.0221 to 7050.0227~~.*

The agency may also adopt new standards according to Minnesota Statutes, chapter 14, to replace those listed in parts ~~7050.0221~~ 7050.0220 to 7050.0227 that are more *stringent or less stringent if new scientific evidence shows that a change in the standard is justified.*

Subp. 2. ***Site-specific criteria.*** ***~~for pollutants not listed in parts 7050.0221 to 7050.0227.~~*** *Class 2 and Class* ***7*** *~~S~~site-specific criteria for toxic pollutants ~~not listed in parts 7050.0221 and 7050.0227~~ shall be derived by the commissioner using the procedures in this part.*

11. Minn. R. 7050.0218, subp. 3, Clarification of Existing Definitions [V.F. 7050 non-substantive, need]

All the proposed changes to definitions, which are not strictly housekeeping will be discussed in this Section. None of the proposed changes are substantive in the sense that the meanings of the definitions are not being changed, and the proposed changes do not make any standard or provision in the rule more or less stringent.

Minn. R. 7050.0218, subp. 3, item D. The Revisor's Office recommends re-ordering the words in the definition of "Bioaccumulation factor" and the Agency is proposing to do that. The changes do not affect the meaning in any way, and are not shown.

Minn. R. 7050.0218, subp. 3, item H. The Agency is proposing to revise the definition of "chronic criterion" to add "humans or wildlife" to the existing word "organisms". These terms refer to safe concentrations of toxicants. These additions are needed because the criteria developed in this part can be calculated to protect aquatic organisms, humans or wildlife, or all three. This will correct an omission made at the time this subpart was first adopted in 1990.

Also, the Agency is proposing to define three abbreviations as part of the definition of "chronic criterion" that are referred to later in this part. The abbreviations are: "CC_{df}", which denotes a criterion that protects humans that both drink the water (d) and eat fish (f) from the same waterbody (e.g., Mississippi River above Minneapolis); "CC_f", which denotes a criterion that protects humans for fish consumption only; and CC_w which indicates a chronic criterion based on the protection of wildlife (w) that eat aquatic organisms. Again, these abbreviations should be defined because they are used later in the rule. The proposed revised definition is shown below.

[Minn. R. 7050.0218, subp. 3] *H. "Chronic criterion" or "CC" means the highest water concentration of a toxicant or effluent to which organisms, including humans or wildlife, can be exposed indefinitely without causing chronic toxicity. "CC_{df}" means a chronic criterion based on protecting humans from exposure to the pollutant from both drinking water and eating sport-caught fish. "CC_f" means a chronic criterion based on protecting humans from exposure to the pollutant from eating sport-caught fish only. "CC_w" means a chronic criterion based on protecting wildlife from exposure to the pollutant from eating aquatic organisms.*

Consistent with the additions to the definitions of "chronic criterion", the Agency is proposing to change the three abbreviations as shown below. The old abbreviations are being replaced in the following parts of the rule:

- "CC_{df}" and "CC_f" replace "dfCC" and "fCC", respectively in Minn. R. 7050.0218, subp. 6 and 10, and in Minn. R. 7050.0222, subp. 7, item D.
- "CC_w" replaces "WCC" in Minn. R. 7050.0218, subp. 9 and 10.

Also, the words, "chronic criterion" has been added to clarify the language in Minn. R. 7050.0218, subp. 9, item B.

where: ~~WCC~~ CC_w = wildlife ~~CC~~ chronic criterion in mg/L

Minn. R. 7050.0218, subp. 3, item Q. The Agency is proposing to replace the term "K value" with "relative source contribution factor or RSC" in the current definition of "K value", and to move the definition to a new location in alphabetical order. The definition of this item itself is not being changed. This change is needed because the term "K value" is no longer in common usage; it has been replaced with the descriptive term, "relative source contribution factor or RSC".

Consistent with the proposed change to the newer term in this definition, "RSC" replaces "K value" in the equations in Minn. R. 7050.0218, subp. 6. Also, "RSC" replaces "K value" in the Minn. R. 7050.0218, subp. 6, item E. The Revisor's Office recommends changing the word "will" to "must". The proposed changes are shown below.

E. A default ~~exposure value (K)~~ relative source contribution factor (RSC) of 0.2 ~~will~~ must be used unless the Minnesota Department of Health uses a different exposure value in the calculation of a drinking water criterion, or sufficient exposure data is available to support an alternative value.

Minn. R. 7050.0218, subp. 3, item AA. The Agency is proposing to delete the clause "*and was formally known as the acceptable daily intake*" from the definition of "reference dose or RfD". At the time the definition of RfD was added to Minn. R. ch. 7050 in 1990 the term RfD had just replaced the older term "acceptable daily intake", and it made sense at the time to include both terms because readers may not have been aware of the change. Seventeen years later, the reference to "acceptable daily intake" is no longer needed. No other change to the definition is proposed.

12. Minn. R. 7050.0218, subp. 4, Removal of References to "National Technical Information Service" and "Office of Health and Environmental Assessment" [V.F. 7050 non-substantive, need]

The EPA guidelines for developing national aquatic life criteria under Section 304(a) of the Clean Water Act are referenced in Minn. R. 7050.0218, subp. 4. The existing rule says this document is, "*available through the National Technical Information Service, Springfield, VA.*" The Agency is proposing to delete this clause. It is not needed now because this document like many other EPA documents is available through the internet. (http://www.epa.gov/waterscience/criteria/85guidelines.pdf).

Similarly, the Agency is proposing to remove the reference to the EPA "*Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH*" from Minn. R. 7050.0218, subp. 6. This reference is not needed because the Integrated Risk Information System (IRIS) can be easily access on line at, http://www.epa.gov/iris/.

13. Minn. R. 7050.0220, subpart 1, Improvements in Rule Language [V.F. 7050 non-substantive, need]

The purpose of Minn. R. 7050.0220 is to list in one place all the numeric water quality standards applicable to four main categories of surface waters[20]. The listing of standards by the four categories is in addition to the listing of standards by individual use class in Minn. R 7050.0221 to 0227. This listing was added to Minn. R. ch. 7050 in 1994 to help eliminate a common error made by users of the rule.

Many users of Minn. R. ch. 7050 were unaware that surface waters are protected for multiple uses and that they needed to consider the standards for all uses assigned to a given waterbody. The Agency believes that this addition has helped reduce the frequency of this mistake, but the comments of users indicate that improvements to the introduction to the tables of standards could further reduce errors. In general, the proposed changes to this part include a better description of the four categories and a slight change in the format of the tables of numeric standards. These changes are needed to improve the understanding of this subpart by users. The Agency is also proposing to change the name of Minn. R. 7050.0220, subpart 1, and to move some existing language to new locations without changing the wording. None of the changes to this part just described changes any water quality standard, or changes how standards are used and implemented. Minn. R. 7050.0220, subpart 1 is quoted below showing the proposed changes.

7050.0220 SPECIFIC WATER QUALITY STANDARDS ~~OF QUALITY AND PURITY~~ BY ASSOCIATED USE CLASSES.

*Subpart 1. ~~**General**~~. **Purpose and scope**. The ~~numerical~~ numeric and narrative water quality standards in this chapter ~~parts 7050.0221 to 7050.0227~~ prescribe the qualities or properties of the waters of the state that are necessary for the designated public uses and benefits. If the standards in this ~~part~~ chapter are exceeded, it is considered indicative of a polluted condition which is actually or potentially deleterious, harmful, detrimental, or injurious with respect to designated uses or established classes of the waters of the state.*

~~Standards for metals are expressed as total metal but must be converted to dissolved metal standards to determine water quality-based effluent limits. Water quality-based effluent limits for metals are expressed as total metal. Conversion factors for converting~~

[20] The four categories of waters are:

1. cold water fisheries (trout), also protected for drinking.
2. warm water fisheries, also protected for drinking.
3. warm water fisheries, not protected for drinking.
4. limited resource value waters.

~~*total to dissolved metal standards are listed in part 7050.0222, subpart 9. The conversion factor for metals not listed in part 7050.0222, subpart 9, is one. The dissolved metal standard equals the total metal standard times the conversion factor.*~~

~~*The standards are listed for associated use classes in tables under subparts 3a to 6a.*~~ *All surface waters are protected for multiple beneficial uses. Numeric water quality standards are tabulated in this part for all uses applicable to four common categories of surface waters, so that all applicable standards for each category are listed together in subparts 3a to 6a. The four categories are:*

A. ~~subpart 3a,~~ cold water sport fish (trout waters), also protected for drinking water: Classes 1B, 2A, 3A or 3B, 4A and 4B, and 5 (subpart 3a);

B. ~~subpart 4a,~~ cool and warm water sport fish, also protected for drinking water: Classes 1B or 1C, 2Bd, 3A or 3B, 4A and 4B, and 5 (subpart 4a);

C. ~~subpart 5a,~~ cool and warm water sport fish, indigenous aquatic life, and wetlands: Classes 2B, 2C, or 2D; 3A, 3B, 3C or 3D; 4A and 4B or 4C; and 5 (subpart 5a); and

D. ~~subpart 6a,~~ limited resource value waters: Classes 3C, 4A and 4B, 5, and 7 (subpart 6a).

14. Minn. R. 7050.0220, subpart 2, Improvements to List of Abbreviations [V.F. 7050 non-substantive, need]

This Section and the next discuss improvements to the lists of abbreviations and acronyms used in the tables of numeric standards in Minn. R. 7050.0220 and 7050.0222. Minnesota R. 7050.0220, subp. 2, item D includes a list of abbreviations or acronyms used in the tables that follow in Minn. R. 7050.0220, subp. 3a to 6a. Several changes are needed to include new terms, eliminate redundant definitions, and to move a term.

New items are:

--	*double dashes means there is no standard*
NA	*means not applicable*

Redundant definitions are removed and the citation to the full definition is included for:

CS	*means chronic standard*
FAV	*means final acute value*
MS	*means maximum standard*

And moved is:

** an asterisk following the FAV and MS values or double dashes (--) means part 7050.0222, subp. 7, item E, applies*

All the proposed changes to the list are shown below.

[Minn. R. 7050.0220] *Subp. 2.* ***Explanation of tables.***

…

D. The tables of standards in subparts 3a to 6a include the following abbreviations and acronyms:

AN means aesthetic enjoyment and navigation, Class 5 waters

* an asterisk following the FAV and MS values or double dashes (--) means part 7050.0222, subpart 7, item E applies

(c) means the chemical is assumed to be a human carcinogen

CS ~~or~~ means ~~"~~chronic standard, ~~" means the highest water concentration of a toxicant to which organisms can be exposed indefinitely without causing chronic toxicity~~ defined in part 7050.0218, subpart 3

DC means domestic consumption (drinking water), Class 1 waters

-- double dashes means there is no standard

exp. ( ) means the natural antilogarithm (base e) of the expression in parenthesis

FAV ~~or "~~means final acute value,~~" means an estimate of the concentration of a pollutant corresponding to the cumulative probability of 0.05 in the distribution of all the acute toxicity values for the genera or species from the acceptable acute toxicity tests conducted on a pollutant~~ defined in part 7050.0218, subpart 3

IC means industrial consumption, Class 3 waters

IR means agriculture irrigation use, Class 4A waters

LS means agriculture livestock and wildlife use, Class 4B waters

MS ~~or "~~means maximum standard,~~" means the highest concentration of a toxicant in water to which aquatic organisms can be exposed for a brief time with zero to slight mortality. The MS equals the FAV divided by two~~ defined in part 7050.0218, subpart 3

NA means not applicable

(S) means the associated value is a secondary drinking water standard

su means standard unit. It is the reporting unit for pH

TH means total hardness in mg/L, which is the sum of the calcium and magnesium concentrations expressed as $CaCO_3$

TON means threshold odor number

~~*For the FAV and MS values noted with an asterisk (*), see part 7050.0222, subpart 7, item E.*~~

E. *Important synonyms or acronyms for some chemicals are listed in parentheses below the primary name.* ~~*Standards that vary with total hardness or pH are in the form of formulas and are listed as numbered notes at the end of the tables.*~~

F. *When two or more use classes have standards for the same pollutant, the most stringent standard applies pursuant to part 7050.0450. All surface waters are protected for Class 6, but this class has no* ~~*numerical*~~ *numeric standards so it is not included in the tables.*

The Revisor's Office recommended assigning items to the paragraphs in Minn. R. 7050.0220, subp. 2; items A through F are proposed as shown above.

15. Minn. R. 7050.0222, subpart 1, Inclusion of List of Abbreviations and Acronyms Used in the Tables of Class 2 Standards [V.F. 7050 non-substantive, need]

As discussed in the previous Section, several abbreviations and acronyms are used in the tables of Class 2 numeric standards in Minn. R. 7050.0222. About five are described in the current rule; they are repeated in the three lead-in paragraphs to Minn. R. 7050.0222, subp. 2 to 4 (Class 2A, 2Bd and 2B waters). The Agency is proposing to list and define these five, plus an additional eight all in one place at the beginning of the listings of Class 2 standards (Minn. R. 7050.0222, subp. 1). This list is similar to the listing of abbreviations and acronyms at the beginning of Minn. R. 7050.0220 (previous Section). In fact, nine of the 13 to be listed in Minn. R. 7050.0222 are the same as those listed in Minn. R. 7050.0220. They are repeated in the two places numeric standards are listed as a convenience to the reader; those proposed for Minn. R. 7050.0220. subp. 1 are shown below. The Revisor's Office recommended breaking subpart 1 into four items, which the Agency proposes to do.

C. The tables of standards in this part include the following abbreviations and acronyms:

** an asterisk following the FAV and MS values or double dashes (--) means part 7050.0222, subpart 7, item E applies*

(c) means the chemical is assumed to be a human carcinogen

°C means degrees Celsius

CS means chronic standard, defined in part 7050.0218, subp. 3

-- double dashes means there is no standard

°F means degrees Fahrenheit

FAV means final acute value, defined in part 7050.0218, subp. 3

HH in the "basis" column means the standard is human health-based

MS means maximum standard, defined in part 7050.0218, subp. 3

NA means not applicable

su means standard unit. It is the reporting unit for pH

TH means total hardness in mg/L, which is the sum of the calcium and magnesium concentrations expressed as $CaCO_3$

Tox in the "basis" column means the standard is toxicity-based

The Agency is also proposing to include after the list of abbreviations and acronyms this sentence:

> <u>*D. Important synonyms or acronyms for some chemicals are listed in parentheses below the primary name.*</u>

This sentence is included in Minn. R. 7050.0220 as useful information to the reader. It makes sense to repeat it in Minn. R. 7050.0222 because the synonyms or acronyms are used there as well.

These changes are needed to provide a complete list the abbreviations and acronyms used in Minn. R. 7050.0222, in one place in a more readable format (i.e., not included as part of the text), to eliminate the redundancy of listing them three times in Minn. R. 7050.0222, and to repeat an important item of information about the listing of substances in Minn. R. 7050.0222.

16. <u>Minn. R. 7050.0220, subp. 2 and Minn. R. 7050.0222, subpart 1, Clarification of Total and Dissolved Metal Standard Language</u> [V.F. 7050 non-substantive, need]

The standards for trace metals (e.g., cadmium, copper, mercury and zinc) are listed as "total" metal in the rule. The chronic and acute standards for metals should be converted from "total" to "dissolved" metal before being used. The conversion to "dissolved" is simply the total metal standard times a factor, which is less than one and varies with the metal (Minn. R. 7050.0222, subp. 9). Thus, the dissolved standards for nine of the metals for which there are Class 2 standards will be a lower concentration than the total (except in the case of the mercury chronic standard for which the total and dissolved standards are the same). The total-to-dissolved factor is one when no factor is listed. The dissolved standard is then compared to a dissolved metal concentration in ambient waters to measure compliance with the standard.[21]

Language describing the conversion appears in two places, Minn. R. 7050.0220, subp. 2, item C and 7050.0222, subpart 1. The current language in the two locations is parallel but contains some misleading statements. The current wording says the standards are listed as total in the rule and must be converted to dissolved to determine water quality-based effluent limits. This is a true statement, but it gives the impression that setting water quality-based effluent limits is the only use of metal standards that requires a conversion from total to dissolved. This is not the case; metal standards should be converted to dissolved for all applications of Class 2 standards, not just to set effluent limits. It is important to clarify the language in both locations.

The revised language in Minn. R. 7050.0222, subpart 1 is shown below as an example of the proposed changes (The parallel language in Minn. R. 7050.0220, subpart 2 is not shown).

---

[21] In water, trace metals have an affinity for small particulates, and the particulate-bound metals are generally less "bio-available" and therefore, less toxic to aquatic organisms than the freely dissolved metal faction. To measure dissolved metal the water sample is filtered to remove fine particulates prior to analysis. A total metal sample is not filtered.

[Minn. R. 7050.0222, subpart 1] *B.* *Standards for metals are expressed as total metal in this part, but must be converted to dissolved metal standards for application to surface waters ~~to determine water quality-based effluent limits~~. ~~Water quality-based effluent limits for metals are expressed as total metal.~~ Conversion factors for converting the total metal standards to dissolved metal standards are listed in subpart 9. The conversion factor for metals not listed in subpart 9 is one. The dissolved metal standard equals the total metal standard times the conversion factor. Water quality-based effluent limits for metals are expressed as total metal.*

17. Minn. R. 7050.0220, subp. 3a, 4a, 5a and 6a, Improvements to Tables of Standards [V.F. 7050 non-substantive, need]

The existing four tables of numeric standards by use category are difficult to read, and it is easy for the reader to "get lost" in the tables. For example, in Minn. R. 7050.0220, subp. 3a and 4a there are eight columns of numeric standards needed to accommodate all the applicable use classes. If the column headings are on a previous page and not visible on the page one is looking at, it is very easy to be confused as to which use class the numeric standards belong to. Also, the lack of category or subclass (2A, 3B, etc.) headings at frequent intervals in the long alphabetical lists of numeric standards makes it easy to lose track of which use category one is looking at. There is a need to make these tables as readable and user friendly as possible. Unfortunately the formatting capabilities of the Revisor's Office word processing systems are very limited, which dramatically narrows the options available to improve the tables.

The Agency is proposing to reword the headings of subparts 3a to 6a to make it very explicit which category of standards follow. The proposed heading for Minn. R. 7050.0220, subp 3a is shown below as an example. Similar headings are proposed for subparts 4a, 5a and 6a. The headings are followed by a complete list of all the beneficial use classes applicable to the category.

To help reduce the problem of getting lost in the tables, either by confusing the columns or by losing track of which category one is looking at, the Agency is proposing to repeat the table headings at a regular interval. Because administrative rules are formatted in a variety of ways, including Web and paper versions in varying formats, it is impossible to anticipate where table headings will end up. There is no way to be sure that they will always be at the top of each page. The Agency is showing the headings being repeated after every fifth pollutant or substance below, but the exact spacing will depend on recommendations from the Revisor's Office.

Subp. 3a. ***Cold water sport fish, drinking water, and associated use classes***. *Water quality standards applicable to use Classes 1B, 2A, 3A or 3B, 4A and 4B, and 5 surface waters.*

A. Miscellaneous Substance, ~~or~~ Characteristic, or Pollutant

2A	2A	2A	1B	3A/3B	4A	4B	5
CS	**MS**	**FAV**	**DC**	**IC**	**IR**	**LS**	**AN**
(1) Ammonia, un-ionized as N ~~Units:~~ , µg/L							
16	--	--	--	--	--	--	--
(2) Asbestos, > 10 µm (c) ~~Units:~~ , fibers/L							
--	--	--	*7.0e+06*	--	--	--	--
(3) Bicarbonates (HCO_3) ~~Units:~~ , meq/L							
--	--	--	--	--	*5*	--	--
(4) Bromate, µg/L							
--	--	--	*10*	--	--	--	--
(5) Chloride ~~Units:~~ , mg/L							
230	*860*	*1,720*	*250(S)*	*50/100*	--	--	--

2A	2A	2A	1B	3A/3B	4A	4B	5
CS	**MS**	**FAV**	**DC**	**IC**	**IR**	**LS**	**AN**
(6) Chlorine, total residual ~~Units:~~ , µg/L							
11	*19*	*38*	--	--	--	--	--

The Agency is proposing to remove the word "Units" from the listing of each pollutant or substance. It is felt that repeating "Units" is not needed, that the units themselves (e.g., µg/L) are self-explanatory, and removal helps reduce the amount of verbiage in the tables. When there is no standard in the table, the Agency is proposing to show this with a double dash, "—" rather than a single dash "-". The single dash tends to be less visible in some versions of the rule.

The pollutants or characteristics are divided into three groups in each of the four tables. The Agency is proposing to reword the headings for the three items, repeated in subparts 3a to 5a, as follows.

A. Miscellaneous Substance ~~or~~, Characteristic, or Pollutant

B. Metals and Elements ~~Substance or Characteristic~~

C. ~~Organic Substance or Characteristics~~ Organic Pollutants or Characteristics

This will make the headings more consistent with analogous proposed headings in Minn. R. 7050.0222. In the current rule the three headings shown above are in all capital letters to make them stand out in the tables of standards. The Agency plans to retain the all-cap headings.

The Agency is also proposing to remove the overall heading in each item: "*Standards for Use Classes*". This heading looks out of place in the current format and is redundant. It is not needed.

18. Minn. R. 7050.0220, Removal of "Notes" and Examples of Metal Standards at Representative Hardness Values [V.F. 7050 non-substantive, need]

The tables of numeric standards in existing Minn. R. 7050.0220 include as many as 14 "notes" at the end of subparts 3a to 6a. These notes are referenced by number in the body of the tables and they pertain to standards that have narrative portions that don't fit conveniently in the tables. References to the notes allow the placement of these narratives at the end of the tables. Examples are the existing fecal coliform, dissolved oxygen and temperature standards. In addition, another set of notes deal with standards that vary with the total hardness of ambient waters (or vary with pH in the case of pentachlorophenol). For the metals and pentachlorophenol, the notes include the equations for calculating the standard for any hardness (or pH) and example standards at five representative values (total hardness at 50, 100, 200, 300 and 400 mg/L, and pH at 6.5, 7.0, 7.5, 8.0 and 8.5).

The Agency is proposing to do away with the end-table "notes" altogether. A few will be retained but they will be changed to "items" as discussed below. Some existing notes, such as those dealing with dissolved oxygen, are replaced with citations to the dissolved oxygen standards found in other parts of the rule. All the notes for the hardness-dependant metals (and pentachlorophenol) including the equations and example standards will not be retained in Minn. R. 7050.0220. The equations and example standards are currently duplicated in Minn. R. 7050.0222, and there is little advantage to listing them twice. Thus the equations and examples will appear in Minn. R. 7050.0222, but not in Minn. R. 7050.0220.

The reference to the note for cadmium in the current Minn. R. 7050.0220, subp. 3a, item B and the note proposed for deletion, is shown below as an example.

(7) Cadmium - Units: µg/l - See Note No. 3 below

-	-	-	5	-	-	-	-

~~Note No. 3, CADMIUM~~

~~STANDARDS THAT VARY WITH TOTAL HARDNESS (TH)~~	~~EXAMPLE STANDARDS IN µg/l AT TOTAL HARDNESS OF:~~				
	~~50~~	~~100~~	~~200~~	~~300~~	~~400~~
~~CS = exp.(0.7852[ln(TH mg/l)]-3.49)~~	~~0.66~~	~~1.1~~	~~2.0~~	~~2.7~~	~~3.4~~
~~MS = exp.(1.128[ln(TH mg/l)]-3.828)~~	~~1.8~~	~~3.9~~	~~8.6~~	~~14~~	~~19~~
~~FAV = exp.(1.128[ln(TH mg/l)]-3.1349)~~	~~3.6~~	~~7.8~~	~~17~~	~~27~~	~~37~~

~~Note No. 4, CHROMIUM +3~~

~~STANDARDS THAT VARY WITH TOTAL HARDNESS (TH)~~	~~EXAMPLE STANDARDS IN µg/l AT TOTAL HARDNESS OF:~~				
	~~50~~	~~100~~	~~200~~	~~300~~	~~400~~

Another problem with the current listing of metal standards in Minn. R. 7050.0220 is that no numeric standards are listed in the spaces for the chronic (CS), maximum (MS) and final acute value (FAV) standards; dashes occupy those spaces instead (see cadmium example above, the 5 µg/L standard shown is the drinking water standard). This could give the false impression that there are no CS, MS and FAV standards for the metals at all, particularly if the reader did not look for the "note" at the end of the table. The Agency proposes to include in the revised Minn. R. 7050.0220, example standards determined at a hardness of 100 mg/L. The Class 2A cadmium standard is shown below as an example of the proposed new entry in the tables in Minn. R. 7050.0220, subp. 3a to 5a for the hardness-dependent metals. For the pH dependant pentachlorophenol standards the example standards are calculated at a pH of 7.5.

(7) Cadmium, total, µg/L

1.1	*3.9*	*7.8*	*5*	*--*	*--*	*--*	*--*

Class 2A cadmium standards are hardness dependent. Cadmium values shown are for a total hardness of 100 mg/L only. See part 7050.0222, subpart 2 for examples at other hardness values and ~~formulas~~ equations to calculate cadmium standards for any hardness value between 10 and 400 mg/L.

The numeric standards are followed by a statement informing the reader where to find the equations to calculate standards for any hardness plus values for five example hardness values, 50, 100, 200, 300 and 400 mg/L. The Class 2A cadmium standard in Minn. R. 7050.0222 and the information referenced in Minn. R. 7050.0220 is shown below.

Substance, Characteristic or Pollutant (Class 2A)	***Units***	***CS***	***Basis for CS***	***MS***	***FAV***	***Basis for MS,FAV***
Cadmium, total	*µg/L*	*~~Formula~~ equation*	*Tox*	*~~Formula~~ equation*	*~~Formula~~ equation*	*Tox*

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

The CS in µg/L shall not exceed: exp.(0.7852[ln(total hardness mg/L)]-3.490)
The MS in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-3.828)
The FAV in µg/L shall not exceed: exp.(1.128[ln(total hardness mg/L)]-3.1349)

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

For hardness values less than 10 mg/L, 10 mg/L shall be used to calculate the standard and for hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.

Example of total cadmium standards for five hardness values:

TH in mg/L	*50*	*100*	*200*	*300*	*400*
Cadmium, total					
CS µg/L	*0.66*	*1.1*	*2.0*	*2.7*	*3.4*
MS µg/L	*1.8*	*3.9*	*8.6*	*14*	*19*
FAV µg/L	*3.6*	*7.8*	*17*	*27*	*37*

As mentioned, the “notes” to be retained will be designated as “items” that follow the tables to be more consistent with normal rule structure. A reference to the item will appear with the listing of the standard in the tables in subparts 3a to 6a. Three to four items will be needed depending on the subpart. Below is a list of the standards that will now include references to items.

- Subpart 3a. Trout waters:
    - Item D, proposed new *E. coli* standard (replaces fecal coliform)
    - Item E, radioactive substances
- Subpart 4a. Warm water fisheries protected for drinking water:
    - Item D, *E. coli*
    - Item E, radioactive substances
    - Item F, temperature
- Subpart 5a. Warm water fisheries and wetlands:
    - Item D, *E. coli*
    - Item E, pH

- o Item F, radioactive substances
  - o Item G, temperature
- Subpart 6a. Limited resource value waters:
  - o Item B, *E. coli*
  - o Item C, oxygen, dissolved
  - o Item D, radioactive substances
  - o Item E, toxic pollutants

In summary, it is not needed to list the hardness and pH equations and examples of standards at a range of hardness and pH values in more than one location in the rule. These proposed changes are needed to clarify the metal standards in Minn. R. 7050.0220, reduce redundant information and reduce the need to "jump from place to place" in the rule looking for the appropriate "notes". And finally, the few "notes" that need to be retained will become "items".

19. Minn. R. 7050.0220, subp. 5a, Removal of "Note No. 1" [V.F. 7050 non-substantive, need]

Minnesota R. 7050.0220, subp. 5a lists the water quality standards for Class 2B, 2C and 2D waters plus the associated use classes, Classes 3, 4 and 5. Classes 2D, 3D and 4C all refer to wetlands (Class 5 includes standards for wetlands as well, but not as a separate subpart). For the most part, the Class 3, 4 and 5 standards for wetlands are "maintain background." Rather than try to include "maintain background" in the table of standards wherever applicable, the Agency referred the reader to these standards with "Note No. 1" in the existing rule, which is quoted below.

> *Note No. 1, CLASS 3D, 4C, and 5 STANDARDS, applicable to wetlands*
> *In general, if Class 3, 4, or 5 standards are exceeded, background conditions shall be maintained. See parts 7050.0223, subpart 5; 7050.0224, subpart 4; and 7050.0225, subpart 2.*

The Agency is proposing to remove "Note No. 1" because the only information needed in this "note" is the citations to the pertinent parts of the rule for the wetland standards. These citations can be easily incorporated into the opening paragraph of Minn. R. 7050.0220, subp. 5a (see below). Also, the note as it reads now contains an error. The standard is "maintain background" regardless of whether or not the standard is exceeded. Deletion of the note will remove this misleading wording.

> *Subp. 5a. **Cool and warm water sport fish and associated use classes**. Water quality standards applicable to use Classes 2B, 2C, or 2D; 3A, 3B, or 3C ~~or 3D~~; 4A and 4B ~~or 4C~~; and 5 surface waters. ~~See note no. 1 below.~~ See parts 7050.0223, subpart 5; 7050.0224, subpart 4; and 7050.0225, subpart 2 for Class 3D, 4C, and 5 standards applicable to wetlands, respectively.*

20. Minn. R. 7050.0222, Changes to the Headings for the Tables of Class 2 Standards [V.F. 7050 non-substantive, need]

The Agency is proposing to change the headings for Tables of numeric standards in Minn. R. 7050.0222. The headings, including the first standard for Acenaphthene as an example, will go from this:

~~Substance or Characteristic (c) = carcinogen~~	~~Units~~	~~Class 2A Chronic Standard CS~~	~~Basis~~	~~Class 2A Acute Standards MS~~	~~FAV~~	~~Basis~~
~~Acenaphthene~~	~~µg/l~~	~~20~~	~~HH~~	~~56~~	~~112~~	~~Tox.~~

To this:

Substance, ~~or~~ Characteristic, or Pollutant (Class 2A)	***Units***	***CS***	***Basis for CS***	***MS***	***FAV***	***Basis for MS,FAV***
Acenaphthene	*µg/L*	*20*	*HH*	*56*	*112*	*Tox*

The changes include:

- The addition of the word "pollutant" to the first column of the heading, so the heading for the list of chemicals having numeric standards, will read: "*Substance, Characteristic, or Pollutant*;"
- The addition of "Class 2A" (or other Class 2 subclass) to the first column;
- The removal of "(c) = carcinogen" because this is described elsewhere and is only one of several abbreviations or acronyms used in the tables;
- Streamline the column headings for the standards by using two lines instead of four; and
- Clarification as to which "basis" applies to the CS, MS and FAV.

These changes are needed to simplify the rule and make the tables of standards easier to read.

21. Minn. R. 7050.0222, Changes Throughout the Tables of Class 2 Standards [V.F. 7050 non-substantive, need]

Several minor changes are proposed in the tables of Class 2 water quality standards in Minn. R. 7050.0222, subp. 2 to 6. These changes, listed below, are proposed to help clarify the tables and to make them easier to read. Three of the changes involve the Class 2 dissolved oxygen standards.

As mentioned above, "Pollutant" will be added to the heading for the list of chemicals to make the heading more descriptive.

“None” is replaced with a double dash (--) wherever there is no standard, consistent with the proposed change to Minn. R. 7050.0220.

The standard for “Dissolved oxygen” is listed as “Oxygen, dissolved”, and moved accordingly in alphabetical order. This standard is more properly listed under “oxygen” because oxygen is the key word and “dissolved” is the modifier.

Change the citation to the provision for site-specific modification of standards in the narrative portions of the “Oxygen, dissolved” standards. The site-specific standard modification provision is proposed to be moved from Minn. R. 7050.0222, subp. 8 to Minn. R. 7050.0220, subp. 7. This citation does not appear in the existing Class 2A and Class 2D dissolved oxygen standards in Minn. R. 7050.0222, subp. 2 and subp. 6, respectively. Therefore, this change does not apply to these two parts.

Remove the partial definition of $7Q_{10}$ in the narrative portions of the dissolved oxygen standards and replace it with just the term “$7Q_{10}$”. This term is proposed to be defined in Minn. R. 7050.0130, subp. 3. The partial definitions are not needed in the standards. The change is not applicable to Minn. R. 7050.0222, subp. 6 because the $7Q_{10}$ is not referenced in the Class 2D standard.

The Revisor’s Office recommended some changes to the existing set of equations used to calculate the fraction (or percent) of un-ionized ammonia in Minn. R. 7050.0222, subp. 2. The Agency is proposing to repeat the equations in Minn. R. 7050.0222, subp. 3 and 4 as a convenience to the user. The changes do not affect the calculation of the fraction on un-ionized ammonia.

Add “*as used in this subpart*” to the explanatory footnote describing “maintain background” in Minn. R. 7050.0222, subp. 6, because background may have a somewhat different meaning in other parts of the rule.

22. <u>Minn. R. 7050.0222. Improvements to Hardness-dependent Trace Metal Standards</u> [V.F. 7050 non-substantive, need]

The Agency proposes to reword and restructure the metal standards that vary with total hardness in Minn. R. 7050.0222, as already shown in Section V.F.18 above. The pentachlorophenol standard that varies with pH is reworded and restructured in a similar way (not shown).

Included in these changes is a reorganization of the tables of example standards at representative hardness values, and an expansion from three to five examples. Expanding the number of examples is prompted by the proposal to eliminate the metal standard “end notes” in Minn. R. 7050.0220. Currently there are examples at five hardness values in that part of the rule. Expansion from three to five examples in Minn. R. 7050.0222 replaces what is being removed in Minn. R. 7050.0220.

The Agency proposes to include the definition of “exp.” with each of the hardness (and pH)-dependent standards as a convenience to the reader, so they do not have to go back to the beginning of the section to find the definition. “Exp.” is used in all the hardness or pH dependent equations.

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

These changes are needed to improve the usability of the rule.

23. Minn. R. 7050.0222, subp. 7, item E, Minor Additions [V.F. 7050 non-substantive, need]

Minnesota R. 7050.0222, subp.7, item E provides the Agency the option of using alternative acute toxicity standards (maximum and final acute value standards) for pollutants marked with an asterisk (*) in the tables of water quality standards (Minn. R. 7050.0220 and 7050.0222). This provision says that 100 times the chronic standard (CS) can be used in place of the maximum standard (MS), and 200 times the chronic standard can be used in place of the final acute value (FAV), for bioaccumulative and carcinogenic chemicals[22].

The Agency is proposing a new lead-in sentence for this provision and one other minor change. The new lead-in sentence replaces the last sentence in the current item. This change is needed to make the rule clearer, and so this provision is consistent with wording changes elsewhere in the rule. The acronym “CS” (Chronic standard) is spelled out the first time it is used in this provision, in case the reader is visiting this subpart for the first time.

[Minn. R. 7050.0222, subp. 7] *E. The provisions of this item apply to maximum standards (MS), final acute values (FAV), and double dashes (--) in this part and part 7050.0220 marked with an asterisk (*). For carcinogenic or highly bioaccumulative chemicals with BCFs greater than 5,000 or log K_{ow} values greater than 5.19, the human health-based chronic standard (CS) ~~CS~~ may be two or more orders of magnitude smaller than the acute toxicity-based MS. If the commissioner finds that a very large MS and FAV, relative to the CS for such pollutants is not protective of the public health, the MS and FAV shall be reduced according to the following guidelines:*

If the ratio of the MS to the CS is greater than 100, the CS times 100 should be substituted for the applicable MS, and the CS times 200 should be substituted for the applicable FAV. Any effluent ~~limitation~~ limit derived using the procedures of this item shall only be required after the discharger has been given notice of the specific proposed effluent ~~limitations~~ limits and an opportunity to request a hearing as provided in part 7000.1800. ~~The relevant MS and FAV values, or if there is no MS or FAV, the word "none," are marked by an asterisk (*) in subparts 2 to 4 and part 7050.0220.~~

[22] There is a disconnect when the CS is human health-based and the MS and FAV are toxicity-based. This can result in a large difference between the CS and MS and FAV. For example, the existing human health-based mercury CS is 6.9 ng/L, the toxicity based MS and FAV are 2400 and 4900 ng/L, respectively.

24. Minn. R. 7050.0222, subp. 9, Changes to the Metal Conversion Factors [V.F. 7050 non-substantive, need]

The Agency is proposing to reorganize and reword portions of Minn. R. 7050.0222, subp. 9. These changes should make finding and applying the correct conversion factor easier.

*Subp. 9. **Conversion factors for dissolved metal standards**.*

	~~Chronic standard~~	*~~Maximum standard and Final Acute Value~~*
Metal	*Conversion Factor for CS*	*Conversion Factor for MS and FAV*
Cadmium~~~~*	*0.909*	*0.946*
	1.1017-[(ln TH, mg/L) (0.0418)]	*1.1367-[(ln TH, mg/L) (0.0418)]*
Chromium ~~III~~ +3	*0.860*	*0.316*
Chromium ~~VI~~ +6	*0.962*	*0.982*
Copper	*0.960*	*0.960*
Lead~~~~*	*0.791*	*0.791*
	1.4620-[(ln TH, mg/L) (0.1457)]	*1.4620-[(ln TH, mg/L) (0.1457)]*
Mercury	*1.0*	*0.850*
Nickel	*0.997*	*0.998*
Silver	*0.850*	*0.850*
Zinc	*0.986*	*0.978*

~~~~Conversion factors for cadmium and lead are hardness (TH) dependent. The ~~values~~ factors shown in the table above are for a total hardness of 100 mg/L only ~~(as $CaCO_3$)~~. ~~The hardness dependent conversion factors for cadmium are calculated using the following formulas:~~ Conversion factors for cadmium and lead for other hardness values shall be calculated using the equations included in the table. The dissolved standard is the total standard times the conversion factor.*

~~Chronic standard: 1.101672-[(ln total hardness) (0.041838)]~~
~~Maximum standard and final acute value: 1.136672-[(ln total hardness) (0.041838)]~~
~~The hardness dependent conversion factors for lead are calculated using the following formulas:~~
~~Chronic and maximum standards and final acute value: 1.46203-[(ln total hardness) (0.145712)]~~

25. <u>Minn. R. 7050.0224, Clarification of the Listing of Wild Rice Waters</u> [V.F. 7050 non-substantive, need]

The Agency is proposing to clarify language in Minn. R. 7050.0224, standards for the protection agricultural uses, pertaining to the listing of waterbodies that support wild rice. The Agency added specific listings of certain wild rice waters to Minn. R. 7050.0470 in 1998 in response to requests from the Fond du Lac and Grand Portage Bands. The purpose of those listings was to recognize and protect important wild rice waterbodies. Wild rice waters are identified with a "WR" in Minn. R. 7050.0470.

The need for this clarification is two-fold. First, the current language implies that all waterbodies that support wild rice are specifically identified. This is not the case. Only waterbodies suggested to the Agency by the tribes are specifically identified; and all of these waters are located in the Lake Superior watershed. Second, the current language states that the waters are listed in Minn. R. 7050.0460 and 7050.0470. The waterbodies are listed only in Minn. R. 7050.0470. The "WR" identifier is explained in Minn. R. 7050.0460. Removal of the latter citation will correct this discrepancy. The Agency is proposing to include a mention of the identifier in the context of the wild rice related language, as shown below.

7050.0224. SPECIFIC <u>WATER QUALITY</u> STANDARDS ~~OF QUALITY AND PURITY~~ FOR CLASS 4 WATERS OF THE STATE; AGRICULTURE AND WILDLIFE.

*Subpart 1. **General.** The ~~numerical~~ <u>numeric</u> and narrative water quality standards in this part prescribe the qualities or properties of the waters of the state that are necessary for the agriculture and wildlife designated public uses and benefits. Wild rice is an aquatic plant resource found in certain waters within the state. The harvest and use of grains from this plant serve as a food source for wildlife and humans. In recognition of the ecological importance of this resource, <u>and in conjunction with Minnesota Indian tribes, selected</u> wild rice waters have been specifically identified <u>(WR)</u> and listed in part~~s~~ ~~7050.0460 and~~ 7050.0470, subpart 1. The quality of these waters and the aquatic habitat necessary to support the propagation and maintenance of wild rice plant species must not be materially impaired or degraded. If the standards in this part are exceeded in waters of the state that have the Class 4 designation, it is considered indicative of a polluted condition which is actually or potentially deleterious, harmful, detrimental, or injurious with respect to the designated uses.*

26. <u>Addition of "Class 2 Standards" and "Wetlands" to the Title of Four Subparts</u> [V.F. 7050 non-substantive, need]

The Agency is proposing to add the words "Class 2 standards" to the heading for Minn. R.7050.0222, subp. 7 (below). The addition simply helps remind the reader that this subpart is in the context of the standards for Class 2 waters.

Minn. R. 7050.0222, subpart 7. ***Additional standards<u>; Class 2 waters.</u>***

The Agency is proposing to add the word "wetlands" to the title of three subparts so the new titles will read:

Minn. R. 7050.0222, subpart 6. Class 2D waters<u>; wetlands.</u>
Minn. R. 7050.0223, subpart 5. Class 3D waters<u>; wetlands.</u>
Minn. R. 7050.0224, subpart 4. Class 4C waters<u>; wetlands.</u>

These additions are needed to identify these subparts as pertaining to standards for Class 2 waters or wetlands. It will help the reader identify them as such.

G. MINN. R. CH. 7053, NON-SUBSTANTIVE CHANGES TO RULE LANGAUGE NOT ASSOCIATED WITH THE DIVISION INTO TWO RULES [V. need]

1 <u>Introduction</u> [V.G. 7053 non-substantive, need]

Since much of the proposed new Minn. R. ch. 7053 is already existing language in Minn. R. ch. 7050 and because the Agency prefers not to change wording unnecessarily, there are few proposed changes to the language in Minn. R. ch. 7053 that are neither associated with the separation of Minn. R. ch. 7050 into two rules or that go beyond the "housekeeping" category. For the most part, the three changes described in this Section stem from recommendations by the Revisor's Office. They do not change the basic meaning of the rule.

2. <u>Clarification of Minn. R. 7053.0205, subp. 12</u> [V.G. 7053 non-substantive, need]

The provision that requires dischargers of sewage, industrial or other wastes to report to the Agency, Minn. R. 7053.0205, subp. 12, contains a reference to "*these waters or to tributaries which affect the same*" (see below). This provision including the "*these waters*" reference appears to date back to at least 1971 when the rules were much shorter and there were separate rules for intra and inter-state waters. It is reasonably clear from the original context that "these waters" refers to all intra- (WPC 14) or inter-state waters (WPC 15). As Minn. R. ch. 7050 has increased in size over the years the context for "*these waters*" has become less apparent. On the advice of the Revisor's Office, the Agency is proposing to change "*these waters*" to "*waters of the state*" as shown below.

[Minn. R. 7053.0205] *Subp. <u>12</u> ~~15~~.* ***Point source dischargers must report to agency****. All persons operating or responsible for sewage, industrial waste, or other waste disposal systems ~~which~~ <u>that</u> are adjacent to or ~~which~~ <u>that</u> discharge effluents to ~~these waters or to tributaries which affect the same,~~ <u>waters of the state</u> shall submit a report to the agency upon request on the operation of the disposal system, the effluent flow, and the characteristics of the effluents and receiving waters. Sufficient data on measurements, observations, sampling, and analyses, and other pertinent information ~~shall~~ <u>must</u> be furnished as may be required by the agency to adequately evaluate the condition of the disposal system, the effluent, and the waters receiving or affected by the effluent.*

This change does not change the meaning of the rule and it will have no impact on the interpretation of the rule.

3. Minn. R. 7053.0215, Deletion of Lead-in Sentences [V.G. 7053 non-substantive, need]

The Revisor's Office recommended removing the short lead-in sentences in Minn. R. 7053.0215, subp. 2 and 3 as shown below. These statements are redundant and not needed and the Agency proposed to make this change.

> [Minn. R. 7053.0215.
> *Subp. 2.* ***Exception for existing trickling filter facilities***. ~~*The exception for existing trickling filter facilities is:*~~
> *Subp. 3.* ***Exception for pond facilities***. ~~*The exception for pond facilities is:*~~

4. Minn. R. 7053.0405, Removal of Titles for Items and Other Language Improvements [V.G. 7053 non-substantive, need]

The Revisor's Office recommended removing the titles assigned to items in existing Minn. R. 7050.0216, *Requirements for Aquaculture Facilities*. The items in subparts 3 (items A to C), 5 (items A to G), and 6 (items A to E), have titles. In the current style preferences for administrative rules items do not have titles. Items elsewhere in existing Minn. R. ch. 7050 do not have titles. The removal of the titles in this part does not change the meaning of the rule. With one exception, the provisions themselves are self explanatory and the titles are not needed and somewhat redundant. The one exception in our opinion is existing Minn. R. 7050.0216, subp. 5, item B, now called "*Variance application*." The Agency proposes to add the phrase, "*for a variance*" to this item to make it clear that the additional requirements in this item refer to a variance request (shown below). The Agency proposes to follow the Revisor's recommendation and remove the titles.

> *B. ~~Variance application.~~ In addition to the requirements of part 7000.7000, subpart 2, the written application for a variance must contain:*

The Agency proposes to make additional minor changes to Minn. R. 7053.0405, subp.5, items D and G prompted in part by recommended changes from the Revisor's Office. The term "*control pollutant limit*" used in these items seems awkward, confusing and inconsistent with the heading in the table of limits listed in item G (see below). The Agency is proposing to replace "*control pollutant limit*" with "*limiting concentration*," which agrees with the heading of the numeric limits (in bold).

The Agency is also proposing to insert the term "*instantaneous value*" in front of the double and quadruple asterisks in the table of limiting concentrations (see below) to make it clear that these limits are interpreted as instantaneous values. This clarification was prompted by Revisor's Office suggestion that "*instantaneous value*" be removed from the beginning of the double and quadruple asterisk footnotes. This change should clarify the interpretation of these limits and it does not change the meaning of this provision. The quote below also includes examples of other minor editorial changes recommended by the Revisor's Office which the Agency proposes to make.

The changes to existing Minn. R. 7050.0216, subp. 5, item D to G are shown below**.**

D. ~~Closure.~~

If a variance is granted under item A, the permittee shall restore the receiving waters to baseline quality when:

(1) aquatic animal production from the facility ceases;

(2) any of the ~~control pollutant limits~~ limiting concentrations in item G are exceeded;

(3) the permit for the facility expires, and reissuance of the permit is not applied for or is applied for and denied;

(4) the permit for the facility is revoked;

(5) an agency order to cease operation is issued; or

(6) the required financial assurance under item F for closure, postclosure monitoring, or corrective actions is not maintained with the proper payment or substitute instrument.

E. ~~Closure plan.~~ The applicant shall submit a closure plan with the variance application. The closure plan shall demonstrate financial assurance under item F for closure, postclosure monitoring, and corrective actions for restoration of the receiving waters to baseline quality~~,~~ and shall describe the methods and processes that will be implemented to restore the receiving waters to baseline quality within three years of initiation of closure. The demonstration must show that no additional restoration is needed beyond three years. Restoration to baseline quality of the following parameters is required: dissolved oxygen, total phosphorus, and chlorophyll-a. Restoration to the baseline quality level means that the mean postclosure baseline quality levels ~~shall~~ are not ~~be~~ significantly different, as determined with the appropriate statistical test, from the mean preoperational baseline quality level.

F. ~~Financial assurance.~~ The applicant shall submit to the commissioner, for review and approval, a closure, postclosure monitoring, and corrective action cost estimate, and evidence of financial assurance, prepared ~~in accordance with~~ according to parts 7035.2685 to 7035.2805.

*G. ~~Control pollutant limits.~~ The following ~~control pollutant limits~~ **limiting concentrations** are established to prevent irreversible pollution and to protect the existing beneficial uses~~,~~ and apply to the receiving waters at all times:*

~~Substance or~~ Characteristic or Pollutant	*Limiting Concentration or Range*
Total organic carbon	*5 ~~milligrams per liter~~ mg/L**
Nitrate nitrogen	*10 ~~milligrams per liter~~ mg/L instantaneous value***
Chlorophyll-a	*30 ~~micrograms per liter~~ ug/L ****
Dissolved oxygen	*Not less than 3 ~~milligrams per liter~~ mg/L in the bottom half of the hypolimnion and 5 ~~milligrams per liter~~ mg/L in the upper half of the hypolimnion, instantaneous value*****

** Annual mean.*

*** ~~Instantaneous value.~~ "Instantaneous value" means the concentration in one sample.*

**** Monthly mean (May through September).*

***** ~~Instantaneous value.~~ If the baseline monitoring shows that the preoperational oxygen concentration for the same time of the year is less than three milligrams per liter for the bottom half of the hypolimnion and five milligrams per liter for the upper half, there ~~shall~~ may be no further reduction of the preoperational oxygen concentrations. If the baseline quality of a pollutant is greater than the ~~control pollutant limit~~ **limiting concentration**, or less in the case of dissolved oxygen, the baseline quality of the pollutant ~~shall~~ must be used as the ~~control pollutant limit~~ **limiting concentration**.*

H. MINN. R. CHS. 7050 AND 7053, HOUSEKEEPING CHANGES TO RULE LANGUAGES [v. need]

1. Change “Numerical” to “Numeric” Throughout Rule [V.H. housekeeping, need]

The Agency is proposing to change the word “numerical” to “numeric” throughout Minn. R. 7050 wherever the former appears to refer to numeric standards in the rule (“numeric” does not appear in Minn. R. ch. 7053). The change simply reflects a preference for the word “numeric” over “numerical”. The term “numeric” is listed as a variant of “numerical” in the American Heritage Dictionary, but “numeric” is in common usage in the Agency and is the preferred term.[23]

[23] The American Heritage Dictionary, Second College Edition. 1985. Houghton Mifflin Co., Boston.

2. Minn. R. 7050.0130, subp. 3, Use of Term "$7Q_{10}$" [V.H. housekeeping, need]

The shorter term, "$7Q_{10}$" or "$7Q_{10}$ flow" can be substituted for the phrase, "*once in ten year, seven-day ten-year*" because $7Q_{10}$ is proposed to be more clearly defined in Minn. R. 7050.0130, subp. 3. The change is needed to remove unnecessary wording in two locations in Minn. R. ch. 7050. The word "flow" will be included after "$7Q_{10}$" in sentences that do not otherwise mention "flow," or are not part of the definition of $7Q_{10}$ to provide context, as shown in the example below from Minn. R. 7050.0185, subp. 2, item G, subitem (3).

> *(b) the entire ~~once in ten year, seven-day~~ $7Q_{10}$ ~~low~~ flow of the receiving water as defined in part ~~7050.0210~~ 7050.0130, subpart 3 ~~7~~; and*

3. Minn. R. 7050.0218, subp. 3, item I, Addition of Reference to Minn. R. 7050.0220 [V.H. housekeeping, need]

The Agency is proposing to add to the existing definition of "chronic standard" in Minn. R. 7050.0218, subp. 3, item I, the reference to Minn. R. 7050.0220. The new citation will go with the existing reference to Minn. R. 7050.0222. Chronic standards are listed in both places.

> *I. "Chronic standard" or "CS" means the highest water concentration of a toxicant to which organisms can be exposed indefinitely without causing chronic toxicity. Chronic standards are listed in parts 7050.0220 and 7050.0222.*

4. Minn. R. 7050.0218, subp. 4, item B, Reformatting Equation [V.H. housekeeping, need]

The Revisor's Office recommends changing one of the equations used to calculate the final acute value in Minn. R. 7050.0218, subp. 4, item B from:

```
L = (Σ(ln GMAV)-S(Σ(square root of P)))/4
```

to,

$$L = \frac{\Sigma(\ln GMAV)-S(\Sigma(\text{square root of } P))}{4}$$

The Agency plans to make this change.

5. Minn. R. 7050.0218, subp. 6, Addition of "(Class 2A and 2Bd)" [V.H. housekeeping, need]

The Agency is proposing to add "(Class 2A and 2Bd)" to Minn. R. 7050.0218, subp. 6. The introductory paragraph to this subpart explains that human health-based water quality standards protect people that eat sport-caught fish **and**, for some waters, the consumption of drinking water as well. The addition of "(Class 2A and 2Bd)" is added to identify the subclasses that protect both these aspects of the Class 2 use.

6. Minn. R. 7050.0218, subp. 7, item D, Move Equation [V.H. housekeeping, need]

The Agency is proposing to move a equation in Minn. R. 7050.0218, subp. 7, item D so that its placement is consistent with the placement of other equations in the rule. The equation is:

$$\log_{10} BCF = 0.79 \log_{10} K_{ow} - 0.40$$

7. Minn. R. 7050.0222, subp. 7, items B and D, Changes to Citations [V.H. housekeeping, need]

The Agency is proposing to change the citations in Minn. R. 7050.0222, subp. 7, item B from existing parts of Minn. R. ch. 7050 to proposed parts in Minn. R. ch. 7053, because the referenced parts will be in the proposed new rule. These references are to provisions prohibiting acutely toxic conditions in effluents and mixing zones. Most required changes to citations are discussed as a group in Section V.E.8.

8. Minn. R. 7050.0223 to 7050.0225, Change in the Way pH Standards Are Listed for Class 3, 4 and 5 Waters [V.H. housekeeping, need]

The Agency is proposing to change how the pH standards are listed as shown in the following example from the Class 3B standards. The proposed change is from this:

~~*pH value*~~ ~~*6.0*~~ – ~~*9.0*~~

to this:

pH, minimum value	*6.0*
pH, maximum value	*9.0*

This proposed change makes the listing of the pH standards for Class 3, 4 and 5 uses consistent to how the Class 2 pH standards are listed.

Also, the Agency is proposing to re-format the listing of the Class 5 standards in the non-wetland and wetland categories, to go from a "two-column" format to a "three-column" format.

Substance, ~~or~~ Characteristic or Pollutant	*Class 5 Standards*	
	For non-wetlands	*For wetlands*
pH, minimum	*6.0*	*Maintain background*
pH, maximum	*9.0*	*Maintain background*
Hydrogen sulfide as S	*0.02 mg/L*	*Maintain background*

9. Minn. R. 7050.0221 to 7050.0227, Changes to Headings [V.H. housekeeping, need]

The Agency proposed to remove the words "*quality and purity*" from the headings for Minn. R. 7050.0221 to 7050.0227. The term "purity", is somewhat archaic and vague. It will be replaced with “water quality standards”. This change is needed to bring the language up to date, and to make it consistent with analogous changes throughout the rule, including the change to the title for Minn. R. ch. 7050 (Section V.F.2). An example of the change is shown below for Class 1 Waters. The headings for the other use classes, 2 to 7 will parallel this example.

> *7050.0221. SPECIFIC <u>WATER QUALITY</u> STANDARDS ~~OF QUALITY AND PURITY~~ FOR CLASS 1 WATERS OF THE STATE; DOMESTIC CONSUMPTION.*

10. <u>Minn. R. 7050.0425 and 7050.0430, Change Reference to Definition of Wetlands</u> [V.H. housekeeping, need]

The Agency is proposing to change the citation to the definition of wetlands in Minn. R. 7050.0425 and 7050.0430 from its current location in Minn. R. 7050.0130, item F to the proposed new location in Minn. R. 7050.0186, subpart 1a.

11. <u>Minn. R. 7053.0215, subpart 1. Requirements for Discharge of Sewage</u> [V.H. housekeeping, need]

The Agency is proposing to rename this part of the new Minn. R. 7053, as shown below. A change in the title is needed for two reasons. First, the term “facility” is not defined; it could have a range of meanings, and it could refer to industrial as well as sewage treatment works. The term “standards” in the context of effluent limits is misleading and helps perpetuate the confusion between ambient water quality standards and effluent limits. The Agency is trying to clarify this distinction.

> *<u>7053.0215</u> ~~FACILITY STANDARDS~~ <u>REQUIREMENTS FOR POINT SOURCE DISCHARGES OF SEWAGE</u>.*

The Agency proposes to remove the word “below” in the context of describing a “whole effluent toxicity test” (not shown). The description of this test follows immediately after it is mentioned, and the word “below” is not needed.

12. <u>Change in the Headings for the List of Pollutants that have Specific Effluent Limits in Minn. R. 7053.0215, 7053.0235 and 7053.0245</u> [V.H. housekeeping, need]

The Agency proposes to change the heading for the lists of pollutants that have effluent limits from “*Substance or Characteristic*” to “*Characteristic or pollutant*”. This change reflects the fact that most of the substances for which effluent limits are listed are pollutants. The same change is being proposed for Minn. R. 7053.0245 (effluent limits for Class 7 waters), and a similar change is being proposed for Minn. R. 7053.0235 (effluent limits for advanced treatment). In the latter, “item” is being replaced with ”pollutant”.

13. Limit/Standard, Limit/limitation [V.H. housekeeping, need]

The Agency is proposing to replace the word "standards" with "limits" in the context of effluent limits in two places in Minn. R. 7053.0235. This change is needed to minimize the confusion between ambient standards and effluent limits.

14. Will, Shall, Must, May and Other Recommendations of the Revisor's Office [V.H. housekeeping, need]

The Revisor's Office has recommended numerous editorial changes to the proposed rules, both Minn. R. ch. 7050 and 7053. Many of the changes can be grouped into one of the categories discussed below. The Agency plans to follow the recommendation of the Revisor's Office in making these changes throughout Minn. R. ch. 7050 and 7053. In some cases the word change is in provisions that the Agency is not otherwise proposing to change. The changes are shown in the proposed rule but are not individually listed in the SONAR. None of the Revisor's recommended changes change the meaning of the rule or how the rule is used or implemented.

The Revisor recommends using "shall" rather than "will" in situations where the Agency is requiring something, or requiring someone to take an action. The word "shall" was commonly used in early rule language, but over the years its use fell out of favor. "Shall" often survived in portions of the rule that the Agency had not changed in many years, and it is now preferred in some contexts. In other contexts the Revisor recommends the word "must" be used. The Revisor's Office also recommended limiting the use of the word "may" if it connotes an uncertainty about whether or not an action is required but suggests its use in other situations.

In several places in the two rules the Revisor recommended adding items to break up longer subparts to make it easier to cite exact provisions in the rules.

Other common changes recommended by the Revisor include the elimination of unnecessary or outdated words, a change from "which" to "that" where appropriate and the insertion or deletion of comas.

Examples of Revisor recommended changes follow:

Shall:

7050.0222, subp. 3a. "*The commissioner ~~will~~ shall determine baseline quality*…"
7053.0195 subp. 1. "…*Environmental Protection Agency ~~will~~ shall be advised*…"

Must:

7053.0155. "*The sample ~~shall~~ must be collected*…"
7053.0195, subp. 2. "*The list ~~shall~~ must be available for public inspection and ~~shall~~ must be provided*…"

May:

7050.0210 subp. 5. "…*by allowing dilution, ~~may~~ will consider* …"

7053.0205, subp. 1. "*No untreated sewage ~~shall~~ may be discharged …*"

Which/that:

7050.0140, subp. 2 to 6. "*…waters of the state ~~which~~ that are or may be used…*"
7053.0205, subp. 7. "*…at all stream flows ~~which~~ that are equal to…*"

Economy of language

7050.0130, subp. 2. "*…statutes, as used herein have the meanings ~~ascribed~~ given to them…*"
7050.0130, subp. 2. "*…of the agency ~~shall~~ are not ~~be construed to be~~ waters of the state.*"

Addition of items

7053.0205, subp. 5

15. Minn. R. ch. 7050 and 7053, Use of Milligram and mg/L [V.H. housekeeping, need]

The Agency proposes to replace "milligrams per liter" with "mg/L" in the listings of the Class 3, 4A, 4B and 5 standards. This will make these tables of standards consistent with how units are expressed in the tables of Class 2 standards. However, when milligram appears in text it will be spelled out and numbers below 10 will also be spelled out, for example:

[Minn. R. 70503.0255, subp. 3] *Phosphorus removal to one milligram per liter is …*

16. Conclusions and Housekeeping Changes Not Specifically Listed [V.H. housekeeping, need]

All the housekeeping changes are needed to accommodate other proposed rule changes, correct errors, clarify language and conform with recommendations of the Revisor's Office. The Agency has attempted to discuss all the proposed housekeeping changes in this Section of the SONAR. However, given the separation of Minn. R. 7050 into two rules, the clarifying language changes, and the changes suggested by the Revisor's Office, some housekeeping changes may have been over looked. Some are as minor as capitalization changes, others may involve changes in formatting necessitated by the differences between the Agency's and the Revisor's Offices' word processing systems and others may be a minor word change. Any and all of these "unlisted" changes are needed, and none impacts the meaning or substance of the rules.

VI. NEED FOR PROPOSED MAJOR AND SUBSTANTIVE RULE AMENDMENTS, MINN. R. CH. 7050 AND 7053

A. INTRODUCTION [VI. need]

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the need for and the reasonableness of the rules as proposed. In general terms, “need” means that the Agency must present the reasons for making the proposed changes to Minn. R. ch. 7050, and for the proposed the new Minn. R. ch. 7053. Also, need implies that a problem exists that needs to be fixed or dealt with through administrative attention.

In this Section of SONAR Book I the Agency will discuss the need for:

1. Eight major or substantive rule changes; and
2. Repeal of Minn. R. ch. 7056 and 7065.

The eight proposed major or substantive changes to Minn. R. ch. 7050, and to some parts of the proposed new Minn. R. ch. 7053, go beyond simple clarification of wording, reorganization, correction of errors, or reformatting of tables of standards, etc. The Agency considers these to be “major” changes to the rule. However, the major changes described in Sections VI. C, F and G are not intended to change the overall meaning of the current rule. They are considered to be “non-substantive” in that sense. The changes described in Sections VI. B, D, E, H and I **are** intended to change the meaning of the rule language, and they are considered both major **and** substantive.

For the most part the proposed amendments and language changes are shown in the *need* sections and are not repeated when the same topic is discussed in the *reasonableness* sections. If discrepancies in language are found between the Revisor’s Office version, the Agency’s version and the portions quoted in the SONAR, the Revisor’s Office version should be considered the correct version.

B. PROPOSED DEFINITIONS [VI. major and substantive, need]

1. <u>Introduction</u> [VI.B. major and substantive, need]

The Agency is proposing to define the nine terms listed below. Five of the nine are relevant to both Minn. R. ch. 7050 and 7053 and identical definitions are proposed to be included in both rules, as shown in the Table I-7.

Table I-7. Location of Nine Proposed Definitions in Minn. R. ch. 7050 and 7053.

Term	Located In:	
	Minn. R. 7050.0150	Minn. R. 7053.0255
$122Q_{10}$	Yes	Yes
Eutrophication	Yes	No
Fish and other biota and lower aquatic biota	Yes	No
Natural causes	Yes	No
Lake	Yes	Yes
Measurable increase or measurable impact	Yes	Yes
Reservoir	Yes	Yes
Shallow lake	Yes	Yes
Affects	No	Yes

None of these terms are among those required to be defined in the recently completed Session Law rulemaking, as required by Minn. laws 2003 ch. 128, art. 1, §156 (Exhibit A-37a).

2. <u>Definition of $122Q_{10}$; Minn. R. 7050.0150, subp. 4, item A, and Minn. R. 7053.0255, subp. 2, item A</u> [VI.B. major and substantive, need]

The definition of $122Q_{10}$ closely parallels the definitions of $7Q_{10}$ and $30Q_{10}$. The only difference in these definitions is number of daily low flow values for each year that are averaged together; in the case of the $122Q_{10}$ it is 122 days instead of 7 or 30 days. Also, like the $30Q_{10}$, the $122Q_{10}$ definition refers back to the definition of the $7Q_{10}$ for the information in the second paragraph.

The period of 122 days is used because that is the number of days in June through September. The $122Q_{10}$ low flow is part of the definition of "reservoir." It is the flow used to determine the residence time for reservoirs to distinguish reservoirs from rivers. The $122Q_{10}$ flow is relevant to both the eutrophication standards (in Minn. R. ch. 7050) and to the setting of phosphorus effluent limits (in Minn. R. ch. 7053); and, in this context, the $122Q_{10}$ will apply to the summer months of June through September. The Agency believes it is important to have the definition appear in both Minn. R. ch. 7050 and 7053.

> [Minn. R. 7050.0150 (also similar to 7053.0255)] <u>*"122-day ten-year low flow" or "$122Q_{10}$" means the lowest average 122-day flow with a once in ten-year recurrence interval. A $122Q_{10}$ is derived using the same methods used to derive a $7Q_{10}$, and the guidelines regarding period of record for flow data and estimating a $7Q_{10}$ apply equally to determining a $122Q_{10}$, as described in part 7050.0130, subpart 3.*</u>

3. Definition of Eutrophication; Minn. R. 7050.0150, subp. 4, item E [VI.B. major and substantive, need]

The Agency is proposing to include a definition of "eutrophication" in Minn. R. 7050.0150 because of the proposed addition of eutrophication water quality standards. "Eutrophication" is not a term in everyday usage and it needs to be defined.

> [Minn. R. 7050.0150] *"Eutrophication" means the increased productivity of the biological community in water bodies in response to increased nutrient loading. Eutrophication is characterized by increased growth and abundance of algae and other aquatic plants, reduced water clarity, reduction or loss of dissolved oxygen, and other chemical and biological changes. The acceleration of eutrophication due to excess nutrient loading from human sources and activities, called cultural eutrophication, causes a degradation of lake quality and possible loss of beneficial uses.*

4. Definition of Fish and Other Biota and Lower Aquatic Biota; Minn. R. 7050.0150, subp. 4, item F [VI.B. major and substantive, need]

The Agency is proposing to define the terms "fish and other biota" and "lower aquatic biota" in Minn. R. ch. 7050. These definitions are needed to round out the inclusion of definitions for essentially all the terms in the existing narrative standards in Minn. R. 7050.0150, subp. 4. The need to define these terms is enhanced by the increased importance over the last 10 years of water quality assessments, the listing of impaired waters, and the subsequent TMDL process. Narrative standards are the basis for 74 percent of all impairment listings in 2006 (59 % due to mercury contamination of fish tissue). Also, the terms requiring definitions due to the Session Law rulemaking (Section I.B) contributes to the overall need to define the remaining undefined terms in the existing narrative standard.

> [Minn. R. 7050.0150] *"Fish and other biota" and "lower aquatic biota" mean the aquatic community including, but not limited to, game and nongame fish, minnows and other small fish, mollusks, insects, crustaceans and other invertebrates, submerged or emergent rooted vegetation, suspended or floating algae, substrate-attached algae, and microscopic organisms. "Other biota" includes aquatic or semiaquatic organisms that depend on aquatic systems for food or habitat such as amphibians and certain wildlife species.*

5. Definition of Natural Causes; Minn. R. 7050.0150, subp. 4, item N [VI.B. major and substantive, need]

The Agency is proposing to include a definition for "natural causes" in Minn. R. 7050.0150. This definition is needed because the term is used in the proposed eutrophication standards. The Agency is well aware that some lakes cannot meet the proposed standards due to "natural causes". Also, the concept of "natural causes" recognizes that water quality conditions reflect the dramatic impacts humans have had on the Minnesota landscape, and that some level of impact may be unavoidable and possibly irreversible (see Section X.B.8; and in Book II, Section

VI.L.5 for a discussion of natural background applied to lake examples). It is important to define the concept of natural causes in the context of these standards.

> [Minn. R. 7050.0150] *"Natural causes" means the multiplicity of factors that determine the physical, chemical, or biological conditions that would exist in a water body in the absence of measurable impacts from human activity or influence.*

6. Definition of Lake; Minn. R. 7050.0150, subp. 4, item J, And Minn. R. 7053.0255, subp. 2, item D [VI.B. major and substantive, need]

The Agency is proposing to include a definition of "lake" in Minn. R. 7050.0150 because of the proposed addition of eutrophication water quality standards which apply to lakes. The definition of "lake" is included in Minn. R. 7053 as well because the term appears throughout this rule and particularly in the part dealing with phosphorus effluent limits, Minn. R. 7053.0255.

While everyone has a concept of what a lake is, the Agency needs to define it in the context of the proposed eutrophication standards. We need to make a distinction between "lakes" deeper than 15 feet, shallow lakes (less than or equal to 15 feet deep), reservoirs and wetlands. The proposed eutrophication standards vary with the type of lake, and the application of the eutrophication standards can be different depending on the type of lake as well.

> [Minn. R. 7050.0150 and 7053.0255] *"Lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth greater than 15 feet. Lakes may have no inlet or outlet, an inlet or outlet, or both an inlet and outlet.*

7. Definition of Measurable Increase or Measurable Impact; Minn. R. 7050.0150, subp. 4, item M, And Minn. R. 7053.0255, subp. 2, item E [VI.B. major and substantive, need]

The Agency is proposing to include a definition for "measurable increase" or "measurable impact" in both Minn. R. ch. 7050 and 7053 because the terms are used in both rules. In Minn. R. ch. 7050 "measurable impact" is in the definition of "natural causes", and "measurable increase" appears in the definition of "affects" in Minn. R. ch. 7053. Also, prompting the Agency to propose definitions for these terms now is:

- Importance of the "measurable" concept in the context of the eutrophication standards and the assessment of trophic status of lakes and reservoirs;
- Importance of "measurable" concept in the context of the existing phosphorus effluent limit and the definition of the term "affects;"
- Importance of the "measurable" concept in the context of the recently added definitions mandated by Minn. laws 2003 ch. 128, art. 1, §156 (c) and (d); and
- The trend toward defining in rule a range of terms previously undefined or defined only in guidance.

The concept of measurable increase or impact in the context of eutrophication due to nutrient loading is important in the assessment of lake trophic status in general but is especially important when assessing lakes for potential impairment. The definition is needed to spell out how the

Agency goes about determining if a change in trophic status is significant (may or may not be significant in the statistical sense), and discernable above normal variability in typical lake data.

"Measurable increase" describes how the Agency applies the critical word "affects" in the current phosphorus effluent rule, "*When the discharge of effluent is directly to or **affects** a lake,…*" (emphasis added). The "affects" should be measurable, in the meaning given in the definition, for the Agency to apply the current phosphorus limit to a discharger.

The sentence in the proposed definition, "*The change in trophic status does not require a demonstration of statistical significance to be considered measurable*" is not a critical element of the definition; but the Agency believes it is needed so the public has a better understanding of how assessments of lake trophic status is carried out in practice. The data available to the Agency may clearly show, by the weight of evidence, that a change in trophic status has taken place; but the data may not be amenable to a statistical test for significance for a variety of reasons. Probably the most common reason encountered is the small amount of data available upon which decisions must be made. While the data tell a convincing story to the professionals that review it, it may not show statistical significance because of the loss of power in the statistical test due to the small data set.

The Agency believes that having this definition, quoted below, in both rules is needed because the concept is used in both rules. This enhances the independence of the two rules and helps avoid the need to search back and forth from one rule to the other.

> [Minn. R. 7050.0150 and 7053.0255] "*Measurable increase" or "measurable impact" means a change in trophic status that can be discerned above the normal variability in water quality data using a weight of evidence approach. The change in trophic status does not require a demonstration of statistical significance to be considered measurable. Mathematical models may be used as a tool in the data analysis to help predict changes in trophic status.*

8. Definition of Reservoir; Minn. R. 7050.0150, subp. 4, item S, And Minn. R. 7053.0255, subp. 2, item G [VI.B. major and substantive, need]

A definition of "reservoir" is needed to distinguish reservoirs from lakes. The Agency is proposing to put the definition in both Minn. R. ch. 7050 and 7053 because reservoirs are addressed in both rules. The definition of reservoirs, like lakes and shallow lakes, is a fundamental element of the major amendments – the proposed eutrophication standards and extension of the phosphorus effluent limit. In Minn. R. ch. 7050, reservoirs are referenced in the proposed eutrophication standards.

> [Minn. R. 7050.0150 and 7053.0255] "*Reservoir" means a body of water in a natural or artificial basin or water course where the outlet or flow is artificially controlled by a structure such as a dam. Reservoirs are distinguished from river systems by having a hydraulic residence time of at least 14 days. For purposes of this item, residence time is determined using a flow equal to the $122Q_{10}$ for the months of June through September, a $122Q_{10}$ for the summer months.*

9. Definition of Shallow Lake; Minn. R. 7050.0150, subp. 4, item U, And Minn. R. 7053.0255, subp. 2, item H [VI.B. major and substantive, need]

A definition of “shallow lake” is needed in both Minn. R. ch. 7050 and 7053 because shallow lakes are distinct from deeper lakes and reservoirs, and they are addressed in both rules. The Agency is proposing separate eutrophication standards for shallow lakes for most ecoregions in Minn. R. ch. 7050 (SONAR Book II, Section VI.G).

> [Minn. R. 7050.0150 and 7053.0255] *“Shallow lake” means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the summer. The quality of shallow lakes will permit the propagation and maintenance of a healthy indigenous aquatic community and they will be suitable for boating and other forms of aquatic recreation for which they may be usable. For purposes of this chapter, shallow lakes are differentiated from wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186, subpart 1a.*

10. Definition of Affects; Minn. R. 7053.0255, subp. 2, item B [VI.B. major and substantive, need]

The Agency has implemented the current 1 mg/L phosphorus effluent limit rule since the mid 1970s. Again, the key words are: “*When the discharge of effluent is directly to or affects a lake,…*” Since its inception, the determination of “affects” has been the crux of implementing this rule for dischargers that do not discharge directly to a lake. The determination of “affects” is addressed in the Phosphorus Strategy (Exhibit PL-1). Also, the concept of “affects” was the subject of discussion in the 2003 (assessment factor) rulemaking. Providing a definition in rule is probably over due.

It is even more important now to clarify in rule how the Agency is interpreting the current phosphorus effluent limit, which centers around “affects”, to make the distinction between the implementation of the current rule from the proposed extension of the 1 mg/L phosphorus effluent limit (also see SONAR Book II, Section VII.B). Also, proposing a definition for “affects” is logical in the context of the proposed addition of definitions for several terms relevant to the phosphorus effluent limit and the proposed eutrophication standards.

The proposed definition, quoted below, includes an important phrase, which is: *from an **individual** point source discharge* (emphasis added). This phrase is needed to confirm that “affects”, in the context of the current 1 mg/L phosphorus limit, refers to the loading of nutrients from an individual discharge, and is not the “affects” of cumulative loading from all point sources in the watershed. This is the way the current phosphorus limit has been interpreted almost since its inception in 1973 (see history in SONAR Book II, Section IX.B).

> [Minn. R. 7053.0255, subp. 2] *B. “Affects” means a measurable increase in the adverse effects of phosphorus loading as determined by monitoring or modeling, including, but*

not limited to, an increase in chlorophyll-a concentrations, a decrease in water transparency, or an increase in the frequency or duration of nuisance algae blooms, from an individual point source discharge.

11. Summary [VI.B. major and substantive, need]

In summary, definitions for the nine terms discussed above are needed because they are used in the proposed amended rules. It is important to clarify the meaning of these widely used terms in the context of the proposed eutrophication standards and extension of the phosphorus effluent limit to new and expanding dischargers. Also, the definitions are needed because of the greatly increased awareness and emphasis on the identification of impaired waters and resulting TMDLs over the last five years.

C. MINN. R 7050.0185, NONDEGRADATION FOR ALL WATERS, POLICY [VI. major, need]

The Agency is proposing to reword the "policy" part of the existing provisions dealing with nondegradation for all waters, Minn. R. 7050.0185, subp. 1.[24] The nondegradation for all waters provision was added to Minn. R. ch. 7050 in 1988. The need to revise this language falls into two categories.

First, the existing language begins by saying: "*The potential capacity of the water to assimilate additional wastes and the beneficial uses inherent in water resources are valuable public resources*." A statement extolling the value of surface waters for waste assimilation seems out of place in nondegradation language; but more importantly, waste assimilation is not a recognized "beneficial" use.

Federal rules (40 CFR 131.10(a), Exhibit A-60) and EPA guidance (Page 2-1 of EPA's Water Quality Handbook, Exhibit A-61) expressly state that waste assimilation is not an acceptable beneficial use. Accordingly, there are no water quality criteria or standards specifically designed to protect "assimilative capacity." In fact, water quality standards that protect legitimate beneficial uses (e.g., drinking water, aquatic life and recreation, etc.) serve to put limits on how much assimilative capacity can be safely allocated to a receiving stream to avoid exceedances of standards downstream. There is a need to reword this nondegradation language to remove the reference to assimilative capacity.

Waste assimilation is an acknowledged function of rivers and streams and a very important one. The privilege dischargers have to use receiving streams for waste assimilation is guaranteed in other parts of the rule (e.g., proposed Minn. 7053.0205, subp. 5). This long-recognized function of moving water systems is not being questioned, changed or altered by the proposed change to the nondegradation language.

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[24] Minnesota's term "nondegradation" equals the federal term "antidegradation".

Second, the Agency is proposing a modest rewording of existing subpart 1 and the addition of a second paragraph to subpart 1, to better reflect EPA regulations and guidance on the three "tiers" of nondegradation (40 CFR 131.12, Exhibit A-62 and EPA guidance, Exhibit A-63). The three tiers or levels of nondegradation protection, from the "least" to the "most" protective, are summarized as:

1. Maintain and protect existing instream uses and water quality standards.
2. Maintain and protect waters that are better than standards unless a lowering of water quality is necessary to accommodate important economic and social development.
3. Maintain and protect waters that constitute an outstanding national or state resource.

Minnesota R. 7050.0185, nondegradation for all waters, deals with the first two of these tiers. The current language alludes to tiers one and two but the language needs to be clarified. The language being proposed parallels the federal language in 40 CFR 131.12. The last sentence in the first paragraph of subpart 1 (see below) is the "tier one" statement, and it is essentially unchanged from the current language. It is just being made a separate sentence. Nondegradation "tier two" is the proposed new second paragraph in subpart 1. The new paragraph clarifies the main goal of nondegradation, which is to protect high quality waters and to maintain them in that "better-than-standards" condition. Again, the language parallels the federal language in the CFR. This addition does not change the Agency's authority regarding nondegradation for all waters in any way.

Nondegradation tier three, the protection of outstanding national or state resource waters, is addressed in a separate part of the rule, Minn. R. 7050.0180. No changes are being proposed to the "tier three" language in Minn. R. 7050.0180.

The Agency's intent is to correct these two defects in Minn. R. 7050.0185 without changing the level of nondegradation protection that the current rule provides, or how nondegradation to all waters is implemented. That is, the proposed changes will make the nondegradation language neither more lenient nor more stringent.

The proposed new Minn. R. 7050.0185, subpart 1 is quoted below:

> *7050.0185 NONDEGRADATION FOR ALL WATERS.*
>
> *Subpart 1.* ***Policy****. ~~The potential capacity of the water to assimilate additional wastes and the~~ The beneficial uses inherent in water resources are valuable public resources. It is the policy of the state ~~of Minnesota~~ to protect all waters from significant degradation from point and nonpoint sources and wetland alterations~~,~~ and to maintain existing water uses~~,~~ <u>and</u> aquatic and wetland habitats~~, and the level of water quality necessary to protect these uses~~. <u>Existing beneficial uses and the water quality necessary to protect the existing uses must be maintained and protected from point and nonpoint sources of pollution</u>.*
>
> *<u>It is the policy of the agency that water quality conditions that are better than applicable water quality standards and are better than levels necessary to support</u>*

> *existing beneficial uses must be maintained and protected unless the commissioner finds that, after full satisfaction of this part, a lowering of water quality is acceptable. In allowing a lowering of water quality, the existing beneficial uses must be fully maintained and protected and the provisions in subpart 3 must be applied.*

In summary, these changes to the nondegradation for all waters language are needed to remove an inappropriate and unneeded reference to assimilative capacity, and to make the rule conform more closely to tiers one and two of nondegradation protection as laid out in the 40 CFR 131.12.

D. MINN. R. 7053.0195, EXTENSION OF REVIEW PERIOD FOR VARIANCES TO EFFLUENT LIMITS [VI. major and substantive, need]

A modified version of the existing variance language in Minn. R. 7050.0190 is being proposed for Minn. R. ch. 7053. Having a variance provision in both rules allows the two rules to function independently regarding variances. This change is triggered by the separation of Minn. R. ch. 7050 into two rules but it is discussed here because the proposed extension of the review period from three to five years is a substantial change.

The variance process allows dischargers to seek relief when: "… *by reason of exceptional circumstances the strict enforcement of any provision of these standards would cause undue hardship, … and that strict conformity with the standards would be unreasonable, impractical, or not feasible under the circumstances, the agency in its discretion may grant a variance therefrom…*" (existing Minn. R. 7050.0190). An outside party that is seeking relief from an effluent limit or treatment requirement initiates the variance. The review of variance requests involves a careful assessment of the costs and hardships that the strict adherence to the applicable limit(s) would cause the discharger, and the extent of environmental harm, if any, that might result if the variance is granted. The Agency decides whether to grant or deny the variance. In many cases the staff asks the Agency Citizens' Board to approve the staff recommendation to grant or deny the variance. The public has an opportunity to comment on the variance through the permitting process or at the Board meeting. The EPA must approve all variances.

The Agency proposes to name the new subpart, Minn. R. 7053.0195 "*Variance from Treatment Requirements*", to be consistent with the scope of Minn. R. ch. 7053. Similarly, the name of Minn. R. 7050.0190, subpart 1 is proposed to change from "*Standards*" to "*Variance*".

The agency is required to periodically review variances. Currently that review interval is every three years for all variances. The Agency is proposing to lengthen the time period for the review of variances to **effluent limits or treatment requirements** to five years. The Agency is not proposing any change to the three-year review period for variances to water quality standards.

This proposed change from a three to a five-year review cycle for variances to effluent limits is needed because:

- The request for a variance to effluent limit is associated with a particular discharger and that discharger's permit.
- NPDES and state disposal system permits are reviewed and re-issued on a five-year cycle.
- It is much more efficient and logical to combine the review of the discharger's variance with the review of the permit at the time of re-issuance.
- From a practical standpoint the Agency has not had the resources to review variances to effluent limits every three years.
- The change will more closely match what the Agency is able to do now in the periodic review of variances to effluent limits.

The Agency is proposing to add cross-references to the variance language in both Minn. R. 7050.0190 and Minn. R. 7050.0195 (shown below). These references are needed to refer the reader to the appropriate rule depending on whether the variance is to a water quality standard or an effluent limit. This is more important now that the review periods for the two types of variances will be different if these amendments are adopted.

> *7050.0190. VARIANCE FROM STANDARDS*
> …
> *Subp. 3. **Review**. Variances <u>from water quality standards</u> granted by the agency under this part shall be subject to agency and public review at least every three years. <u>Variances from discharge effluent limits and treatment requirements are granted by the agency under parts 7000.7000 and 7053.0195.</u> Variances may be modified or suspended under the procedures in part 7000.7000.*

The variance provision proposed for Minn. R. 7053.0195 uses parallel language and it includes the proposed extension of the review period to five years.

> *<u>7053.0195 VARIANCE FROM TREATMENT REQUIREMENTS.</u>*
>
> *<u>Subp. 3. **Review**. Variances from discharge effluent limits or treatment requirements granted by the agency under this part are subject to agency and public review at least every five years. Variances from water quality standards are granted by the agency under parts 7000.7000 and 7050.0190. Variances may be modified or suspended under the procedures in part 7000.7000.</u>*

In the sentence containing the reference to the variance counterpart in the other rule, the Agency is proposing to add a reference to the part of the Agency's procedural rule, Minn. R. 7000.7000 that deals with variances in general. The Agency needs to make it clear that the provisions in both rules (Minn. R. ch. 7000 and Minn. R. ch. 7050 or 7053) are applicable to all variances.

E. MINN. R. 7053.0235, REMOVAL OF 5 MG/L TSS EFFLUENT LIMIT WHEN PRETREATMENT PLAN IS NOT IN PLACE [VI. major and substantive, need]

The Agency is proposing to remove a provision in the advanced wastewater treatment requirements in proposed Minn. R. 7050.0235 that relates to pretreatment programs for municipal wastewater treatment plants. The provision says the Agency can impose a stringent effluent limit of 5 mg/L for total suspended solids (TSS), if the discharger had failed to implement a pretreatment program. The typical technology-based (secondary treatment) limit for TSS that essentially all dischargers have in their permits is 30 mg/L.

Some industries discharge their wastewater to municipal sanitary sewer systems. Pretreatment of industrial wastewater prior to discharge reduces the concentration of toxic pollutants in the waste stream before it reaches the sewage treatment plant. Reduction of toxic substances at their source through pretreatment is an efficient way to reduce the level of toxics that might "pass through" the treatment plant to the receiving stream. And it protects the treatment plant itself from high concentrations of toxics that could harm the treatment process. The pretreatment program has been very successful in reducing the concentrations of toxic materials reaching rivers and streams.

Most domestic sewage treatment plants are not specifically designed to remove toxic materials.[25] In spite of this, incidental reduction normally does take place. Typically, the better the level of treatment of "conventional" pollutants such as TSS, the better the removal of toxics from the waste stream. While the Agency does not dispute the premise behind the more stringent TSS limit, the 5 mg/L TSS limit has been replaced by the much more efficient pretreatment program as the means of toxics control. This provision is no longer needed and can be removed; and removal will have no negative environmental consequences.

Specifically, removal of the 5 mg/L provision is needed because:

- Industrial pretreatment programs, for those municipalities that are required to have them, are now in place and implemented.
- There are no municipalities to which this provision would apply today because there are none that still must initiate a pretreatment program.
- Toxic pollutants are being directly controlled through pretreatment, and indirect control through imposition of stringent TSS limits is inefficient.
- The 5 mg/L TSS provision has rarely if ever been invoked since being adopted in early 1981.

The proposed language changes and deletion of the unneeded provision are shown below:

> <u>*Subpart 1.*</u> ***<u>Inadequate dilution</u>****. In any instance where it is evident that the minimal treatment specified in part ~~7050.0211~~ 7053.0215, subpart 1, or ~~7050.0212~~ 7053.0225 and dispersion are not effective in preventing pollution, or if at the applicable flows it is evident that the specified stream flow is inadequate to protect the ~~specified~~ water quality*

[25] An important exception to this is the removal of ammonia, a toxic component of domestic wastewater. Many plants are designed and built to achieve ammonia removal.

standards <u>specified in chapters 7050 and 7052</u>, the specific standards may be interpreted as effluent <u>limits</u> ~~standards~~ for control purposes. In addition, the following effluent <u>limits</u> ~~standards~~ may be applied without any allowance for dilution where stream flow or other factors are such as to prevent adequate dilution~~,~~ or where it is otherwise necessary to protect the waters of the state for the stated uses:

~~Item~~ <u>Pollutant</u>	*Limits~~*~~*
Five-day carbonaceous biochemical oxygen demand	*5 ~~milligrams per liter~~ <u>mg/L</u> (arithmetic mean of all samples taken during any calendar month)*

*~~*If a discharger is required by the commissioner to implement a pretreatment program for the control of toxic pollutants from industrial contributors and the program has not yet been implemented, the discharger's effluent limitation for total suspended solids shall be five milligrams per liter until such time as the program has been implemented.~~*

The changes in language shown above also reflect recommendations from the Revisor's Office to separate the provisions in Minn. R. 7053.0235 into three subparts to make it easier to cite specific provisions. The Agency proposes to call the three subparts:

Subpart 1. Inadequate dilution.
Subp. 2. Limits for pond facilities.
Subp. 3. Variability of operations.

In summary, this provision, while adopted with good intentions (see Section X.E), has seldom if ever been used, and is now no longer needed because the pretreatment program is fully implemented.

F. MINN. R. 7050.0220, SUBP. 2 AND MINN. R. 7050.0221, DRINKING WATER STANDARDS NOT APPLICABLE TO CLASS 1 WATERS, UPDATE OF STANDARDS AND OTHER LANGUAGE IMPROVEMENTS [VI. major, need]

1. <u>Introduction</u> [VI.F. major, need]

The Agency is proposing to correct several discrepancies in the individual EPA drinking water standards that do not apply to Class 1 surface and ground waters. At the same time the Agency is proposing to update the reference in rule to the latest EPA drinking water standards, to update the listing of specific drinking water standards in Minn. R. 7050.0220, and to remove redundant citations to the Code of Federal Regulations (CFR).

2. Drinking Water Standards Not Applicable to Class 1 Waters [VI.F. major, need]

The EPA primary and secondary drinking water standards are promulgated by EPA under the authority of the Safe Drinking Water Act, and they have the force of law when adopted as final. These drinking water standards are designed to protect finished drinking water. That is, they apply at the tap after the water has been treated and sent out through community distribution systems. The Minnesota Department of Health has the responsibility to monitor community drinking water after treatment to make sure EPA drinking water standards are met.

The Agency adopted most EPA drinking water standards for application to raw (untreated) water supplies starting with the first statewide water quality rules in 1967. Thus, Minn. R. ch. 7050 applies the EPA drinking water standards to untreated (raw) ground water and those surface waters designated as drinking water supplies (Class 1 waters). Over the years, the Agency has updated outdated, and added new, drinking water standards in Minn. R. ch. 7050 as EPA has amended their standards, and the Agency is proposing to update them again in this revision.

The EPA groups drinking water standards into seven categories. Table I-8 lists the categories along with some explanatory notes (see Exhibits HH-1 and HH-2). Standards for substances in the first six categories are called primary drinking water standards or “maximum contaminant levels” (MCL). “Treatment technique” standards replace numeric MCLs for some substances. The seventh category is the “secondary” standards.

The MCLs, including the treatment technique standards, are initially determined by EPA scientists based on protecting human health. But the final MCLs may be raised or lowered based on non-health related factors, such as effectiveness of water treatment systems, treatment costs and analytical detection limits.[26] Secondary standards are based on non-health related factors such as taste, odors and aesthetic considerations (Table I-8).

[26] Class 2 chronic human health-based standards in Minn. R. 7050.0222 are **not** adjusted for these factors.

Table I-8. Categories of U.S. Environmental Protection Agency Drinking Water Standards (DWS).

Category*	Substance or Pollutant	Explanation
1. Microorganisms and Turbidity	*Cryptosporidium*, *Giardia lamblia*, heterotrophic plate count, *Legionella*, total coliforms, turbidity	Pathogenic bacteria and protozoans, or indicators of possible pathogenic bacteria. Turbidity included in this category because the more turbid the water the more likely microorganisms will be present.
2. Disinfection byproducts	Bromate, chlorite, haloacetic acids, total trihalomethanes	Halogenated organic chemicals formed as a byproduct of disinfection with chlorine or bromine.
3. Disinfectants	chloramines, chlorine, chlorine dioxide	Chemicals used to disinfect drinking water.
4. Inorganic chemicals	See Exhibit HH-1	Trace metals and other inorganic substances.
5. Organic chemicals	See Exhibit HH-2	Solvents, pesticides, etc.
6. Radionuclides	alpha particles, beta particles, radium 226, radium 228, uranium	Radioactive substances.
7. Secondary drinking water standards	See Exhibit HH-1	Standard based on aesthetic or cosmetic considerations, not human health.
DWS in form of a Treatment technique*	acrylamide, epichlorohydrin, copper, lead	Standard based on ability to remove substance during treatment process, in context of human health effects.

*Treatment technique is not one of EPA's seven categories of drinking water standards, but is listed separately because the four substances shown are excluded from the Class 1 standards. Turbidity is included in the microorganism category but the MCL is a treatment technique.

The rationale for applying EPA finished drinking water standards to raw water is that drinking water treatment systems are usually not designed to remove many of the pollutants for which drinking water standards exist. Treatment systems for drinking water may consist of simple filtration followed by chlorination (to kill microorganisms). Some pollutants of concern to humans can pass through this basic level of treatment with little reduction. It is prudent, in this situation, to apply the standards to the raw water sources, both surface and ground. However, applying finished drinking water standards to the raw water supplies creates some issues that need to be addressed in the rule. Certain drinking water standards can never be met in the raw water, or logically should not be applied to ground or surface waters prior to treatment. Examples of the former are the bacteriological standards and examples of the latter are standards for byproducts of the treatment process itself.

Drinking water standards are listed or referenced in two locations in the rule; Minn. R. 7050.0220 and 7050.0221. In Minn. R. 7050.0220 the standards are listed individually (pollutant by pollutant). In Minn. R. 7050.0221 they are not listed individually but incorporated by reference by citing the CFR. In both locations, the current rule mentions certain standards or categories of standards as not being applicable to ground and surface waters. The problem that needs correcting is that the standards excluded from the tables in Minn. R. 7050.0220, or stated as not applicable (in both parts of the rule) contain errors, are inconsistent and outdated.

Table I-9 shows the categories of standards that seem (the current rule is not always clear) to be excluded or included in the current rule and the proposed changes for this rulemaking. It is not always clear from the wording in the current rule whether the intent of not listing certain standards was simply to save space in the tables in Minn. R. 7050.0220, or to indicate that they were not applicable to surface or ground waters.[27] It is evident from Table I-9 just how extensive the current inconsistencies are in Minn. R. 7050.0220 versus 7050.0221, in terms of which standards are excluded or included. There clearly is a need to improve these lists and to make the two parts of the rule consistent. The Agency's rationale for excluded and including certain categories of standards is explained in the *reasonableness* section, Section X.F.

Table I-9. Current and Proposed Excluded and Included EPA Drinking Water Standards in Minn. R. 7050.0220 and 7050.0221.

EPA Drinking Water Standards	Currently Excluded (Ex) or Included (In) in Minn. R. 7050.0220, subp. 2	Currently Excluded (Ex) or Included (In) in Minn. R. 7050.0221, by Subclass*				Proposed to be Excluded (Ex) or Included (In) in both Minn. R. 7050.0220 and 7050.0221, Class 1 waters*	
		1A	**1B**	**1C**	**1D**	**Ground water**	**Surface water**
Microorganisms,	Ex	In	Ex	Ex	Ex	In	Ex
Turbidity	In	In	In	Ex	In	In	Ex
Disinfection Byproducts	Ex	In	In	In	In	Ex	In
Disinfectants	In	In	In	In	In	Ex	Ex
Radionuclides	Ex, but standards are referenced	In	In	In	In	In	In
Treatment Technique***	Ex	In	In	In	In	Ex	Ex
Water Treatment Additives	Ex, but this category is no longer recognized by EPA	In	In	In	In	NA	NA
No standards excluded from the remaining 3 categories: organic and inorganic chemicals, and secondary drinking water standards NA = not applicable							

*Description of waters protected by the subclasses of Class 1 waters in Minn. R. 7050.0221:

Class 1A, "…*restricted to ground waters with a high degree of natural protection*"

Class 1B, "…*restricted to surface and ground waters with a moderately high degree of natural protection*"

Class 1C, "…*restricted to surface and ground waters in aquifers not considered to afford adequate protection against contamination from surface or other sources of pollution*."

Class 1D. "…*restricted to surface and ground waters in aquifers not considered to afford adequate protection against contamination from surface or other sources of pollution.*" It is proposed to remove the Class 1D category from Minn. R. 7050.0221, see Section X.G.

**Class 1C has a turbidity standard of 25 NTU.

***Applies only to the following with treatment technique standards: acrylamide, epichlorohydrin, copper and lead.

[27] The rulemaking completed in 1994 listed individual drinking water standards in the newly proposed Minn. R. 7050.0220. The SONAR for that rulemaking indicates that bacteriological standards apply to class 1A but not Class 2B-2D waters; standards for two treatment additives and two treatment technological metals are not applicable to any Class 1 waters; and the radioactivity standards are not listed but are applicable. The SONAR also stated that if any discrepancies occur between the included/excluded standards mentioned in Minn. R. 7050.0220 and 7050.0221, the latter will be considered correct (1993 SONAR, page 54).

The Agency feels it is important to make these corrections and clarifications. The changes will have no practical impact on the application of drinking water standards to Class 1 waters. The Agency's proposed categories to be excluded and included are already at least partially excluded or included in either Minn. R. 7050.0220 or 7050.0221, with one exception. That exception, highlighted in gray in Table I-9, is the disinfectants category. This category, which includes chemicals used to kill microorganisms in the drinking water treatment process does not need to be applied to the raw water. The proposed revised language in Minn. R. 7050.0220, subp. 2 listing the drinking water standards not applicable to Class 1 surface waters follows. The analogous and parallel language proposed for Minn. R. 7050.0221, subpart 1, listing the drinking water standards not applicable to Class 1 surface and ground waters, is shown in the next Section.

[Minn. R. 7050.0220] *Subp. 2.* ***Explanation of tables.***

> <u>*A.*</u> *Class 1* <u>*domestic consumption (DC)*</u> *standards ~~listed in~~ ~~the tables in subparts 3a and 4a~~ are the United States Environmental Protection Agency primary (maximum contaminant levels) and secondary drinking water standards, as contained in Code of Federal Regulations, title 40, parts 141~~ subparts B and G,~~ and 143*<u>*,*</u>*~~ (1992); and sections 141.61 and 141.62~~ as amended through July ~~17, 1992~~* <u>*1, 2004*</u>*. ~~excluding the bacteriological, radiological, treatment technological, and water treatment additive standards.~~* <u>*The DC standards are listed in subparts 3a and 4a, except that individual pollutants, substances, or organisms in the treatment technological, disinfectants, microbiological, and radiological categories are not listed unless they are listed because a secondary drinking water standard or a standard for another use class exists.*</u>

> <u>*B.*</u> <u>*Certain drinking water standards are not applicable to Class 1 waters.*</u> <u>*The following are not applicable to Class 1 surface waters: the primary drinking water standards for acrylamide, epichlorohydrin, copper, lead, and turbidity (treatment technique standards) and the standards in the disinfectants and microbiological organisms categories. The drinking water standards not applicable to Class1 ground waters are listed in part 7050.0221.*</u>

In summary, Table I-10 shows the EPA drinking water standards proposed to be included or applicable and excluded or not applicable to Class 1 waters.

Table I-10. EPA Drinking Water Standards Applicable to Class 1 Waters.

Category	**Class 1 Ground Waters Minn. R. 7050.0221**	**Class 1 Surface Waters Minn. R. 7050.0220 and 7050.0221**
Microorganisms and Turbidity	Applicable	Not Applicable
Disinfection byproducts	Not Applicable	Applicable
Disinfectants	Not Applicable	Not Applicable
Inorganic chemicals	Applicable	Applicable
Organic chemicals	Applicable	Applicable
Radionuclides	Applicable	Applicable
Treatment technique	Not Applicable	Not Applicable
Secondary standards	Applicable	Applicable

Consistent with these proposed corrections and clarifications, the Agency is proposing the following changes to specific drinking water standards listed under the "DC" column in Minn. R. 7050.0220.

- Turbidity: Changes from "1-5 NTU" to not applicable ("NA")
- Lead: Changes from nothing listed to not applicable ("NA")
- Bromoform: Changes from nothing listed to "see subitem (73)"
- Chloroform: Changes from nothing listed under the "DC" column to "see subitem (73)"

Again, the standards listed in Minn. R. 7050.0220, subp. 3a and 4a apply only to raw surface waters. The turbidity drinking water standard is not applicable to raw surface waters and should not have been listed there. The change shown above will correct that discrepancy. Almost all the lead in finished drinking water comes from pipes in the distribution system, and the drinking water standard for lead is a treatment technique standard, which is not applicable to untreated raw water.[28]

Bromoform and chloroform are listed individually because they have Class 2 standards. They are also two of the four trihalomethane compounds included in the total trihalomethane drinking water standard, which is listed in Minn. R. 7050.0220, subp. 3a (and 4a), item C, subitem (73). A reference is needed to the drinking water standards as a reminder for the reader that the same two compounds are included in the "trihalomethanes, total" standard.

As stated previously, the EPA drinking water standards are incorporated by reference in Minn. R. 7050.0221, subp. 2 to 4. To make it clear that some drinking water standards listed in the CFR are excluded, the Agency is proposing to add "*except as noted in subpart 1*" to

[28] In most waters the Class 2 aquatic life chronic standard for lead is more stringent than the drinking water "action level" value of 15 µg/L (Exhibit HH-1). Waters with a mean total hardness greater than 338 mg/L will have Class 2 lead standards greater than 15 µg/L, up to a maximum of 19 µg/L.

the sentence containing the citation. This clause is needed to call attention to the standards that are not applicable to Class 1 waters (see proposed language in Section VI.F.4).

3. Update of EPA Drinking Water Standards [VI.F. major, need]

The Agency proposes to update the reference to the latest Code of Federal Regulations (CFR) listing of the primary and secondary drinking water standards in both Minn. R. 7050.0220, subp. 2 and 7050.0221 subp. 1 (see proposed language for the latter below). The current reference is to the 1992 CFR and to a *Federal Register* dated July 17, 1992. The latest 40 CFR 141 and 143 is dated July 1, 2004 (Exhibit. A-54).

Also shown in the proposed changes below are the lists of excluded drinking water standards for Class 1 ground and surface waters, discussed in the previous Section.

7050.0221. SPECIFIC WATER QUALITY STANDARDS ~~OF QUALITY AND PURITY~~ FOR CLASS 1 WATERS OF THE STATE; DOMESTIC CONSUMPTION.

Subpart 1. ***General****.*

A. The ~~numerical~~ numeric and narrative water quality standards in this part prescribe the qualities or properties of the waters of the state that are necessary for the domestic consumption designated public uses and benefits. If the standards in this part are exceeded in waters of the state that have the Class 1 designation, it is considered indicative of a polluted condition which is actually or potentially deleterious, harmful, detrimental, or injurious with respect to the designated uses.

B. The Class 1 standards in this part are the United States Environmental Protection Agency primary (maximum contaminant levels) and secondary drinking water standards, as contained in the Code of Federal Regulations, title 40, parts 141 and 143 as amended through July 1, 2004. These Environmental Protection Agency drinking water standards are adopted and incorporated by reference with the exceptions in this item. The following standards are not applicable to Class 1 ground waters: the primary drinking water standards for acrylamide, epichlorohydrin, copper, and lead (treatment technique standards) and standards in the disinfectants and disinfection by-products categories. The following standards are not applicable to Class 1 surface waters: the primary drinking water standards for acrylamide, epichlorohydrin, copper, lead and turbidity (treatment technique standards) and the standards in the disinfectants and microbiological organisms categories.

The Agency is proposing to update the numeric drinking water standards in Minn. R. 7050.0220. Also the Agency is proposing to update the reference to the Code of Federal Regulations in Minn. R. 7050.0221. The individual updated standards and updated CFR reference are based on the same July 1, 2004, CFR (Exhibit A-54). The drinking water standards in Minn. R. ch. 7050 have not been updated since 1994; three existing standards have changed and three new standards have been added. They are listed in Table I-11. These changes are needed to update the rule.

Table I-11. Proposed Updates to Drinking Water Standards in Minn. R. ch. 7050.

Chemical or Substance	Current Standard µg/L	Updated Standard µg/L or notation	Reference or Comments
Existing Standards that Change			
Arsenic	50	10	66 FR 6976
Nickel	100	--	Removed in 1995; 60 FR 33926
Trihalomethanes, total	100	80	63 FR 69390
Turbidity	1 – 5	NA	Corrections to included/excluded standards
New Standards Added			
Bromate		10	63 FR 69390
Chlorite		1000	63 FR 69390
Haloacetic acids, total*		60	63 FR 69390

* Bromoacetic, Dibromoacetic, Dichloroacetic, Monochloroacetic and Trichloroacetic acids
-- means "no standard" in table of standards, Minn. R. 7050.0220.

4. Other Language Improvements [VI.F. major, need]

As part of the changes to the language associated with the drinking water standards, the Agency is proposing to remove the full citations to the parts of the Code of Federal Regulations that contain the drinking water standards in Minn. R. subp. 2 to 4 (Subparts 2 and 3 shown). These citations, repeated in each of the three existing subparts, are not needed and can be replaced with a reference back to full citation in Minn. R. 7050.0221, subpart 1. This change is needed to remove unnecessary verbiage in the rule.

The pertinent portions of Minn. R. 7050.0221, subp. 2 and 3 are quoted below showing the proposed changes.

> [Minn. R. 7050.0221] *Subp. 2.* ***Class 1A waters; domestic consumption***. *The quality of Class 1A waters of the state shall be such that without treatment of any kind the raw waters will meet in all respects both the primary (maximum contaminant levels) and secondary drinking water standards issued by the United States Environmental Protection Agency as* <u>*referenced in subpart 1.*</u> ~~*contained in Code of Federal Regulations, title 40, part 141, subparts B and G, and part 143, (1992); and sections 141.61 and 141.62, as amended through July 17, 1992. These*~~ <u>*The*</u> *Environmental Protection Agency* <u>*drinking water*</u> *standards are adopted and incorporated by reference*<u>*, except as noted in subpart 1*</u>*.*
>
> *These standards will ordinarily be restricted to underground waters with a high degree of natural protection.*

*Subp. 3. **Class 1B waters**. The quality of Class 1B waters of the state shall be such that with approved disinfection, such as simple chlorination or its equivalent, the treated water will meet both the primary (maximum contaminant levels) and secondary drinking water standards issued by the United States Environmental Protection Agency as <u>referenced in subpart 1</u> ~~contained in Code of Federal Regulations, title 40, part 141, subparts B and G, and part 143, (1992); and sections 141.61 and 141.62, as amended through July 17, 1992; except that the bacteriological standards shall not apply~~. ~~These~~ <u>The</u> Environmental Protection Agency <u>drinking water</u> standards~~, as modified in this part,~~ are adopted and incorporated by reference<u>, except as noted in subpart 1</u>.*

These standards will ordinarily be restricted to surface and underground waters with a moderately high degree of natural protection and apply to these waters in the untreated state.

5. <u>Conclusions</u> [VI.F. major, need]

All the proposed changes to the Class 1 drinking water standards are needed to correct errors and inconsistencies, update references to the drinking water standards, update the standards themselves, and remove some unnecessary language.

G. MINN. R. 7050.0221, SUBP. 5, REMOVAL OF CLASS 1D CATEGORY OF DRINKING WATER STANDARDS [VI. major, need]

The Agency is proposing to remove in its entirety Minn. R. 7050.0221, subp. 5, the drinking water standards applicable to Class 1D waters. The need for this change is several-fold.

1. There are no waterbodies in Minnesota specifically classified as Class 1D. All Class 1 surface waters in Minn. R. 7050.0470 are either Class 1A, 1B or 1C. Thus, standards for Class 1D waters are not needed because there are no Class 1D waters. It is theoretically conceivable that there may be Class 1D **ground** waters, but they are not specifically identified in the rule; and
2. The current rule makes no real distinction between Class 1C and 1D ground waters. The suggested treatment requirements for the two classes are essentially the same, and the examples of the types of poorly protected ground water aquifers to which the Class 1D and Class 1C waters apply are identical (see current Minn. R. 7050.0221, subp. 4 and 5).
3. Removal will eliminate a confusing and unneeded portion of the drinking water standards in Minn. R. 7050.0221.
4. The numeric standards for the 10 substances specifically listed in Minn. R. 7050.0221, subp. 5 are woefully outdated. Because they are very outdated and rarely if ever used, their removal will have no effect on the application of drinking water standards to Class 1 waters.

Also, removal of the Class 1D standards provides an opportunity to remove an obscure, confusing and unneeded link between industrial use (Class 3) standards and drinking water standards in the current Minn. R. 7050.0223.

The Class 3A industrial use standards in Minn. R. 7050.0223, subp. 2 include the phrase "*The quality shall be* ***generally comparable*** *to Class* ***1B*** *waters for domestic consumption, …*". Similarly, the Class 3B industrial use standards in Minn. R. 7050.0223, subp. 3 include the phrase "*The quality shall be* ***generally comparable*** *to Class* ***1D*** *waters for domestic consumption, …*" (emphasis added).

The Agency is proposing to remove these two phrases from the industrial use standards. The Agency has never defined what "generally comparable" means in this context. This provision is seldom if ever used, partly due to the uncertainty as to how to interpret the term "generally comparable". In the single interpretation of this provision known to the writer of this SONAR[29], it was the opinion of Agency staff that "generally comparable" did not mean that Class 3A or 3B waters had to meet Class 1B and 1D drinking water standards, respectively. It was thought that at most "generally comparable" could mean that the drinking water standards might be used as an unenforceable guide for assessing the quality of Class 3A or 3B waters.

There will be no impact to the protection of surface waters from pollution, or to the Agency or any other party as a result of the removal of this provision in the Class 3 standards.

H. MINN. R. 7050.0220, SUBP. 7, SITE-SPECIFIC MODIFICATION OF STANDARDS [VI. major and substantive, need]

In the rulemaking completed in 1990, 54 Class 2 numeric water quality standards for toxic pollutants were added to Minn. R. ch. 7050. At the same time language was added that allows the Agency to modify an existing Class 2 or Class 7 numeric standard on a site-specific basis. The Agency is now proposing to extend that authority so that existing standards for use Classes 1, 3, 4, 5 and 6 can be modified on a site-specific basis as well.

The original proposed wording of the site-specific modification language, quoted in part below, implies that a numeric standard for **any** use class could be modified, and that this provision was not limited. However, during the hearing for these amendments the Agency's intent became clear that only Class 2 (and Class7) standards were covered by the provision. A description of that history follows.

> <u>[1990 proposed Minn. R. 7050.0218]</u> *Subp. 13. Site-specific standards. The standards derived in this part, or the standards in part 7050.0220, are subject to review and modification as a result of information pertaining to a specific surface water or segment. …*

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[29] In the 26 plus years of working with water quality standards, both this writer and my colleague, Gerald Blaha recall this provision in the Class 3 standards as coming up on only one occasion. That was an interpretation of this provision by the Metropolitan Waste Control Commission (now Metropolitan Council, Environmental Services) in a publication of water quality monitoring data, that the drinking water standards did apply to Class 3 waters. In subsequent conversations with Commission staff, they were advised that this was not the case. (David Maschwitz)

Part of this quote refers to modification only of Class 2 standards and part to standards for all use classes. It is the clause "*or the standards in part **7050.0220***" that suggests the standards for any use class could be modified. This is because in 1990 part 7050.0220 included all standards for all use classes, listed by Classes 1 through 7. Now standards are listed in separate parts, Minn. R. 7050.0221 to 7050.0227. On the other hand, the clause "*standards derived in this part*" refers only to Class 2 site-specific standards (more accurately called site-specific "criteria" in the context of Minn. R. 7050.0218).

During the public hearings for the 1990 rulemaking, in response to comments, the Agency proposed first one (March 9, 1990) then a second (March 16, 1990) language and location change for the site-specific standard (SSS) provision (Exhibits A-42a and A-42b). These changes strongly suggest that the Agency's intent was to have the site-specific modification provision for existing standards apply only to Class 2 standards. The provision was moved to Minn. R. 7050.0220, subp. 3a, and it included a reference to Minn. R. 7050.0220, subp. 3, the part of the rule that contained only the Class 2 numeric standards. Other subparts of Minn. R. 7050.0220 contained the standards for other use classes in 1990. Also, gone from the language is any reference to site-specific criteria developed using Minn. R. 7050.0218 because these criteria are developed in the absence of an adopted standard, and are site-specific by definition (Minn. R. 7050.0218, subp.1). After these changes, it is clear that the provision dealt just with the modification of an adopted Class 2 standard on a site-specific basis; it is partially quoted below.

> [Minn. R. 7050.0220, 1990] *Subp. 3a. Site-specific modification of standards. The standards listed in subpart 3* [Class 2 standards] *are subject to review and modification as a result of information pertaining to a specific surface water or segment…*

As part of the next revision of water quality rules (1994), Minn. R. 7050.0220 was changed to its current configuration, which is a listing of numeric standards for all use classes by the four most common use categories (see Section V.F.13). Also in 1994, the standards listed by individual use class were separated into their own part of the rule. That is, the old Minn. R. 7050.0220 was split into seven new parts, Minn. R. 7050.0221 to 7050.0227. Thus, Minn. R. 7050.0222 contains only the Class 2 standards. These changes prompted another move of the SSS modification language, this time from Minn. R. 7050.0220 to 7050.0222. This kept the provision in the part of the rule that includes only the Class 2 standards, further confirming its limited applicability.

Since 1994, the need for the Agency to be able to modify standards for other use classes has become increasingly apparent. The Agency is proposing to change the site-specific language so that the standards for any use class can be modified on a site-specific basis. This can be accomplished by moving the provision back to Minn. R. 7050.0220, where the context is standards for all use classes, and by adding a reference to the standards in parts 7050.0221 to 7050.0227 to make the broader application clear.

The need for the Agency to have the authority to modify an existing standard for any use class and not just Class 2 standards, is that local conditions and circumstances can affect the appropriateness of any standard. It is the ability to modify on a site-specific basis the Class 3 (industrial use) and Class 4 (agricultural uses) standards where the need is greatest. These standards have not been reviewed and up-dated since they were first adopted nearly 40 years ago. Also, some Class 3 and 4 standards as listed have proven to be difficult for some dischargers to meet necessitating a variance request (see Section X.H). The ability to modify these standards on a site-specific basis provides an important and usually very cost-effective means of dealing with these local situations, with very little if any impact to the environment. The modification of a standard on a site-specific basis does not change the beneficial uses for which the waterbody is protected.

The current wording of the site-specific provision seems to restrict the development of a SSS to situations involving either a permit or a remedial clean-up action. While these activities may have been the universe of situations that might have called for a SSS in 1990, such is not the case today. The potential need for SSS has expanded, especially in the context of TMDLs. As more attention is focused on numeric water quality standards, the assessment process, the listing of impaired waters, and subsequent TMDLs, the need and demand for SSSs has and will continue to increase. This is happening now as we begin to implement TMDLs for lakes impaired due to excess nutrients. The Agency and local entities involved in TMDLs are looking at SSS as a cost-effective and logical way to deal with situations where meeting the statewide (or ecoregion-based) standard is not possible. To anticipate and accommodate this need, the Agency is proposing to remove the language that appears in two places in the SSS provision: '… *in the course of development of a permit effluent limit or the evaluation of a remedial action cleanup activity*…" This will give the Agency the needed flexibility to deal more efficiently with the increasing number and complexity of TMDLs down the road. And, since the proposed eutrophication standards are ecoregion-based, rather than state-wide, the Agency is proposing to add the words, "or ecoregion" to the SSS provision.

Finally, the Agency is proposing to add the word "body" after "water" in three places in the site-specific provision. This addition is needed simply to clarify that site-specific standards can be developed for any type of surface water, including lakes and wetlands as well as rivers and streams. The first reference to surface waters in the first sentence of the current language (… *as applied to a specific surface water reach or segment…*) might be interpreted as meaning only stream or river reaches. The Agency wants to be clear that this provision can apply to any type of surface water.

The Revisor's Office suggested making the three paragraphs items. The full text of the provision showing the proposed language changes is shown below.

[Minn. R. 7050.0220] <u>*Subp. 7.*</u> ***Site-specific modifications of standards***.

<u>*A*</u>*. The standards in ~~subparts 2 to 6~~ <u>this part and in parts 7050.0221 to 7050.0227</u> are subject to review and modification as applied to a specific surface water <u>body</u>, reach~~,~~ or segment ~~in the course of development of a permit effluent limit or the evaluation of a remedial action cleanup activity~~. If site-specific information is available that shows that a site-specific modification is more appropriate than the statewide <u>or ecoregion</u> standard for a particular water <u>body, reach, or segment</u> ~~to be protected by the permit or cleanup activity~~, the site-specific information shall be applied.*

B. The information supporting a site-specific modification can be provided by the commissioner~~,~~ or by any person outside the agency. The commissioner shall evaluate all relevant data in support of a modified standard and determine whether a change in the standard for a specific water body or reach is justified.

C. Any effluent limit determined to be necessary based on a modified standard shall only be required after the discharger has been given notice ~~to~~ of the specific proposed effluent limits and an opportunity to request a hearing as provided in part 7000.1800.

I. MINN. R. 7050.0222, PROPOSED MINIMUM HARDNESS FOR CALCULATIONS OF TRACE METAL STANDARDS [VI. major and substantive, need]

The toxicity-based standards for seven trace metals vary with the total hardness of the ambient water in which the standard is applied. The greater the ambient hardness the greater the allowable concentration of trace metal that is considered safe for aquatic life. Dissolved metal ions tend to bind with many inorganic and organic constituents in natural waters (carbonates, phosphates, amino acids and humates). Tightly bound or complexed metal ions have been shown to be less bio-available and less toxic than free metal ions. Total hardness (calcium plus magnesium expressed as calcium carbonate) is a surrogate for the inorganic component of the factors that mitigate the toxic effects of trace metals. Numerous toxicity tests have shown that metal toxicity is directly related to total hardness. The seven hardness-related metal standards are for:

- Cadmium
- Chromium, trivalent
- Copper
- Lead
- Nickel
- Silver (maximum and final acute value standards only, chronic standard does not vary)
- Zinc

The standards for these metals are in the form of an equation, which reflects the toxicity/hardness relationship (see Section V.F.18). A hardness value is entered into the equation to calculate a hardness-specific standard. The Agency typically uses mean or median ambient hardness values to calculate metal standards for a given waterbody.

The current rule specifies a high-end cap of 400 mg/L on hardness values that can be used in the calculation. This means, if a waterbody has mean or median hardness greater than 400 mg/L, the standard is calculated using 400 mg/L. Thus, there is a cap on how high the standard can go. Currently there is no minimum hardness value in the rule that would “cap” the metal standard calculation for very low hardness values. The Agency believes a low-end cap is needed and is proposing a minimum hardness or low-end cap of 10 mg/L. If a waterbody has mean or median hardness less than 10 mg/L, the standard would be calculated using 10 mg/L.

The need for a cap at very low hardness values is the same reason a cap was needed and adopted for high hardness values. The toxicity tests that show the toxicity/hardness relationship were typically carried out at a range of hardness values between 45 and 300 mg/L. The true toxicity/hardness relationship at the extremely low, and high, hardness values is uncertain. At very low hardness values, below 10 mg/L, the metal standard could be overly stringent; and, at very high hardness values, above 400 mg/L, the standard could be under protective. As stated, the rule already as a high-end cap of 400 mg/L but no low end cap. The proposed language for a low-end cap is shown below.

> *<u>For hardness values less than 10 mg/L, 10 mg/L shall be used to calculate the standard and</u> for hardness values greater than 400 mg/L, 400 mg/L shall be used to calculate the standard.*

In conclusion, this addition is needed to place a cap at the low end of the hardness range for calculating hardness-dependent metal standards, because the toxicity/hardness relationship is uncertain at these very low hardness values, and to avoid the application of unnecessarily stringent metal standards.

J. REPEAL OF MINN. R. CH. 7056 AND 7065 [VI. major and substantive, need]

1. <u>Introduction</u> [VI.J. major and substantive, need]

The Agency is proposing to repeal both Minn. R. ch. 7056 and 7065 in their entirety, but retain much of Minn. R. ch. 7056 and portions of Minn. R. ch. 7065 and move the retained parts to Minn. R. ch. 7053. Specifically, the Agency is proposing to repeal Minn. R. 7056.0010 to 7056.0040 and Minn. R. 7065.0010 to 7065.0260 (Minn. R. 7065.030 to 7065.0450 were repealed in 1988, 12 SR 1810) Both rules are old (1963 and 1971) and largely outdated. However, both contain important or unique provisions which the Agency wishes to retain. The discharge prohibitions in Minn. R. ch. 7056 (formally WPC-1) and the phosphorus limits in Minn. R. ch. 7065 (formally WPC 27, 28 and 30) were the reasons these rules were among a few early rules retained when about 22 outdated rules were repealed in 1981. The repealed rules had been superseded by state-wide rules.

The proposed creation of a rule to contain effluent limits, Minn. R. ch. 7053, provides an opportunity to move the important provisions from these old rules into the new rule so Minn. R. ch. 7056 and 7065 may be repealed. The other components of Minn. R. ch. 7056 and 7065 have long since been superseded by other rules and repeal of these provisions will have no negative impact on water quality.

2. <u>Minn. R. ch. 7056</u> [VI.J. major and substantive, need]

Minnesota R. ch. 7056 contains provisions that prohibit the discharge of raw or treated sewage, industrial wastes or other wastes into the stretch of Mississippi River from the mouth of the Rum River to the upper lock and dam at St. Anthony Falls in Minneapolis. The most pertinent provisions are quoted below; the full text of Minn. R. ch. 7056 is Exhibit A-56.

7056.0010 SCOPE.

The classification for use and the pollution standards as hereinafter set forth are hereby adopted and established for that portion of the Mississippi River from but not including the mouth of the Rum River to the upper lock and dam at St. Anthony Falls, approximately at the northeastward extension of Fifth Avenue South in the city of Minneapolis, and streams tributary thereto.

7056.0040 STANDARDS.

Subpart 1. Raw sewage and waste. *No raw sewage, and no industrial waste or other wastes, treated or untreated, containing viable pathogenic organisms or any substances which may cause disease, endanger the public health, or otherwise impair the quality of the receiving waters for public water supply shall be discharged into the waters.*

Subp. 2. Treated sewage; general prohibition. No treated sewage effluent shall be discharged into the waters from any source originating after the taking effect hereof, including, without limitation, discharges from watercraft.

Subp. 3. Nuisance prohibited. No treated sewage effluent, industrial waste, or other wastes shall be discharged into the waters so as to cause any nuisance conditions, including, without limitation, the presence of substantial amounts of floating solids, scum, oil slicks, suspended solids, material discoloration, obnoxious odors, visible gassing, sludge deposits, substantial fungus growths, or other offensive effects.

Minnesota R. ch. 7056 was adopted in June of 1964 as WPC-1. As noted, it was not repealed in 1981 because of its unique prohibitions; the purpose of which is to protect the drinking water intakes for the cities of Minneapolis and St. Paul. The other provisions in Minn. R. ch. 7056 have been superseded by provisions in Minn. R. ch. 7050, and are no longer needed. These provisions are listed in Table I-12, along with the provisions in the current rule that supersede them (see Exhibit A-56).

Table I-12. Provisions in Minn. R. ch. 7056 Superseded by Minn. R. ch. 7050, and Provisions Proposed to be Retained and Moved into Minn. R. ch. 7053 (in bold italics).

Minn. R. ch. 7056		**Minn. R. ch. 7050, Superseded by:**	
Part	**Title**	**Part(s)**	**Title**
7056.0010	Scope	NA	***Miss. R. reach description to be moved***
7056.0020	Classification for use	7050.0470 7050.0410	Classifications for waters in major surface water drainage basins Listed waters
7056.0030	Related conditions	7050.0221 7050.0222	Specific standards of quality and purity for class 1 waters of the state; domestic consumption, and for Class 2; aquatic life and recreation
7056.0040	Requirements:		
Subp. 1	Raw sewage and waste	NA	***Prohibitions to be moved***
Subp. 2	Treated sewage; general prohibition	NA	***Prohibitions to be moved***
Subp. 3	Nuisance prohibited	NA	***Prohibitions to be moved***
Subp. 4	Impairment of water quality prohibited	7050.0210, subp. 2, 13	Nuisance conditions prohibited Pollution prohibited
Subp. 5	Dissolved oxygen limitation	7050.0210, subp. 5, 7; 7050.0222, subp. 3	Mixing zones; Minimum stream flow; Class 2Bd dissolved oxygen standard
Subp. 6	Temperature limitation	7050.0210, subp. 5, 7; 7050.0222, subp. 3	Mixing zones; Minimum stream flow; Class 2Bd temperature standard
Subp. 7	Chemical limitations	7050.0210, subp. 5, 7; 7050.0221; 7050.0222	Mixing zones; Minimum stream flow; Class 1 drinking water standards; Class 2Bd aquatic life standards
Subp. 8	Pollution prohibited in general	7050.0210, subp. 13	Pollution prohibited
Subp. 9	Variances	NA	***Variance provision to be moved***

The Agency is proposing to move the unique aspects of Minn. R. ch. 7056, the point source discharge prohibitions, into proposed new Minn. R. 7053.0265, and to repeal Minn. R. ch. 7056. The intent is to preserve these prohibitions without changing them, and then to remove an otherwise outdated and unnecessary rule. As much of the existing unique language in Minn. R. ch. 7056 as needed will be moved intact to avoid inadvertently changing the meaning. The proposed language as it will appear in Minn. R. 7053.0265 is shown below.

7053.0265 DISCHARGE RESTRICTIONS APPLICABLE TO THE MISSISSIPPI RIVER FROM THE RUM RIVER TO ST. ANTHONY FALLS.

*Subpart 1. **Scope and beneficial uses**. The restrictions on discharges specified in this part are applicable to that portion of the Mississippi River from, but not including, the mouth of the Rum River to the upper lock and dam at St. Anthony Falls, approximately at* *the northeastward extension of Fifth Avenue South in the city of Minneapolis, and tributary streams. The primary use of these waters is as a source of public water supply for drinking, food processing, and related purposes.* *Other uses applicable to these waters are defined in parts 7050.0410, 7050.0430, and 7050.0470, subpart 4.*

Subp. 2. ***Discharges prohibited****. Discharges listed in items A to C are prohibited to the waters defined in subpart 1.*

A. Raw sewage and industrial waste or other wastes, treated or untreated, containing viable pathogenic organisms or any substances that may cause disease, endanger the public health, or otherwise impair the quality of the receiving waters for public water supply.

B. Treated sewage effluent from any source, including, without limitation, discharges from watercraft.

C. Treated sewage, industrial waste, or other wastes so as to cause any material increase in taste, odor, color, or turbidity above natural levels or otherwise to impair the quality of the water so as to render it objectionable or unsuitable as a source of water supply.

Subp. 3. ***Variance****. The variance provisions of parts 7000.7000 and 7053.0195 are applicable to this part.*

The creation of Minn. R. ch. 7053 to contain effluent limits provides an ideal time to move the discharge prohibitions in Minn. R. ch. 7056 into this new rule, and to repeal Minn. R. 7056.0010 to 7056.0040. This change is needed in order to consolidate effluent limits in one rule, and to remove an out dated rule that is easily over looked.

3. Minn. R. ch. 7065 [VI.J. major and substantive, need]

Three rules originally adopted in February of 1971 called WPC 27, 28 and 30 were later combined to form Minn. R. ch. 7065. Accordingly, Minn. R. ch. 7065 is divided into three nearly identical sections with special effluent limits for the following waters (Exhibit A-57):

1. Lake Superior drainage basin and Lake St. Croix
2. St. Louis River from its source to the mouth including St. Louis Bay, Mississippi River from its source to Grand Rapids, Big Stone Lake, and Albert Lea Lake
3. St. Croix from the Wisconsin border to Taylors Falls

The important provision of this rule, and the provision the Agency wishes to retain, is the 1 mg/L phosphorus effluent (TP) limit applicable to all facilities discharging to the waters listed in numbers 1 and 2 above. This TP limit is the reason this rule was never repealed. The TP limit for the Lake Superior basin and Lake St. Croix is quoted below as an example.

7065.0040 STANDARD OF EFFLUENT QUALITY AND PURITY.

Except as otherwise provided herein it is hereby established as a minimum requirement applicable to all persons operating or causing to be operated or in any way responsible for the operation of a disposal system which discharges sewage, industrial waste, or other wastes directly to the above delineated waters, or which may affect these waters, that all effluents shall be treated prior to discharge so as to meet the following limiting permissible concentration:

Substance or Characteristic	*Limiting Concentration*
Phosphorus	*1 milligram per liter*

For all practical purposes, everything besides the phosphorus effluent limits in Minn. R. ch. 7065 have been superseded by provisions in Minn. R. ch. 7050, and are no longer needed. The parts of Minn. R. ch. 7065 (including the TP limit applicable to the waters in 1 and 2 listed above) are listed in Table I-13, along with the provisions in the current rule that supersede them. The discussion of the more stringent effluent limits applicable to the St. Croix River from the Wisconsin border to Taylors Falls follows Table I-13.

Table I-13. Provisions in Minn. R. 7065.0010 to 7065.0130 Superseded by Minn. R. ch. 7050, and Provisions Proposed to be Retained and Moved into Minn. R. ch. 7053 (in bold italics).

Minn. R. ch. 7065		**Superseded by Existing Minn. R. ch. 7050**	
Part	**Title**	**Part(s)**	**Title**
7065.0010	Purpose and scope	NA	***L. Superior basin and Lake St. Croix descriptions to be moved***
7065.0020	Definitions	7050.0130	Definitions
7065.0030	Severability	7050.0110; 7050.0210, subp. 6c	Scope Other requirements preserved
7065.0040	Standards of effluent quality and purity	NA	***1 mg/L phosphorus limit to be moved***
7065.0050	Monthly reports	7050.0210, subp. 15	Point source dischargers must report to agency
7065.0060	Determination of compliance	7050.0150, subp. 8	Determination of compliance
7065.0070	Variance from standard	7050.0190	Variance from standards
7065.0100	Scope	NA	***St. Louis R., Miss. R., Little Minn. R., Big Stone L. and Albert Lea L., descriptions to be moved***
7065.0110	Definitions	7050.0130	Definitions
7065.0120	Severability	7050.0110; 7050.0210, subp. 6c	Scope Other requirements preserved
7065.0130	Standards of effluent quality and purity	NA	***1 mg/L phosphorus limit to be moved***

Besides the 1 mg/L phosphorus discharge limits applicable to the listed waters, Minn. R. ch. 7065 includes effluent limits for other pollutants applicable to discharges to the waters listed in numbers 2 and 3 above (Minn. R. 7065.0130 and 7065.0230). The limits in Minn. R. 7065.0130 define minimum secondary treatment requirements and are no more stringent than limits in existing Minn. R. 7050. Repeal will have no impact.

However, some of the effluent limits in Minn. R. 7065.0230 applicable to the St. Croix River from the Wisconsin border to Taylor's Falls are more stringent than today's secondary treatment requirements (Exhibit A-57). In all cases these limits have been either deemed unnecessary in the definition of secondary treatment by EPA, or represent an outdated and ineffective means to protect the water quality of the St. Croix River. These effluent limits are not needed. Section X.J. discusses the reasonableness of removing these effluent limits as part of the repeal of the two rules. The Agency would not propose these rule changes if it though that doing so would weaken the protection of the very important St. Croix River.

In summary, the Agency proposes to move the relevant phosphorus effluent limits now in Minn. R. ch. 7065 into Minn. R. 7053 and repeal Minn. R. 7065.0010 to 7065.0260. The phosphorus limits in this rule, originally WPC 27, 28 and 30, were the reasons these outdated rules were not repealed in 1981. The proposed new rule, Minn. R. ch. 7053, is the logical place to put the relevant provisions of Minn. R. ch. 7065. The remaining provisions in this outdated rule can be repealed with no negative impacts on water quality.

The more stringent effluent limits in Minn. R. 7065.0230 are not effective tools in the protection of the water quality of the St. Croix River. They are not needed. Current effluent limits, water quality standards, and, in particular, the nondegradation provisions in Minn. R. 7050.0180 provide a much more effective means of protecting this valuable resource. This change is needed in order to consolidate effluent limits in one rule, and to remove outdated and redundant rules.

K. CONCLUSIONS [VI. major and substantive, need]

In conclusion, the proposed changes and addition discussed in this SONAR are needed as summarized below:

1. A simplification of Minnesota's water quality rule, Minn. R. ch. 7050, is needed. Through successive revisions this rule has gotten very large and increasingly difficult to use. Users often have questions about the interpretation of Minn. R. ch. 7050, miss relevant provisions, or make mistakes in interpretation. These problems can be minimized by improving the rule. The Agency is proposing to accomplish this through:

    - Splitting Minn. R. 7050 into two rules, one for ambient water quality standards (revised Minn. R. ch. 7050), and one for effluent limits (new Minn. R. ch. 7053).
    - Reorganizing and consolidating some parts of revised Minn. R. ch. 7050.
    - Clarifying language throughout the rules and improving the arrangement and formatting of the water quality standards.

2. The numerous housekeeping and minor non-substantive changes are needed to: accommodate the split of Minn. R. ch. 7050 into two rules, correct errors, update and consolidate language, improve formatting, change citations, and to comply with recommendations of the Revisor's Office.

3. Definitions of eight terms[30] are needed because they are used in existing rule language or in proposed additions. Also, the greatly increased awareness and emphasis on the identification of impaired waters and resulting TMDLs in the last 10 years has highlighted the need to define these terms.

4. Changes to the introductory language to nondegradation for all waters are needed to remove an inappropriate and unneeded reference to assimilative capacity, and to make the rule conform more closely to tiers one and two of nondegradation protection, as laid out in the federal CFR.

5. Lengthening the review period for variances to effluent limits from three to five years is needed because variance reviews are always associated with permit re-issuance. The life of an NPDES permit is five years, and reviewing variances on a five-year schedule is a much more efficient use of staff time and is consistence with current practice.

6. Removal of the 5 mg/L total suspended solids effluent limit when no pretreatment program is in place is needed because this provision is outdated, was rarely if ever used, is not an efficient means of removing toxics, and because the current pretreatment program is fully implemented.

7. The proposed changes to the Class 1 drinking water standards are needed to correct errors and inconsistencies in the drinking water standards that should not apply to Class 1 raw water supplies, to update the CFR references to the latest drinking water standards, to update three existing and add three new EPA drinking water standards, and to remove some unnecessary language.

8. Removal of the Class 1D subclass is needed because there are no surface waters classified as 1D, and there is no distinction between the characteristics used to define Class 1C and 1D ground waters in the current rule. Removal will eliminate the long-since outdated (1962) Class1D numeric drinking water standards. The 1D subclass is not needed.

9. Removal of the "*generally comparable*" references in the Class 3 standards to the Class 1B and 1D drinking water standards is needed because the references are vague and unnecessary.

10. The authority to develop site-specific standards for use classes other than Class 2 is needed because the absence of this authority has forced the Agency to use more time

[30] Eutrophication, fish and other biota (lower aquatic biota), natural causes, lake, measurable increase (impact), reservoir, shallow lakes and affects.

consuming and costly means, such as variances, to legitimately remedy Class 3 and 4 standards that are not appropriate in a particular location.

11. A minimum total hardness of 10 mg/L is needed to “cap” the calculation of hardness-dependent metal standards at the low end of the hardness range, because the toxicity/hardness relationship is unknown at these very low hardness values, and to prevent the application of unnecessarily stringent metal standards.

12. As a part of the rule consolidation effort and the placement of effluent limits in the new Minn. R. ch. 7053, the relevant provisions in Minn. R. ch. 7056 and 7065 can be moved to Minn. R. ch. 7053. The relevant provisions are the discharge prohibitions to the Mississippi River above the Twin Cities drinking water intakes (Minn. R. ch. 7056), and the 1 mg/L phosphorus effluent limits for certain waterbodies (Minn. R. ch. 7065). This change is needed to consolidate effluent limits in one rule, and minimize the chance that the important provisions in these two outdated rules are over looked. Repeal of these two rules with their remaining provisions is needed because they have been superseded by other rules.

VII. REASONABLENESS OF THE PROPOSED RULE AMENDMENTS AS A WHOLE

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the reasonableness of the proposed rules. "Reasonableness" means: 1) that there is a rational basis for the Agency's proposed actions, 2) that the Agency's proposed amendments are appropriate and consistent with its mandate to protect Minnesota's water resources, and 3) due consideration has been given to the potential economic impacts of the proposals. The reasonableness of the proposed rule amendments covered in Book I of the SONAR is explained in the next four Sections.

Clearly it is to the Agency's advantage to have rules that are as clear, concise and as understandable as possible. It is also in the public's best interest to have understandable rules. First and foremost, the Agency **wants** the rules to be used. Correct use, or any use at all, may be stymied if the rules are confusing and difficult for the reader to understand. It is more efficient for everyone if the rules are used correctly with a minimum of misinterpretations and errors. The less time that Agency staff needs to spend correcting mistaken interpretations and answering the same questions is to everyone's benefit.

The Agency understands that no combination of proposed splitting, consolidating and rewording will remove all uncertainties and questions that might arise about rule content. However, the Agency firmly believes that the changes being proposed will make Minn. R ch. 7050 and the proposed new Minn. R. ch. 7053 significantly easier to use.

The proposed changes discussed in this Book of the SONAR deal mostly with the splitting of Minn. R. ch. 7050 into two rules, and language changes intended to make the rules more understandable without changing the meaning. The reasonableness of several more substantive proposed changes is discussed in Section X.

VIII. REASONABLENESS OF PROPOSED AMENDMENTS, REQUIRED INFORMATION

A. INTRODUCTION [VIII. required, reasonableness]

Minnesota Stat. § 14.131 requires that this SONAR include information about 11 aspects of the potential impacts of this rulemaking. The discussion in Sections VIII.B to VIII.L that follows pertains only to the items covered in Book I of the SONAR.

B. CLASSES OF PERSONS AFFECTED BY THE PROPOSED RULE AMENDMENTS, INCLUDING THOSE CLASSES THAT WILL BEAR THE COSTS AND THOSE THAT WILL BENEFIT [VIII. required, reasonableness]

Theoretically at least, all the citizens of Minnesota could be affected by, and benefit by, the proposed amendments to make the rules easier to understand. Those that use and apply the rule, and certainly those that support their application, should welcome the improvements. Most regulated parties, while probably neutral on these amendments, probably prefer to know and understand their regulatory obligations rather than be left in the dark due to a confusing rule. The proposed changes should help in that respect.

In general, the affected or interested outside parties that have commented on the more substantive aspects of the proposed amendments, have been silent on the proposal to split Minn. R. ch. 7050 into two rules. The draft proposed rules, Minn. R. ch. 7050 and 7053 showing all the proposed language changes were made available to the public through the Agency's Web page in August 2005.[31]

Of the nine major or substantive changes discussed in Section X, the one that potentially could have the most benefit for outside parties, particularly regulated parties, is the change to allow site-specific modification of a standard for any use Class. This option, if adopted, could potentially save dischargers money, assuming a particular problematic standard can be modified (made less stringent) on a site-specific basis with no harm to the environment. There is no way to predict actual future savings, if any, that might result from this change, because the Agency does not know how many situations amenable to a site-specific standard modification will arise in the future. A small number have come up in the last few years. While site-specific standards generally end up being more lenient than the adopted state-wide standard, because the motivation to develop a site-specific standard usually stems from a pending regulatory action, they can be more stringent also.

Other state agencies that have occasion to use Minn. R. ch. 7050 should benefit from the proposed changes. The Environmental Protection Agency (EPA) has an interest in these

[31] The proposed standards for acetochlor and metolachlor were made available in December, 2005.

proposed amendments. Under the Clean Water Act the EPA Regional Administrator (Region 5 in Chicago) must approve all changes to Minnesota's water quality standards (40 CFR 131.5).

C. ESTIMATE OF THE PROBABLE COSTS TO THE AGENCY AND OTHER AGENCIES OF IMPLEMENTING AND ENFORCING THE RULE AMENDMENTS, AND ANY ANTICIPATED EFFECT ON STATE REVENUES [VIII. required, reasonableness]

All the proposed rule changes, including the major changes discussed in SONAR Books II and III, are not expected to significantly affect Agency staff needs or work loads. There will be no impact on overall Agency costs or state revenues as a result of any of these proposed amendments. There is a possibility that Agency work loads may increase, which will increase costs. However, any added work and costs will be absorbed into the normal staff complement and current budgets.

Regarding just the changes covered in SONAR Book I, the Agency might incur very modest added costs. For example, it would be wise for the Agency to devote some time to train Agency water quality staff on the rule changes, particularly the split of Minn. R. ch. 7050 into two rules. This potential cost should be very minor. The training could be worked into the existing periodic training carried out by water quality standards staff to inform both new and existing staff about water quality rules and their implementation. Any added costs attributable to training staff on just the proposed rule changes is impossible to estimate, but should be small, due to the existing training program that can be used to advantage. And, any training costs should be offset in the long run by cost savings, if staff is more efficient and confident about implementing the rules without having to consult standards staff as frequently.

There is a possibility that the change to allow site-specific modifications of standards for any use class might cost the Agency additional money, but these costs may be more than offset if development of a site-specific standard avoids a usually more time consuming alternative, such as a variance. The "up-front" costs would be the additional staff resources needed to research a site-specific standard for a use class other than Class 2, if the proposed change generates additional "demand" for site-specific standards. Site-specific standards may potentially avoid an even more costly alternative such as a change in use classification, which requires a use attainability analysis followed by rulemaking. Long-term savings may result because the site-specific modification process usually requires fewer steps and less staff time than the alternatives now available.

It is unlikely that the proposed lengthening of the review period for variances to effluent limits from three to five years will save the Agency any money. Currently reviews are part of the permit review and reissuance process and are seldom carried out on a three-year cycle now. None of the other more substantive changes discussed in Section X are likely to impact costs for the Agency or for any outside party.

The Minnesota Department of Health (MDH) was consulted on the proposed changes to the drinking water standards (Section X.F). The Minnesota Departments of Natural Resources and

Agriculture have followed the Agency's progress in developing these rule amendments, but are more directly involved in other aspects of the amendments (SONAR Books II and III). No state or federal Agency will incur any costs due to the proposed changes covered in SONAR Book I.

D. DETERMINATION OF WHETHER THERE ARE LESS COSTLY OR LESS INTRUSIVE METHODS OF ACHIEVING THE RULE AMENDMENT'S PURPOSE [VIII. required, reasonableness]

There are no costs to outside parties associated with the proposed amendments covered in Book I of the SONAR. The Agency does not consider any of these changes to be "intrusive", in the sense that the changes will "intrude" on the public's activities or cause any party to take any action. To the contrary, these changes should help outside parties use the rules more efficiently, and to interpret the rules without the need for as much Agency involvement.

E. DESCRIBE ANY ALTERNATIVE WAYS OF ACHIEVING THE PURPOSE OF THE RULE AMENDMENTS THAT THE AGENCY SERIOUSLY CONSIDERED AND THE REASONS WHY THEY WERE REJECTED IN FAVOR OF THE PROPOSED AMENDMENTS [VIII. required, reasonableness]

Outside of several changes made to the scope of these proposed amendments since the planning process started in 2003, the Agency has not considered the alternative of not entering into this rulemaking. Indeed, the Clean Water Act requires a review of state water quality standards every three years. If the Agency is to achieve all its goals of making the rules smaller, clearer and easier to use, significant rearrangement and rewording of rule language needs to take place. Obviously alternatives of how to rearrange rule provisions and how to clarify wording are numerous. At the outset, the Agency defined the goals to be achieved through these changes which became the framework for how proposed changes were made (see Section IX.B). The Agency believes the proposed changes discussed in SONAR Book I as a whole accomplish these goals and are reasonable. The Agency's reasons for entering into rulemaking are described at length in the "Need" portion of this SONAR.

F. ESTIMATE OF THE PROBABLE COSTS OF COMPLYING WITH THE PROPOSED RULE AMENDMENTS, AND COSTS BORNE BY CATEGORIES OF AFFECTED PARTIES [VIII. Required, reasonableness]

As stated, the proposed amendments covered in SONAR Book I will not result in increased costs to any outside party.

G. ESTIMATE OF THE PROBABLE COSTS OF NOT ADOPTING THE PROPOSED RULE AMENDMENTS, AND COSTS BORNE BY CATEGORIES OF AFFECTED PARTIES [VIII. Required, reasonableness]

Any possible costs to outside parties of not adopting the proposed changes covered in SONAR Book I would be impossible to quantify, and any added costs are likely to be very small. Probably the proposed change if not adopted that has the potential to cost outside parties money is the extension of the site-specific modification provision to standards in all use classes. If this is not adopted, some regulated parties may be forced to use potentially more expensive alternatives to gain legitimate relief from certain standards (see Section VIII.B).

Even more speculative but still a possibility would be costs to outside parties forced to deal with a complex and often confusing water quality rule, and the costs associated with making an error in interpretation.

H. DIFFERENCES BETWEEN THE PROPOSED RULE AND EXISTING FEDERAL REGULATIONS AND THE NEED FOR AND REASONABLENESS OF EACH DIFFERENCE [VIII. required, reasonableness]

None of the proposed changes discussed in Book I of the SONAR are inconsistent with federal regulations. In our judgment, one proposed change discussed in Book I may be inconsistent with EPA **guidance**, but not regulations.[32] That is the proposed minimum total hardness of 10 mg/L to be used for calculating hardness related metal standards.

The proposed addition of the minimum hardness value of 10 mg/L for the calculation of the hardness dependant trace metal standards is not consistent with EPA guidance (see Exhibit A-51). The Agency recognizes that the proposed adoption of a minimum hardness value as low as 10 mg/L for the calculation of metal standards probably will be seldom implemented; nevertheless, we believe that this addition is both needed (Section VI.I) and reasonable (Section X.I).

The Agency is not aware of any fundamental difference between the other proposed changes and either EPA regulations or guidance. In fact, the changes proposed to Minn. R. 7050.0185, subpart 1, nondegradation for all waters, are meant to bring the introductory language more in line with the federal antidegradation language in 40 CFR 131.12. Also, the proposal to remove the two references to assimilation of wastewater as a beneficial use in the existing rule (Minn. R. 7050.0185, subpart 1; and 7053.0305, subp. 2, item G), will achieve consistency with federal regulations (40 CFR 131.12(a)) and guidance.

[32] The proposed retention of the fecal coliform effluent limit in NPDES permits may be inconsistent with EPA guidance. This is discussed in SONAR Book III.

I. CONSIDERATION AND IMPLEMENTATION OF THE LEGISLATIVE POLICY UNDER MINN. STAT. § 14.002 [VIII. required, reasonableness]

Minnesota Stat. § 14.002 requires state agencies, whenever feasible, to develop rules that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

The Agency is making an effort to be flexible and open minded in the implementation of regulatory programs; and to seek solutions to problems in an atmosphere of freedom to "think outside the box". These Agency goals are certainly consistent with the spirit of this statute.

The application of these principals to water quality rules in general, and to the current set of proposed amendments in particular, is interesting and complex. There are strong and legitimate pressures to make rules very precise and prescriptive on one hand, and to make them flexible and open to interpretation on the other. Finding the balance in rulemaking between the ends of the prescriptive/flexible spectrum is not always easy; and the balance the Agency finds can be unsatisfactory to various outside parties, depending on their point of reference. Flexibility to some means inconsistent application of rules and the granting of too much authority to staff or to the Agency Citzens' Board. Too much prescriptiveness to others means inability to deal with case-by-case variability and being forced into untenable bureaucratic positions and endless red tape. The Revisor's Office, appropriately, applies certain conventions to rules that places limits on language that is deemed too flexible or "open ended". Also, the Attorney General staff tends to prefer explicit language over language open to too much interpretation. Finally, not all rules or provisions in rules require, or should have, the same level of prescriptiveness. A reasonable middle ground between the two ends of this spectrum varies depending on the proposed amendment and part of the rule being revised. In the amendments being proposed, the Agency believes it has found a reasonable balance between detail and flexibility.

On the appropriately "prescriptive" side are numeric standards, including those proposed in this rulemaking. The proposed *E. coli* standard of 126 organisms per 100 ml and the mercury standard of 0.2 ppm in fish, for example, are very explicit. A 30-day geometric mean of 127 organisms per 100 ml is an exceedance of the *E. coli* standard[33]. Interestingly, the proposed numeric eutrophication standards for lakes illustrate the Agency's intent, with these particular standards, to moderate their prescriptiveness by attaching a narrative to the numeric standards. In doing this for the proposed lake standards, the Agency is recognizing the huge range and variety of lake characteristics that exist in Minnesota's lakes (see SONAR, Book II, Sections IV.F and G).

Another "prescriptive" example is the proposed *de minimis* phosphorus loading of 1,800 pounds per year. It is important that dividing line that determines whether or not a new or expanding discharger gets a 1 mg/L phosphorus limit is explicit.

[33] The precise nature of numeric standards does not prevent the Agency from applying good science and professional judgment in the analysis of data to determine the magnitude and extent of exceedances.

Examples of appropriately "flexible" rule language in the proposed amendments are the exemptions in Minn. R. 7053.0255, subp. 4, items A to C. The exemptions (also called "off ramps") allow a new or expanding discharger to petition the Agency for an exemption to the 1 mg/L phosphorus limit. The wording of the off ramps is general enough to give the Agency the leeway it needs to evaluate the merits of each petition on a case-by-case basis. The rule includes guidance to permittees on the types of information that should be included in their petition. The supportive information submitted by the discharger and the conditions that might justify an exemption will be very case-specific. The Agency must retain enough flexibility to make individual decisions tailored to each case while providing enough guidance in rule to inform parties of their obligations. No amount of prescriptive language in the off ramps could capture all possible relevant factors that will enter into these individual decisions; thus, more flexible language is warranted in this context.

Another example of flexibility in rules is the change to allow site-specific modification of an existing standard for any use classification. In this case the flexibility is not in the language itself (i.e., being open to a range of interpretations), but in the authority it grants to the Agency to modify standards for any use class on a site-specific basis (with EPA approval).

As stated, the range of changes the Agency is proposing in these amendments represents a reasonable balance between detail and flexibility; and that "balance" appropriately varies depending on the particular amendment. The Agency believes that the examples provided above are consistent with the intent of Minn. Stat. § 14.002; and, indeed, the site-specific modification of standards and off ramp examples epitomize the type of flexibility sought by this statute.

J. ADDITIONAL NOTIFICATION OF THE PUBLIC UNDER MINN. STAT. § 14.131 AND 14.23 [VIII. required, reasonableness]

Minnesota Stat. § 14.131 requires the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

The Agency has outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of this SONAR. The Agency has gone well beyond the requirements of Minn. Stat. § 14.131 in its efforts to involve the public in this rulemaking. The Agency has made significant changes to the scope and content of the proposed amendments in response to public comments.

The Agency intends to send a copy of the Notice of Hearing to the following people and organizations.

- All parties who have registered with the Agency for the purpose of receiving notice of rule proceedings, as required by Minn. Stat. § 14.14, subd. 1a,
- All individuals and representatives of associations the Agency has on file as interested and affected parties; and

- The chairs and ranking minority party members of the legislative policy and budget committees, with jurisdiction over the subject matter of the proposed rule amendments, will receive a copy of the proposed rule amendments, SONAR and notice, as required by Minn. Stat. § 14.116.

This statute also states that if the mailing of notice is within two years of the effective date of the law granting the Agency authority to adopt the proposed rules, the Agency must make reasonable efforts to send a copy of the notice and SONAR to all sitting House and Senate legislatures who were chief authors of the bill granting the rulemaking. This provision is not applicable to this rulemaking.

Minnesota Stat. § 115.44, subd. 7 states that notices required under sections 14.14, subd. 1a, and 14.22 must also be mailed to the governing body of each municipality bordering or through which the waters for which standards are sought to be adopted flow. The Agency intends to hold a hearing, therefore, section 14.22 does not apply. To comply with Minn. Stat. § 115.44, subd. 7, the Agency shall provide a copy of the notice to:

- Mayors of cities in Minnesota
- Minnesota County Commissioners Chairs
- Minnesota Township Chairs
- Soil and Water Conservation Districts
- County Water Planners
- Watershed Offices
- Water Management Organizations
- NPDES/SDS industrial permittees
- POTW permittees

Additionally, the Agency will provide notice to:

- Environmental Justice Advocates of Minnesota
- Council of Asian-Pacific Minnesotans
- Chicano-Latino Affairs Council
- Council of Black Minnesotans
- Minnesota Indian Affairs Council
- EPA Tribal Liaison, and the Indian tribes in Minnesota:
    - Boise Fort Band of Chippewa
    - Fond du Lac Reservation
    - Grand Portage Reservation
    - Leech Lake Reservation
    - Lower Sioux Indian Community
    - Mille Lacs Band of Chippewa
    - Prairie Island Community

- Red Lake Nation – Red Lake Band of Chippewa
- Shakopee Mdewakanton Sioux (Dakota) Community
- Upper Sioux Community
- White Earth Reservation

The Agency will issue a press release at the time the notice of proposed rule adoption is published in the *State Register*. The press release will include the dates, times and locations of the public hearings, and information on how the public can submit comments. In addition, a copy of the notice, proposed rule amendments and SONAR will be posted on the Agency's Public Notice Web site at: http://www.pca.state.mn.us/news/index.html

Pursuant to Minn. Stat. § 14.14, subd. 1a, the Agency believes its regular means of notice, including publication in the *State Register* and on the Agency's Public Notice Web page will adequately provide notice of this rulemaking to persons interested in or potentially regulated by these rules.

K. CONSULTATION WITH THE COMMISSIONER OF FINANCE AND IMPACTS ON LOCAL GOVERNMENTS [VIII. required, reasonableness]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

L. AGENCY DETERMINATION REGARDING WHETHER COST OF COMPLYING WITH PROPOSED RULE IN THE FIRST YEAR AFTER THE RULE TAKES EFFECT WILL EXCEED $25,000 [VIII. required, reasonableness]

The Administrative Procedures Act was amended in 2005 to include a section on potential first-year costs attributable to the proposed amendments (Minn. Stat. § 14.127, subd. 1 and 2). This amendment requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees.[34]

[34] Minnesota Stat. § 410.015 defines "statutory city" as any city that has not adopted a home rule charter pursuant to the Constitution and laws; it defines "home rule charter city" as any city that has adopted such a charter. Subdivision 2 of Minn. Stat. § 14.127 [*Agency Determination*] requires an agency to make the determination required by subdivision 1 before the close of the hearing record.

The Agency has determined that there will be no added costs to any outside parties due to the proposed amendments discussed in Book I of the SONAR. Therefore, costs will not exceed $25,000 in the first year after they take effect for the two categories listed above. The proposed amendments discussed in Book I of the SONAR do not fundamentally change the way the Agency applies existing Minn. R. ch. 7050.

IX. REASONABLENESS OF PROPOSED NON-SUBSTANTIVE CHANGES TO RULE LANGUAGE

A. INTRODUCTION [IX. non-substantive, reasonableness]

This section of the SONAR discusses the reasonableness of the language changes that are associated with the split of Minn. R. ch. 7050 into two rules, and the non-substantive changes proposed to make the rules more concise and understandable. This includes the following items treated separately in Section V (*need*).

- Changes to rule language associated with the division into two rules, Minn. R. ch. 7050 and 7053 (Sections V.D and V.E);
- Changes to rule language **not** associated with the division into two rules, Minn. R. ch. 7050 (Sections V.F and V.G), and
- Housekeeping changes to rule language, Minn. R. ch. 7050 and 7053 (Section V.H).

For the most part the proposed amendments and language changes are shown in the *need* sections and are not repeated when the same topic is discussed in the *reasonableness* sections.

B. PROPOSED CHANGES ASSOCIATED WITH THE SEPARATION OF MINN R. CH. 7050 INTO TWO RULES [IX. non-substantive, reasonableness]

The Agency believes the time has come to shorten and simplify Minn. R. ch. 7050, and that it is reasonable to do this by splitting Minn. R. ch. 7050 into two rules. The proposed separation of the ambient standards from the effluent limits is a logical and reasonable approach. Besides shortening and simplifying the rules, the Agency's goal in splitting Minn. R. ch. 7050 is to:

- Have one rule for use classifications, ambient water quality standards and related provisions, and one rule for effluent limits, treatment requirements and related provisions;
- Not change the meaning of any part of the rule (unless a change is intended);
- Leave sections of the rule being moved intact and unchanged if possible, consistent with the need to clarify, consolidate language and comply with recommendations of the Revisor's Office;
- Minimize the amount of rule language that needs to appear in both Minn. R. ch. 7050 and 7053; and
- Allow the two rules to function well independently.

For the most part, the overall organization of Minn. R. ch. 7050 is logical. The rule begins with introductory information, followed by a description of the beneficial uses, general and specific narrative standards, methods for developing criteria, lists of standards for protection of the beneficial uses, and finally, the use classifications for specific waterbodies. Placed in the midst of these provisions are wastewater treatment requirements and effluent limits. It is these provisions that the Agency is proposing to move to the proposed new rule, Minn. R. ch. 7053. None of the language changes associated with the rule separation changes the basic meaning of the original language in Minn. R. ch. 7050. That is, these changes are not intended to make the rule either more stringent or more lenient.

The parts of Minn. R. ch. 7050 that include changes associated with the separation are listed below (see Section V.D).

- Minn. R. 7050.0110. Scope.
- Minn. R. 7050.0185, subp. 3, Minimum Treatment.
- Minn. R. 7050.0210, subp. 5, Mixing Zones.
- Minn. R. 7050.0210, subp. 6c, Other Requirements Preserved.
- Minn. R. 7050.0210, subp. 7, Minimum Stream Flow.
- Minn. R. 7050.0218, subp. 3, item O, Definition of "Final Acute Value".

The parts of the proposed new Minn. R. ch. 7053 that include changes specifically associated with the separation are listed below (see Section V.E).

- Minn. R. 7053.0115 Scope.
- Minn. R. 7053.0135 General Definitions.
- Minn. R. 7053.0155, Determination of Compliance.
- Minn. R. 7053.0205, General Requirements for Discharges to Waters of the State.
- Minn. R. 7053.0205, subp. 6, Other requirements Preserved.
- Minn. R. 7053.0205, subp. 7, Minimum Stream Flow.
- Minn. R. 7053.0205, subp. 9, Water Quality-based Effluent Limits.

The Agency plans to retain the existing part numbers in the revised Minn. R. ch. 7050 for the provisions not being moved. Also, the proposed order of provisions in the new Minn. R. ch. 7053 will follow closely the order in which they appear now in Minn. R. ch. 7050.

It is the Agency's intent in assigning new numbers to the parts of proposed Minn. R. ch. 7053 to follow a logical pattern consistent with the recommendations of the Revisor's Office. It is proposed to have all the part numbers in Minn. R. ch. 7053 end in "5" (e.g., Minn. R. 7053.0115, see Table I-14). When the two rules share parts with similar titles and analogous content, such as "scope" and "definitions"; they are given parallel numbers. Some of these "shared" parts in both rules have numbers in the "0100" series. The treatment requirement parts of Minn. R. ch. 7050 that are being moved to 7053 with little change, will be given "0200" series numbers. The Agency is proposing to increase the numbers by increments of 10 for each subsequent part in the "0200" series (Table I-14). Finally, because the feedlot and aquaculture requirements are distinct from the rest of the rule, they will be given numbers in a "0300" and "0400" series, respectively. The Agency feels that this is a logical and reasonable approach for numbering the parts in the proposed Minn. R. ch. 7053.

Table I-14. Contents and Part Numbers in Proposed Revised Minn. R. ch. 7050 and New Minn. R. ch. 7053.

Revised Minn. R. ch. 7050		**New Minn. R. ch. 7053**	
7050.0110	Scope	7053.0115	Scope
7050.0130	General definitions	7053.0135	General definitions
7050.0140	Use classifications	7053.0155	Compliance with effluent limits
7050.0150	Compliance with standards	7053.0195	Variance
7050.0170	Natural water quality	7053.0205	General requirements for discharges
7050.0180	Nondegradation for ORVWs	7053.0215	Requirements for discharges of sewage
7050.0185	Nondegradation for all waters	7053.0225	Requirements for industrial discharges
7050.0186	Wetland standards and mitigation	7053.0235	Advanced wastewater treatment
7050.0190	Variance	7053.0245	Requirements for discharges to Class 7 waters
7050.0210	General narrative standards	7053.0255	Phosphorus effluent limits
7050.0217	Level of protection goals for standards	7053.0265	Requirements for discharges to Miss. R. in metro area
7050.0218	Methods for developing site-specific criteria	7053.0275	Antibacksliding
7050.0220	Standards by associated use classes	7053.0305	Requirements for animal feedlots
7050.0221-0227	Standards for Class 1 through Class 7	7053.0405	Requirements for aquaculture facilities
7050.0400-0450	Use classifications and unlisted waters		
7050.0460-0470	Listings of specifically classified waters		

The separation of Minn. R. ch. 7050 into two rules provides an opportunity to consolidate the phosphorus (TP) effluent limits in one place in Minn. R. 7053.0255, and to repeal the outdated Minn. R. ch. 7065 (Section X.J). The proposed reorganization and consolidation of the TP limits in a single subpart is reasonable not only as a convenience to readers but because it facilitates a concise and logical organization to the TP limit provisions. This is more important now because of increased prevalence of TP limits due to implementation of the Agency's Phosphorus Strategy, TMDLs and the proposed extension of the TP limit to new or expanding facilities (SONAR Book II).

The Agency believes that, as a group, all the changes to rule language in both Minn. R. 7050 and 7053 associated with the separation represent a reasonable solution to the matters raised by the split of the rule into two parts.

C. PROPOSED CHANGES NOT ASSOCIATED WITH THE SEPARATION OF MINN. R. CH. 7050 INTO TWO RULES AND HOUSEKEEPING CHANGES [IX. non-substantive, reasonableness]

The Agency believes that all the proposed changes to rule language not directly associated with the separation of Minn. R. ch. 7050 into two rules are reasonable. This includes the non-substantive proposed changes and housekeeping changes, discussed individually in "*need*" Sections V.F, V.G and V.H. The Agency feels that, if the need for these changes can be demonstrated, which we believe has been done, the proposed solution is either obvious (e.g., some housekeeping changes), or there exists a range of reasonable solutions to satisfy the need, and that the Agency's proposed solutions are among those reasonable solutions. Agency staff has had many years of experience implementing, interpreting, explaining, revising and amending Minn. R. ch. 7050. The staff is in a good position to arrive at a reasonable solution to solve the problems with the current rule based on that experience. Public input, even if only in the form of questions, plays an important role in the proposed changes. As stated, public input has resulted in improvements to the proposed rule language.

The non-substantive and housekeeping changes will not be individually discussed in the *reasonableness* section. The purpose of essentially all of these changes is to make the rule language and formatting easier to read, to clarify confusing language, to correct errors, and to remove inconsistent and redundant language. Many of the minor changes are based on recommendations of the Revisor's Office. None of these changes is intended to alter the fundamental meaning of Minn. R. ch. 7050.

The proposed non-substantive changes to provisions dealing with use classifications are discussed together in Section IX of SONAR Book III. These changes will update the classification listings, correct errors and improve the readability of Minn. R. 7050.0400 through 7050.0470. The proposed changes in use classification for specific waterbodies, including the proposed new limited resource value waters, are discussed in SONAR Book III, Sections X and XI.

X. REASONABLENESS OF PROPOSED MAJOR AND SUBSTANTIVE AMENDMENTS

A. INTRODUCTION [X. major, reasonableness]

In this Section of the SONAR the Agency will discuss the major and substantive proposed changes to Minn. R. ch. 7050 and Minn. R. ch. 7053 in the categories listed below.

- Major or substantive changes to rule language, Minn. R. ch. 7050 and 7053 (*need*, Section VI)
- Repeal of Minn. R. ch. 7065 and 7056 (*need*, Section VI.J)

These categories include the major changes that do not impact the overall meaning of Minn. R. ch. 7050 or 7053, and the changes that will change the meaning or intent of these rules. The latter are considered major and substantive changes.

B. PROPOSED DEFINITIONS [X. major and substantive, reasonableness]

1. Introduction [X.B. major and substantive, reasonableness]

The Agency is proposing to define in Minn. R. 7050.0150, subp. 4 the terms listed below. The same definition for the terms marked with an asterisk are proposed to be included in Minn. R. 7053.0255, subp. 2 also. In addition, the Agency proposes to define "*affects*" in Minn. R. 7053.0255, subp. 2. The proposed definitions are shown in Section VI.B and will not be repeated here.

- *$122Q_{10}$
- Eutrophication
- Fish and Other Biota, and Lower Aquatic Biota
- *Lake
- *Measurable Increase and Measurable Impact
- Natural Causes
- *Reservoir
- *Shallow lake

2. Eutrophication [X.B. major and substantive, reasonableness]

The Agency's proposed definition of "eutrophication" is the result of consulting the definitions and the descriptions of eutrophication in several standard limnology texts. For example, Wetzel describes eutrophication as: "a multifaceted term usually associated with increased productivity".[35] The Agency's proposed definition begins with similar language, "*Eutrophication means the increased productivity of the biological community in water bodies in*

[35] Page 4 in Wetzel, R.G. 1975. Limnology. W.B. Saunders Co. 743 p.

response to increased nutrient loading." The definition continues on to provide examples of the resulting, usually negative, consequences of eutrophication, such as algae blooms and loss of water clarity. Ultimately, if the nutrient loading pushes eutrophication "too far", beneficial uses such as recreational uses, aquatic life and aesthetics can be jeopardized or lost. This definition does not say that any nutrient input automatically leads to an unacceptable or impaired condition.

The definition also differentiates between natural eutrophication and "cultural eutrophication". In many locations and in many ways, human activities have increased the influx of nutrients into lakes and rivers. Human-caused eutrophication is called "cultural eutrophication".   Wetzel (see last footnote) says on page 659: "*A common result of misuse of the drainage basin and excessive nutrient loading of fresh waters is the acceleration of eutrophication, literally turning lakes into "algal bowls.*" It is, of course, cultural eutrophication that the Agency is seeking to minimize or reduce in order to protect lake resources. The proposed eutrophication standards for lakes will be an important tool in that effort. The proposed eutrophication definition also mentions the potential loss of beneficial uses through cultural eutrophication. It is appropriate and reasonable to mention beneficial uses in the definition because the protection of uses is the fundamental purpose of water quality standards.

3. <u>Fish and Other Biota, and Lower Aquatic Biota</u> [X.B. major and substantive, reasonableness]

The Agency is proposing to define the terms "fish and other biota" and "lower aquatic biota" in Minn. R. 7050.0150, subp. 4. These terms appear in the existing narrative standard in Minn. R. 7050.0150, subp. 3.   The definition simply serves to list examples of the aquatic organisms typically found in surface waters of all types, from game fish to microscopic organisms, both animal and plant. The term "lower" aquatic biota is a dated and somewhat pejorative term referring to aquatic insects and other aquatic invertebrates. Of course, all organisms in an aquatic community are important to the structure and function of the aquatic system, and some organisms are not "lower" than others. However, the Agency is not proposing to change the term.

The Agency is defining "other biota" as the animals that live in or on the water and depend on water for habitat and a source of food. Examples are loons, ospreys, herons, ducks and other waterfowl; muskrats, otters, beavers, other aquatic or semi-aquatic mammals; and turtles, frogs, salamanders and other reptiles and amphibians. It is reasonable for the Agency to include a definition of these terms to round-out the task of defining the important terms in the narrative standards in Minn. R. 7050.0150, subp. 4.

4. <u>Lake and Shallow Lake</u> [X.B. major and substantive, reasonableness]

Definitions for "lake" and "shallow lake" are proposed. Definitions are needed now that eutrophication standards are being proposed that will apply to these waterbodies (definitions in Section VI.B). The agency has had working definitions for "lake" for some time. The definition of "shallow lake" is a more recent addition.

The Agency has consulted with the Minnesota Department of Natural Resources (MDNR) on these definitions. The proposed definition of "lake" is very simple and straightforward – any basin filled with water with a maximum depth greater than 15 feet. This definition is consistent with those found in text books on limnology.

In particular, the Agency sought input from MDNR on the definition of "shallow lake" because of their active program with shallow lakes. Shallow lakes are normally characterized by an extensive **littoral zone**, which is the portion of the lake shallow enough to support submerged and emergent aquatic plants. MDNR has conducted several studies and published reports on shallow lakes. For example MDNR compared fisheries data to the percent of littoral zone in over 3000 lakes, and found that lakes with 80 percent or more littoral zone were more likely to experience winter fish kills than lakes with less than 80 percent littoral.[36] A value of 80 percent littoral formed somewhat natural dividing line in this respect (Exhibit EU-1). Thus, the 15 foot maximum depth and 80 percent littoral zone parameters in the definition are consistent with MDNR's concept of shallow lakes. Also, we worked with the MDNR to define the threshold for total phosphorus that will encourage a diverse macrophyte community over an algal dominated community. MDNR supports having separate definitions for shallow and deep lakes.

The definition of shallow lake reflects the Agency's emphasis of the ecological uses of shallow lakes over their potential use for swimming, without precluding the latter use. This is accomplished by repeating the description of beneficial uses for Class 2C waters in the definition of shallow lakes (see Minn. R. 7050.0222, subp. 5). The key part of the definition, borrowed from the Class 2C language, is: *The quality of shallow lakes will permit the propagation and maintenance of a healthy indigenous aquatic community, and they will be suitable for* ***boating and other forms of aquatic recreation for which they may be usable****.* (emphasis added). Omitted from the phrase in bold are the words "*including bathing,*" which is in the description of the beneficial uses for Class 2A and 2B waters (*These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable*). This is a subtle difference in the way Class 2 uses are described, but one that the Agency believes is significant. It tends to de-emphasizes primary body contact recreation ("bathing") for Class 2C waters and shallow lakes while not precluding this use. The Agency believes this is an appropriate and reasonable concept for the definition of shallow lakes. The proposed eutrophication standards for shallow lakes reflect this shift in Class 2 uses (see Sections VI.G. and VI.K in SONAR Book II).

The Minnesota Environmental Science and Economic Review Board (MESERB) commented on the Agency's proposed shallow lake definition in a March 18, 2005, letter. They suggested that the definition should contain three elements, two of which are included in the Agency's proposed definition, but the third is not (Exhibit A-35, page 6, no.7). The two concepts that are part of the Agency's proposed definition are, in MESERB's words: "*a preponderance of emergent vegetation over the surface area*" and "*generally do not stratify*". The Agency agrees with these suggestions.

[36] Winterkill is a late winter die-off of fish usually due to depletion of dissolved oxygen during periods of ice cover.

The Agency chose not to include in the definition, as MESERB suggested, that shallow lakes are "*generally not desirable for body contact recreation*". It is assumed that MESERB means "primary" body contact recreation or swimming. While many shallow lakes may not be attractive places for swimming in the traditional sense, the Agency cannot assume that some sort of "primary body contact" will not take place (see discussion on primary body contact recreation in Section VII.A.1 in SONAR Book III). More importantly, the statement, "*generally not desirable for body contact recreation,*" implies a limitation or restriction on recreational uses. The Agency believes that such a statement cannot be included in the general definition for a whole class of waterbodies without doing a use attainability analysis for the class. The UAA would need to document that primary body contact for the whole class is not only "*generally not desirable*" but highly unlikely as well, a difficult task without doing a UAA for each and every shallow lake. This is an impractical solution in the Agency's opinion and contrary to the current beneficial use classification system in Minnesota (see Section II.B; and SONAR Book II, Section VI.K). The Agency feels that using the existing "Class 2C" language discussed above suggests a shift toward ecological uses without limiting the possibility of "swimming" in shallow lakes.

MESERB also suggested using average rather than maximum depth to differentiate shallow from deep lakes (Exhibit A-35). Use of maximum depth makes sense biologically. Lakes with a maximum depth greater than 15 feet are less likely to experience winter kill than lakes shallower than this. Possibly more important is that maximum depth is a statistic readily available for nearly every lake in Minnesota. Average depth can be a complicated calculation and is much less commonly known.

The proposed definition includes a statement that shallow lakes will be differentiated from deep lakes and wetlands on a case-by-case basis. Differentiations are needed because different standards apply to these waterbodies. The Agency sees no reasonable alternative to a case-by-case approach in borderline situations. Deep lakes, shallow lakes and wetlands form more or less a continuum that makes consistent differentiation difficult. Criteria exist that, when applied collectively in a weight of evidence approach, can differentiate the categories; the problem is that the systems are not static. A waterbody that is a wetland one year may be a shallow lake the next depending on changes in the wet/dry regional climate patterns. Also beavers can turn a wetland into a shallow lake almost overnight.

In conclusion, the proposed definition of shallow lake is reasonable because:

- It focuses on the ecological uses of shallow lakes while still protecting them for swimming, where usable;
- Lakes shallower than 15 feet will exhibit biological, mixing and trophic conditions different from deeper lakes, but they;
- They are deep enough to sustain fish compared to shallower waterbodies (wetlands);
- A maximum depth of 15 feet is consistent with expected dominance of the littoral zone and an extensive macrophyte community; and it is
- It is consistent with a definition developed by MDNR;
- It states that lakes, shallow lakes, and wetlands will be differentiated on a case-by-case basis

5. <u>Reservoir and $122Q_{10}$</u> [X.B. major and substantive, reasonableness]

The Agency's definition of "reservoir" was crystallized in the assessment factor rulemaking, completed in 2003. A reservoir is a basin that fills with water because of a man-made structure such as a dam at the outlet. A key aspect of this definition is the minimum hydraulic residence time of 14 days. The hydraulic residence time is the time it takes a slug of water to move through the basin on its way to the outlet. Specifying a hydraulic residence time in the definition is important to distinguish reservoirs from rivers. Reservoirs respond more like lakes to nutrient loading, and rivers may respond differently to the same nutrient concentrations. Since hydraulic residence time is heavily dependant on flow into the basin, it is also very important to specify the flow at which the resident time is determined. The Agency has in the past used the summer-season low flow or $122Q_{10}$ for June through September. This is the lowest flow, averaged over the full summer season, June – September, with a probability of occurring once in 10 years. If the residence time, measured at the $122Q_{10}$, is less than 14 days then the system is considered to be a river and not a reservoir, and the eutrophication standards do not apply.

The period of 122 days for the defined low flow is the number of days in June through September. The statistical tools used to calculate low flow values are completely flexible. Low flow values can be determined for any period of days (1 -365) for any duration (e.g., 1 to 100 years). Thus, using the exact number of days in the four summer months does not complicate the calculation of the $122Q_{10}$. However, some low flow publications contain "pre-calculated" low flow values for a range of periods and durations. For example, they may include values for $1Q_{10}$, $7Q_{10}$,$30Q_{10}$ and $120Q_{10}$ for a river at the site of a continuous gauging station. If available for the desired location, the Agency may use a published "pre-calculated" $120Q_{10}$ in place of a specifically calculated $122Q_{10}$ as a reasonable estimate of the latter.

The selection of a 14-day period is consistent with EPA guidance (Exhibit EU-16). The Agency's own analysis and experience with the impact of nutrients on rivers and reservoirs supports a 14 day period (Exhibit PL-1). While the response to rivers of excess nutrients can be similar to that of lakes (i.e., algae turning the water green and loss of clarity), the proposed eutrophication standards are not intended to apply to rivers. Therefore, it is reasonable to have a clear definition to separate rivers from reservoirs for application of the standards.

Specification of a statistically-defined low flow, below which eutrophication standards will not apply to rivers, is consistent with the long-standing concept that water quality standards in general do not apply at very low flows. For most water quality standards this low flow is defined as the $7Q_{10}$; i.e., the lowest average 7-day low flow with a once in 10 year recurrence interval (existing Minn. R. 7050.0210, subp. 7). It is established in rule and it has been Agency practice for over 30 years to set water quality-based effluent limits so that water quality standards are met at all flows equal to or greater than the $7Q_{10}$ low flow ($30Q_{10}$ is used for ammonia). The specification of the larger $122Q_{10}$ low flow for determining hydraulic residence time in a reservoir, and as the threshold for applying the proposed eutrophication standards, is the extension of this policy to nutrients.

Because the 14-day residence time is determined at a $122Q_{10}$ flow, and because the eutrophication standards are to be applied as summer season averages does not mean, however, that negative effects appear only in riverine/reservoir systems when flows reach the $122Q_{10}$. Lake Pepin for example has algal blooms each and every summer in response to excessive nutrient loading; however, these blooms are much more severe during summers of low flow. As noted above, the use of a 14-day residence time and the $122Q_{10}$ is the Agency's position in guidance that emerged out of the recent assessment factor rulemaking. The Agency is now proposing to include these concepts in rule.

6. Affects [X.B. major and substantive, reasonableness]

The proposed extension of the 1 mg/L phosphorus effluent limit to new and expanding discharges with an annual loading greater than 1,800 pounds of phosphorus per year provides an opportunity to define the term "*affects*." This term has been the crux of the current phosphorus effluent limit rule since it was adopted in 1973 (existing Minn. R. 7050.0211, subp. 1a, "*When the discharge of effluent is directly to or affects a lake,…*"). The Agency's decisions on what constitute "affects," and, therefore, which dischargers get a phosphorus limit occasionally has been controversial and challenged over the years.[37] The interpretation of "affects" is addressed in the Phosphorus Strategy (Exhibit PL-1), and it is discussed in SONAR Book II (see in particular, Sections VII.B and IX.B). Also, the concept of "affects" was the subject of discussion in the assessment factor rulemaking in 2003. Providing a definition in rule is probably over due.

It is reasonable to define "affects" to help make the distinction between the implementation of the current rule from the implementation of the proposed extension of the 1 mg/L phosphorus effluent limit. Also, proposing a definition for "affects" is logical in the context of the proposed addition of definitions for several terms relevant to the phosphorus effluent limit and the proposed eutrophication standards.

The proposed definition, repeated below, includes the phrase, which is: *from an **individual** point source discharge* (emphasis added). The Agency has consistently interpreted "affects" as the loading of nutrients from an individual discharge in the context of the current 1 mg/L phosphorus limit. It is not the "affects" of the cumulative loading from all point sources in the watershed.

The proposed definition includes another important concept , which is: "*means a **measurable** increase in the adverse effects*" (emphasis added). Over the years the Agency has assessed individual discharges for the potential need for a phosphorus limit by requiring a "measurable" impact or projected impact due to the point source loading. That is, the estimated loading from the facility must cause, or be projected to cause, a discernable response, such as an increase in algae growth or a decrease in water clarity (see next Section).

It is reasonable to include these two long-standing concepts in the proposed definition of "affects."

> [Minn. R. 7053.0255, subp. 2] *B. "Affects" means a measurable increase in the adverse effects of phosphorus loading as determined by monitoring or modeling, including, but not limited to, an increase in chlorophyll-a concentrations, a decrease in water*

[37] For example, the permits for St. Cloud, Faribault and Owatonna.

<u>transparency, or an increase in the frequency or duration of nuisance algae blooms, from an individual point source discharge.</u>

7. <u>Measurable Increase or Measurable Impact</u> [X.B. major and substantive, reasonableness]

The proposed definition for "measurable increase" or "measurable impact" expresses the same concepts included in the definitions of "material increase" and the four similar terms adopted in the recently completed Session Law rulemaking (Section I.B; Exhibit A-4). The context for the terms discussed here is changes in trophic status in lakes and reservoirs. As the word implies, "measurable" means to quantify using data, mathematical models and other relevant information. It implies that a condition can be distinguished as having changed, is different than the previous or an expected condition. The changes must be discernable above background variability; and, they must be apparent to most trained observers by the weight of evidence. The change does not have to result in an exceedance of relevant standards to be "measurable."

The proposed definition includes the statement: "*The change in trophic status does not require a demonstration of statistical significance to be considered measurable*". It is reasonable to include this statement because not all measurable increases or impacts will be statistically significant. The Agency will use statistics to help demonstrate changes and impacts whenever possible, and statistical tests are part of the modeling process. However, statistical tests will not be useful in all situations and should not be required. The weight of evidence may clearly show that a change in trophic status has occurred even though the change may not be "statistically significant" (see Section VI.B.7).

It is reasonable for the Agency to include the "statistical significance" statement to provide information to the public on how assessments are carried out in practice even though it could be removed without changing the definition substantially. On the contrary, to include a requirement that the change must be statistically significant in all cases, or that the Agency must demonstrate why statistics was not used in each case is not reasonable, because of the unnecessary burden this places on the Agency. The former requirement would put severe constraints on the ability of the Agency do assessments and to make the best use of limited data; and, the latter creates additional work for Agency staff for little purpose. The public will always have an opportunity to comment on the listing of a waterbody as impaired and to question the Agency's interpretation of available data.

8. <u>Natural Causes</u> [X.B. major and substantive, reasonableness]

The Agency is proposing to include a definition for "natural causes" in Minn. R. 7050.0150. This definition is needed because the term is used in the proposed eutrophication standards. The Agency is well aware that some lakes cannot meet the proposed standards due to "natural causes". Lakes, shallow lakes and reservoirs that cannot meet the eutrophication standards due to natural causes will not be considered in violation of the standards. It is important to define the concept of natural causes in the context of these standards.

The term "natural causes" is open to interpretation, and it is important for the Agency to be as specific as possible about what it means when referring to natural causes in the context of the eutrophication standards. The proposed definition includes the clause: *"in the absence of human influence."* The natural condition should be relatively free of human-caused sources of nutrients. This condition is represented by the Agency's selection of "reference lakes" (Section VI.C.1 in SONAR Book II). The absence of human influence does not mean that natural conditions must equate to conditions that existed 200 years ago before European immigrants settled Minnesota. It is interesting to note, however, that the trophic status of many lakes in the forested parts of Minnesota (Northern Lakes and Forest ecoregion) has changed little in that time. Tools are available to estimate the trophic condition of Minnesota's lakes before European settlement (see SONAR Book II, Section VI.C.3).

The Agency recognizes that the concept of "natural causes" must reflect certain realities of today's world. Population growth, urban and suburban expansion, land use changes such as row-crop agriculture and mining, may represent essentially irreversible factors that can impact lake resources. The Agency's concept of "natural causes," as it relates to the eutrophication standards, will account for some unavoidable changes in water quality and trophic status due to these "essentially irreversible" factors. For example, the Minneapolis lakes are completely surrounded by urban development. Similarly, many lakes in southern Minnesota are completely surrounded by farmland. In both examples, the land now bears little resemblance to the native plant and animal communities that were there 200 years ago. It is quite unlikely that the basic land use in these two examples will change any time soon, and the concept of "natural causes" needs to recognize these facts. This does not mean that the Agency is "giving up" on such lakes, or that all such lakes cannot meet the proposed eutrophication standards. Improvements in the trophic condition of the Minneapolis lakes has been documented in the last decade due to the implementation of management practices in their watersheds that has reduced phosphorus input to the lakes. One cannot preclude the possibility that future cost-effective technologies or methods, as yet unforeseen, may produce further improvements in years to come.

There is another important point to be made about natural causes and lakes impacted by these essentially irreversible nutrient loadings. The Agency's goal will be to achieve the best water quality feasible in such lakes, following:

- Implementation of all applicable point source requirements, effluent limits, stormwater and feedlot controls, and
- Implementation of all appropriate and reasonable best management practices throughout the lake's watershed to minimize nonpoint sources of nutrients.

A very similar definition of "natural background" is included in the Clean Water Legacy Act passed during the 2005/2006 legislative session, which is quoted below:

> `Senate file 762. "Natural background" means characteristics of the water body resulting from the multiplicity of factors in nature, including climate and ecosystem dynamics, that affect the physical, chemical, or biological conditions in a water body, but does not include measurable and distinguishable pollution that is attributable to` **`human activity or influence.`** (emphasis added)

In other words, while "natural causes" recognizes potential loading from essentially irreversible land use changes, that "acceptable" loading should be reduced to the fullest practicable extent by implementing all point and nonpoint source reductions. The Agency believes this is a realistic concept of "natural causes" and a reasonable expectation for achieving reductions in nutrient loading (see further discussion in SONAR Book II, Section VI.L.5).

C. INTRODUCTION AND POLICY STATEMENT, NONDEGRADATION FOR ALL WATERS [X. major, reasonableness]

The Agency proposes to remove the references to waste assimilation in the context of beneficial uses in the nondegradation for all waters provisions in Minn. R. 7050.0185 subp. 1 (and in Minn. R. 7053.0405, subp. 2, item G). This change is reasonable in light of EPA's position in regulation and guidance (Exhibits A-60 and A-61). EPA is clear that the assimilation of wastes is not an acceptable beneficial use of the waters of the U.S. The proposed change will bring the rules into agreement with EPA regulations. The use of receiving streams for waste assimilation is guaranteed in other parts of the rule (e.g., proposed Minn. 7053.0205, subp. 5), and this will not change.

Also, to make the rule more consistent with federal regulations and guidance, the Agency is proposing to reword the policy part of the existing provisions dealing with nondegradation (= antidegradation) for all waters. Federal regulations and guidance (Exhibits A-62 and A-63) lay out three tiers or levels of nondegradation protection (see Section VI.C). The existing language in Minn. R. 7050.0185 (nondegradation for all waters) alludes to tiers one and two, but by making fairly simple changes, the language can be improved. It is reasonable to take the language directly from the Code of Federal Regulations (40 CFR 131.12) for the proposed rule as much as possible, which is what the Agency proposes to do. Nondegradation tier three, the protection of outstanding resource waters, is addressed in Minn. R. 7050.0180, which is not proposed for change.

The proposed wording changes will not change the level of nondegradation protection that the current rule provides, or how nondegradation to all waters is implemented. There are no costs associated with these changes.

In addition, the Agency is proposing to include a reference to the nondegradation provisions in the proposed new rule, Minn. R. 7053.0205, subp 8. Both nondegradation provisions in Minn. R. ch. 7050. (one for outstanding resource value waters and one for all waters) focus on point sources, and because most nondegradation reviews and assessments carried out by the Agency, are linked to the review of discharge permits for new or expanding facilities, the Agency feels it is reasonable to include a reminder of the applicability of nondegradation to point sources in the proposed new "effluent limit" rule, Minn. R. ch. 7053. This addition does not add any new nondegradation requirements to point source discharges; it simply reminds the reader of their applicability.

D. EXTENSION OF REVIEW PERIOD FOR VARIANCES TO EFFLUENT LIMITS [X. major and substantive, reasonableness]

The Agency is proposing to lengthen the review period for variances to effluent limits from three to five years to match the life of NPDES permits. The Agency is **not** proposing to change the review period for variances to water quality standards; that review period will remain three years.

EPA made it clear to the Agency that they would not approve a lengthening of the review period for variances to water quality standards in a letter (Exhibit A-66). EPA cites Section 101(a)(2) of the Clean Water Act and 40 CFR 131.20(a) as the basis for the three-year review cycle. The Agency originally proposed to extend the review period for all variances from three to five years, but changed its mind in response to EPA's comments. The Clean Water Act and CFR provisions, however, do not extend to variances to effluent limits. The Agency is making a distinction between the two types of variances, and proposing to lengthen the review period only for variances to effluent limits (see Section VI.D).

Variances are initiated by an outside party that is seeking relief from an effluent limit or treatment requirement. The Agency reviews the variance request, evaluates the relevant environmental, social and economic data and pubic comments, and makes a decision to grant or deny the variance. Over the years the Agency has granted a total of 54 individual or pollutant-specific variances to about 37 dischargers.[38] Twenty two of the variances are for specific effluent limits (15 for the 1 mg/L phosphorus limit), 27 are for water quality standards and five are for both standards and effluent limits or other requirements. EPA must approve all variances.

It is the permitting process that triggers a request for a variance to an effluent limit. All the variances the Agency has granted are associated with a specific discharger and permit. This is true whether the variance is to a specific effluent limit (e.g. the 1 mg/L phosphorus limit), or to a water quality standard upon which an effluent limit is based (e.g. chloride standard). Thus, it is reasonable to tie the review of variances on a cycle that coincides with the permit cycle, which is five years.

When a permit is being reviewed for re-issuance, staff also review any variance associated with the permit at the same time. These two reviews go hand in hand because the status of the variance will impact the permit limits. It makes little sense to review a variance independently when another review will be needed when the permit is reviewed. It is simply not practical for the Agency to undertake a review of permit-associated variances outside of the permit review and re-issuance process. Staff resources are better allocated to other priorities, such as keeping the backlog of expired and un-reissued permits to a minimum. For all practical purposes, the Agency is on a five-year variance review cycle now. The proposed change will make the rule consistent with these realities.

[38] Based on a list current as of February 14, 2003.

E. FIVE MG/L TSS LIMIT IF PRETREATMENT PLAN NOT IN PLACE [X. major and substantive, reasonableness]

Pretreatment refers to the treatment of industrial wastewater at the industry prior to discharge to a sanitary sewer and the municipal wastewater treatment plant (POTW).[39] Pretreatment reduces the concentrations of toxic pollutants in the influent to the POTW (see Section VI.E). Reduction of pollutant concentrations before they reach the POTW accomplishes three things:

- Prevents introduction of pollutants incompatible with the municipal POTW.
- Prevents pass-through of pollutants with inadequate treatment.
- Prevents interference with the physical plant, the chemical and biological treatment processes, plant personnel, and the disposal of sludge.

While POTWs are not specifically designed to remove most toxic pollutants, some reduction typically takes place as part of conventional sewage treatment. For example, it is generally accepted that the better the level of removal of solid particulates (measured as total suspended solids, or TSS), the better the incidental removal of trace metals like cadmium and lead. This was part of the reason the language, now proposed for removal, was inserted into the rule in 1981.

The Agency is proposing to remove a provision that calls for the Agency to require an effluent limit of 5 mg/L for TSS, **if** the discharger had failed to implement a pretreatment program. The language proposed for removal is in the advanced wastewater treatment part of the rule (proposed Minn. R. 7053.0235). This part of the rule applies to dischargers that discharge to a receiving stream that provides inadequate dilution under low flow conditions, and secondary treatment is inadequate to protect downstream water quality standards; advanced (tertiary) treatment is required.

Essentially all POTWs have a 30 mg/L TSS limit now, whether they provide advanced treatment or not; and removal of the "5 mg/L TSS provision" will not change that practice (existing Minn. R. 7050.0211, subp. 1; proposed language changes are shown in Section VI.E).

Minnesota received EPA approval in 1979 for delegation of its pretreatment program. In the 1980/1981 water quality standards rulemaking the Agency originally proposed to simply remove the 5 mg/L TSS effluent limit altogether because it was not needed (Exhibit A-55a). The applicable TSS limit then would become 30 mg/L. The Agency's rationale in 1980, which is valid today, was:

- There is no evidence that an effluent concentration of 30 mg/L TSS is harmful to aquatic life in the receiving stream.
- Meeting the 5-day 5 mg/L biochemical oxygen demand (BOD_5) limit (in existing Minn. R. 7050.0213) would not necessarily mean the 5 mg/L TSS limit could be met. However, the BOD_5 limit dictates the type of advanced treatment required; and, meeting such a stringent BOD_5 limit would also result in very low levels of TSS in the effluent.

[39] POTW means Publicly owned treatment works.

- The new (in 1980) pretreatment program would be a more cost-effective means of removing toxics from the waste stream than imposing a stringent TSS effluent limit.

In reviewing the Agency's proposal to remove the 5 mg/L TSS limit in light of public comments, the Administrative Law Judge found that the Agency had not made a convincing case for the change, and that the record was unclear (Exhibit A-55b, finding no. 119, page 80). The Judge recommended retaining the 5 mg/L TSS limit, but also suggested adding language stating that it could be relaxed to 30 mg/L when the discharger had implemented a pretreatment program. While the Agency made a minor change in the Judges wording in its findings of fact and conclusions proposed to the Agency Board (Exhibit A-55c), the Agency was comfortable with the Judge's recommendation and felt that complying with the recommendation would also:

- Provide some interim control for toxic substances likely to be present in POTW effluents while the municipality was implementing a pretreatment program; and
- It would act as an incentive for the municipality to complete development of their pretreatment program promptly.

The Agency proposed language to comply with the Judge's recommendation in its Order Adopting Rules presented to the Agency Board for approval on October 28, 1980 (Exhibit A-55d). The proposed addition was adopted in 1981 and is in the current rule.[40]

The Agency believes this language can be removed now with no negative environmental consequences for several reasons.

First, the 5 mg/L TTS provision is not relevant today because those municipalities that needed to implement a pretreatment program, either under the state program or under federal requirements, have done so. There are no communities left that have not implemented a pretreatment program, either to control toxic or for any other reason. Second, the 5 mg/L TSS provision has very rarely been implemented and has not been used at all for many years. The permit cycle of five years is longer than the time required to implement a pretreatment program, which does not exceed two years. Thus, the provision would only be relevant for two years or less while the POTW was developing the program. Thirdly, known industrial contributors of toxic pollutants, if not controlled through a pretreatment program, are controlled by:

- Standard permit conditions, which require POTWs to control their significant industrial users on an individual basis, including monitoring them and reporting to the Agency on the control of that industry; and by
- A pretreatment state disposal system permit, if the contributing industry is subject to technology-based (by industry category) pretreatment standards.

In summary, the TSS provision is highly unlikely to be applicable to any POTW today, has been very seldom used, and pretreatment plus other toxics reduction efforts (e.g., pollutant minimization plans, monitoring of effluent for toxics to raise awareness, and ceiling limits for

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[40] 5 S.R. 1137.

metals in sludge) already in place are more efficient means of controlling toxics. Removal of this provision is both needed and reasonable.

The Agency is currently proposing new pretreatment rules.[41] This pretreatment rulemaking is intended to bring the Agency into compliance with a federal requirement that Minnesota have state pretreatment rules. These rules will extend pretreatment program requirements to POTWs not previously covered under the requirements of the federal general pretreatment regulations (40 CFR 403). The proposed rules incorporate federal pretreatment regulations applicable to delegated POTWs, and provisions to enhance the Agency's authority to require non-delegated POTWs to control toxics from significant industrial users. The rule will codify what the Agency has been implementing under the state pretreatment program. The rule does not affect the proposal to remove the 5 mg/L TSS provision.

F. DRINKING WATER STANDARDS NOT APPLICABLE TO CLASS 1 WATERS, AND UPDATE OF CLASS 1 STANDARDS [X. major and substantive, reasonableness]

The Agency is proposing to correct several discrepancies in the listings of EPA drinking water standards that do not apply to Class 1 surface and ground waters. At the same time the Agency is proposing to:

- Update the reference to the latest list of EPA drinking water standards in the Code of Federal Regulations,
- Update the individual drinking water standards in Minn. R. 7050.0220,
- Simplify and expand the list of abbreviations or acronyms used in the tables of standards, and
- Remove redundant citations to the Code of Federal Regulations in Minn. R. 7050.0221.

The EPA develops primary and secondary drinking water standards under the authority of the Safe Drinking Water Act (see Section VI.F). Minnesota R. ch. 7050 adopts the EPA drinking water standards unchanged and applies them to ground water and those surface waters designated as drinking water resources (Class 1 waters).

1. <u>EPA Drinking Water Standards Not Applicable to Class 1 Waters</u> [X.F. major and substantive, reasonableness]

Drinking water standards are listed individually in Minn. R. 7050.0220, but simply included by reference in Minn. R. 7050.0221. The EPA promulgates drinking water standards with the intent that they should be met at the tap after treatment; and therefore, not all drinking water standards can be met, and should not be expected to be met, in raw ground or surface water supplies. Also, certain categories of drinking water standards logically should not be applied to ground or surface waters prior to treatment. For this reason, some EPA drinking water standards are not applicable to Class 1 waters and they are excluded or not listed in Minn. R. 7050.0220, subp. 3a

[41] http://www.pca.state.mn.us/water/pretreatment-rulechange.html.

and 4a. However, the listings of excluded standards in the two parts of the rule (Minn. R. 7050.0220 and 7050.0221) are inconsistent and confusing (Section VI.F). The fact that the Agency lists the standards individually in one place but not the other may have contributed to the inconsistencies and errors in the current rule going unnoticed for as long they did.

The list of standards that should not be applied to Class 1 **ground** waters is not exactly the same as the list that should not be applied to Class 1 **surface** waters. This is because most ground water receives natural protection from contamination by the fact that it is under ground and not in direct contact with surface waters. Also, many people get their drinking water directly from individual private wells that is not treated. Community systems that use ground or surface waters treat the water prior to distribution.

The Agency is proposing to correct, clarify, and make consistent the two lists of excluded drinking water standards. Table I-9, repeated here, shows the categories of standards excluded (and included) in the current rule and the proposed changes.

Table I-9. Current and Proposed Excluded and Included EPA Drinking Water Standards in Minn. R. 7050.0220 and 7050.0221.

Category of Drinking Water Standards	**Currently Excluded (Ex) or Included (In) in Minn. R. 7050.0220, subp. 2**	**Currently Excluded (Ex) or Included (In) in Minn. R. 7050.0221, by Subclass***				**Proposed to be Excluded (Ex) or Included (In) in both Minn. R. 7050.0220 and 7050.0221, by Subclass***	
		1A	**1B**	**1C**	**1D**	**Ground water**	**Surface water**
Microorganisms,	Ex	In	Ex	Ex	Ex	In	Ex
Turbidity**	In	In	In	Ex	In	In	Ex
Disinfection Byproducts	Ex	In	In	In	In	Ex	In
Disinfectants	In	In	In	In	In	Ex	Ex
Radionuclides	Ex, but standards are referenced	In	In	In	In	In	In
Treatment Technique***	Ex	In	In	In	In	Ex	Ex
Water Treatment Additives	Ex, but this category is no longer recognized by EPA	In	In	In	In	NA	NA
No standards excluded from the remaining 3 categories: organic and inorganic chemicals, and secondary drinking water standards NA = not applicable							

*Description of waters protected by the subclasses of Class 1 waters in Minn. R. 7050.0221:

Class 1A, "*…restricted to ground waters with a high degree of natural protection*"

Class 1B, "*…restricted to surface and ground waters with a moderately high degree of natural protection*"

Class 1C, "*…restricted to surface and ground waters in aquifers not considered to afford adequate protection against contamination from surface or other sources of pollution.*"

Class 1D. "*…restricted to surface and ground waters in aquifers not considered to afford adequate protection against contamination from surface or other sources of pollution.*" It is proposed to remove the Class 1D category from Minn. R. 7050.0221, see Section X.G.

**Class 1C has a turbidity standard of 25 NTU.

***Applies only to the following with treatment technique standards: acrylamide, epichlorohydrin, copper and lead.

The rationale for the Agency's proposed exclusions/inclusions follows.

<u>Microorganisms</u>: The microbiological standards as a category should be applied to ground water because water from private wells is often used for drinking without treatment. The potential contamination of ground water with pathogens from animal fecal material is a concern. Without treatment to kill these organisms, it is reasonable and prudent to expect raw ground water to meet the microbiological standards. On the other hand, microbiological standards should not be applicable to Class 1 surface waters because the standards can never be met in the surface waters and the water will be treated before being used.

<u>Turbidity</u>: The EPA includes turbidity in the microbiological category of drinking water standards because the greater the turbidity levels, the greater the change of also having elevated bacteriological counts. For the same reasons discussed above for microorganisms, the turbidity drinking water standard should be applicable to ground water but not surface waters. Turbidity is listed separately from the microbiological category in the rule because turbidity is not typically considered a microbiological parameter. Also, turbidity is routinely measured in surface waters and is a pollutant of concern in many rivers.

The EPA standards for the microorganisms and turbidity are listed as "treatment technique" instead of a numeric MCL. This means that a treatment process is required that will achieve removal of the organisms (or turbidity) to satisfactory levels, often expressed as a percent kill to be achieved (Exhibit HH-2)[42]. Even thought the EPA standard is based on a treatment process, and the context in which the Agency is applying the standard assumes there is no treatment, the goal is the same in both situations; and that is to have no pathogenic organisms in the drinking water. Thus, the Agency believes that the fact that these standards are "treatment technique" does not change the need and reasonableness of applying these standards to raw ground water. Also, this proposal is consistent with the existing rule (Table I-9).

<u>Disinfection byproducts</u>: The Agency proposes that the standards for disinfection byproducts not be applicable to ground water supplies. A recommended procedure is to periodically disinfect the water in private wells using disinfection chemicals. This can cause the formation of disinfection byproducts in the water. However, both the disinfectants and their byproducts most likely will be purged from the well by the recommended flushing of the well after treatment. Neither disinfectants nor disinfection byproducts are likely to persist for a significant length of time. Also, it is unlikely that these products will be transferred to the aquifer because of the purging. Such disinfection treatments are periodic, not continuous, so any exposure would be short-term and infrequent. The standards for disinfection byproducts are proposed to be applicable to surface waters because they may be present in surface waters downstream from a wastewater treatment plant that uses a halogen such as chlorine to disinfect the effluent. However, the Agency believes that the risk to people from this source is low.

<u>Disinfectants</u>: The Agency proposes that the standards for disinfectants be excluded for both ground and surface water supplies. The Agency's reasons for excluding this category for ground

[42] The standard for total coliforms is listed as 5%; i.e., no more than 5% of samples taken in a month should be positive for coliform bacteria.

waters are the same as discussed above under "disinfection byproducts." It is reasonable to exclude this category of standards for surface waters as well because disinfectants are applied during the treatment process. Raw water will not have disinfectants in it. This category should not be applicable to either raw surface or ground waters.

Radionuclides: The Agency proposes to include this category for both ground and surface waters because they could be present in both sources of drinking water. This appears to be no change from the current rule, although the current rule needs to be clarified.

Water treatment additives: This category of drinking water standards is included in the current Minn. R. ch. 7050, but the category is no longer used by EPA (Exhibits HH-1 and HH-2).

The Minnesota Department of Health drinking water staff was consulted on these proposed clarifications. They were comfortable with the Agency's proposed changes (Exhibit A-53).

In summary, the Agency's proposed changes to the "included/excluded" drinking water standards for Class 1 waters are needed to correct errors and discrepancies in the current rule and are reasonable given the fact that the rule applies EPA finished (after treatment) drinking water standards to raw surface and ground water supplies. The proposed language changes in the rule are shown in *need* section, Section VI.F.2.

2. Proposed Update of Drinking Water Standards and Minor Changes [X.F. major and substantive, reasonableness]

Minnesota R. 7050.0221, subp. 2 to 4 include a statement that the EPA drinking water standards are incorporated by reference into Minn. R. ch. 7050. The Agency is proposing the add "*except as noted in subpart 1*" to this sentence to call attention to the standards that are not applicable to Class 1 waters of the state.

It is reasonable to update the reference to the latest listing of the EPA primary and secondary drinking water standards in both Minn. R. 7050.0220, subp. 2 and 7050.0221 subp. 1. The current reference is to the 1992 Code of Federal Regulations and to a *Federal Register* dated July 17, 1992. The Agency proposes to cite only the most recent Code of Federal Regulations for the latest list of EPA drinking water standards, which was dated July 1, 2004.

The Agency proposes to update three existing numeric drinking water standards listed in Minn. R. 7050.0220 so the standards in the rule agree with the latest EPA standards. Also, the addition of three new standards is proposed for Minn. R. 7050.0220 (see Section VI.F.3, Table I-11). The CFR reference and the numeric standards have not been updated since 1994; it is reasonable to do so now.

Minnesota R. 7050.0220, subp. 2 includes a list of abbreviations or acronyms used in the tables of standards that follow in the rule. The changes, which include adding two new items, eliminating redundant definitions, and moving one item, are summarized below. These changes are reasonable to deal with changes and additions to the tables of standards in Minn. R. 7050.0220, all part of the Agency's intent to make the rule easier to use. The "need" for these changes is discussed in Section V.F.14.

New items are:

-- *means there is no standard*
NA *means "not applicable"*

Redundant definitions are removed and the citation to the full definition is included for:

CS *means "chronic standard"*
FAV *means "final acute value"*
MS *means "maximum standard"*

And moved is:

* *an asterisk following the FAV and MS values or --, part 7050.0222, subp. 7, item E, applies*

Finally, the Agency is proposing to remove the full citations in Minn. R. 7050.0221, subp. 2 to 4 to the parts of the CFR that contain drinking water standards. The full citation is now repeated in each of these four subparts. It is reasonable to limit the full citation to Minn. R. 7050.0221, subpart 1, and to refer back to it in Minn. R. 7050.0221, subp. 2 to 4, in order to shorten the rule, if only a little. The proposed language changes are shown in Section VI.F.4.

All these changes are needed and reasonable to correct errors, inconsistencies and to improve the understandability of this part of the rule. No standard or provision is made more or less stringent by these proposed changes.

G. REPEAL OF SUBCLASS 1D DRINKING WATER STANDARDS, AND REMOVAL OF LINK BETWEEN CLASS 3 AND CLASS 1 STANDARDS [X. major and substantive, reasonableness]

1. <u>Repeal of Subclass 1D, Minn. R. 7050.0221, subp.</u> 5 [X.G. major and substantive, reasonableness]

Class 1 waters are divided into four subclasses, Class 1A, 1B, 1C and 1D (Minn. R. 7050.0221). As the subclasses sequence from 1A to 1D, they describe characteristics of aquifers which provide decreasing levels of natural protection to ground water supplies. For example, the protection level for Class 1A waters is, "*…underground waters with a high degree of natural protection*", and for Class 1C waters it is, "*…and ground waters in aquifers not considered to* *afford adequate protection against contamination…"*. It should be noted also that Class 1A is restricted to ground waters whereas Classes 1B to 1D include both underground and surface waters.[43]

Early in the planning process for this rulemaking the Agency discussed removing the separately listed Class 1D numeric drinking water standards currently in Minn. R. 7050.0221, subp. 5. Subsequently, in the context of splitting Minn. R. ch 7050 into two rules, and the other proposals to update and "clean-up" Minn. R. ch. 7050, as discussed in this SONAR, the Agency felt that it was not only reasonable to delete the separate Class 1D standards, but to remove the 1D subclass altogether (Minn. R. 7050.0221, subp. 5). The Agency is proposing to remove all of Minn. R. 7050.0221, subp. 5 from the rule (see Section VI.G).

The Class 1D numeric standards are a subset of a more complete list of drinking water standards applicable to Class 1A to 1C waters adopted in the first water quality rule in 1967. All the drinking water standards in the 1967 rule were based on a 1962 document.[44] Of the 10 Class 1D standards listed, only two were different from the standards applicable to other Class 1 waters; the main difference was the shorter Class 1D list (Table I-15). Unlike the drinking water standards for the other Class 1 subclasses, the Class 1D standards have never been updated; thus, they are very outdated. They have been superseded by later, mostly more lenient**,** EPA drinking water standards. Only the current EPA drinking water standards for arsenic and cadmium are more stringent (Table I-15).

The Class 2A and 2Bd standards are included in Table I-15 simply to show that for the pollutants listed, the applicable Class 2 standard is usually more stringent than the EPA drinking water standard. Class 2A, 2Bd waters are protected for both aquatic life and as a source of drinking water; and, Class 2A, 2Bd standards are the lower of a toxicity-based criterion or a human health-based criterion. The human health-based standards for these use classes take into account human exposure through both fish consumption and drinking water.

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[43] A somewhat puzzling aspect of the Class 1 subclasses that dates back to 1967 is that the subclasses are distinguished by differences in ground water aquifers, but no distinctions are made in the subclass descriptions for Class 1 **surface waters**. Only surface waters are specifically assigned to a subclass, Class 1B, 1C or 1D (Minn. R. 7050.0470). In Minnesota, all ground water is protected as an actual or potential source of drinking water (Class 1).

[44] U.S. Department of Health, Education and Welfare, 1962. Public Health Service Drinking water standards. Revised 1962.

Table I-15 The 1967 Class 1D and Class 1A – 1C Drinking Water Standards and the Current EPA Drinking Water Standards. The Class 2A and 2Bd Standards for the Same 10 Pollutants are Shown for Comparison.

Substance. All units, µg/L, except total coliform	**1967 Class 1D standards***	**1967 Class 1A, 1B, 1C standards***	**Current EPA standards**	**Current Class 2A and 2Bd standards**
Arsenic	50	10	10	2
Barium	1000	1000	2000	None
Cadmium	10	10	5	3.4***
Chromium +6	50	50	None*	11
Cyanides	200	10	200	5.2
Fluoride, primary	None	None	4000	None
Fluoride, secondary	1500	1500	2000	None
Lead	50	50	NA**	19***
Selenium	10	10	50	5
Silver, secondary	50	50	100	1
Total coliform organisms	4000	1, 50, 4000	≤ 5% of samples positive in one month	200 fecal coliform organisms

*Current EPA standard for total chromium is 100 µg/L
**Not applicable because lead standard is treatment technique; action level is 15 µg/L
*** Class 2 standards for cadmium and lead calculated for the maximum hardness of 400 mg/L

The Agency believes there is no reason to perpetuate the outdated and essentially irrelevant distinction between Subclass 1D and Subclass 1A, 1B, 1C; and that it is reasonable to provide the same level of protection to all Class 1 drinking waters. This can be accomplished by removal of Subclass 1D and the application of the same set of updated EPA drinking water standards to all Class 1 waters.

The Class 1D subclass serves no useful purpose because there are no designated Class 1D surface waters, and because there is no real distinction between Class 1C and 1D ground waters, in terms of the aquifer descriptions. There are no waters designated as Class 1D in Minn. R. 7050.0470. Conceivably an argument could be made that, while not specifically identified, there could be Class 1D ground waters in Minnesota based on the descriptions of the poorly protected aquifers But this is a moot point because the aquifer descriptions for Class 1C and 1D are identical. The descriptions of the aquifers in both existing Minn. R. 7050.0221, subp. 4 and 5 are quoted below:

> *These standards will ordinarily be restricted to surface waters, and groundwaters in aquifers not considered to afford adequate protection against contamination from surface or other sources of pollution. Such aquifers normally would include fractured and channeled limestone, unprotected impervious hard rock where water is obtained from*

mechanical fractures or joints with surface connections, and coarse gravels subjected to surface water infiltration.

To summarize, removal of the 1D subclass of drinking waters is reasonable because the subclass serves no purpose. There are no Class1D surface waters, no distinction is made between Class1C and 1D ground waters. Class 1D is redundant and the specific Class 1D standards are very outdated. Removal of Minn. R. 7050.0221, subp.5 will have no effect on the protection of Class 1 waters for drinking. The drinking water standards applied to Class 1 waters will not change in any practical way. Also, removal of the 1D subclass provides an opportunity to remove a confusing and unneeded link between industrial use (Class 3) standards and drinking water standards in the current Minn. R. 7050.0223 as discussed in the next Section.

2. Proposed Removal of Link Between Drinking Water Standards and Industrial Use Standards in Current Minn. R. 7050.0223 [X.G. major and substantive, reasonableness]

The Class 3A industrial use standards in Minn. R. 7050.0223, subp. 2 include the phrase "*The quality shall be **generally comparable** to Class **1B** waters for domestic consumption, …*". Similarly, the Class 3B industrial use standards in Minn. R. 7050.0223, subp. 3 include the phrase "*The quality shall be **generally comparable** to Class **1D** waters for domestic consumption, …*" (emphasis added).

The Agency is proposing to remove these two phrases from the industrial use standards. These two provisions are seldom if ever used, partly because the Agency has never defined what "generally comparable" means. The Agency staff opinion is that, at most, "generally comparable" means that the drinking water standards might be used as an unenforceable guide for assessing the quality of Class 3A or 3B waters (see Section VI.G).

There will be no impact to the protection of surface waters from pollution, or to the Agency or any other party as a result of the removal of this provision in the Class 3 standards.

The Class 3B/1D "generally comparable" connection potentially impacts most waterbodies in Minnesota because the current "default" use classification includes the 3B designation (Minn. R. 7050.0430).[45] However, the only conceivable impact on Class 3B waters this change might have would be a lessening in the level of protection, **if** the Agency or any party could sustain an argument that "generally comparable" meant that the drinking water standards are enforceable standards for Class 3B waters. The Agency has not taken this position in the past and it seems unlikely that it would take such a position in the future. The agency believes that an interpretation that the Class 1D standards are enforceable to Class 3B waters is unsupportable. This question is partially irrelevant because all Class 3B waters are also Class 2 waters, and several of the Class 2 standards are more stringent than the corresponding Class 1 standards (see Table I-15).

The Class 3A/1B "generally comparable" link potentially affects only a very small set of waterbodies because the Class 3A classification is very rare. A search for Class 3A waters

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[45] For different reasons the Agency is proposing to change the default classification from 3B to 3C (see SONAR Book III, Section VIII).

among all the specifically classified waters in Minn. R. 7050.0470 produced just 18 waterbodies. The “3A/1B link” applies only to these 18 waterbodies. For all but three of the 18, the “link” is superseded by specific classifications in Minn. R 7050.0470. These 15 are listed as Class 3A **and** 1B waterbodies. For these waters, the “generally comparable” link is superfluous; that is, through direct classification, the current Class 1B standards do apply to these 15 Class 3A waterbodies.

The other three Class 3A waterbodies have either no drinking water designation at all or a Class 1C designation. These three waterbodies are listed below:

1. Class 3A but not Class 1
    a. Seven Beaver Lake; Class 2B, 3A. Minn. R. 7050.0470, subp. 1, item B, subitem (114).
    b. Rainy River, Railroad Bridge in Baudette to Lake of the Woods; Class 2B, 3A. Minn. R. 7050.0470, subp. 2, item A, subitem (44).
2. Class 3A and 1C
    a. Rainy River, Dam in International Falls to Railroad Bridge in Baudette; Class 1C, 2Bd, 3A. Minn. R. 7050.0470, subp. 2, item A, subitem (43).

As discussed for the Class 3B/1D link, the only conceivable lessening of protection for these three Class 3A waterbodies hinges on the very unlikely interpretation of “generally comparable” to mean that the Class 1B drinking water standards are enforceable standards for Class 3A waters. The Rainy River between International Falls and Baudette is essentially not affected because the Class 1B and 1C standards are identical except that the Class 1C standard for turbidity is more lenient. Seven Beaver Lake is a remote lake in St. Louis County which forms the headwaters of the St. Louis River. The Rainy River between Baudette and Lake of the Woods is the downstream end of the Rainy River, a reach approximately 11 to 12 miles long. The proposed change will not effect the protection of these waterbodies.

In summary, removal of these two “generally comparable” clauses in Minn. R. 7050.0223, subp. 2 and 3 will eliminate never used and confusing provisions. There will be no environmental impacts or costs due to the change.

H. SITE-SPECIFIC MODIFICATION OF STANDARDS [X. major and substantive, reasonableness]

In the 1990 rulemaking, language was added that allows the Agency to modify an existing Class 2 numeric standard on a site-specific basis. The original proposed wording left it unclear whether the Agency could modify a standard for any use class or just Class 2. The language was subsequently clarified to restrict the authority to just Class 2 standards. The evolution of the changes leading to the restricted version is described in Section VI.H.

The Agency is proposing to change the site-specific language so that the standards for any use class can be modified on a site-specific basis. This can be accomplished by moving the provision to Minn. R. 7050.0220, where the context is standards for all use classes, and by adding a reference to the standards in parts 7050.0221 to 7050.0227. The Agency is also proposing to make two changes to the site-specific provision; 1) to remove the language that limits a SSS to situations that involve a permit or a remedial action clean-up, and 2) include "ecoregion" with statewide standards that can be modified.

Local conditions and circumstances can affect the appropriateness of standards for any use class, not just Class 2 standards. It is reasonable for the Agency to have the authority to modify a standard applicable to other use classes as it has now for Class 2 standards.

As the name implies, a site-specific standard (SSS) is applicable only to a specific waterbody, which could be a lake, wetland or a defined reach of river. Development of a SSS requires enough data and information on the local resource to support, by a convincing weight of evidence, that a numeric standard different from the one listed in the rule is protective for that waterbody. The data needed may include physical, chemical and biological data, depending on the pollutant. A SSS can be less stringent or more stringent than the listed standard, but in practice the SSS is almost always less stringent. The SSS does **not** change or downgrade the beneficial use itself, it merely reflects documented local conditions that allow the standards to be safely modified. The SSS still protects the designated uses assigned to the local waterbody.

Typically, a SSS is developed as a cost-effective means to ameliorate a concern on the part of the Agency or an outside party, that meeting the listed standard will cause hardship, such as unnecessary treatment costs, with little or no environmental benefit. Extending this authority to the Class 3 (industrial use) and Class 4 (agricultural uses) standards in particular could save the Agency and possibly some outside parties time and money. The Class 3 and 4 standards have not been reviewed and up-dated since they were first adopted nearly 40 years ago. An example is the Class 4A sulfate standard of 10 mg/L, designed to protect wild rice. This standard has become problematic for some taconite mining operations (Exhibits A-8a and A-11a). Taconite operations commonly re-circulate process water to reduce overall water demands. This tends to concentrate the natural levels of ions including sulfate in the process water as it is used over and over again. If the mining company needs to discharge excess water, and if the receiving stream supports wild rice, the elevated sulfate levels may exceed the 10 mg/L sulfate standard in the receiving stream. Some evidence indicates that wild rice can thrive at sulfate levels higher than 10 mg/L. Having to meet this standard could prevent the discharge. The ability to modify this standard on a site-specific basis could provide the margin needed to allow the discharge without harming wild rive or the environment in general.

The site-specific modification of a standard is usually a faster and more cost-effective process for both the Agency and the regulated party than other alternatives available to adjust a standard such as a variance or a change to the rule.[46] While the burden to develop and justify a SSS falls mainly on the Agency, it is probably less demanding of staff resources than the alternatives. A SSS is probably the least costly alternative for the regulated party, although data and other supportive information can come from outside sources including the affected party. Alternatives that require rulemaking may not involve direct costs to the regulated party, but rulemaking is

[46] Options available to the Agency for adjusting standards, besides the site-specific modification of Class 2 standards, include: 1) natural high background levels, 2) a variance, 3) a change to the standard in rule, and 4) a change in use classification through a use attainability analysis. The latter two options require rulemaking.

very time consuming and the final outcome is not certain. Regulated parties may not have the time to wait, or wish to gamble on a favorable outcome for an option that requires rulemaking. Variance requests are initiated and supported by an outside party but the Agency staff must review the request and decide whether or not to grant the variance.

The public is afforded an opportunity to participate in the application of a SSS. Many SSSs are applied as part of a process in which opportunities for public participation is built-in. Examples are the NPDES permit process for point source dischargers and the total maximum daily load (TMDL) process for impaired waters. If a SSS is developed in a situation that does not have a "built in" public participation process, the Agency will need to provide that opportunity. The EPA (EPA Region 5 Office in Chicago) must approve all SSSs. But SSSs do not have to be promulgated into water quality rules.[47] This fact makes a SSS an attractive option to accommodate legitimate local conditions. The Agency maintains a list of SSSs; there are currently five on the list.

The Agency is proposing to remove the apparent restriction of SSSs to situations involving either a permit or a remedial clean-up action. The Agency is facing an increasing need for the ability to develop SSSs for application in other situations, such as in TMDLs. A SSS may be a cost-effective and logical way to deal with situations where meeting the statewide (or ecoregion) standard may not be possible for a range of reasons. The flexibility to apply SSS beyond permits and remedial actions is reasonable, and an important tool for the Agency. For much the same reason, the Agency is proposing to add the word "body" in three places after "water". This is a reasonable addition to remove any ambiguity that the site-specific provision might be limited to rivers and streams. It is important that this provision apply to any type of surface waterbody. This greater flexibility will not compromise protection of beneficial uses. A very important step in the TMDL process is the acquisition of additional water quality and other types of data for the impaired waterbody. The additional data may, in some cases, show that the state-wide (or ecoregion) standard can be modified while still protecting the environment.

In summary, the Agency believes it is reasonable and appropriate to extend the authority to modify an existing standard for uses other than Class 2, and to remove the apparent restrictions on its application to just permits and remedial actions. The ability to modify an existing standard on a site-specific basis is typically a cost-effective means of dealing with local extenuating situations, with very little if any cost to the environment. The Agency will provide the interested public the opportunity to comment on SSSs and seek EPA approval, as required. The proposed language changes are shown in the need section, Section VI.H.

I. MINIMUM HARDNESS FOR CALCULATION OF TRACE METAL STANDARDS [X. major and substantive, reasonableness]

The Agency is proposing to adopt a minimum total hardness value of 10 mg/L to be used in the calculation of toxicity-based standards for seven trace metals (see Section VI.I). Minnesota R. 7050.0222 currently specifies a high-end cap on hardness of 400 mg/L, and the proposed low-

[47] Some SSSs have been adopted into Minn. R. ch. 7050; for example SSSs for dissolved oxygen for a short reach on the Mississippi River in the metro area and for the lower Minnesota River, in Minn. R. 7050.0222, subp. 5.

end cap would function like the high-end cap. That is, if a waterbody has mean or median hardness values below 10 mg/L, the value of 10 would be used in the calculation of the metal standard. The Agency is concerned that calculating a standard at extremely low hardness values, below 10 mg/L, will result in a standard that is unsupported by toxicity data and potentially unnecessarily stringent.

The toxicity mitigating properties of natural waters, as representative of total hardness, has not been adequately tested at hardness levels below 20 mg/L, as reported in the EPA metal criteria documents (Table I-16). Also, since hardness is a surrogate for a number of unmeasured water quality characteristics that potentially mitigate metal toxicity, how well hardness represents these other characteristics when hardness is very low, is uncertain. The Agency would agree that making the **assumption** that toxicity continues to increase as hardness decreases to very low levels, as predicted by the slope of the toxicity/hardness relationship established at higher hardness values, may be prudent in the absence of data to the contrary. Nevertheless, the Agency believes that a low-end cap is needed and reasonable for the reasons outlined here.

A search of the EPA criteria documents for the seven hardness-variable metal standards shows that only one toxicity test has been carried out at a hardness value below 10 mg/L. This is a zinc toxicity test with rainbow trout (Table I-16). The true relationship between toxicity and hardness at these very low hardness values has not been established, and EPA says this in Exhibit A-51 (page 8).

Table I-16. Lowest Total Hardness Values in the Ranges of Hardness Values Tested to Establish the Acute Toxicity/Hardness Relationship for Seven Metals, as Reported in the EPA Criteria Documents.

Metal, Year of EPA criteria document	Lowest hardness tested mg/L	Species tested	Number of species tested to establish toxicity/hardness relationship used in the standard
Cadmium, 1985	18	Bluegill	5
Chromium III, 1985	20	Fathead minnow and bluegill	3
Copper, 1985	13	Chinook salmon	8
Lead, 1985	20	Fathead minnow and bluegill	4
Nickel, 1986	20	Fathead minnow and bluegill	4
Silver, 1980	20	Rainbow trout	3
Zinc, 1987	5	Rainbow trout	8

The total hardness in Minnesota rivers spans a very large range. For example, rivers in the upper parts of the Minnesota River basin often average more than 400 mg/L, while the rivers in the Rainy River basin have very low hardness values. The Agency reviewed total hardness data for the two watersheds in Minnesota that generally have the softest water, the Rainy and Lake Superior watersheds, to determine how frequently hardness values drop below 10 mg/L. The lowest hardness values occur in the Rainy River watershed. Out of 1,159 hardness values measured from 1975 to the present, slightly less than five percent of the values measured in the Rainy River basin were below 10 mg/L (Table I-17). In the Lake Superior watershed the lowest value measured out of 856 values was 19 mg/L (Table I-17). This suggests that even in the Rainy River watershed the proposed minimum cap will seldom be invoked because an average hardness value below 10 mg/L will be a very unusual occurrence.

As mentioned, total hardness is a “surrogate” for multiple inorganic properties that mitigate metal toxicity in natural waters, but it does not represent the mitigative properties of dissolved organics. A direct relationship between the acute toxicity of copper to aquatic organisms and the concentration of dissolved organics has been demonstrated.[48] A similar response would be expected for other trace metals. Dissolved organics mitigate the toxicity of metals in water by forming complexes with free metal ions. The organo-metalic complexes are generally not as toxic as the metal ions. Ideally we would use direct measurements of dissolved organic carbon (DOC) to record the levels in water, but available DOC data for Minnesota rivers are localized and not representative of entire major watersheds. The amount of color natural water has can be used as a substitute for DOC. High levels of some dissolved organics give surface waters a dark “tea” color or “bog stain”. High color readings indicate high levels of dissolved organics and the Agency has a large amount of color data. Therefore, color data are used here to represent the concentration of dissolved organics in rivers.

Bog stained waters are often evident in watersheds that have a substantial wetland component, such as typical in the Rainy River watershed. Table I-17 provides a summary of large data sets for hardness and color for the Rainy, Lake Superior and Minnesota watersheds. Data for the Minnesota River basin are included to show contrasting data for a “high hardness” and relatively “low color” watershed. The central values (mean and median) indicate that waters in the Rainy watershed are generally softer than those in the Lake Superior, but that color, as an indicator of dissolved organics, is not very different. Hardness averages more that 400 mg/L in the Minnesota River basin but color is relatively low.

[48] Lind, D. et al. Manuscript. Regional copper-nickel study: aquatic toxicity study (probable date, 1978); as discussed in: EPA 1985. Ambient water quality criteria for copper – 1984. EPA 440/5-84-031.

Table I-17. Total Hardness and Color Data for Rivers in the Rainy, Lake Superior and Minnesota River Watersheds.

Parameter	**Rainy River Watershed**	**Lake Superior Watershed**	**Minnesota River Watershed**
Total Hardness, mg/L			
Mean	34	72	454
Median	34	71	420
% of values < 10 mg/L	4.7	0	0
Number of data points	1159	856	2146
Period	1975-1998	1990-1998	1970-1998
Color, platinum/cobalt units			
Mean	96	102	22
Median	80	90	20
Number of data points	479	345	1618
Period	1953-1985	1953-1986	1953-1998

These data indicate that, in general, waters with low hardness in Minnesota are likely to be relatively high in color or dissolved organic content; and, the lack of mitigative properties represented by hardness may be at least partially compensated for by the mitigative properties of dissolved organics. The chance of the same water having both very low hardness and very low color seems very remote.

The Agency speculated that standards calculated at very low hardness values might often be below background concentrations for some metals, providing further support for the minimum cap. However, an examination of metals data from the same three watersheds does not support this hypothesis. A comparison of metal standards calculated at low hardness values to background metal concentrations measured in the Rainy, Lake Superior and Minnesota River watersheds is shown in Table I-18. Only metals data collected using ultra clean sampling techniques and low-level detection analyses is used in this analysis. The 75th percentile value was selected for comparison as a reasonable representation a "high" background value, but not an extreme high value. The comparison shows that the lead standards calculated at 10 and 5 mg/L hardness are below the 75th percentile background values in the two low-hardness watersheds, and the copper standard calculated at 5 mg/L is below background levels in the Lake Superior watershed (shaded cells in Table I-18). Thus, standards calculated at very low hardness levels are not generally below background concentrations.

Table I-18. Metal Standards Calculated at Three Low Hardness Values Compared to 75th Percentile Background Values for Three Watersheds.

Metal	Standard in µg/L for hardness of:			75th Percentile background concentrations, µg/L		
	25 mg/L	10 mg/L	5 mg/L	Rainy	L. Superior	Minn. R
Cadmium	0.38	0.19	0.11	0.03	0.03	0.05
Chromium III	67	31	18	1.28	no data	0.99
Copper	4.2	2.3	1.5	1.25	2.19	2.38
Lead	0.54	0.17	0.070	0.35	0.37	0.91
Nickel	49	22	13	1.55	1.7	5.35
Silver, maximum std.*	0.19	0.039	0.012	no data	no data	no data
Zinc	33	15	8.4	2.97	no data	5.66

*The maximum and final acute value standards for silver cannot be less than 1.0 µg/L; these values are shown only for illustrative purposes.

As briefly mentioned in Section VIII.H, EPA guidance says: *"…EPA now recommends that hardness not be capped at 25 mg/L, or any other hardness on the low end."*. The EPA had previously recommended a low-end cap of 25 mg/L but changed its position (Exhibit A-50, page 8). The EPA rationale for the change is that, in the absence of data to confirm the assumption that there is no reduction in the mitigative properties of hardness at very low levels, it is better to make that assumption regardless, to be protective. As stated previously, the Agency does not disagree with the fundamental logic of this assumption; but the Agency is confident that standards calculated at a hardness of 10 mg/L will be protective of aquatic organisms in the rare situation when waterbody hardness values average less than 10 mg/L. The Agency believes the proposed low-end cap at the low hardness level of 10 mg/L is needed and reasonable for the reasons summarized below.

1. Only a single toxicity test is listed in the seven EPA metal criteria documents as having been done at hardness values less than 10 mg/L (zinc: rainbow trout). The relationship between hardness and toxicity at these very low hardness levels has not been demonstrated (Exhibit A-50).

2. Metal standards calculated for hardness values less than 10 mg/L potentially could be overly stringent.

3. Total hardness does not represent all the toxicity mitigative properties in natural waters. Waters in the Rainy and Lake Superior watersheds with very low hardness values often have high color readings. High color indicates the presence of organic ligands, which have been shown to mitigate metal toxicity.

4. Mean or median total hardness values below 10 mg/L are not likely to occur very often even in the Rainy River basin; and a low-end cap of 10 mg/L will need to be invoked only rarely. But with the cap in place, in that unusual situation, it will prevent the calculation of a metal standard at very low hardness levels that could be overly stringent.

J. REPEAL OF MINN. R. CH. 7056 AND 7065 [X. major and substantive, reasonableness]

The Agency is proposing to extract the important provisions in two rules, Minn. R. ch. 7056 and 7065, move the important provisions to the new Minn. R. ch. 7053, and then repeal the two former rules. The important provisions in Minn. R. ch. 7056 are the prohibitions for the discharge of raw or treated sewage, industrial wastes or other wastes into the stretch of Mississippi River from the mouth of the Rum River to the upper lock and dam at St. Anthony Falls in Minneapolis. The important provisions in Minn. R. ch. 7065 are the 1 mg/L phosphorus effluent limits applicable to all dischargers discharging to the waters in the:

- Lake Superior drainage basin and Lake St. Croix
- St. Louis River from its source to the mouth including St. Louis Bay, Mississippi River from its source to Grand Rapids, Big Stone Lake, and Albert Lea Lake

The full texts of the two rules are Exhibits A-56 and A-57.

The relevant portions of these two rules and the language proposed for the move to Minn. R. ch. 7053 are shown in *need* sections, Sections VI.J. 2 and 3. As much as possible the needed existing language in Minn. R. ch. 7056 is being moved intact to avoid inadvertently changing the meaning. Both Minn. R. ch. 7056 and 7065 date from the 1960s, have never been revised, and are very outdated. They were retained when several other outdated rules were repealed in 1981 because of their important provisions (see Tables I-12 and I-13). The proposed separation of the ambient standards from effluent limits into two separate rules provides an ideal opportunity to move and consolidate the relevant effluent limits from these two rules into the new rule, Minn. R. ch. 7053, and repeal both Minn. R. ch. 7056 and 7065.

Some portions of the provisions in Minn. R. ch. 7056 the Agency is proposing to move are covered already in Minn. R. ch. 7050. For example, the "Nuisance prohibited" provisions in Minn. R. 7056.0040, subp.3 are covered, for the most part, by similar narrative standards in Minn. R. 7050.0210. The Agency is proposing to retain and move this language because of its specific emphasis on protecting drinking water supplies, and because we would rather err on the side of having some "redundancy" in the rules rather than creating potential "gaps" in coverage. Similarly, the Agency is proposing to move the variance provision even though the opportunity for a variance is available to dischargers in this reach of the Mississippi River under Minn. R. 7050.0190 and 7000.7000. However, because of the unique aspects of these prohibitions, the Agency feels that including a statement of the opportunity for a variance is prudent and reasonable.

Besides the 1 mg/L phosphorus effluent limits in Minn. R. ch. 7065, which the Agency is proposing to retain and move into Minn. R. 7053.0255, Minn. R. ch. 7065 includes other specific numeric effluent limits for discharges to the:

- St. Louis, Mississippi and Little Minnesota Rivers, and Big Stone and Albert Lea Lakes, and
- St. Croix River from the Minnesota/Wisconsin border to Taylors Falls

The effluent limits for discharges to the St. Louis, Mississippi and Little Minnesota Rivers, and Big Stone and Albert Lea Lakes are in addition to the 1 mg/L phosphorus limit. These secondary treatment limits are shown below (existing Minn. R. 7065.0130).

7065.0130 STANDARDS OF EFFLUENT QUALITY AND PURITY.

Except as otherwise provided herein it is hereby established as a requirement applicable to all persons operating or causing to be operated or in any way responsible for the operation of a disposal system which discharges sewage, industrial waste, or other wastes directly to the above delineated waters, or which may affect these waters, that all effluents shall be treated prior to discharge so as to meet any or all of the following limiting permissible concentrations:

Substance or Characteristic	*Limiting Concentration*
5-day biochemical oxygen demand	*25 milligrams per liter*
Total suspended solids	*30 milligrams per liter*
Fecal coliform group organisms	*200 most probable number per 100 milliliters*
*Total coliform group organisms**	*1,000 most probable number per 100 milliliters*
Pathogenic organisms	*None*
Oil	*Essentially free of visible oil*
Turbidity value	*25*
pH	*6.5-8.5*
Phosphorus	*1 milligram per liter*
Unspecified toxic or corrosive substances	*None at levels acutely toxic to humans or other animals or plant life, or directly damaging to real property.*

**May be used as the control parameter in lieu of fecal coliforms if desired.*

The effluent limits above include limits for turbidity, pathogenic organisms and the option of using total coliform organisms in lieu of fecal coliform. Also, the range of pH values allowed, 6.5 to 8.5, is more stringent than the range allowed in the current Minn. R. ch. 7050.0211 of 6.0 to 9.0.

Removal of these outdated effluent limits with the repeal of Minn. R. ch. 7065 is reasonable for the following reasons. Turbidity and pathogenic organisms are not included in the Agency's list of secondary treatment limits, and they are not included in the federal definition of secondary treatment either.[49] The definition of "secondary treatment" has changed since 1971. That is, the substances for which limits are needed to demonstrate a treatment level that achieves secondary treatment of domestic wastewater is now limited to:

- Carbonaceous biochemical oxygen demand, 25 mg/L (30-day average limit),
- Total suspended solids (TSS), 30 mg/L (30-day average limit), and
- pH, within the range of 6.0 – 9.0.

Minnesota specifies the following limits as requirements of secondary treatment, in addition to those listed above (Minn. R. 7050.0215).

- Fecal coliform organisms, 200 organisms/100 ml (30-day average limit),
- Oil, essentially free of oil, and
- Toxic or corrosive pollutants, no acute toxicity.

A limit for turbidity is no longer part of either the state or federal definition of secondary treatment and a turbidity limit is not needed. Turbidity is controlled largely by the total suspended solids limit of 30 mg/L, and to some extent by the 25 mg/L 5-day carbonaceous biochemical oxygen demand ($CBOD_5$) limit as well. Also, meeting the 1 mg/L phosphorus limit usually means that the effluent has low TSS concentrations.

Pathogenic organisms are controlled by the fecal coliform effluent limit of 200 organisms per 100 ml. This fecal coliform monthly average "end-of-pipe" limit is the same as the current 30-day geometric mean ambient standard designed to protect swimmers. The Agency believes that removal of the more stringent pH limit will have no negative environmental impact, and will bring the limits applicable to the waters listed in Minn. R. ch. 7065 in line with the pH limits applicable elsewhere throughout the state. The outdated limits in Minn. R. ch. 7065 do not provide any additional protection to the St. Louis, Mississippi and Little Minnesota Rivers, and Big Stone and Albert Lea Lakes, beyond the protection provided by the current secondary treatment limits in Minn. R. 7053.0215.

The effluent limits applicable to the St. Croix River from the Minnesota/Wisconsin border to Taylors Falls (existing Minn. R. 7065.0230) are a mix of the customary secondary treatment limits and some limits more stringent than secondary treatment. **Not** included, however, for this reach of the St. Croix River is a 1 mg/L phosphorus limit. The limits in Minn. R. 7065.0230 are shown below. The Agency is proposing to delete these outdated limits as part of the proposed repeal of Minn. R. ch. 7065.

> *7065.0230 STANDARDS OF EFFLUENT QUALITY AND PURITY.*
>
> *Except as otherwise provided herein it is hereby established as a minimum requirement applicable to all persons operating or causing to be operated or in any way responsible for the operation of a disposal system which discharges sewage, industrial waste, or other wastes to the above delineated waters, or which may affect these waters, that all effluents*

[49] 40 CFR 133.102.

shall be treated prior to discharge so as to meet any or all of the following limiting permissible concentrations:

Substance or Characteristic	*Limiting Concentration*
5-day biochemical oxygen demand	*25 milligrams per liter*
Total suspended solids	*30 milligrams per liter*
Fecal coliform group organisms	*10 most probable number per 100 milliliters*
*Total coliform group organisms**	*50 most probable number per 100 milliliters*
Pathogenic organisms	*None*
Oil	*Essentially free of visible oil*
Turbidity value	*10*
pH	*6.5-8.5*
Unspecified toxic or corrosive substances	*None at levels acutely toxic to humans or other animals or plant life, or directly damaging to real property.*

**May be used as the control parameter in lieu of fecal coliforms if desired.*

The limits in Minn. R. ch. 7065 shown above that are more stringent than the secondary limits in existing Minn. R. ch. 7050 are for:

- Fecal coliform, 10 organisms/100 ml
- Pathogenic organisms, none
- Turbidity, 10 NTU
- pH, within the range of 6.0 – 8.5

Pathogenic organisms and turbidity are not included in the current list of secondary treatment limits in Minn. R. 7050.0211 or in the federal definition of secondary treatment.[50] Removal of these pollutants is controlled now through the fecal coliform and TSS limits. The definition of "secondary treatment" has changed since 1971. That is, the substances for which limits are needed to demonstrate a treatment level that achieves secondary treatment has changed.

A fecal coliform limit more stringent that 200 organisms per 100 ml is largely ineffective in reducing bacterial levels in rivers. The S.E. Minnesota regional fecal coliform TMDL for rivers in the Lower Mississippi River watershed estimated that municipal wastewater treatment plants contribute only about one percent of all the fecal bacteria measured in rivers, under both wet and dry conditions. As mentioned above, the effluent limit of 200 organisms/100 ml equals the calendar month ambient standard; i.e., the fecal coliform effluent limit does not allow for any dilution. Also, disinfection of wastewater, especially when chlorine is used as the disinfectant, is typically an "all or none" process. That is, to assure compliance with the 200 limit, plant operators typically use enough chlorine to get a complete or near-complete kill of effluent bacteria. Meeting an effluent limit for fecal coliform organisms, which is an indicator of the possible presence of pathogenic organisms, has proven to be an effective means to eliminate pathogens. There is no need for a separate "pathogen" limit.

[50] 40 CFR 133.102.

Similarly, a stringent turbidity limit is not a very useful means to achieve better than secondary treatment. Turbid water is caused by very fine to relatively large particulates in water that reflect light and make the water appear opaque. Relatively high turbidity does not necessarily mean the presence of pollutants. The TSS limit achieves the same purpose of limiting particulates, and is probably a better indicator of potential pollution than turbidity. Many wastewater treatment plants in the St. Croix basin have a 1 mg/L total phosphorous limit, and meeting that limit usually means that TSS will be low in the final effluent. And, if a discharger of any size anywhere in the St. Croix basin does not already have a phosphorus limit, they are very likely to get one if they expand in the future. This is true whether or not the Agency's proposed extension of the phosphorus limit is adopted (SONAR Book II).

As discussed above, the removal of the more stringent pH effluent limit does not significantly impact water quality. The limits in Minn. R. 7065.0230 for the most critical characteristics that define secondary treatment, $CBOD_5$ and TSS, are the same as current secondary limits.

Protection of the water quality of the upper St. Croix is a very high priority for both Minnesota and Wisconsin. The national significance and value of the St. Croix as a scenic and recreational resource can hardly be over stated (see Exhibit PL-1, for example). The Agency is confident that these more stringent limits can be removed with no harm or degradation to the water quality of the upper St. Croix River. Both Minnesota and Wisconsin have stringent nondegradation provisions in place to protect the existing high quality of the St. Croix.[51]

In summary, the creation of Minn. R. ch. 7053 to contain effluent limits and treatment requirements provides an excellent opportunity to move the important elements of Minn. R. ch. 7056 and 7065 into the new rule, and to repeal these two outdated rules. It is reasonable to consolidate effluent limits in one rule, and to remove these two rules that are easily over looked. The parts Minn. R. ch. 7056 not being moved and proposed for repeal have long ago been superseded by provisions in Minn. R. ch. 7050. Removal of the basin specific effluent limits in Minn. R. ch. 7065, except the phosphorus limits, will have no negative impacts on the water quality of the St. Croix basin. The existing secondary limits plus the common application of a 1 mg/L phosphorus limit in the basin assures adequate treatment of wastewater. Removal of these outdated limits will bring effluent limits applicable to the waters named in Minn. R. ch. 7065 in line with limits applicable everywhere else in the state, including other Outstanding Resource Value Waters. Most of all, the strict application of nondegradation to this Outstanding Resource Value Water (Minn. R. 7050.0180) provides a very high level of protection to the St. Croix River and a much more effective means of protecting this valuable resource.

K. CONCLUSIONS, REASONABLENESS OF THE PROPOSED AMENDMENTS [X. reasonableness]

The proposed changes discussed in this Book of the SONAR are reasonable, and the rationale for the major proposed changes is summarized in this Section.

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[51] Minnesota: Minn. R. 7050.0180 subp. 6 and 6a. Wisconsin: NR 102.10 (a) 1.

Costs. There are no costs to outside parties associated with the proposed amendments covered in Book I of the SONAR. The changes should benefit outside parties, and future cost savings to some outside parties are possible due to some changes (e.g., site-specific standards). The Agency might incur some small additional costs that, if they occur, would be absorbed into existing budgets and staffing levels.

Separation into two rules. The Agency believes it is reasonable to split Minn. R. ch. 7050 into two rules, one for ambient water quality standards and one for effluent limits to make the rules easier to use. The Agency's goal is to:

- Not change the meaning of any part of the rule (unless a change was intended);
- Leave sections of the rule being moved intact and unchanged if possible, consistent with the need to clarify and consolidate language;
- Minimize the amount of rule language that needs to appear in both Minn. R. ch. 7050 and 7053; and
- Allow the two rules to function well independently.

Changes associated with split and other non-substantive changes. The Agency believes that, as a group, all the changes to rule language in both Minn. R. 7050 and 7053 associated with the separation represent a reasonable solution to the matters raised by the split of the rule into two parts. The purpose of essentially all of the non-substantive changes is to make the rule language and formatting easier to read, to clarify confusing language, to correct errors, and to remove inconsistent and redundant language. None of these changes is intended to alter the fundamental meaning of Minn. R. ch. 7050.

Nondegradation for all waters. Two proposed wording changes will remove a reference to an important but inappropriate "beneficial" use (waste assimilation) and to bring the nondegradation language more into line with federal policy. These changes do not change the level of nondegradation protection that the current rule provides.

Variance review period. Extending the variance review period from three to five years for variances to effluent limits is reasonable because the variance must be reviewed at the time the permit is reissued regardless, which is a five-year cycle (Minn. R. 7053.0195). It is impractical to review these variances on a three-year cycle independent of the permit review. About 40 percent of all variances granted are for effluent limits. The proposed change does not impact the three-year review cycle for variances to water quality standards (Minn. R. 7050.0190). Practically speaking, the Agency is on a five-year variance review cycle for effluent limits now.

Removal of 5 mg/L TSS/ pretreatment provision. The stringent 5 mg/L TSS limit is no longer applicable to any municipal discharger because the pretreatment program has been fully implemented. Pretreatment and other toxics reduction efforts already in place are a more direct and efficient means of controlling toxics.

Drinking water standards applicable to Class 1 waters. The proposed changes to the "included/excluded" drinking water standards for Class 1 waters are needed to correct errors and discrepancies in the current rule. The exclusion if certain drinking water standards from applicability is reasonable given the fact that the Minnesota's rule applies EPA finished (after treatment) drinking water standards to raw surface and ground water supplies. The other proposed changes associated with the drinking water standards are reasonable to update the standards, correct errors, inconsistencies and to improve the understandability of this part of the rule. Also, it is reasonable to update the Code of Federal Regulations reference to the latest EPA standards and to update the numeric drinking water standards themselves in Minn. R. 7050.0220.

Removal of the two "generally comparable" clauses in Minn. R. 7050.0223, subp. 2 and 3 will eliminate never used and confusing provisions. There will be no environmental impacts or costs due to the change.

<u>Authority to develop site-specific standards for all use classes</u>. The Agency believes it is reasonable and appropriate to extend the authority to modify an existing standard for uses other than Class 2. While most standards the Agency implements are Class 2 standards there is an increasing need to have the ability to modify Class 3 and Class 4 standards as well. The ability to modify an existing standard on a site-specific basis typically is a cost-effective means of dealing with local extenuating situations, with very little if any cost to the environment.

<u>Proposed minimum hardness for trace metal standards</u>. Establishing a minimum hardness of 10 mg/L for the calculation of hardness-related metal standards is reasonable because, the toxicity/hardness relationship is uncertain at very low hardness values, hardness does not account for the mitigative properties of dissolved organics in natural waters common in many low-hardness waters, and mean hardness values below 10 mg/L are rare. A minimum of 10 mg/L will prevent the calculation of unnecessarily stringent standards if extremely low hardness values are encountered.

<u>Repeal of Minn. R. ch. 7056 and 7065</u>. It is reasonable to consolidate the relevant effluent limits in two these two outdated rules into the new Minn. R. ch. 7053. Existing Minn. R. ch. 7050 has superseded the parts of these rules proposed for repeal. Removal of the more stringent basin-specific effluent limits in Minn. R. ch. 7065 for the upper St. Croix will have no negative impacts on the water quality of this very important river. Nondegradation for this Outstanding Resource Value Water and the existing secondary limits, plus the common application of a 1 mg/L phosphorus limit in the basin assures protection of this resource.

XI. CONSIDERATION OF ECONOMIC FACTORS

The proposed changes discussed in Book I of the SONAR will not require any additional expenditure of money by any outside party, including small business or small cities (Section VIII.L). It is the Agency's belief that the simplification and clarification of Minn. R. ch 7050 and the creation of a new rule, Minn. R. ch. 7053 might save the Agency and outside entities money over the long run by making the rules easier to use, and by reducing mistakes in interpretation or oversight of relevant provisions; but, there is no way to estimate any actual savings. Extension of the site-specific modification of existing standards to all beneficial use classes may result in cost saving to some entities in the future, as a less costly alternative for addressing standards that may be problematic in a local situation. Again it is impossible to estimate any cost savings that might occur because we do not know how often this extending site-specific option may be used.

There are no direct additional costs to the Agency, other state, federal or other governmental jurisdictions as a result of these amendments. The possibility of modest expenses that might be incurred by the Agency as a result of the changes covered in SONAR Book I is discussed in Section VIII.C. Any costs would be incorporated into existing Agency budgets and staff resources.

XII. IMPACT ON AGRICULTURE

Minnesota Stat. § 14.111 requires agencies to send a copy of any proposed rule that affect farming operations to the Commissioner of Agriculture no later than 30-days prior to publication of the proposed rule in the *State Register*. The Agency maintains that the proposed amendments to Minn. R. ch. 7050 discussed in Book I of the SONAR will have no effect on farming operations. On April 18, 2007, the MPCA sent a letter, together with a draft copy of the proposed rule amendments, to the Commissioner of Agriculture, well in advance of the targeted publication date in the *State Register*. The letter, which will be introduced as an exhibit at the beginning of the public hearings, highlighted the proposed water quality standards for acetochlor and metolachlor discussed in Section V of SONAR Book III.

XIII. NOTICE TO THE COMMISSIONER OF TRANSPORTATION

Minnesota Stat. § 174.05, subd. 1 requires the Agency to inform the Commissioner of Transportation of all activities which relate to the adoption, revision or repeal of any standard or rule concerning transportation. A representative of the Minnesota Department of Transportation (MDOT) is on the Agency's interested party mailing list and received all the mailings discussed in Section III. The proposed revisions discussed in this Book will have no affect on transportation. On April 18, 2007, the MPCA sent a letter, together with a draft copy of the proposed rules, to the Commissioner of MDOT. The letter, which will be introduced as an exhibit at the beginning of the public hearings, explained that the proposed amendments will have no affect on transportation.

In an unrelated letter, the Agency informed MDOT that we would not be revising the Class 2 standard for chloride as they had requested (see Section III.F and Exhibits A-14j and A-22).

XIV. LIST OF WITNESSES AND EXHIBITS

A. WITNESSES

The Agency plans to have the following staff available to testify at the public hearings on issues relevant to Book I of the SONAR.

David Maschwitz – Proposed amendments in general, history of their development, preparation the proposed rule language and author of the SONAR.
Mark Tomasek – Supervisor of Standards Unit, phosphorus limits and related issues.
Gerald Blaha – The proposed changes to rule language in general and those specifically associated with use classifications, plus certain housekeeping changes.

B. EXHIBITS

The list of all exhibits is attached.

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B. EXHIBITS

The list of all exhibits is attached.

XV. CONCLUSION

Based on the foregoing, the proposed rule amendments described in SONAR Book I are both needed and reasonable.

Dated: 7/16/07

Brad Moore
Commissioner

Exhibit List: Statement of Need and Reasonableness, Books I-III

A-1 Statement of Need and Reasonableness, Book I of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

July 2007 Book I of III

A-2 Statement of Need and Reasonableness, Book II of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

July 2007 Book II of III

A-3 Statement of Need and Reasonableness, Book III of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

Book III of III

A-4 Statement of Need and Reasonableness (SONAR): In the Matter of Proposed Additions To Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; Proposed Additions Required By Minnesota Session Law 2003, Chapter 128, Article 1, Section 156 As Amended By Minnesota Session Law 2005, First Special Session, Chapter 1, Article 2, Section 156

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

May 2006 http://www.pca.state.mn.us

A-5 Exhibit List for Statement of Need and Reasonableness, Books I-III

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

July 2007

A-6 2006 303(d) List. (Final 2004 MPCA Clean Water Act Section 2004 303(d) Total Maximum Daily Load (TMDL) List of Impaired Waters)

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Publication MPCA St. Paul

June 1, 2006 http://www.pca.state.mn.us

The List identifies impaired streams and lakes in ten major River Basins.

A-7 Guidance Manual For Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) Report and 303(d) List

Author: Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Guidance MPCA St. Paul

October 2005 pp1-106 & Appendices http://www.pca.state.mn.us/water/tmdl/index

URL: See first document under "publications"

A-8a Subject: Triennial Review -Revised

From Larry C. Salmela, Department Manager - Environmental, United States Steel Corporation (USS)

Comment Letter Mount Iron

September 22, 2003

To Mr. Marvin Hora, Environmental Outcomes Division, MPCA

A-8b

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter

October 31, 2003

To David Maschwitz and Greg Gross, Environmental Outcomes Division, MPCA

Follow-up to Meeting on October 24, 2003 in New Ulm, Minnesota

A-9 Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

Author: Minnesota Pollution Control Agency (MPCA)

Public Notice State Register (SR) St. Paul

November 10, 2003 Vol 28 (19), pp.614-5

A-10

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter MPCA St. Paul

November 6, 2003 http://www.pca.state.mn.us

To Interested Parties for 7050, 7052 and 7055 Water Quality Rules

1st Notice to mailing list. MPCA Cover Letter with State Register Notice to Interested Parties for 7050, 7052 and 7055.

A-11a Subject: State Register of November 10, 2003 - Possible Amendments to Rules Governing State Water Quality Standards

From Larry C. Salmela, Department Manager - Environmental, United States Steel Corporation (USS)

Comment Letter Mount Iron

December 12, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11b Subject: Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB), Christopher M. Hood, Flaherty & Hood, P.A.

Comment Letter

December 31, 2003

To David Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11c Subject: Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Rebecca J. Flood, Manager - Environmental Compliance Section, Environmental Services Division, Metropolitan Council

Comment Letter St. Paul

December 31, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11d Subject: Proposed Water Quality Standards Rules Revision Invitation to Comment

From Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy (MCEA)

Comment Letter St. Paul

January 9, 2004

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11e Subject: Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Keith E. Hanson, Minnesota Chamber of Commerce Water Quality Subcommittee - Chair

Comment Letter St. Paul

December 31, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11f Subject: Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Steven Colvin, Environmental Management Unit Supervisor, Division of Ecological Services, Minnesota Department of Natural Resources (MDNR)

Comment Letter St. Paul

December 31, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11g Subject: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process… (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

September 29, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-11h Subject: RE: MPCA WQ Standards Rule Revision…

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

September 29, 2003

To David Flakne, Syngenta

Comment Letter from 1st Notice.

A-11i Subject: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process… (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

December 19, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice. 3 Attachments:
EPA DWLOC Values iRED.ppt; EPA LOC CASM Screening Values…; US EPA Atrazine Aquatic Life Water Quality (see Exhibit H-59)

A-11j Subject: RE: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process…

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

December 22, 2003

To David Flakne, Syngenta

Comment Letter from 1st Notice. Attachment: Atrazine U.S. EPA.doc

A-11k Subject: Syngenta Comments/Questions on MPCA Proposed Revisions to WQ Standards 7050 and 7052… (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

May 25, 2004

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice. Comment Letter from 1st Notice. 3 Attachments:
EPA DWLOC Values iRED.ppt; EPA LOC CASM Screening Values…; US EPA Atrazine Aquatic Life Water Quality

A-11l Subject: RE: Syngenta Comments/Questions on MPCA Proposed Revisions to WQ Standards 7050 and 7052…

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

May 25, 2004

To David Flakne, State Government Relations Manager, Syngenta Crop Protection

Comment Letter from 1st Notice.

A-12 Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

Minnesota Pollution Control Agency (MPCA)

Public Notice State Register (SR) St. Paul

May 17, 2004 Vol 28(46); pp.1464-7

Notice to solicit in SR, May 17, 2004

A-13

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Letter
May 11, 2004
To Interested Party
Cover Letter & Mailing List - 2nd Notice

A-14a Subject: Water Quality Rule Revisions

From Paula West, Executive Director, Minnesota Lakes Association (MLA)
e-mail — Brainerd
May 13, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14b Subject: Proposed Extension of 1 mg/L Phosphorous Effluent Limit to New or Expanding Discharges

From Steven Colvin, Environmental Management Unit Supervisor, Division of Ecological Services, Minnesota Department of Natural Resources (MDNR)
Letter — St. Paul
May 14, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14c Subject: RE: Syngenta Comments/Questions on MPCA Proposed Revision to WQ Standards Chapter 7050 and 7052... (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection
e-mail — Madison
May 25, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14d

From Crosby-Ironton Presbyterian Church
Letter — Crosby
June 11, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Re: Upholding Strict Standards to Protect Water Quality in Our State

A-14e Subject: Clean Water/Public Input

From Tine Thevenin, Author/Speaker
e-mail — Lake City
June 18, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14f Subject: Request for Development of Water Quality Standards

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)
Letter — St. Paul
June 23, 2004
To Greg Gross, Environmental Outcomes Division, MPCA

A-14g Subject: Mercury Comments

From Donald Barron
Comment Letter — Thief River Falls
Received June 24, 2004
To Environmental Protection Agency Administrator, Ariel Rios Building (Washington, D.C.)
Copy Mailed To: David E. Maschwitz, Environmental Outcomes Division, MPCA, St. Paul, MN

A-14h Subject: Comments - Proposed Changes to MS Ch. 7050

From Terry Noonan, Project Manager - Water Resources, Ramsey County Public Works
e-mail — Shoreview
June 25, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14i **Subject: Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052**
From Al Christopherson, President, Minnesota Farm Bureau Federation (MFBF)
Comment Letter
June 28, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
with Cover Letter (e-mail from Jackie Gauger sent on June 29, 2004)

A-14j **Subject: Mn/DOT Comments on Water Quality Standards Revision**
From Richard Elasky, Chief Environmental Officer, Minnesota Department of Transportation (MNDoT)
Comment Letter St.Paul
June 29, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
3 Attachments: Derivation of Acute and Chronic Toxicity Criteria for Chloride (January, 2000) prepared by: Jim Schmidt -WDNR; Chronic Data - Chlorides spread sheet provided by Jim Schmidt -WDNR; Ambient Aquatic Life Criteria For Chloride -Chloride Issue Paper (2003) provided by Connie Due - Iowa DNR, Environmental Services Division, Water Quality Bureau

A-14k **Subject: MESERB/CGMC Data Practices Act Request Relative to Proposed Amendments to the Phosphorus Rule, Minn. R. 7050.0211, subp. 1a**
From Chistopher M. Hood, Flaherty & Hood, P.A.
Letter St. Paul
June 30, 2004
To Commissioner Sheryl Corrigan
Included an Attached Memo (Exhibit A-14l)

A-14l **Subject: Supplemental Data Practices Act Request**
From Christopher M. Hood, Flaherty & Hood, P.A. for Coalition of Greater Minnesota Cities (CGMC)
Letter St. Paul
July 16, 2004
To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

A-14m **Subject: Proposed Water Quality Standards Rule Revision Invitation to Comment**
From Sol Simon, President - Mississippi River Revival (MRR)
Comment Letter Winona
June 30, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-15a **Proposed Amendments to Minnesota Rules Chapter 7050 [RULES AS PROPOSED]**
Author: Minnesota Pollution Control Agency (MPCA)
Rule MPCA St. Paul
July 16, 2007 wq-rule1-02

A-15b **Proposed New Minnesota Rules Chapter 7053 [RULES AS PROPOSED]**
Author: Minnesota Pollution Control Agency (MPCA)
Rule MPCA St. Paul
July 16, 2007 wq-rule1-03

A-16 **NEWS RELEASE: MPCA Seeks Input on Proposed Changes to State Water-Quality Standards**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Publication MPCA St. Paul
For Release: June 4, 2004 http://www.pca.state.mn.us
News Release for the public meetings

A-17 **Subject: Plans for Additions and Revisions to Water Quality Standards in Minn. R. chs. 7050 and 7052**

From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo — St. Paul

September 23, 2003

To MPCA's Citizens' Board

with cover letter to interested parties from David Maschwitz dated September 12, 2003, and list of 59 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on September 23, 2003)

A-18 **Triennial Review of Water Quality Standards, Minn. R. ch. 7050 & 7052**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation — St. Paul

September 23, 2003

For MPCA's Citizens' Board

PowerPoint presentation

A-19 **Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards**

From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo — St. Paul

August 13, 2004

To MPCA's Citizens' Board

with cover letter to interested parties dated August 16, 2004, and list of 72 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on August 24, 2004)

A-20 **Update of Plans to Revise MN Water Quality Standards**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation — St. Paul

August 24, 2004

To MPCA's Citizens' Board

PowerPoint presentation

A-21 **Health Risk Limits for Groundwater Water Intake and Cancer Potency Adjustment Factors**

Author: Helen Goeden, Ph.D., Minnesota Department of Health (MDH)

Presentation — St. Paul

August 24, 2004

To MPCA's Citizens' Board

PowerPoint presentation - New MDH Slides

A-22 **Subject: Request for Change to the Class 2 Standard for Chloride**

From Marvin E. Hora, Manager, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

September 24, 2004

To Mr. Richard Elasky, Chief Environmental Officer, Minnesota Department of Transportation (MNDoT)

A-23 **Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo — St. Paul

September 21, 2004

To MPCA's Citizens' Board

Cover letter to interested parties; 2 Attachments; Agency Board Meeting was on September 28, 2004.

A-24 **Update of Plans to Revise MN Water Quality Standards**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation — St.Paul

September 28, 2004

To MPCA's Citizens' Board

PowerPoint presentation

A-25 2003 Administrative Rule Preliminary Proposal Form

Author: David E. Maschwitz, Environmental Outcomes Division, MPCA

Form MPCA St. Paul

October 27, 2003

with cover memorandum To: Scott Wiggins, Legislative Coordinator; From: Kevin Molloy, Water Quality Rule Coordinator; 1st of three forms to the Governor's Office

A-26 2007 Admistrative Rule Proposed Rule and SONAR form: Minnesota's Water Quality Standards, Proposed Revision of Minnesota Rules Chapter (Minn. R. Ch.) 7050, Proposed Addition of a New Rule, Minn. R. Ch. 7053, Proposed Repeal of Out-dated Rules, Minn. R. Ch. 7056 and 7065

Author: David E. Maschwitz (Rule/SONAR Content) and Kevin Molloy (Rulemaking Coordinator), Minnesota Pollution Control Agency (MPCA)

Form MPCA

April 9, 2007 Adm. Rule Tracking #: AR081(B)

Attached to Memo: Letters to Commissioner Tom Hanson, Department of Finance, Commissioner Gene Hugoson, Minnesota Department of Agriculture, and Commissioner Carol Molnau, Minnesota Department of Transportation

A-27 No Exhibit

A-28 Petition for Rulemaking to the Minnesota Pollution Control Agency -Pursuant to Minnesota Statutes § 14.09 et seq.

From Chistopher M. Hood, Flaherty & Hood, P.A.

Petition St. Paul

December 15, 2003

To Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Includes cover letter to Commissioner Sheryl Corrigan Re: Petition to amend Minn. R. 7050.0211, subp. 1a (the "phosphorus rule")

A-29 Subject: Response to Petition to Amend Minn. R. 7050.0211, subp. 1a (the "phosphorus rule")

From Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

January 13, 2004

To Christopher M. Hood, Flaherty & Hood, P.A.

A-30 Phosphorus Rulemaking Petition

From Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy

Petition Minnesota Center for Environmental Advocacy (MCEA) St. Paul

July 27, 2004

To Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Includes cover letter (Re: Petition to Amend Minn. R. 7050.0211)

A-31 Subject: Petition to Amend Minn. R. 7050.0211

From Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

August 18, 2004

To Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy

(Response to MCEA's July 27, 2004 Petition)

A-32a Subject: MPCA Proposed Phosphorous Rule and Phosphorous Strategy Amendments

From Christopher M. Hood, Flaherty & Hood, P.A.

Letter St. Paul

June 30, 2004

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Attached Technical Memo from MESERB (see Exhibit A-32b)

A-32b **Subject: MPCA Approach to Phosphorus Effluent Limits in NPDES Permitting**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Memo — Alexandria

June 30, 2004

To Commissioner Sheryl Corrigan

Attachment to Exhibit A-14k

A-33

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

August 5, 2004

To Christopher M. Hood, Flaherty & Hood, P.A.

Response to Christopher Hood on the Minnesota Data Practices Act Request of June 30, 2004, and the Follow-up Request of July 16, 2004.

A-34 **Subject: Amendments to Phosphorus Rule, Minn. R. 7050.0211, subp. 1a**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter — Alexandria

February 11, 2005

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Additional Contact: Steve Nyhus, Flaherty & Hood, P.A.

A-35 **Subject: MPCA Proposed Water Quality Assessment Rules Revisions and Ecoregion-Based Eutrophication Standards**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter — Alexandria

March 18, 2005

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Additional Contact: Steve Nyhus, Flaherty & Hood, P.A.

A-36 **Subject: Response to MESERB February 11, 2005 Letter, Comments on Amendments to Phosphorus Rule; and March 18, 2005 Letter, Comments on Proposed Eutrophication Standards**

From Greg Gross, Supervisor, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

May 12, 2005 — pp.1-13 and pp.1-6

To Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Attachment: Draft Amendments to Minnesota Rules Chapter 7050; Excerpt of Planned Revision of Water Quality Standards

A-37a **Minn. Session Law 2003, ch. 128, art. 1, § 156, subdivisions 1 and 2 Water Quality Assessment Process**

Law — Minnesota Office of Revisor of Statutes — St. Paul

2003 — http://www.revisor.leg.State.mn.us

(Original Law)

A-37b **Minn. Special Session Law 2005 ch. 1, art. 2, § 151, subdivisions 1, 2 and 3 Water Quality Assessment Process**

Law

2005 — http://www.revisor.leg.State.mn.us

(Amendment to: Minn. Session Law 2003, ch. 128, art. 1, § 156, subdivisions 1 and 2)

A-38 **No Exhibit**

A-39 **No Exhibit**

A-40a **Subject: Critical Concerns Regarding Draft Nutrient Standards and Phosphorous Rule**
From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)
Comment Letter — Alexandria
June 16, 2005 — pp.1-4
To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

A-40b **Water Quality Standards: A Review with an Emphasis on Numeric Nutrient Criteria**
Author: Walt Poole, Ph.D., America's Clean Water Foundation (ACWF)
Report — ACWF
March 2005 — pp.6-31
In Cooperation with the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA)

A-41 **Subject: MESERB's Concerns Regarding Nutrient Standards and Phosphorous Rule**
From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)
Letter — St. Paul
June 29, 2005 — pp.1-3
To Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

A-42a **Changes to Proposed Amendments to Minn. Rules, ch. 7050**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document — MPCA — St. Paul
March 9, 1990 — pp.1-6

A-42b **Revised Changes to Proposed Amendments to Minn. Rules pts. 7050.0218, subp. 2 and 7050.0220, subp. 4**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document — MPCA — St. Paul
March 16, 1990

A-43 **No Exhibit**

A-44a **Sensitivity of Mussels to Ammonia Toxicity, Implications for a Revised Minnesota Ammonia Standard Considering the Biology and Distribution of Mussels in Minnesota**
Author: Minnesota Pollution Control Agency (MPCA)
Agenda — MPCA — St. Paul
March 25, 2004
Contact List on back

A-44b **Subject: Meeting at MPCA, 1:00-4:30p.m., March 25, 2004**
Sensitivity of Mussels to Ammonia Toxicity, Implications for a Revised Minnesota Ammonia Standard Considering the Biology and Distributions of Mussels in Minnesota
From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Letter — St. Paul
March 15, 2004
To Ammonia Toxicity Experts (see exhibit A-44c for list)

A-44c
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document — St. Paul
2004
List of Attendees (for March 25, 2004 Mtg.: exhibit A-44b)

A-45 **Notice of Intent To Re-Evaluate the Aquatic Life Ambient Water Quality Criteria for Ammonia**
Author: Geoffrey H. Grubbs, Director, Office of Science and Technology, Environmental Protection Agency (EPA)
Public Notice — Federal Register - Online via GPO Access — Washington, D.C.
July 8, 2004 — Vol 69(130); pp.41262-4 — http://www.gpoaccess.gov/fr/index.html

A-46a **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

December 3, 2004 http://www.pca.state.mn.us

Included excerpts from Minn. Rule ch 7050 revisions (See Exhibit A-46b).

A-46b **Excerpts of Planned Revision of Water Quality Standards: Preliminary Draft Amendments to Minn. R. 7050.0150 and 7050.0222 - Relevant Definitions and Eutrophication Standards for Lakes, Reservoirs and Shallow Lakes [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule Minnesota Office of Revisor of Statutes St. Paul

November 1, 2004 http://www.pca.state.mn.us

Attachment to December 3, 2004 website, "Proposed Water Quality Standards Rule Revisions".

A-47 **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: June 16, 2005 http://www.pca.state.mn.us

A-48a **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: August 9, 2005 http://www.pca.state.mn.us

Includes complete versions of Minn. Rules ch 7050 & 7055 [Drafts]. (See Exhibit A-48b & A-48c)

A-48b **Proposed Amendments to Minnesota Rules Chapter 7050 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

July 28, 2005 http://www.pca.state.mn.us

A-48c **Proposed Amendments to Minnesota Rules Chapter 7055 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule Office of Revisor of Statutes, State of Minnesota St. Paul

July 28, 2005

Attached to August 9, 2005 Rule Revision Website

A-49a **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: January 26, 2006 http://www.pca.state.mn.us

Includes complete versions of Minn. Rules ch 7050 & 7055 [Drafts] (Updated January 1, 2006; See Exhibit A-49b & A-49c) and Derivation of acetochlor and metolachlor standards (See Exhibit A-49d)

A-49b **Proposed Amendments to Minnesota Rules Chapter 7050 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

Revised January 1, 2006 http://www.pca.state.mn.us

A-49c **Proposed New Minnesota Rule Chapter 7055 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

Revised January 1, 2006 http://www.pca.state.mn.us

A-49d **Outline of Basis for Draft Proposed Acetochlor and Metolachlor Class 2 Water Quality Standards**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

January 17, 2006 http://www.pca.state.mn.us

A-50 **Water Quality Standards Handbook: 2nd Ed.**
Author: Office of Water, Environmental Protection Agency (EPA)
Guide EPA Washington
August 1994 EPA-823-B-94-005a; pp.5-11, 5-12 http://www.epa.gov
[5.3] Variances From Water Quality Standards

A-51 **National Recommended Water Quality Criteria: 2002**
Author: Office of Water and Office of Science and Technolgy, Environmental Protection Agency (EPA)
EPA Report Washington, D. C.
November 2002 http://www.epa.gov

A-52 **Announcement: Health Risk Limits Expert Advisory Panel**
From Patricia Bloomgren, Director, Division of Environmental Health, Minnesota Department of Health (MDH)
Letter St. Paul
2005 http://www.health.state.mn.us
(General Posting on MDH website)

A-53 **Subject: Exclusions/Inclusions for DWS in 7050**
From Richard D. Clark
e-mail St. Paul
May 20, 2005
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Includes Attachment: SONAR excerpt on Drinking Water Standards

A-54 **40 CFR parts 141 and 143**
Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access
Rule Code of Federal Regulations (CFR) Washington, D.C
Revised July 1, 2004 Vol 21 http://www.gpoaccess.gov/fr/index.html
Title 40 "Protection of Environment"; Part 141 "National Primary Drinking Water Regulations" and Part 143 "National Secondary Drinking Water Regulations"

A-55a **Statement of Need and Reasonableness [Excerpt]**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document St. Paul
1979; 1980 Rule Revision PCA-004-80-AK, pp.1, 37-8
Excerpt on Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55b **Report of the Hearing Examiner [Excerpt]**
Hearing Examiner
Report Stat e of Minnesota Office of Hearing Examiners St. Paul
1980 PCA-80-004-AK, pp.1, 78-81
Excerpt related to Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55c **Proposed Findings of Fact and Conclusions [Excerpt]**
Minnesota Pollution Control Agency (MPCA)
MPCA Document St. Paul
October 28, 1980 Cover sheet, pp.20
Cover Sheet: Agenda Item Control Sheet; Excerpt on Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55d **Order Adopting Rules**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document St. Paul
1980 PCA-80-004-AK, p. 3, no. 4
In the Matter of the Proposed Amendments to MPCA Rules WPC 14, 15, 24 and 25 and the Proposed Repeal of WPC 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17,18, 19, 20, 21, 23, 26, 29, 31 and 32.

A-56 Minn. R. ch. 7056
Author: Minnesota Pollution Control Agency (MPCA)
Rule Minnesota Office of Revisor of Statutes St. Paul
November 3, 1998 http://www.revisor.leg.state.mn.us/
Mississippi River and Tributaries

A-57 Minn. R. ch. 7065
Author: Minnesota Pollution Control Agency (MPCA)
Rule Minnesota Office of Revisor of Statutes St. Paul
November 3, 1998 http://www.revisor.leg.state.mn.us/
http://www.revisor.leg.state.mn.us/
Effluent Standards for Disposal Systems

A-58 No Exhibit

A-59 No Exhibit

A-60 40 CFR 131.10 (a) Designation of Uses
Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access
Rule Code of Federal Regulations (CFR) Washington, D.C.
Revised July 1, 2004 pp.370-1 http://www.gpoaccess.gov/fr/index.html
(Waste Assimilation Not a Beneficial Use).

A-61 Water Quality Standards Handbook: 2nd Ed.
Author: Office of Water, Environmental Protection Agency (EPA)
Guide EPA Washington, D.C.
August 1994 EPA-823-B-94-005a; pp.2-1, 2-2 http://www.epa.gov
[2.1] Use Classification - 40 CFR 131.10(a) in Chapter 2, "Designation of Uses"

A-62 40 CFR 131.12 Antidegradation Policy
Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access
Rule Code of Federal Regulations (CFR) Washington, D.C.
Revised July 1, 2005 pp.390-1 http://www.gpoaccess.gov/fr/index.html
Title 40 "Protection of Environment"; Part 131 "Water Quality Standards"

A-63 Water Quality Standards Handbook: 2nd Ed.
Author: Office of Water, Environmental Protection Agency (EPA)
Guide EPA Washington, D.C.
August 1994 EPA-823-B-94-005a; pp.4-1 to 4-14 http://www.epa.gov
Chapter 4 - Antidegradation

A-64a Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards
From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Memo MPCA St. Paul
January 13, 2006 http://www.dnr.state.mn.us
To MPCA Citizens' Board
with cover letter to interested parties dated January 13, 2006, and list of 72 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on January 24, 2006)

A-64b Triennial Review of Water Quality Standards: Update on Revisions of Minn. R. ch. 7050
Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Presentation St. Paul
January 24, 2006
To MPCA's Citizens' Board

A-65a **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised July 28, 2006 http://www.pca.state.mn.us

Included Draft Minn. R. chs. 7050 and 7053 and Outline of Acetochlor and Metolachlor Standards

A-65b **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St, Paul

June 6, 2007 http://www.pca.state.mn.us

Includes Proposed Minn. R. chs. 7050 (Exhibit A-15a) and 7053 (Exhibit A-15b) and Outline of Acetochlor and Metolachlor Standards; Attached email to Interested Parties

A-66 **Subject:**

From Tom Poleck, Water Quality Branch, Environmental Protection Agency (EPA)

Letter Chicago

December 19, 2005

To Dave Maschwitz, Environmental Outcomes Division, MPCA

"…initial response to changes that the Minnesota Pollution Control Agency (MPCA) is considering making to certain aspects of Minn. R. ch. 7050, including proposed rule revisions that MPCA posted on its website on August 9, 2005."

A-67a **Subject: Water Quality Standards for Mercury**

From Char Brooker

e-mail Maplewood

February 3, 2006

To David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Example of emails received after January 24, 2006 presentation at the MPCA's Citizen Board Meeting

A-67b **Subject: FW: FW: Act to Reduce Mercury in Minnesota Fish!**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

March 2, 2006

To Interested Party

EC-1 **Ambient Water Quality Criteria for Bacteria-1986**

Author: Environmental Protection Agency's (EPA's) Office of Research and Development Microbiology and Toxicology Div., Cincinnati, OH and Office of Water Regulations and Standards, Criteria and Standards Div., Washington, D.C.

EPA Report EPA Washington, D.C

January 1986 EPA440/5-84-002; pp.i-iv, 1-18 http://www.epa.gov

Bacteriological Ambient Water Quality Criteria for Marine and Fresh Recreational Waters

EC-2 **Implementation Guidance for Ambient Water Quality Criteria for Bacteria**

Primary Authors: Jim Keating, Jennifer Wigal, and Lars Wilcut, Office of Water (4305T), Environmental Protection Agency (EPA)

Guidance EPA Washington, D.C.

March 2004 EPA-823-B-04-002; pp.i-x, 1-89 http://www.epa.gov

EC-3 **Fecal Contamination of Surface and Recreational Waters: Disease Transmission and Public Health Protection [DRAFT]**

Prepared by Tetra Tech EM Inc. for Minnesota Pollution Control Agency (MPCA);

Report MPCA St. Paul

September 30, 1997 pp. i- ii, 1-28 http://www.pca.state.mn.us

EC-4 **Microbial Indicators of Faecal Contamination In Water: A Current Perspective**

Author: Pam Tallon, Brenda Magajna, Cassandra Lofranco and Kam Tin Leung, Department of Biology, Lakehead University, and Ontario Ministry of the Environment, Standards Development Branch, Etobicoke

Journal Water, Air and Soil Pollution Ontario -Canada

2005 Vol 166; pp.139-166 http://springerlink.metapress.com/content/1573-2932/

EC-5 **Do U.S. Environmental Protection Agency Water Quality Guidelines for Recreational Waters Prevent Gastrointestinal Illness? A Systematic Review and Meta-Analysis**

Author: Timothy J. Wade, N. Pai, Joseph N.S. Eisenberg, and J. Colford, Jr., Epidemiology and Biomarkers Branch, Environmental Protection Agency (EPA), Research Triangle Park, NC; School of Public Health, Div. of Epidemiology, Univ. of California

Review | Environmental Health Perspectives (EHP) | | Berkley
June 2003 | | Vol 111; pp.1102-8 | http://www.ehponline.org

EC-6a **Method 1603: Escherichia coli (E. coli) in Water by Membrane Filtration Using Modified membrane-Thermotolerant Escherichia coli Agar (Modified mTEC)**

Author: Office of Water (4303T) Environmental Protection Agency (EPA)

EPA Report | EPA | | Washington, E.C.
September 2002 | | EPA-821-R-02-023 | http://www.epa.gov

EC-6b **40 CFR Part 136.**
Part III. Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Ambient Water [Final Rule]

Author: Environmental Protection Agency (EPA)

Rule | Federal Register (FR)
July 21, 2003 | | Vol 68(139); pp.43271-83 | http://www.epa.gov/fedrgstr

EC-6c **Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Notice of Data Availability**

Author: Environmental Protection Agency (EPA) -from Online via GPO Access

Public Notice | Federal Register (FR)
April 11, 2006 | | Vol 71(69); pp.18329-31 | http://www.epa.gov/fedrgstr/

EC-7 **Rapidly Measured Indicators of Recreational Water Quality are Predictive of Swimming Associated Gastrointestinal Illness**

Author: Timothy J. Wade, Rebecca L. Calderon, Elizabeth Sams, Michael Beach, Kristen P. Brenner, Ann H. Williams, and Alfred P. Dufour, The National Institute of Environmental Health Sciences, U.S. Department of Health and Human Services

Journal | Environmental Health Perspectives (EHP)
Online: September 1, 2005 | | Vol 114 (1); pp.24-8 | http://www.ehponline.org

EC-8 **South Zumbro River in Rochester Fecal Coliform and E. coli Monitoring (2001) [DRAFT]**

Author: Norman Senjem and Lee Ganske, Minnesota Pollution Control Agency (MPCA)

MPCA Document | MPCA | | St. Paul
April 2003 | | | http://www.pca.state.mn.us

EC-9 **Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota**

Submitted by: Norman Senjem, Lee Ganske, Gregory Johnson, David Morrison, and Bill Thompson, Regional Environmental Management Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document | MPCA | | St. Paul
October 2002 | | | http://www.pca.state.mn.us

For Submission To: Region 5, U.S. Environmental Protection Agency (EPA), Chicago, Illinois

EC-10 **Water-Resources Investigations.**
Escherichia coli and Fecal-coliform Bacteria as Indicators of Recreational Water Quality

Author: Donna S. Francy, Donna N. Myers, and Kevin D. Metzker, U.S. Geological Survey

Report | U.S. Geological Survey | | Columbus
1993 | | Report# 93-4083 | http://www.usgs.gov

EC-11 **Surface Water Pathogen Study**

Prepared by Wenck Associates, Inc.

Study | Minnehaha Creek Watershed District
Study Completion: July 2003 | | pp.i-vii, 2-1 to 6-3, Appendix A & B

Prepared for the Minnehaha Creek Watershed District

EC-12 **1984 Mississippi River Bacteria Study**

Author: Gary L. Fandrei, Minnesota Pollution Control Agency (MPCA)

Study | MPCA | | Roseville
April 1985 | | pp.i-vii, 1-29 | http://www.pca.state.mn.us

EC-13 **Health Effects Criteria for Fresh Recreational Waters**

Author: Alfred P. Dufour, Toxicology and Microbiology Division, Environmental Protection Agency (EPA)

EPA Report — EPA — Cincinnati

August 1984 — EPA-600/1-84-004 — http://www.epa.gov

EC-14 **Fecal Coliform vs. E. coli Water Quality Standards**

Author: Dave Christopherson, Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

May 2003

EC-15 **Water Pollution Control Act of 1972 Amendment to Section 303(i) Beaches Environmental Assessment and Coastal Health Act of 2000 .**

106th Congress

Law — U.S. Code — Washington, D.C.

October 10, 2000 — Public Law 106-284; 114 STAT.870 — http://www.gpoaccess.gov/uscode/index.html

BEACH Act Amendment to the Clean Water Act

EC-16a **Subject: Reminder of Deadline and Advisement of EPA's Plans to Comply with Requirements of Section 303(i) of the Clean Water Act, Also Known As the BEACH Act**

From Benjamin H. Grumbles, Office of Water, Environmental Protection Agency (EPA)

Letter — EPA — Washington, D.C.

April 19, 2004

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

with Attachment - Outline/Requirements: "General Background of the BEACH Act"

EC-16b **Subject: Federal Promulgation of Water Quality Criteria for Bacteria**

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter — MPCA — St. Paul

May 7, 2004

To Benjamin H. Grumbles, Office of Water Environmental Protection Agency (EPA)

Response to EPA

EC-17 **40 CFR Part 131**
Part II. Water Quality Standards for Coastal and Great Lakes Recreation Waters; Final Rule

Author: Environmental Protection Agency (EPA)

Public Notice — Federal Register (FR) — Washington, D.C.

November 16, 2004 — Vol 69(220); pp.67218-67243 — http://www.epa.gov/fedrgstr

Rules and Regulations. (EPA Promulgation of Standards for States Not Meeting Deadline)

EC-18 **Minnesota Lake Superior Beach Program**

Author: Minnesota Pollution Control Agency (MPCA)

Website — MPCA — St. Paul

June 24, 2004; Accessed: March 3, 2005 — http://www.pca.state.mn.us/water/beaches/index.html

EC-19 **Draft Matrix of Protocols and Criteria Used in Beach Closing Decisions [DRAFT]**

Prepared by the Metro Area Beach Monitoring Group, Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

September 2005

Headings: Sampling and Analysis Methods; ods; Thresholds; Actions; Other Items

EC-20 **Subject: Comments on the May 2002 Draft "Implementation Guidance for Ambient Water Quality Criteria for Bacteria"**

From Marvin E. Hora, Manager, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter — MPCA — St. Paul

August 2002

To Mr. William Morrow, Assistant Branch Chief, Water Quality Standards Branch, U.S. Environmental Protection Agency (EPA)

EC-21 **Microbiological Quality of Puget Sound Basin Streams and Identification of Contaminant Sources**

Author: Sandra S. Embrey, Hydrologist, U.S. Geological Survey

Journal J. of the American Water Resources Assoc. (JAWRA) Tacoma

April 2001 Vol 37(2); pp.407-21 http://www.awra.org/publicationindex.htm l

EC-22 **Accommodating Change of Bacterial Indicators In Long Term Water Quality Datasets**

Author: Curtis G. Cude, Natural Resource Specialist, Oregon Department of Environmental Quality, MSD/BSD

Journal J. of the American Water Resources Assoc. (JAWRA) Portland

February 2005 Vol 41(1); pp.47-54 http://www.awra.org/publicationindex.htm l

EC-23 **Bacterial Water Quality Standards for Recreational Waters (Freshwater and Marine Waters)**

Author: Office of Water (4305T), Environmental Protection Agency (EPA)

Report EPA Washington, D.C.

June 2003 EPA-823-R-03-008; pp.i-iii, 1-9+ http://www.epa.gov/waterscience/beaches

Status Report

EC-24 **Environmental Sampling and Analytical Contract Valid from July 1, 2004 Through June 30, 2006**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

June 30, 2006

Showing Costs for Bacteriological Sample Analysis at Eight Labs

EU-1 **Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria, Third Edition**

Prepared by Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and C. Bruce Wilson Watershed Section, Regional Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

September 2005 http://www.pca.state.mn.us/water

EU-2 **The Changing Lake Regions of Minnesota**

Author: Minnesota Lakes (MLA) Reporter

Newspaper Minnesota Lakes Association Reporter

July 2003 Vol 7 (2); pp.1 & 6 http://www.mnlakes.org

David E. Maschwitz, Environmental Outcomes Division, MPCA

EU-3a **Ecological Disaster. The State We're In. One of a Series of Articles About Conservation, Chapter 3: Clearing the Shorelines**

Author: Dennis Anderson, Star Tribune Staff Writer

Newspaper Minneapolis Star Tribune -Metro Edition Minneapolis

December 18, 2001 pp.A-1, A-10 & A-11 #http://www.startribune.com#

EU-3b **State of the Lakes. Minnesota is Known as the State of 10,000 Lakes and the Land of Sky Blue Waters. But Who's Looking After Our Trademark Waters?**

Author: Greg Breining, Minnesota Department of Natural Resources (MDNR)

Journal Minnesota Conservation Volunteer St. Paul

July-August, 2003 http://www.dnr.state.mn.us/volunteer

EU-3c **'Dog Days' of Summer Bring the Greening of Minnesota's Lakes. The Solution to Lake Water Degradation May Be in Our Own Backyards**

Author: Forrest Peterson, Minnesota Pollution Control Agency (MPCA)

MPCA Publication Minnesota Environment St. Paul

Fall 2001 Vol 2 (1); pp.1-6 www.pca.state.mn.us

EU-4 **Minnesota Sea Grant: Why Love Lakes? and Summary Report: Public Perceptions, Use, and Future of Minnesota Lakes. Results of the 1998 Minnesota Lakes Survey (1999)**

Author: Keith A. Anderson, University of Minnesota Sea Grant Program

Newsletter The Seiche Newsletter

December 1998; Accessed: February 23, 2006 pp.1-4 http://www.seagrant.umn.edu/seiche

EU-5 **Limnology. Ontogeny and Evolution of Lake Ecosystems**

Author: Robert G. Wetzel, Professor of Botany, Kellogg Biological Station, Michigan State University

Book Section W. B. Saunders Company Philadelphia

1975 p.640 of 743

EU-6 **Detailed Assessment of Phosphorus Sources to MN Watershed: Under TMDL Master Contract [Executive Summary]**

Prepared by Barr Engineering

Report MPCA St. Paul

February 2004 pp.1, 2, ii-xxxiv http://www.pca.state.mn.us

EU-7 **Rules and Standards Development for Nonpoint Source Controls**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Publication MPCA St. Paul

January 7, 1986 http://www.pca.state.mn.us

EU-8 **Subject: Lake Eutrophication Standards Development**

From Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, Minnesota Pollution Control Agency (MPCA)

Memo MPCA

January 26, 1995

To Duane L. Anderson, Manager, Monitoring & Assessment Section, Water Quality Division, MPCA

EU-9 **Phosphorus Strategy Task Force**

Author: Water Quality Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

June 1996 http://www.pca.state.mn.us

EU-10 **National Strategy for the Development of Regional Nutrient Criteria**

Author: Office of Water, Environmental Protection Agency (EPA)

EPA Report EPA Washington,

June 1998 EPA 822-R-98-002 http://www.epa.gov

EU-11 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VI**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA 822-B-00-008; pp.i-x, 1-27, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northern Glaciated Plains and Western Corn-belt Plains Ecoregions

EU-12 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VII**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA-822-B-00-009; pp.i-xii, 1-28, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northcentral Hardwood Forests Ecoregion

EU-13 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VIII**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA-822-B-00-010; pp.i-x, 1-26, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northern Lakes and Forests Ecoregions

EU-14 **Ecoregional Nutrient Criteria**

Author: Office of Water, Environmental Protection Agency (EPA)

Fact Sheet EPA

October 2002 EPA-822-F-02-008 http://www.epa.gov/OST/standards/nutrient.html

EU-15 **Nutrient Criteria Development; Notice of Ecological Nutrient Criteria (66 FR 1671)**

Author: Environmental Protection Agency (EPA)

Public Notice Federal Register (FR)

January 9, 2001 Vol 66(6); pp.1671-4 http://www.epa.gov/fedrgstr/

EU-16 **Nutrient Criteria Technical Guidance Manual. Lakes and Reservoirs - First Edition**

Author: George Gibson, et al., Office of Water, Office of Science and TechnologyEnvironmental Protection Agency (EPA)

Guidance EPA Washington,

April 2000 EPA-822-B00-001 http://www.epa.gov

EU-17 **Subject: Development and Adoption of Nutrient Criteria into Water Quality Standards**

From/Signed by Geoffrey Grubbs, Director, Office of Science & Technology, Environmental Protection Agency (EPA)

Memo EPA

November 14, 2001 http://www.epa.gov/OST/standards/nutrient.html

To Water Directors, Regions I - X; Directors, State Water Programs; Directors, Great Water Body Programs; Directors, Authorized Tribal Water Quality Standards Programs; State & Interstate Water Pollution Control Administrators

EU-18 **Subject: EPA Policy as it Relates to the Phosphorus Objectives for the Nation's Receiving Waters**

From Francis T. Mayo, Regional Administrator, Environmental Protection Agency (EPA)

Letter EPA Region V Chicago

April 20, 1973

To Clarence A. Johannes, Director, Division of Water Quality, MPCA

EU-19a **Minnesota's Plan for Development of Nutrient Criteria**

Author: Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Plan MPCA

April 2003

To U. S. Environmental Protection Agency (EPA), Region V, Chicago, IL

(Including: Schematic, Summary, Timeline & Narrative)

EU-19b **Minnesota's Plan for Development of Nutrient Criteria**

From Environmental Outcomes and Analysis Division, Minnesota Pollution Control Agency (MPCA)

Plan MPCA St. Paul

September 2006

To U. S. Environmental Protection Agency (EPA), Region V, Chicago, IL

(Including: Schematic, Summary, Timeline & Narrative)

EU-20 **Subject: Minnesota's Nutrient Criteria Development Plan**

From Michael J. Sandusky, Division Director, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

April 2003

To Mr. David Pfeifer, U.S. Environmental Protection Agency (EPA), Region V

Cover Letter to April 2003 Nutrient Plan (Exhibit EU-19a)

EU-21

From Jo Lynn Traub, Director Water Division, Environmental Protection Agency (EPA), Region V

Letter EPA Region V Chicago

May 5, 2003

To Michael Sandusky, Director, Environmental Outcomes Division, MPCA

EPA Approval of 2003 Nutrient Plan (Exhibit EU-19a)

EU-22a **Subject: Minnesota Nutrient Criteria Plan Update: 2004**
From Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, MPCA
Memo MPCA St. Paul
April 7, 2004
To Dave Pfeifer, U. S. Environmental Protection Agency (EPA), Region V

EU-22b **Subject: Cover Letter - Response to a Request for Progress on Minnesota's Nutrient Criteria Development Plan**
From Leo Raudys, Division Director, Regional Division, Minnesota Pollution Control Agency (MPCA)
Letter MPCA St. Paul
December 1, 2004 http://www.pca.state.mn.us
To Jodi Lynn Traub, U. S. Environmental Protection Agency (EPA), Region V
Response to Exhibit EU-21

EU-23 **Minnesota Ecoregions**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
1993
MPCA Map & Ecoregion Descriptions

EU-24 **Analysis of Regional Patterns in Lake Water Quality: Using Ecoregions for Lake Management in Minnesota**
Author: Steven A. Heiskary, C. Bruce Wilson, Division of Water Quality, Minnesota Pollution Control Agency (MPCA) and David P. Larsen, Environmental Research Lab, Environmental Protection Agency (EPA), Corvallis, Oregon
Journal Lake & Reservoir Management (LRM) -Intnt'l
1987 Vol III; pp.337-44 http://www.nalms.org/journal/lrm.htm

EU-25 **Developing Eutrophication Standards for Lakes and Reservoirs**
Prepared by the Lake Standards Subcommittee, North American Lake Management Society (NALMS)
Report NALMS Alachua
May 1992 http://www.nalms.org
Chair: Steve Heiskary, MPCA

EU-26 **No Exhibit**

EU-27 **The Regional Nature of Lake Water Quality Across Minnesota: An Analysis for Improving Resource Management**
Author: Steven Heiskary and Bruce Wilson, Research Scientists, Program Development Section, Water Quality Division, Minnesota Pollution Control Agency (MPCA)
Journal Journal of the Minnesota Academy of Science (JMAS) St. Paul
1989 Vol 55(1); pp.71-7

EU-28 **Minnesota Lake Water Quality Assessment Report, Second Edition**
A Practical Guide for Lake Managers
Author: Steven A. Heiskary and C. Bruce Wilson, Program Development Section Division of Water Quality, Minnesota Pollution Control Agency (MPCA)
Report MPCA St. Paul
May 1990 http://www.pca.state.mn.us

EU-29 **Lake Assessment Program: A Cooperative Lake Study Program**
Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Journal Lake and Reservoir Management (LRM)
1989 Vol 5(1); pp.85-94 http://www.nalms.org/journal/lrm.htm

EU-30 **Developing Phosphorus Criteria for Minnesota Lakes**
Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA), and W. W. Walker, Jr., Environmental Engineer, Concord, Massachusetts
Journal Lake and Reservoir Management (LRM)
1988 Vol 4(1); pp.1-9 http://www.nalms.org/journal/lrm.htm

EU-31 No Exhibit

EU-32 **A Chlorophyll a Trophic Status Classification System for South African Impoundments**

Author: R. D. Walmsley

Journal Journal of Environmental Quality

1984 Vol 13(1); pp.97-104 http://jeq.scijournals.org

EU-33 **Analysis and Application of Lake User Survey Data**

Author: Eric Smeltzer, Vermont Department of Environmental Conservation and S. A. Heiskary, Environmental Outcomes & Analysis, Minnesota Pollution Control Agency (MPCA)

Journal Lake and Reservoir Management (LRM)

1990 Vol 6(1); pp. 109-18 http://www.nalms.org/journal/lrm.htm

EU-34 **Citizen Lake-Monitoring Program - 2001 Secchi Data Sheet**

From Minnesota Pollution Control Agency (MPCA)

Form MPCA

November 17, 2001 http://www.pca.state.mn.us

Includes choices for perceptions of physical condition and suitability for recreation.

EU-35 **Reconstructing Historical Water Quality in Minnesota Lakes from Fossil Diatoms**

Author: Steven A. Heiskary, Edward B. Swain, Minnesota Pollution Control Agency (MPCA), and Mark B. Edlund, Science Museum of Minnesota, St. Croix Watershed Research Station

MPCA Publication Environmental Bulletin St. Paul

September 2004 No. 4 http://www.pca.state.mn.us

EU-36 **Water Quality Reconstruction from Fossil Diatoms: Applications for Trend Assessment, Model Verification, and Development of Nutrient Criteria for Lakes in Minnesota, USA**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information and Edward B. Swain, Ph.D., Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

September 2002 http://www.pca.state.mn.us/water/lakequality.html reports

Part of a Series on Minnesota Lake Water Quality Assessment

EU-37 **Shallow Lakes of Southeastern Minnesota: Status and Trend Summary for Selected Lakes**

Author: Steven A. Heiskary, Howard Markus, and Matt Lindon, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

July 2003 http://www.pca.state.mn.us

Part of a Series on Minnesota Lake Water Quality Assessment
www.pca.state.mn.us/publications/reports/lakes-shallowlake-swmn.pdf

EU-38 **Interrelationships Among Water Quality, Lake Morphometry, Rooted Plants and Related Factors for Selected Shallow Lakes of West-Central Minnesota**

Author: Steven A. Heiskary and Matt Lindon, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

March 2005 http://www.pca.state.mn.us

Part of a Series on Minnesota Lake Water Quality Assessment

EU-39 **Lakeshore Property Values and Water Quality: Evidence from Property Sales in the Mississippi Headwaters Region**

Author/Submitted by: Charles Krysel, Elizabeth Marsh Boyer, Charles Parson, Ph.D., and Patrick Welle, Ph.D., Mississippi Headwaters Board & Bemidji State University

Report Mississippi Headwaters Board Bemidji

June 2003 http://www.mississippiheadwaters.org

Submitted To the Legislative Commission on Minnesota Resources

EU-40 **Economic Value of Protecting Minnesota's Lakes**

Author: Harold E. Dziuk, Ph.D., Board Member for the Itasca Coalition of Lake Associations (CLA)

Newspaper   Minnesota Lakes Association Reporter

November 2005   Vol 9(4); pp.1, 6-7   http://www.mnlakes.org

EU-41 **Importance of Lakes to Minnesota's Economy**

Author: Hank Todd, Minnesota Office of Tourism

Report   Minnesota Lake Management Conference

October 1989   http://www.mnlakes.org

EU-42 **No Exhibit**

EU-43 **Economic Values of Lakes**

A publication of the North American Lake Management Society (NALMS)

Journal   LakeLine   Bloomington

Fall 2003   Vol 23(3); pp.1-48   http://www.nalms.org/lakeline/lakeline.htm

EU-44 **Shallow Lakes**

A publication of the North American Lake Management Society (NALMS)

Journal   LakeLine   Bloomington

Spring 2003   Vol 23(1); pp.11-36   http://www.nalms.org/lakeline/lakeline.htm

Special Issue of Lake Line

EU-45 **Developing Environmental Indicators for Minnesota. Lakes. The Environmental Indicators Initiative**

Author: State of Minnesota, Funded by the Minnesota Legislature on Recommendation of the Legislative Commission on Minnesota Resources (LCMR), Sponsored by The Environmental Quality Board (EQB)

Report   Legislative Commission on Minnesota Resources (LCMR)

1998   http://www.commissions.leg.state.mn.us/lcmr/lcmr.htm

EU-46a **Statement of Need and Reasonableness: In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document   MPCA   St. Paul

April 2002

Assessment Factors Rule Revision

EU-46b **Staff Post-hearing Response to Public Comments**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document   MPCA   St. Paul

July 8, 2002

Assessment Factor Rule Revision   *[Attachments not part of the exhibit]*

EU-46c **Staff Final Response to Public Comments**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document   MPCA   St. Paul

July 15, 2002

Assessment Factor Rule Revision

EU-47 **Measuring the Economic Value of Water Quality: The Case of Lakeshore Land**

Author Donald N. Steinnes, Department of Economics, University of Minnesota Duluth

Journal   The Annals of Regional Science

1992   Vol 26; pp.171-6

EU-48 **Protecting Aesthetics and the Visual Resource Quality of Lakes**

Author: Eric J. Macbeth, Minnesota-Wisconsin Boundary Area Commission

Journal Proceedings of a National Conference on Enhancing the States' Lake Management Program Chicago

April 1992 1991; pp.17-23

EU-49 **Subject: Nutrient Pollution and Numeric Water Quality Standards**

From Benjamin H. Grumbles, Assistant Administrator, Office of Water Environmental Protection Agency (EPA)

Memo EPA Washington, D.C.

May 25, 2007

To Director, State Water Programs

H-1 **Subject: Request for Development of Water Quality Standards**

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)

Letter St. Paul

February 27, 2002

To Greg Gross, Environmental Outcomes Division, MPCA

H-2a **Subject: Water Quality Criterion for the Wrogge Spill**

Author: Dann D. White, Monitoring and Assessment, Water Quality Division, Min esota Pollution Control Agency (MPCA)

Letter St. Paul

June 10, 1996

To Ms. Michelle Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture (MDA)

H-2b **Aquatic Life Criteria (Summary Sheet): Acetochlor**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

January 29, 1998

Includes Cover Letter

To Ms. Michele Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture. From Dann D. White

H-3 **Subject: Interim Water Quality Guideline Value for Metolachlor**

From Dann D. White, Monitoring and Assessment, Water Quality Division, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

February 23, 1998

To Ms. Michelle Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture (MDA)

H-4 **Acetochlor Supplement: Supplementary Information on Acetochlor and Metolachlor**

Author: Angela L. H. Preimesberger and David E. Maschwitz, Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

November 7, 2005

Developed by the Water Quality Standards Unit, MPCA, in Cooperation with the Minnesota Department of Agriculture, Agronomy and Plant Protection Division

H-5 **Metolachlor Supplement: Supplementary Information on Acetochlor and Metolachlor**

Author: Angela L. H. Preimesberger and David E. Maschwitz, Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

November 8, 2005

Developed by the Water Quality Standards Unit, MPCA, in Cooperation with the Minnesota Department of Agriculture, Agronomy and Plant Protection Division

H-6 **Subject: Request for Development of Water Quality Standards**

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)

Letter St. Paul

April 11, 2003

To Greg Gross, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

H-7 **Subject: Request for Development of Water Quality Standards**

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)

Letter St. Paul

June 23, 2004

To Greg Gross, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

H-8 **Water Quality Best Management Practices for Agricultural Herbicides**

Author: Minnesota Department of Agriculture (MDA)

Guide St. Paul

February 2004 http://www.mda.sate.mn.us

H-9 **Aquatic Life Criteria: Acetochlor [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

March 14, 2006

Summary Sheet (5pgs) & Tables 1-5

H-10a **Aquatic Life Criteria: Metolachlor (50:50 Formula) [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

March 15, 2006

Summary Sheets (4pgs) & Tables 1-5

H-10b **Aquatic Life Criteria: Metolachlor (88:12) formula [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

February 7, 2006

Summary Sheets (4pgs) & Tables 1-5

H-11 **Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses**

Author: Charles E. Stephan, Donald I. Mount, David J. Hansen, John H. Gentile, Gary A. Chapman, and William A. Brungs, Office of Research and Development, U.S. EPA, Environmental Research Laboratories -Duluth, MN, Narragansett, RI, Corvallis, OR

Guide EPA Duluth

July 30, 1985 pp.i-vi, 1-98 http://www.epa.gov

H-12a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Acute Toxicity to Rainbow Trout (Salmo gairdneri). Prepared by ICI Group Environmental Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: November 18, 1991 OPP# (MRID No.) 419633-06; Registrant Report# BL3960/B http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-12b **Acetochlor: Acute Toxicity to Rainbow Trout (Salmo gairdneri). Prepared by ICI Group Environmental Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, P. A. Johnson and D. S. Adams

Study Monsanto

1991 Registrant Report# BL3960/B; OPP# (MRID No.) 419633-06

Attachment: MPCA Reference Review Form by D. White (Exhibit H-12a)

H-13a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acute Toxicity of MON-097 (AB-81-181) to Bluegill Sunfish (Lepomis macrochirus). Unpublished Study prepared by Analytical Bio-Chemistry Laboratories, Inc. on 23 Sept. 1981 for Monsanto Company Submitted 10-27-81 Under Accession (SIC) No. 246128**

Reviewed by J. Tice, Fish & Wildlife Biologist; HED/EEB

Evaluation EPA

Reviewed: November 5, 1981 OPP# 85993 and OPP# ACC246128 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-13b **Acute Toxicity of MON-097 (AB-81-181) to Bluegill Sunfish (Lepomis macrochirus). Unpublished Study prepared by Analytical Bio-Chemistry Laboratories, Inc. on 23 Sept. 1981 for Monsanto Company Submitted 10-27-81 Under Accession (SIC) No. 246128**

Author: J. Griffin and C. M. Thompson

Study Monsanto

1981 OPP# 85993 and OPP# ACC246128

For Monsanto Company

Attachment: MPCA Reference Review Form by D. White (Exhibit 13a)

H-14a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Determination of Acute Toxicity to Bluegill Sunfish (Lepomis macrochirus). Brixham Study No. R1072/B. Study performed by Imperial Chemical PLC, Brixham Laboratory, Freshwater Quarry, Brixham, Devon, U.K. Submitted by ICI Americas, Inc.**

Reviewed by Rosemary Graham Mora, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: September 20, 1991 OPP# (MRID No.) 41565133 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-14b **Acetochlor: Determination of Acute Toxicity to Bluegill Sunfish (Lepomis macrochirus). Brixham Study No. R1072/B. Study performed by Imperial Chemical PLC, Brixham Laboratory, Freshwater Quarry, Brixham, Devon, U.K. Submitted by ICI Americas, Inc. EPA**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, and B. J. Harland

Study Monsanto

1989 OPP# (MRID No.) 415651-33

Attachment: MPCA Reference Review Form by D. White (Exhibit H-14a)

H-15 **Acetochlor Fish Studies - Acetochlor: Determination of Acute Toxicity to Mirror Carp (Cyprinus carpio), Submitted by ICI Brixham Environmental Laboratory**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, and H. M. Miller

Study Monsanto

1989 Report# BL/B/3554,

Attachment: MPCA Reference Review Form by D. White

H-16a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: An Investigation of the Toxicity of Technical Material and Formulation WF2061 to First Instar Daphnia magna. Laboratory Report No. RJ 0744B. Study performed by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, U.K. Submitted by ICI Americas, Inc.**

Reviewed by Rosemary Graham Mora, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 3, 1991 OPP# (MRID No.) 415651-34 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-16b **Acetochlor: An Investigation of the Toxicity of Technical Material and Formulation WF2061 to First Instar Daphnia magna. Study performed by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, U.K. Submitted by ICI Americas, Inc.**

Author: E. Farrelly, M. J. Hamer

Study Monsanto

1989 Registrant Report# RJ 0744B, OPP# (MRID No.) 415651-34

Attachment: MPCA Reference Review Form by D. White (Exhibit H-16a)

H-17 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acute Toxicity to Daphnids (Daphnia magna) Under Static Conditions, Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC**

Reviewed by Rosemary Graham Mora, M.S., Environmental Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 14, 1996 OPP# (MRID No.) 439289-12 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-18a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102 - Acute Toxicity to Rainbow Trout (Oncorhynchus mykiss) Under Static Conditions. Springborn Laboratories, Inc, Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation EPA

Reviewed: May 20, 1996 OPP# (MRID No.) 439289-11 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-18b **Final Report:**
CGA 77102 - Acute Toxicity to Rainbow Trout (Oncorhynchus mykiss) Under Static Conditions. Springborn Laboratories, Inc, Wareham, MA

Author: Maura K. Collins, Study Director, Springborn Laboratories Inc.

Study Syngenta (Ciba-Geigy Corporation)

December 12, 1995 Registrant Report# CGA-77102; OPP# (MRID No.) 439289-11

Submitted To: Ciba-Geigy Corporation (Greensboro, NC)

Attachment: MPCA Reference Review Form by D. White

H-19a **Data Evaluation Record (Validation Sheet) - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acute Toxicity of CGA-24705 to Rainbow Trout (Salmo gairdneri) Report# BW-78-6-186

Author: R. Balcomb

Evaluation EPA

Reviewed: July 20, 1978 OPP# (MRID No.) 18722 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-19b **Acute Toxicity of CGA-24705 to Rainbow Trout (Salmo gairdneri)**

Prepared by Robert J. Buccafusco, EG & G, Bionomics, Aquatic Toxicology Laboratory

Study Syngenta (Ciba-Geigy Corporation)

June 1978 Report# CGA-24705; OPP# (MRID No.) 18722

Attachment: MPCA Reference Review Form by D. White

H-20 **Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals**

Author: Foster L. Mayer and Mark R. Ellersieck

Manual United States Department of the Interior -Fish & Wildlife Service Washington, D.C.

1986 Resource Publication 160; cover,pp.3,4 & 313 http://www.fws.gov

H-21a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
(Acetochlor: Daphnia magna Life-Cycle Study. Prepared by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, UK. Submitted by ICI Americas, Inc. Wilmington, DE)

Reviewed by Louis M. Rifici, M.S., Associate Scientist, KPN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 4, 1991 OPP# (MRID No.) 415651-38 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-21b **Acetochlor Aquatic Invertebrate Studies - Acetochlor: Daphnia magna Life-Cycle Study**

Prepared by ICI Agrochemicals

Study Monsanto

1990 Report# RJ0785B; OPP# (MRID No.) 415651-38

Attachment: MPCA Reference Review Forms by D. White

H-22a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acetochlor: Determination of Chronic Toxicity to Fathead Minnow (Pimphales promelas) Embryos and Larvae. Prepared by ICI PLC, Brixham Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.

Reviewed by Louis M. Rifici, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 4, 1991 OPP# (MRID No.) 415920-11 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-22b **Acetochlor: Determination of Chronic Toxicity to Fathead Minnow (Pimphales promelas) Embryos and Larvae. Prepared by ICI PLC, Brixham Laboratory, Brixham, Devon, UK.; Submitted by ICI Americas, Inc.**

Author: J. F. Tapp, J. E. Caunter and R. D. Stanley

Study Monsanto

1989 Report# BL/B/3669; OPP# (MRID No.) 415920-11

Attachment: MPCA Reference Review Form by D. White (Exhibit H-22a)

H-23 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Chronic Toxicity of Acetochlor to Daphnia magna Under Flow-Through Test Conditions. Study conducted by Analytical Bio-Chemistry Laboratories, Inc., Columbia, MO. Submitted by Acetochlor Registration Partnership, c/o Monsanto Agricultural Company, St. Louis, MO**

Reviewed by William S. Rabert, Biologist, Ecological Effects Branch, Environmental Fate and Effects Division (7507C), Environmental Protection Agency (EPA)

Evaluation EPA

Reviewed: November 2, 1993 OPP# (MRID No.) 427131-05 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-24a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: S-Metolachlor (CGA-77102): Early Life-Stage Toxicity Test with Fathead Minnow (Pimephales promelas). Springborn Laboratories, Inc, Wareham, MA. Novartis Crop Protection Inc., Greensboro, NC**

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation EPA

Reviewed: May 2, 2000 OPP# (MRID No.) 449959-03 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-24b **s-Metolachlor (CGA-77102): Final Report s-Metolachlor (CGA-77102) - Early Life-Stage Toxicity Test with Fathead Minnow (Pimephales promelas)**

Author: J. V. Sousa, Study Director, Springborn Laboratories Inc.

Study Syngenta (Novartis Crop Protection, Inc.)

Study Completion: November 30, 1999 Registrant Report# CGA-77102; OPP# (MRID No.) 449959-03

Attachment: MPCA Reference Review Form by D. White

H-25a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Determination of Toxicity to the Green Alga Selenastrum capricornutum. Laboratory ID No. R1072/I. Conducted by Imperial Chemical Industries PLC, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: January 17, 1992 OPP# (MRID No.) 415651-41 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-25b **Acetochlor: Determination of Toxicity to the Green Alga Selenastrum Capricornutum. Laboratory ID No. R1072/I. Conducted by Imperial Chemical Industries PLC, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Author: D. V. Smyth, J. F. Tapp, S. A. Sankey and R. D. Stanley

Study Monsanto

1989 OPP# (MRID No.) 415651-41

H-26a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor Toxicity to the Duckweed (Lemna gibba). Laboratory ID No. W556/D (FT21/92). Conducted by ZENECA Agrochemicals, Surrey, UK**

Reviewed by William S. Rabert, Biologist, Ecological Effects Branch, Environmental Fate and Effects Division (7507C)

Evaluation EPA

Reviewed: November 4, 1993 OPP# (MRID No.) 427131-07 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-26b **Acetochlor Toxicity to the Duckweed (Lemna gibba). Laboratory ID No. W556/D (FT21/92). Conducted by ZENECA Agrochemicals, Surrey, UK**

Author: D. V. Smyth, S. A. Sankey, and A. J. Penwell

Study Monsanto

1993 OPP# (MRID No.) 427131-07

Attachment: MPCA Reference Review Form by D. White (Exhibit H-26a)

H-27 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Acetochlor: Toxicity to the Freshwater Diatom Navicula pelliculosa. Laboratory ID No. W566/C (FT20/92). Conducted by Imperial Chemical Industries PLC, Devon, UK. Submitted by ICI Agrochemicals, Surrey, UK

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 24, 1993 OPP# (MRID No.) 427131-08 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-28 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Acetochlor: Toxicity to Blue-green Alga Anabaena flos-aqua. Laboratory ID. No. W566/A (FT18/92). Conducted by Imperial Chemical Industries PLC, Devon, UK. Submitted by ICI Agrochemicals, Surrey, UK

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: June 1, 1993 OPP# (MRID No.) 427131-09 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-29 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of One Day Exposure to Technical Acetochlor on Elodea canadensis Acquired from an Outdoor Pond

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2003-149

Attachment: MPCA Reference Review Form by D. White

H-30 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of a Single Application of Technical Acetochlor in a Static Test on Elodea canadensis Acquired from an Outdoor Pond

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2004-009

Attachment: MPCA Reference Review Form by D. White

H-31 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of a Single Application of Technical Acetochlor in a Static Test on Elodea canadensis Acquired from a Commercial Supplier

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2004-010

Attachment: MPCA Reference Review Form by D. White

H-32 Acetochlor Outdoor Microcosm/Mesocosm Studies - The Determination of the Biological Effects of a Single Pulse of Technical Acetochlor in Outdoor Ponds

Author: E. M. Foekema

Study Monsanto

2005 Registrant Report# TN-2005-076

Attachment: MPCA Reference Review Form by D. White

H-33 Acetochlor Algae Studies - Acetochlor Technical-Toxicity Test and Recovery Period with Freshwater Green Alga, Psudokchneriella subcapitata

Author: J. R. Hoberg

Study Monsanto

2003 Registrant Report# SE-2003-097

Attachment: MPCA Reference Review Form by D. White

H-34 Acetochlor Algae Studies - Acetochlor Technical-Toxicity Test and Recovery Period with Marine diatom, Skeletonema costatum

Author: J. R. Hoberg

Study Monsanto

2003 Registrant Report# SE-2003-098

Attachment: MPCA Reference Review Form by D. White

H-35 Acetochlor Outdoor Microcosm/Mesocosm Studies - An Assessment of Toxicity of Technical Acetochlor to the Aquatic Macrophytes Glyceria maxima, Myriophyllum spicatum, and Lagarosiphon major.

Author: P. Kaur, B. Caswell, J. Newman, and S. J. Powers

Study Monsanto (Dow Agrosciences)

2003 Registrant Report# DAS 011246

Attachment: MPCA Reference Review Form by D. White

H-36 Acetochlor Laboratory Aquatic Macrophyte Tests - Acetochlor Technical-Toxicity Test and Period with Duckweed, Lemna gibba

Author: A. E. Putt

Study Monsanto

2003 Registrant Report# SE-2003-095

Attachment: MPCA Reference Review Form by D. White

H-37 Factors Determining the Bioaccumulation Potential of Pesticides in the Individual Compartments of Aquatic Food Chains

Author: H. Ellgehausen, J. A. Guth, and H. O. Esser, Agricultural Division, CIBA-GEIGY Ltd., Basel, Switzerland

Journal Ecotoxicology and Environmental Safety

1980 Vol 4 (2); pp.134-157; ECOTOX# 6458 http://www.elsevier.com/wps/find/journaldescription.cws_home/622819/description#description#

Attachment: MPCA Reference Review Form by D. White

H-38 Short-Term Effects of Herbicides on Primary Productivity of Periphyton in Lotic Environments

Author: K. E. Day

Journal Ecotoxicology

1993 Vol 2 (2); pp.123138; ECOTOX# 13325 http://www.springerlink.com/content/1573-3017

Attachment: MPCA Reference Review Form by D. White

H-39 Metolachlor and 2,4-Dichlorophenoxyacetic Acid Sensitivity of Salvinia natans

Author: A. M. Goncz, and L. Sencic

Journal Bulletin of Environmental Contamination and Toxicology

1994 Vol 53 (6); pp.852-5; ECOTOX# 13738

Attachment: MPCA Reference Review Form by D. White

H-40 Aquatic Phyto-Toxicity of 23 Pesticides Applied at Expected Environmental Concentrations

Author: H. G. Peterson, C. Boutin, P. A. Martin, K. E. Freemark, N. J. Ruecker, and M. J. Moody

Journal Aquatic Toxicology

1994 Vol 28 (3/4); pp.275-92; ECOTOX# 13800 http://www.elsevier.com/wps/find/journaldescription.cws_home/505509/description#description#

Attachment: MPCA Reference Review Form by D. White

H-41 Comparative Sensitivity of Selenastrum capricornutum and Lemna minor to Sixteen Herbicides

Author: J. F. Fairchild, D. S. Ruessler, P. S. Haverland, and A. R. Carlson

Journal Archives of Environmental Contamination and Toxicology

1997 Vol 32; pp.353-57; ECOTOX# 18093

Attachment: MPCA Reference Review Form by D. White

H-42 Comparative Sensitivity of Five Species of Macrophytes and Six Species of Algae to Atrazine, Metribuzin, Alachlor, and Metolachlor

Author: J. F. Fairchild, D. S. Ruessler, and A. R. Carlson

Journal Environmental Toxicology and Chemistry

1998 Vol 17 (9); pp.1830-4; ECOTOX# 19461 http://etc.allenpress.com/entconline/?request=index-html

Attachment: MPCA Reference Review Form by D. White

H-43 **Comparative Assessment of Herbicide Phytotoxicity to Selenastrum capricornutum Using Microplate and Flask Bioassay Procedures**

Author: D. St. Laurant, and C. Blaise

Journal — Environmental Toxicology and Water Quality: An International Journal

1992 — Vol 7; pp.35-48 (OECDG Data File); ECOTOX# 56387 — http://www3.interscience.wiley.com/cgi-bin/jhome/10008541

Attachment: MPCA Reference Review Form by D. White

H-44 **An Aquatic Risk Assessment of Four Herbicides Using Six Species of Algae and Five Species of Aquatic Macrophytes**

Author: J. F. Fairchild, S. D. Ruessler, M. K. Nelson, and A. R. Carlson

Journal — Society of Environmental Toxicology and Chemistry (SETAC)

1994 — Conference Proceeding; ECOTOX# 61707 — http://www.setac.org

Presented at the 1994 SETAC Meeting, Oct. 30-Nov. 3, 1994, Denver, CO
Attachment: MPCA Reference Review Form by D. White

H-45 **The Toxicity of the Herbicide Metolachlor, Some Transformation Products and a Commercial Safener to an Alga (Selenastrum capricornutum), a Cyanophyte (Anabaena cylindrica) and a Macrophyte (Lemna gibba)**

Author: K. E. Day, and V. Hodge

Journal — Water Quality Research Journal -Canada

1996 — Vol 31 (1); pp.197-214 — http://www.cciw.ca/wqrjc/wqrjce.htm

Attachment: MPCA Reference Review Form by D. White

H-46 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor-technical-5 Day Toxicity to Freshwater Green Alga, Anabaena flos-aqua. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-04 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-47a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical -Toxicity to Duckweed (Lemna gibba). Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-05 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-47b **Metolachlor technical - Toxicity to Duckweed (Lemna gibba)**

Author: James R. Hoberg

Study — Syngenta (Ciba-Geigy Corporation)

January 9, 1995 — SLI Registrant Report# 94-8-5404; OPP# (MRID No.) 43487105

Attachment: MPCA Reference Review Form by D. White

H-48 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical-Toxicity to the Marine diatom, Skeletonema costatum. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-06 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-49 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical-5-Day Toxicity to the Freshwater Green Alga, Selenastrum capricornutum, Using Acetone as a Carrier Solvent. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: March 1, 1995 — OPP# (MRID No.) 435413-01 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-50 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Metolachlor technical-5-Day Toxicity to the Freshwater diatom, Navicula pelliculosa, Using Acetone as a Carrier Solvent. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation EPA

Reviewed: March 1, 1995 OPP# (MRID No.) 435413-01 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-51 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Acute Toxicity of CGA-51202 to the Duckweed, Lemna gibba G3

Reviewed by Karl Bullock, M.S. Environmental Scientist, Golder Associates, Inc.

Evaluation EPA Marblehead

Reviewed:November 10, 1999 OPP# (MRID No.) 449295-14 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-52 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Report on the Growth Inhibition Test of CGA-51202 to Green Algae (Scenedesmus subspicatus). Ciba-Geigy Ltd, Crop Protection Division, Basle, Switzerland. Novartis Crop Protection, Inc., Greensboro, NC

Reviewed by Karl Bullock, M.S. Environmental Scientist, Golder Associates, Inc.

Evaluation EPA

Reviewed: November 10, 1999 OPP# (MRID No.) 449295-15 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-53 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Toxicity of CGA-354743 to Duckweed, Lemna gibba G3. T.R. Wibury Laboratories, Inc., Marblehead, MA. Novartis Crop Protection, Inc., Greensboro, NC

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation EPA

Reviewed: April 13, 2000 OPP# (MRID No.) 449317-20 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-54 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
CGA 77102: 5-Day Toxicity to the Marine Diatom Skeletonema costatum. Springborn Laboratories, Inc, Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 16, 1996 OPP# (MRID No.) 439289-30 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-55a Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
CGA 77102: 5-Day Toxicity to the Fresh Water Green Alga Selenastrum capricornutum. Springborn Laboratories, Inc, Wareham, MA

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 16, 1996 OPP# (MRID No.) 439289-29 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-55b Final Report:
CGA 77102: 5-Day Toxicity to the Fresh Water Green Alga Selenastrum capricornutum. Springborn Laboratories, Inc Wareham, MA

Author: James R. Hoberg

Study Syngenta (Cib-Geigy Corporation)

September 20, 1995 Registrant Report# 95-8-6031;
OPP# (MRID No.) 439289-29

Submitted To: Ciba-Geigy Corporation, Crop Protection Division (Greensboro, NC)

Attachment: MPCA Reference Review Form by D. White

H-56a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102: Toxicity to Duckweed Lemna gibba. Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 16, 1996 OPP# (MRID No.) 439289-31 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-56b **Final Report:**
CGA 77102: Toxicity to Duckweed Lemna gibba. Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Author: James R. Hoberg

Study Syngenta (Ciba-Geigy Corporation)

Study Completion: September 28, 1995 Registrant Report# 95-8-6068; OPP# (MRID No.) 439289-31

Attachment: MPCA Reference Review Form by D. White

H-57 **Acetochlor Plant Toxicity Data from Table 4a, Proposed Water Quality Standard**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

January 19, 2006

Spreadsheets: Species Chronic Value (SCV), and Ranked Toxicity Values (January 20, 2006)

H-58 **Metolachlor Plant Toxicity Data from Table 4a, Proposed Water Quality Standard**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

January 19, 2006

Spreadsheets: Species Chronic Value (SCV), and Ranked Toxicity Values (January 20, 2006)

H-59 **Ambient Aquatic Life Water Quality Criteria for Atrazine [REVISED DRAFT]**

Author: Office of Water, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

October 2003 EPA-822-R-03-23 http://www.epa.gov

H-60 **New York State-Aquatic Fact Sheet: Ambient Water Quality Value for Protection of Aquatic Life [DRAFT]**

From New York State

Fact Sheet

August 10, 2005

H-61 **Health Risk Limits for Groundwater Chemical: Acetochlor, CAS# 34256-82-1 [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

December 28, 2006 http://www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

H-62 **Subject: Health Based Values for Acetochlor ESA & Acetochlor OXA**

From Helen Goeden, Health Risk Assessment Unit, Environmental Health Division, Minnesota Department of Health (MDH)

Memo St. Paul

February 13, 2006

To Dan Stoddard, Joseph Zachmann, Minnesota Department of Agriculture (MDA)

Includes Attachment: Data for Derivation of Ground Water Health Based Value (HBV)

H-63 **Acetochlor Fish Studies - Acetochlor: An Investigation of Accumulation and Elimination in Bluegill Sunfish in a Flow-Through System (ICI Americas Report# RJ0846B) and Calculation of Bioconcentration Factors in Bluegill Sunfish (Addendum to RJ0846B)**

Author: M. J. Hamer, E. Farrelly, J. Litzen, and I. R. Hill; M. J. Hamer, S. J. Crook, and I. R. Hill; K. H. Carr

Study Monsanto

1990; Addendum Dates: 1991, 2003 Registrant Report# MSL-18896

Attachment: MPCA Reference Review Form by D. White (BCF Studies)

H-64 **Health Risk Limits for Groundwater Chemical: Metolachlor, CAS# 51218-45-2 (and s-Metolachlor) [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

July 26, 2004 http://www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

H-65 **Subject: Health Based Value for Metolachlor OA and Metolachlor ESA**

From Anne Kukowski, Health Risk Assessment Unit, Minnesota Department of Health (MDH)

Memo St. Paul

July 7, 2004

To Joseph Zachmann, Dan Stoddard, Minnesota Department of Agriculture (MDA)

H-66 **Metabolism of [14C] Metolachlor in Bluegill Sunfish**

Author: Sean M. Cruz, Margaret N. Scott, and Andrew K. Merrit, Metabolism Department, Agricultural Division, Ciba-Geigy Corporation

Journal Journal of Agricultural Food Chemistry

1993 Vol 41; pp.662-8 http://www.health.state.mn.us

Attachment: MPCA Reference Review Form by D. White

H-67 **CORN - Minnesota Agriculture in the Classroom Program**

Author: Minnesota Department of Agriculture (MDA)

Fact Sheet MDA St. Paul

2004 http:/www.mda.state.mn.us/maitc

Commodity Card: Corn (Field)

H-68a **S-Metolachlor; Pesticide Tolerance**

Author: Environmental Protection Agency (EPA)- From the Federal Register Online via GPO Access

Public Notice Federal Register (FR) Washington, D.C

August 30, 2006 Vol 71(168); pp.51505-10 http://www.epa.gov/fedrgstr/

H-68b **Subject: Transmittal Memo for the Ecological Risk Assessment for the Use of S-Metolachlor on Pumpkins and Winter Squash (IR-4, DP 324973) and on Pumpkins in New York State (S18, DP 327861)**

From Paige Doelling Brown, Ph.D., Fisheries Biologist, James Hetrick, Ph.D., Senior Chemist, and Nancy Andrews, Ph.D. Branch Chief Environmental Risk Branch 1, Environmental Fate and Effects Division

Memo EPA Washington, D.C,

May 31, 2006

To Joanne Miller, Product Manager, Herbicide Branch, Barbara Madden, Risk Integration, Minor Use, Emergency Response Branch, and Daniel Rosenblatt, Team Leader, Emergency Response Team, Registration Division

H-68c **Ecological Risk Assessment for Use of S-Metolachlor (PC 108800) on Pumpkins and Winter Squash (DP324973, DP327861)**

Author Environmental Fate and Effects, Environmental Protection Agency (EPA)

EPA Document EPA Washington, D.C.

May 2006 http://www.epa.gov

Referenced in Memo (Exhibit H-68b)

H-68d **Subject: S-metolachlor Human Health Risk Assessment for Proposed Section 18 Uses on Cilantro, Collards, Kale, and Mustard Greens; Section 3 Use on Pumpkins; and Tolerance on Winter Squash without a US Registration. PC Code: 108800 S-metolachlor & 108801 Metolachlor, ID#: 06OH05 & PP#5E7015, DP Numbers: 329117 & 326011. [Executive Summary]**

From W. Cutchin, Chemist, ARIA Team, Technical Review Branch, Registration Division

Memo EPA Washington, D.C.

July 13, 2006 pp.1-11

To Barbara Madden and A. Ertman PM-5, Risk Integration Minor Use and Emergency Response Branch, Registration Division; Through Christina Swartz, Chief Registration Action Branch, Health Effects Division

H-69 **Toxicity to Daphni magna, Hyalella azteca, Oncorhynchus kisutch, Oncorhynchus mykiss, Oncorhynchus tshawytscha, and Rana catesbeiana of Atrazine, Metolachlor, Simazine, and Their Formulated Products**

Author: M. T. Wan, C. Buday, G. Schroeder, J. Kuo, and J. Pasternak

Journal — Environmental Contamination and Toxicology

2006 — Vol 76; pp.52-58

Attachments: Journal article and report providing details on test methods (Environmental Toxicology and Chemistry, Vol 24(5);pp.1146-54, 2005; Environmental Protection, Conservation and Protection, Environment Canada, Report EPS 1/RM/11, 1990)

HH-1 **Current Drinking Water Standards: List of Drinking Water Contaminants and MCLs**

Author: Ground Water and Drinking Water, Environmental Protection Agency (EPA)

Website — EPA — Washington, D.C.

July 2002, Accessed: July 14, 2005 — EPA 816-F-02-013 — http:/www.epa.gov/safewater/mcl.html

HH-2 **2006 Edition of the Drinking Water Standards and Health Advisories**

Author: Environmental Protection Agency (EPA)

EPA Report — EPA — Washington, D.C.

August 2006 — EPA 822-R-06-013 — http:/www.epa.gov/waterscience

HH-3 **Guidelines for the Development of Surface Water Quality Standards. For Protection of Aquatic Life, Including Human Health and Wildlife [DRAFT]**

Author: David E. Maschwitz, Environmental Outcomes Division, Environmental Standards and Analysis Section, Minnesota Pollution Control Agency (MPCA)

Guide — MPCA — St. Paul

August 28, 2000 — pp.1-40, and Appendix A - G1. — http:/www.pca.state.mn.us

1st Version: January 1990

HH-4 **Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health**

Author: Office of Water, Office of Science and Technology, Environmental Protection Agency (EPA)

Guide — EPA — Washington, D.C.

October 2000 — EPA-822-B-00-004; pp.i-xvii, 1-1 through 5-67 — http:/www.epa.gov

FINAL

HH-5 **Health Risk Limits for Groundwater Chemical Summary: Benzene, CAS# 71-43-2 [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary — MDH — St. Paul

November 24, 2004 — http:/www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

HH-6 **Health Risk Limits for Groundwater Chemical Summary: Naphthalene, CAS# 91-20-3 [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary — MDH — St. Paul

February 17, 2004 — http:/www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

HH-7 **Aquatic Life Criteria: Benzene, CAS# 71432**

Author: Minnesota Pollution Control Agency (MPCA)

Summary — MPCA — St. Paul

January 1990, Revised February 1993

Summary Sheets (3pgs) and Tables 1-5a

HH-8 **Aquatic Life Criteria: Benzene, CAS# 71-43-2 [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary — MPCA — St. Paul

February 1993, Revised January 2006

Summary Sheets (5pgs) and Tables 1-5a

HH-9 **Aquatic Life Criteria: Naphthalene, CAS# 91203**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

April 1991

Summary Sheets (4pgs) and Tables 1-5b

HH-10 **Aquatic Life Criteria: Naphthalene, CAS# 91-20-3 [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

April 1991, Revised January 2006

Summary Sheets

HH-11 **Fact Sheet for the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit Program General Permit No. MN G790000 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

April 20, 2006 http://www.pca.state.mn.us

with Attachments (pp.1-21)

M-1 **Water Quality Criterion for the Protection of Human Health: Methylmercury**

Author: Office of Science and Technology, Office of Water, Environmental Protection Agency (EPA)

Report EPA Washington, D.C.

January 2001 EPA-823-R-01-001; pp.i-xvii, 1-1 through 7-2, R-1-29, A, A1-33; http://www.epa.gov

M-2 **Minnesota's Total Maximum Daily Load Study of Mercury [DRAFT]***

Prepared by Minnesota Pollution Control Agency (MPCA)

Study MPCA St. Paul

June 1, 2006 Study# wq-iw4-01b; pp.i-xiii, 1-57, Appd.A and B www.pca.state.mn.us

**Draft Report Until Approved by U.S. EPA*

M-3 **Sources of Mercury Pollution and the Methylmercury Contamination of Fish in Minnesota**

Author: Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

August 2005 #4-06 http://www.pca.state.mn.us

Pollution Prevention & Sustainability Fact Sheet

M-4 **Eat Fish Often?**

Author: Minnesota Department of Health (MDH)

Pamphlet MDH St. Paul

May 2004 IC# 141-0378 http://www.health.state.mn.us

A Minnesota Guide to Eating Fish

M-5 **Water Quality Criteria: Notice of Availability of Water Quality Protection of Human Health: Methylmercury**

Author: Environmental Protection Agency (EPA) -From the Federal Register Online via GPO Access

Public Notice Federal Register (FR)

January 8, 2001 Vol 66(5); pp.1344-59; [DOCID:fr08ja01-55] http://www.epa.gov/fedrgstr/

M-6 **Subject: Bioaccumulation Factors (BAF) for Mercury in Northern Pike and Walleye: Rivers**

Author: Dennis Wasley (update by Bruce Monson), Minnesota Pollution Control Agency (MPCA)

Memo MPCA St. Paul

September 30, 2005 (Updated: August 5, 2003)

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Includes Tables

M-7 **Subject: Bioaccumulation Factors (BAF) for Mercury in Northern Pike and Walleye: Lakes [DRAFT]**

From Bruce Monson, Minnesota Pollution Control Agency, (MPCA)

Memo — MPCA — St. Paul

July 30, 2003

To David E. Maschwitz, Environmental Outcomes Division, Dennis Wasley, Gary Kimball, MPCA

M-8 **Notice of Draft Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion**

Author: Environmental Protection Agency

Public Notice — Federal Register (FR) — Washington, DC

August 9, 2006 — Vol 71(153); pp.45560-4 — http://www.epa.gov/fedrgstr/

PL-1a **MPCA Phosphorus Strategy Web Page**

Author: Minnesota Pollution Control Agency (MPCA)

Website — MPCA — St. Paul

July 14, 2006 — http://www.pca.state.mn.us/water/phosphorus.html

PL-1b **Phosphorus Strategy: NPDES Permits (000306) - Strategy for Addressing Phosphorus in National Pollutant Discharge Elimination System (NPDES) Permitting**

Author: Minnesota Pollution Control Agency (MPCA)

Fact Sheet — MPCA — St. Paul

March 2000 — (000306) — http://www.pca.state.mn.us

PL-1c **MPCA Phosphorus (P) Strategy: NPDES Permits [Information Packet]**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

March 2000 — (000306) — http://www.pca.state.mn.us

Referenced in fact sheet (Exhibit PL-1b)

PL-2a **St. Croix Basin Phosphorus-Based Water-Quality Goals - Report on the Recommended Water-Quality Goals of the St. Croix Basin Water Resources Planning Team and the 5th Annual Conference "Protecting the St. Croix: Reducing and Managing Nutrients and Sediments"**

Prepared by Pamela J. Davis, Coordinator, St. Croix Basin Water Resources Planning Team

Report — St. Croix Basin Water Resources Planning Team

August 2004 — Report# wq-b6-01 — http://www.pca.state.mn.us

PL-2b **Wisconsin Department of Natural Resources and Minnesota Pollution Control Agency: Agreement on Nutrient and Sediment Reduction in the St. Croix River Basin**

Signed: Sheryl Corrigan, Commissioner Minnesota Pollution Control Agency and Scott Hassett, Secretary Wisconsin Department of Natural Resources

Agreement

Signed: April 6, 2006

Includes Strategy-Based Subcommittee Structure [Draft] June 15, 2006

PL-3 **Subject: Cost Estimates for Phosphorus Removal**

From Randy Thorson, Municipal Division, Minnesota Pollution Control Agency (MPCA)

Memo

August 17, 2005 — http://www.pca.state.mn.us

To David E. Maschwitz, Environmental Analysis and Outcomes Division, MPCA

PL-4 **Wastewater Phosphorus Control and Reduction Initiative**

Author: Hydroqual, Inc. in Association with H. David Stensel, Ph.D., P.E., University of Washington

Study — Minnesota Environmental Science and Economic Review Board (MESERB) — Seattle

Study Completion Date: April 2005 — Project #MESE0001; ppES1-14

Bio-P Study (Executive Summary)

PL-5 **Joint LMC/MPCA Survey of Bio-P Costs**

Survey

PL-6 **Economic Evaluation of Aesthetic Amenities: A Case Study of River View**
S. N. Kulshreshtha and J. A. Gillies, University of Saskatchewan
Journal Water Resources Bulletin
April 1993 Vol 29(2); pp.257-66

PL-7 **Establishing Relationships Among Nutrient Concentrations, Phytoplankton Abundance, and Biochemical Oxygen Demand in Minnesota, USA, Rivers**
Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and Howard Markus, Monitoring & Assessment, Minnesota Pollution Control Agency (MPCA)
Journal Lake and Reservoir Management (LRM) St. Paul
2001 Vol 17(4); pp.251-62 http://www.nalms.org/journal/lrm.htm

PL-8 **Establishing Relationships Among In-Stream Nutrient Concentrations, Phytoplankton and Periphyton Abundance and Composition, Fish and Macroinvertebrate Indices, and Biochemical Oxygen Demand in Minnesota USA Rivers - Final Report**
Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and Howard Markus, Monitoring & Assessment, Minnesota Pollution Control Agency (MPCA)
Report MPCA St. Paul
July 2003 pp.i-iv, 1-100
To USEPA Region V

PL-9 **Subject: Proposed Extension of 1mg/L Phosphorus Effluent Limit to New or Expanding Discharges**
From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Memo St. Paul
March 18, 2004
To Michael Sandusky, Director, Environmental Outcomes Division, MPCA
(without attachments)

PL-10 **Municipalities Given 1 mg/L Total Phosphorus Effluent Limits Since Phosphorus Strategy Was Approved, March 2000**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document
September 2005

PL-11 **Industries Given 1 mg/L Total Phosphorus Effluent Limits Since Phosphorus Strategy Was Approved, March 2000 [Working DRAFT]**
Author: David E. Maschwitz, Environmental Outcomes Division, MPCA
MPCA Document St. Paul
September 2005

PL-12 **Evaluation of Membrane Bioreactor Process Capabilities to Meet Stringent Effluent Nutrient Discharge Requirements**
Author: Edwin J. Fleischer, Thomas A. Broderick, Glen T. Daigger, Anabela D. Fonseca, R. David Holbrook, Sudhir N. Murthy
Journal Water Environment Research (WER)
2005 Vol 77(2); pp.162-78 http://www.wef.org/ScienceTechnologyResources/Publications/WER/

PL-13 **Chapter NR 217-Effluent Standards and Limitations**
Wisconsin Department of Natural Resources
Rule
November 1992 http://www.legis.state.wi.us/rsb/index.html

PL-14 **Implementation Guidance for Chapter NR 217: Phosphorus Effluent Standards and Limitations [Final Document]**
Author: Wisconsin Department of Natural Resources and Bureau of Watershed Management
Guidance WI DNR
June 1999 http://www.dnr.state.wi.us/

PL-15 **Notice of Adopted Amendment**
Illinois Pollution Control Board
Public Notice Illinois Register
February 17, 2006 Vol 30(7); pp.2365-72

UC-1 **Subject: Stream Reclassification Request of Renville County Ditch No. 45, (Branch Lateral 3)**
From Craig R.Olson (Yaggy Colby Associates) on behalf of Midwest Investors of Renville, Inc., dba Golden Oval Eggs Cooperative
Letter
June 13, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-2 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45 (Branch Lateral 3)**
Golden Oval Eggs Cooperative
Form Renville
November 8, 2004

UC-3 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45 (Branch Lateral 3)**
Southern Minnesota Beet Sugar Cooperative
Form Renville
November 8, 2004

UC-4 **Subject: Requesting Discharge Variance and Reclassification of Judicial Ditch No. 29, Evan, Minnesota**
From Sylvia Schwarz, Arden Environmental Engineering, Inc. on behalf of the City of Evan, Minnesota
Letter Evan
August 14, 2001
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-5 **Stream Assessment Worksheet Use Attainability Analysis, Lateral Judicial Ditch No. 29 and Judicial Ditch No. 29**
City of Evan, Minnesota
Form Evan
October 24, 2002

UC-6 **MPCA Board Item and Attachments Re: Evan NPDES/SDS Permit Issuance and Variance Request, Brown County – Request for Variance from the Dissolved Oxygen, Un-ionized Ammonia Nitrogen and Fecal Coliform Bacteria Water Quality Standards for Judicial Ditch No. 29**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA Evan
April 22, 2003 http://www.pca.state.mn.us

UC-7 **Subject: Requesting Reclassification of Judicial Ditch No. 4**
From Scott A. Johnson, Terracon on behalf of Lac Qui Parle Oil Cooperative
Letter Dawson
April 28, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-8 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 4**
Lac Qui Parle Oil Cooperative
Form Dawson
November 4, 2004

UC-9 **Subject: Dawson Ditch**
From Chris Domeier, Minnesota Department of Natural Resources (MDNR) Fisheries, Ortonville, MN
e-mail Ortonville
January 26, 2006
To Gerald Blaha, Environmental Outcomes Division, MPCA
Referencing April 1982 sodium hydroxide spill to Jud. Dt. No. 4 at Dawson, MN Spill File No. 10403

UC-10 **Subject: Requesting a Total Chloride Variance Request for Discharge to an Unnamed Ditch to Sater's Creek**
From Rick Serie, Agri-Energy, LLC
Letter Luverne
February 27, 2002
To Becky Olson, MPCA

UC-11 **Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditch and Sater's Creek**
Agri-Energy, LLC
Form — Luverne
November 4, 2004

UC-12 **Subject: Requesting Stream Reclassifications for Unnamed Ditches and Freeborn County Ditch No. 71 and Discharge Variances, Myrtle, Minnesota**
From Dan Bigalke (Arden Environmental Engineering, Inc.), on behalf of the City of Myrtle
Letter — Myrtle
December 23, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-13 **Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditches and County Ditch No. 71**
City of Myrtle, MN
Form — Myrtle
November 3, 2004

UC-14 **Subject: Requesting Stream Reclassification for Freeborn County Ditch No. 11 and Discharge Variances, Manchester, Minnesota**
From Dan Bigalke (Arden Environmental Engineering, Inc.) on behalf of the City of Manchester
Letter — Manchester
December 23, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-15 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 11**
City of Manchester, MN
Form — Manchester
November 3, 2004

UC-16 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45: Class 7 Reclassification back to a Class 2B Water Use Classification**

Form
November 8, 2004

UC-17 **Biological Monitoring Report for CD45 and Sacred Heart Creek**
Author: Barr Engineering
Report — Renville
March 2006

UC-18 **2003 Aerial Photograph of the Wright Lake, Hoot Lake Area at Fergus Falls, Minnesota Showing the Locations of Waters Proposed for Class 1C Classification**
U. S. Department of Agriculture, Farm Service Agency
Map(s)
2003

UC-19 **Overview of Minnesota's NPDES/SDS Construction Stormwater Permit**
Author: Minnesota Pollution Control Agency (MPCA)
Fact Sheet MPCA
November 2005 Water Quality/Stormwater #2-05 http://www.pca.state.mn.us

UC-20 **Summary Comparison of Chloride Water Quality Standards for EPA Region V States, North Dakota, South Dakota, and Iowa**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA
Not Given

UC-21 **Minnesota Subregional Hydrologic Unit Code Chloride Data Summary retrieved from the EPA STORET National Environmental Data System**

Author: Environmental Protection Agency (EPA)

Summary EPA

Accessed: May 2006 http://www.epa.gov/storet/

STORET (short for STOrage and RETrieval)

UC-22 **Figure 5. – Mean Hardness of Calcium Carbonate at NASQAN (National Stream Quality Accounting Network) Stations During 1975 Water Year from Quality of Rivers in the United States**

J.C. Briggs and J. F. Fricke

Report U.S Geological Survey

1977 Open-file Report 78-200

UC-23 **Total Hardness of Minnesota's Ground Water 1992 - 1996 from Minnesota Pollution Control Agency's Baseline Water Quality of Minnesota's Principal Aquifers, 1992 - 1996.**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

Not Given

UC-24 **Minnesota Subregional Hydrologic Unit Code Total Hardness Data Summary retrieved from the EPA STORET National Environmental Data System**

Author: Environmental Protection Agency (EPA)

Summary EPA

Accessed: May 2006

STORET (short for STOrage and RETrieval)

UC-25 **Water Quality Criteria, Second Edition**

Editors: Jack E. McKee and Harold W. Wolf

Report California State Water Resources Board

Revised 1963 Publication No. 3 – A

UC-26 **Manual on Industrial Water and Industrial Waste Water, Second Edition [Excerpt pp. 24 and 25, Table III: Water Quality Tolerances for Industrial Applications]**

Author: American Society for Testing and Materials

Manual ASTM Philadelphia

1959 ASTM Special Technical Publication No. 148-D

UC-27 **Guidelines for Establishing Water Quality Standards for Interstate Waters, (Under the Water Quality Act of 1965, Public Law 89-234)**

Author: U.S. Department of Interior, Federal Water Pollution Control Administration.

Guidance

May 1966

UC-28 **Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior [Excerpt]**

Author: U.S. Department of the Interior, Federal Water Pollution Control Administration

Report

April 1, 1968 pp.185-215

[a.k.a Green Book]

UC-29 **Categorization of Surface Waters for Industrial Consumption for WPC-15**

Author: George R. Koonce, Chief - Section of Industrial and Other Wastes, Division of Water Quality, Minnesota Pollution Control Agency

MPCA Document MPCA

1973

Rulemaking exhibit from the 1973 revisions to WPC-15 (PCA Exhibit 41, 5-31-73)

UC-30 **Water Quality Criteria 1972 [Excerpt]**

A Report of the Committee on Water Quality Criteria, Environmental Studies Board, National Academy of Sciences, National Academy of Engineering,

EPA Report EPA

March 1973 EPA.R3.73.033; pp.368-96 http://www.epa.gov

[a.k.a. Blue Book]

UC-31 **Quality Criteria for Water 1986 [Excerpt page entries regarding Hardness]**

Author: Office of Water Regulations and Standards, Environmental Protection Agency (EPA)

EPA Report EPA

May 1, 1986 EPA 440/5-86-001; Unnumbered http://www.epa.gov

[a.k.a. Gold Book]

UC-32 **Non-irrigation Surface Water Permit Locations Retrieved from Minnesota Department of Natural Resources Water Appropriation Permits Database**

Author: Minnesota Department of Natural Resources (MDNR)

Summary DNR

Accessed: May 2006

UC-33 **Closed-cycle Cooling Systems for Steam-electric Power Plants: A State-of-the-art Manual, Interagency Energy/Environment R&D Program Report [Excerpt]**

Author: Industrial Environmental Research Laboratory, Environmental Protection Agency (EPA)

Manual EPA

Not Given EPA-600/7-79-001; pp.237-61

UC-34 **Subject: Soliciting Comments on the MPCA Proposed Class 3B to Class 3C Changes as Outlined in a May 26, 2004 Email Message from David Maschwitz (MPCA) to Keith Hanson**

From Keith Hanson, Minnesota Power

e-mail

May 27, 2004

To Minnesota Chamber of Commerce Environment and Water Quality Committee

UC-35 **Subject: Response to Comments on the Proposed Class 3B to Class 3C Changes**

From David E. Maschwitz, Environmental Outcomes Division, MPCA

e-mail

March 4, 2005

To Kevin Kangas, Sappi Paper Cloquet, LLC,

UC-36 **Cluster Rule Impact on Recovery Boiler Operations: Chloride and potassium Concentrations in the Kraft Liquor Cycle**

Author: J. M. Jordan and P.S. Bryant

Journal TAPPI

December 12,1996 Vol 79(12); pp.108-16

UC-37 **Dynamic Modeling of Potassium and Chloride in the Recovery Area**

Author: B. Malmberg, L. Edwards, et al.

Journal TAPPI

June 2002 Vol 1(4); pp.3-6

UC-38 **Selective Removal of Chloride and Potassium in Kraft Mills.**

Author: L. Manuel, G.A. Ferreira, et al.

Journal TAPPI

April 2003 Vol 2(4); pp.21-5

UC-39 **Mineral Scale Management, Part I. Case Studies**

Author: P.W. Hart and A.W. Rudie

Journal TAPPI

June 2006 Vol 5(6); pp.22-7

UC-40 Mineral Scale Management. Part II. Fundamental Chemistry

Author: A.W. Rudie and P.W. Hart

Journal TAPPI

July 2006 Vol 5(7); pp.17-23

UC-41 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditch to County Ditch No. 42

Form Winthrop

November 4, 2004

UC-42 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Creek to Cedar Creek

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Form Isanti

November 9, 2004

Minnesota Pollution Control Agency

STATEMENT OF NEED AND REASONABLENESS

BOOK II of III

**In the Matter of Proposed Revisions
Of Minnesota Rules Chapter 7050,
Relating to the Classification and
Standards for Waters of the State;**

**The Proposed Addition of a New Rule,
Minnesota Rules Chapter 7053,
Relating to Point and Nonpoint Source Treatment Requirements; and**

The Repeal of Minn. R. Chapters 7056 and 7065

BOOK II

1. Numeric eutrophication standards for lakes, shallow lakes and reservoirs.
2. Requirement for new or expanding dischargers to meet a 1 mg/L phosphorus effluent limit, if they discharge more than 1,800 pounds of total phosphorus per year.

July 2007

BOOK II
Contents

TABLES

FIGURES

ACRONYMS AND ABBREVIATIONS USED IN THE SONAR

ACR	Acute to chronic ratio
Agency	Minnesota Pollution Control Agency
ASTM	American Society for Testing and Materials
AWWDF	Average [monthly] wet weather design flow
BAF	Bioaccumulation factor
BAP	Bioavailable phosphorus
BCF	Bioconcentration factor
BEACH	Beach Environmental Assessment and Coastal Health (BEACH) Act
Bio-P	Biological phosphorus removal treatment technologies
BMP	Best management practice
BOD_5	Biochemical oxygen demand; BOD_5 is BOD measured over a 5-day period
BWCAW	Boundary Waters Canoe Area Wilderness
CAS	Chemical abstract services registry number
$CBOD_5$	Carbonaceous biochemical oxygen demand; $CBOD_5$ is CBOD measured over a 5-day period
CESARS	Chemical Evaluation Search and Retrieval System database
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu	colony-forming units
CGMC	Coalition of Greater Minnesota Cities
ch.	Chapter
Chl-a	Chlorophyll-a
CLMP	Citizens Lake Monitoring Program
CS	Chronic standard
CSF	Cancer slope factor
CSMP	Citizens Stream Monitoring Program
CWA	Clean Water Act
CWP	Clean Water Partnership
DMR	Discharge monitoring report
DO	Dissolved oxygen
DOC	Dissolved organic carbon
DWS	Drinking water standard
EC20, EC50	Effect concentration; concentration of chemical that has a significant effect on 20 percent and 50 percent of the test organisms in a specified time period, respectively
ECOTOX	Ecotoxicology database
EPA	U.S. Environmental Protection Agency
Ex.	Exhibit
EU	Eutrophication
FAV	Final Acute Value
FPE	fullest practicable extent
FTE	Full time equivalent – measurement of staff resources
g/d	grams per day
GLI	Great Lakes Water Quality Initiative
IBI	Index of Biotic Integrity
IEPA	Illinois Environmental Protection Agency
HBV	Health based value
HH	Human health-based standard
HRL	Health risk limit
IRIS	Integrated Risk Information System
L	Liter
LAP	Lake Assessment Program
LC50	Lethal concentration; concentration of chemical that results in death of 50 percent of the test organisms in a specified time period
LOEC	Lowest observable effect concentration
M	meter or meters
MATC	Maximum acceptable toxicant concentration
MCEA	Minnesota Center for Environmental Advocacy
MCES	Metropolitan Council, Environmental Services
MCL	Maximum contaminant levels (EPA drinking water standards)
MDA	Minnesota Department of Agriculture

MDEP	Massachusetts Department of Environmental Protection
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
MeHg	Methylmercury
MESERB	Minnesota Environmental Science and Economic Review Board
MFCA	Minnesota Fish Consumption Advice or Advisory
µg/L	microgram per liter or parts per billion
Mg/kg	milligram per kilogram or parts per million
Mg/L	milligram per liter or parts per million
mgd	million gallons per day
µm	micron, one millionth of a meter
MPCA	Minnesota Pollution Control Agency
Minn. R. ch.	Minnesota Rules chapter
Minn. Stat. ch.	Minnesota Statutes chapter
MS	Maximum standard
NA or na	Not applicable or not available
NALMS	North American Lake Management Society
NCHF	North Central Hardwood Forest Ecoregion (CHF in Figure II-9)
NE	No effect concentration
ng/L	nanogram per liter or parts per trillion
NGP	Northern Glaciated Plains Ecoregion
NLF	Northern Lakes and Forest Ecoregion
NHD	National Hydrography Data
NOEC	No observable effect concentration
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
OPP	Office of Pesticide and Planning, EPA
ORVW	Outstanding Resource Value Water
P Rule	Existing Minn. R. 7050.0211, subp. 1a; proposed Minn. R. 7053.0255
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PMP	Phosphorus management plan
POTW	Publicly owned treatment works
ppm	parts per million
RfD	Reference dose
RSC	Relative Source Contribution Factor
SCV	Species chronic value
SD	Secchi depth or Secchi transparency
SDS	Minnesota State Disposal System permits
SONAR	Statement of Need and Reasonableness
SR	Minnesota *State Register*
SSS	Site-specific standard
STORET	EPA water quality data storage and retrieval system
su	standard units, units for pH measurements
TBEL	Technology-based effluent limit (limit = limitation)
TMDL	Total Maximum Daily Load
TSI	Carlson Trophic State Index
Tox	Toxicity-based standard
TP	Total phosphorus or phosphorus
TSS	Total suspended solids
UAA	Use attainability analysis
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VOC	Volatile organic carbon
WCBP	Western Corn Belt Plains Ecoregion (WCP in Figure II-9)
WDNR	Wisconsin Department of Natural Resources
WQBEL	Water quality- [standard] based effluent limit
WQS	Water quality standard
WWTP	Wastewater treatment plant

Table II-A. Reader's Guide to Location of Major Topics on Proposed Eutrophication Standards in SONAR Book II.

ITEMS	SECTIONS AND PAGE NUMBERS			
Section in SONAR:	Introduction, Background I – III	Need IV	Reasonable-ness V, VI	Economics, etc. X
Major Topics, Proposed Eutrophication Standards				
What's proposed in this rulemaking*	Na			
What's in SONAR Books I, II and III*	1			
Numeric eutrophication standards	14	31, 32	40, 63	
Narrative eutrophication standards	14, 26	34	40, 75	
Threat of eutrophication of MN lakes	5, 10	29		
The study of lakes and rivers, limnology	7			
Definitions	7		48, 81	
Ecoregions	14, 23			
Total phosphorus	9		47, 54	
Chlorophyll-a	10		47, 54	
Secchi disk transparency	10		47, 54	
Lake trophic data			48	
Assessment of lakes for impairment due to nutrients	27, 29			
EPA guidance on nutrient standards	19			
EPA nutrient criteria	23		67	
Development of MPCA nutrient criteria	26			
How eutrophication standards will help protect lakes		31, 32	87	
Lake types and uses			72	
Trout lakes			57, 73	
Deep lakes			60,74	
Shallow lakes			63, 74	
What other states are doing			93	
Economic value of lakes	5			169
Economic impact, miscellaneous			38 – 42	173
Costs to point sources				45, 175
Costs to nonpoint sources				173
Impact on agriculture				206

*See SONAR Book I, pages 1 and 3.

Table II-B. Reader's Guide to Location of Major Topics on Proposed Extension of 1 mg/L Phosphorus Effluent Limit to New or Expanded Dischargers in SONAR Book II.

ITEMS	SECTIONS AND PAGE NUMBERS			
Section in SONAR:	Introduction, Background I - III	Need VII	Reasonable-ness VIII, IX	Economics, etc. XI
Major Topics, Proposed Extension of 1 mg/L Phosphorus Effluent Limit				
Phosphorus as an important pollutant	7, 19, 29			
Sources of phosphorus to MN waters		102		
Impact of phosphorus on rivers		106		
Phosphorus Strategy			131	
History of point source phosphorus limits			127	
Proposed extension of phosphorus limit		98	127	
Definitions		110	142	
De-minimis plant flow			139	
Possible exemptions from limit		111	150	
- TMDL complete		115	153	
- environmental impact		116	159	
- exempt watersheds, winter limits		116	160	
- variance			161	
Best practicable treatment		111	147	
Averaging period for phosphorus limit		113	148	
Mercury and phosphorus removal			163	
Biological phosphorus treatment				184
Gross costs to point sources			121, 125	184
- municipalities				186
- industries				195
Real costs attributable to extension of limit				203
Economic benefit				185
What other states are doing			165	
Repeal of Minn. R. ch. 7065		109	133	

I. INTRODUCTION

A. SCOPE [I. introduction]

The Minnesota Pollution Control Agency (Agency) is proposing to amend Minn. R. ch. 7050, establish a new rule, Minn. R. ch. 7053, and repeal two rules, Minn. R. ch. 7056 and 7065. This book of the Statement of Need and Reasonableness (SONAR) covers the proposed eutrophication standards for lakes, shallow lakes and reservoirs, and the proposed extension of the total phosphorus effluent limit to new or expanding dischargers that discharge more than 1,800 pounds of phosphorus per year. The change to the phosphorus effluent limit would take effect on May 1, 2008.

B. STATEMENT OF NEED AND REASONABLENESS [I. introduction]

The Administrative Procedures Act (Minn. Stat. ch. 14) requires the agency to address certain questions and issues in rulemaking that are discussed in the SONAR. The SONAR contains the Agency's affirmative presentation of facts on the need for and reasonableness of the proposed rule amendments. It also addresses all the statutory requirements associated with proposed administrative rules. As mentioned, Book II of the SONAR covers the proposed eutrophication standards and the extension of the phosphorus effluent limit, and these two major proposals are discussed in separate *need*, *reasonableness* and *economic impact* sections.

The proposed eutrophication standards and all the proposed additions and changes to Minn. R. ch. 7050 are shown in Exhibit A-15a. The proposed changes to the 1 mg/L phosphorus effluent limit (Minn. R. 7053.0255) are shown in Exhibit A-15b.

Book I of the Agency's SONAR covers background information on topics relevant to these proposed revisions, which is not repeated in SONAR Books II or III (see list below).

- Beneficial uses and use classification system;
- Water quality standards;
- Triennial review of water quality rules;
- Assessment of impaired waters;
- Total maximum daily loads (TMDL);
- Items originally considered, but postponed for this rulemaking;
- Response to comments outside scope of proposed amendments; and
- Public participation.

References to Minn. R. ch. 7050 or 7053 in this SONAR are to the **proposed revised or new rules**[1], unless specifically stated otherwise.

[1] Throughout the SONAR some terms or phrases are in **bold** for emphasis.

Numerous exhibits pertinent to the proposed amendments are cited throughout SONAR Book II. Exhibits have been catalogued in an Access file for ease of tracking, sorting and numbering. The list of exhibits pertinent to the subjects covered in Book II is attached. The prefixes used to identify the categories exhibits are placed in are shown in Table II-1.

Table II-1. Prefixes for Categories of Numbered Exhibits.

Prefix to Exhibit Number	**Category of Exhibits**
A	Administrative, legal authority, Board appearances, rule language changes, public comments, etc.
EU	Eutrophication standards for lakes and reservoirs
PL	Phosphorus effluent limit
M	Mercury standard
HH	Human health-based and drinking water standards
H	Standards for herbicides acetochlor and Metolachlor
EC	*E. coli* standard
UC	Use classification changes: Class 1-Domestic Consumption, Class 2-Aquatic Life and Recreation, Class 3-Industrial Consumption, and Class 7-Limited Resource Value Waters.

The SONAR has been assigned the following exhibit numbers:

- SONAR Book I is Exhibit A-1
- SONAR Book II is Exhibit A-2
- SONAR Book III is Exhibit A-3
- A complete list of all exhibits is Exhibit A-5

Due to the large number of exhibits and the large size of some, exhibits will not be available on the Agency's Web pages. They will available for the cost of reproduction upon request.

Throughout the text the reader is referred to relevant sections elsewhere in the SONAR. The references are to sections rather than page numbers. To help locate the cited sections, section and subsection headings are followed [in brackets] by the Roman numeral and capital letter, if needed, that identifies the location of that section or subsection. Also in the same brackets as an aid to the reader is an abbreviated name of the major section. For example, a heading in the *need* Section is: "Promulgation of the Nutrient Criteria is the Appropriate Step [IV.D. EU standards, need]."

This SONAR can be made available in other formats, including Braille, large print and audio tape. TTY users may call the Agency teletypewriter at 651-282-5332 or 800-657-3864. The Agency will make the *State Register* notice, the SONAR and the proposed rule available during the public comment period on the Agency's Public Notices Web site: http://www.pca.state.mn.us/news/data/index.cfm?PN=1

C. AGENCY'S STATUTORY AUTHORITY [I. introduction]

The Agency's authority to adopt water quality standards and to classify waters of the state is found in Minn. Stat. § 115.03 (2005), particularly subdivisions 1(b) and 1(c). Subdivision 1(b) authorizes the Agency to classify waters, while subdivision 1(c) authorizes the Agency:

> To establish and alter such reasonable pollution standards for any waters of the state in relation to the public use to which they are or may be put as it shall deem necessary for the purposes of this chapter and, with respect to the pollution of waters of the state, chapter 116;

Additional authority for adopting standards is established under Minn. Stat. § 115.44, subd. 2 and 4. Subdivision 2 authorizes the Agency to:

> …group the designated waters of the state into classes, and adopt classifications and standards of purity and quality therefor. …

Subdivision 4 authorizes the Agency to:

> …adopt and design standards of quality and purity for each classification necessary for the public use or benefit contemplated by the classification. The standards shall prescribe what qualities and properties of water indicate a polluted condition of the waters of the state which is actually or potentially deleterious, harmful, detrimental, or injurious to the public health, safety, or welfare; to terrestrial or aquatic life or to its growth and propagation; or to the use of the waters for domestic, commercial and industrial, agricultural, recreational, or other reasonable purposes, with respect to the various classes established…

Finally, the Agency is authorized under Minn. Stat. § 115.03, subd. 5 to perform any and all acts minimally necessary, including the establishment and application of standards and rules, for the Agency's ongoing participation in the NPDES[2] permitting program.

Under these statutory provisions, the Agency has the necessary authority to adopt the proposed rules.

The adoption of administrative rules is regulated under Minn. Stat. ch. 14. This statute and Minn. R. ch. 1400 lay out the rulemaking process, and obligations of the Agency to, for example, involve the public, consider the impact of the rule amendments on certain subsets of Minnesotans, and assess the economic impact of the proposed amendments. They also serve to assure fairness and openness in the process.

[2] NPDES means National Pollutant Discharge Elimination System.

If approved and adopted, the proposed new rule (Minn. R. ch. 7053) and the changes to the existing rule will be enforceable by the Agency in accordance with the authority provided to the Agency by Minn. Stat. ch. 116 and 115. The Agency has general authority to enforce its rules under these statutes.

II. PROPOSED EUTROPHICATION STANDARDS FOR LAKES, SHALLOW LAKES AND RESERVIORS, BACKGROUND

A. IMPORTANCE OF LAKES [II. background]

Minnesota is defined by its lakes. Our license plates have claimed for decades that we are the land of 10,000 lakes. The quarter commemorating Minnesota's statehood features an image of a lake, a fishing boat and a loon. Lakes are very important to Minnesota's overall economy, a value which is quantifiable in dollars. Minnesota's water resources are the cornerstone of a $10 billion a year tourism industry. Possibly even more valuable than this however, is the contribution lakes make to the overall quality of life in Minnesota. This "value" of lakes is much more difficult if not impossible to quantify, but the skyrocketing value of lakeshore property is certainly one indication[3]. However, no one can put a dollar value on the peace of mind one gets gazing out on a beautiful lake setting, taking in the sounds and smells as well as the scenery. However, this image is disappearing in many parts of Minnesota's lake country, as lakeshore property is becoming increasing developed, and seasonal cabins are replaced by large, year-round homes (Exhibit EU-2). The demand for the finite amount of buildable lakeshore is not likely to let up any time soon. Popular articles about the importance of lakes and the mounting threats to them appear routinely in newspapers, magazines and state agency publications and on TV (for example, see Exhibits EU-3a to 3c). A survey of lake users in 1998 indicated that the close proximity of lakes to many Minnesota residents was an important reason they visited lakes. Other important reasons were scenery and fishing (Exhibit EU-4).

Governor Pawlenty made protection of water quality a priority in his first administration.

> *"More so that any other state, the quality and quantity of water in Minnesota is central to our way of life. It helps define who we are and what we value."*
> Governor Pawlenty

A particularly relevant example of the Governor's commitment to water quality is the Central Lakes Initiative, which is part of the Governor's Clean Water Initiative. This project involves five counties in North Central Minnesota in the heart of the northern lakes region. It is a multifaceted effort to shape the inevitable development in such a way that the very resource (lakes) that brings people (and money) to the area is not destroyed.[4]

Probably almost every person in Minnesota that fishes, swims, canoes, boats, water skis or recreates in any way on Minnesota lakes, including many lakeshore property owners, has experienced the negative impacts of excess nutrient loading to lakes – poor water clarity, green water, algae blooms, floating algal mats – conditions that make a lake much less enjoyable for

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[3] Land Rush, A Star Tribune Special Report, Subdividing the North Country. *Minneapolis Star Tribune*, October 16, 2005.
[4] http://www.dnr.state.mn.us/lakes/ncml.html.

recreation. Excess phosphorus loading is almost always responsible for these degraded conditions.

Phosphorus comes from both point and nonpoint sources. The distinction between point and nonpoint sources has changed somewhat in the last several years, but point sources are generally controlled through use of some type of wastewater treatment facility, usually under the terms of a permit. Point sources include discharges from municipal and industrial wastewater treatment plants, discharges from permitted stormwater systems and feedlots, and failing individual septic systems. Nonpoint sources include uncontrolled or poorly controlled runoff from urban landscapes, agricultural land, construction sites and other altered landscapes[5]. These sources are generally controlled through application of best management practices. The relative contribution of nutrients from point and nonpoint sources depends on many factors including the frequency, duration and magnitude of rainfall events.

The 2003 Minnesota State Legislature requested a detailed study to quantify all sources of phosphorus to Minnesota's watersheds[6]. The study was in response to legislative initiatives to lower the phosphorus content in automatic dishwasher detergents[7]. Barr Engineering was contracted to do the study and they issued a report in February 2004. Exhibit EU- 6 is the executive summary of their report. Under average flow conditions, nonpoint sources contribute 69 percent, and point sources 31 percent, of the total loading of phosphorus to state waters. These percentages are strongly affected by the effluent concentration for the very large Metro Plant in St. Paul (Metropolitan Council, Environmental Services). They were calculated assuming an average effluent phosphorus concentration of 3 mg/L for the Metro Plant, which was valid at the time the study was done. A 1 mg/L phosphorus effluent limit went into effect in January, 2006; but, in fact, the Metro Plant has been achieving an effluent concentration of 1 mg/L for about a year prior to the required change. Because the size of the Metro Plant (about 220 million gallons per day) dwarfs all other plants in Minnesota, the reduction from 3 to 1 mg/L for this single facility has a dramatic effect on the relative point/nonpoint source phosphorus loading percentages. With the Metro Plant effluent at 1 mg/L, the revised percentages are 75 (nonpoint) and 25 (point) (Exhibit EU-6).

In general, phosphorus loading is reduced in two basic ways. For the most part, nonpoint sources are controlled by the application of a wide range of best management practices (BMP). BMPs reduce the quantity of runoff or reduce the concentration of phosphorus in runoff, or both. All citizens need to be mindful of personal actions that increase phosphorus in runoff that will impact rivers and lakes. Lakeshore property owners bear a particularly important responsibility in this area because of their close proximity to the lake. They should manage their property with an eye toward minimizing nutrient loading to the very lake resource they so highly treasure. Numerous publications, Web pages and resources are available to help property owners manage their property to protect lake water quality.

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[5] Urban stormwater runoff and construction site runoff controlled by permit are considered point sources.

[6] Minnesota Laws 2003, ch. 128, art. 1, §166.

[7] The study found that about 3 percent of the total loading of phosphorus to Minnesota surface waters was from commercial and residential dishwashing detergent.

Point sources are controlled through phosphorus effluent limits in NPDES[8] permits, and through mandatory and voluntary phosphorus reduction programs. A phosphorus management plan is required in many NPDES permits in situations where phosphorus loading is a concern but the permit does not include a numeric limit. Phosphorus management plans seek to locate and identify concentrated sources of phosphorus loading to the sanitary sewer system, and to work with these contributors to reduce their contributions, if possible. Less phosphorus loading to the front end of the wastewater treatment plant means less coming out and going into the receiving stream.

Over the last eight to ten years the Agency has focused considerable attention on phosphorus as a state-wide pollutant of major concern. The Agency developed a Phosphorus Strategy (Strategy) as a guide for the Agency and the public on how the Agency interprets the 1 mg/L total phosphorus effluent limit in existing Minn. R. 7050.0211, subp. 1a. In brief, the Strategy emphasizes a basin-wide approach to evaluating phosphorus loadings to lakes and a more holistic approach to phosphorus reductions while providing guidance on implementing the 1 mg/L limit (Exhibit PL-1c, see Section IX.C).

Given our love for lakes, and considering the pressures we place on them as a result, the Agency believes that multiple tools are needed to help protect lake water quality, and to safeguard the many beneficial uses lakes provide. The proposed numeric eutrophication standards for lakes, shallow lakes and reservoirs will provide one such tool.

B. LAKE SCIENCE [II. background]

The science of freshwater lakes and rivers is called limnology. Most of the discussion in this SONAR deals with lakes or static fresh water systems rather than flowing waters. The chemical, physical and biological properties of freshwater lakes have been extensively studied. Exhibit EU-45 provides a good introduction to lake biology, as well as a discussion of the pressures we place on lakes, trends in lake quality indicators, and lake programs.

For background purposes it is important to discuss some fundamental limnological concepts, and to define some terms because they will be used throughout this SONAR. The **terms below** marked with an **asterisk (*)** are defined in existing Minn. R. 7050.0150, subp. 4; those marked with a "**#**" are proposed to be defined in rule as part of this rulemaking.

<u>Aquatic Plants and Nutrients</u>. All lakes support a community of aquatic plants and animals of some type. Typically, the plant community can be divided into two major groups. One is the submerged and emergent rooted aquatic plants or **macrophytes**. The area of a lake shallow enough to support macrophytes, which is typically that portion of the lake 15 feet or less in depth, is called the **littoral zone**. The second major part of the plant community is the mostly microscopic single-celled green plants called **algae** or phytoplankton. Algae in lakes are typically suspended in the water column, but they can float on the surface or attach to plants, rocks, bottom sediments or other substrates. Attached algae can be long and stringy and make

[8] NPDES. National Pollutant Discharge Elimination System.

rocks feel slimy. It is the suspended or floating species of algae that contribute most to objectionable conditions in the form of algae blooms.

Just like terrestrial plants, aquatic plants need nutrients to grow and thrive. Lake water serves as a "nutrient medium" for the plants living in it that are not rooted to the bottom. This is true regardless of whether the lake water is very nutrient poor (oligotrophic) or very nutrient rich (eutrophic). The primary macro-nutrients (nutrients needed in relatively large amounts) plants need are carbon, hydrogen, oxygen, nitrogen and phosphorus. The first four in this list are almost always available in abundant supply in Minnesota lakes. Thus, algae that depend on nutrients supplied by the water very seldom want for carbon, hydrogen, oxygen or nitrogen. The growth of algae in a lake is controlled by the nutrient that is in the shortest supply, which is called the "limiting" nutrient. If more of the limiting nutrient is added to the water, algae respond very quickly to take advantage of the needed nutrient. This is reflected by the increased growth and abundance of algae. If a non-limiting nutrient such as nitrogen is added to a lake, the algae respond very little if at all because algal growth is still controlled by the supply of the limiting nutrient. Phosphorus is almost always the limiting nutrient in Minnesota lakes. Thus, as phosphorus concentrations increase or decrease algal biomass increases or decreases. Therefore, phosphorus is the focus of proposed eutrophication standards and the proposed extension of the phosphorus effluent limit.

An often quoted statement from a well known limnology textbook[9] is that "*phosphorus can theoretically generate 500 times its weight in living algae*"; a response based on the relationship between phosphorus and algal growth requirements (Exhibit EU-5). Adding just one pound of phosphorus to a lake can result in 500 pounds of additional algae. Thus, any additional phosphorus loading to a lake can have a negative effect and should be avoided if possible or practical, even if the resulting change is not measurable due to variability within the system.

Phosphorus is the pollutant of concern in most Clean Water Partnership and Clean Lakes Program projects. Phosphorus tends to persist as it moves downstream, making it a pollutant of regional, state-wide and even national concern.

Occasionally lakes at the extreme ends of the trophic spectrum, that is lakes that are either extremely nutrient poor (ultraoligotrophic) or nutrient rich (hypereutrophic), can become nitrogen limited. While the Agency's goal is to limit the influx of nutrients to surface waters in general, it is not usually practical to try to limit nitrogen as a nutrient due to its abundance in nature. Also, blue-green algae have the ability to utilize (fix) nitrogen directly from the atmosphere; they do not necessarily rely solely on the nitrogen in water. No standards are being proposed for nitrogen as a nutrient and, in general, nitrogen will not be discussed in this SONAR.   The Agency will need to evaluate any nitrogen limited lakes on a case-by case basis. In the case of a nitrogen-limited hypereutrophic lake, a substantial reduction of in-lake phosphorus is usually required to bring the lake back to a phosphorus-limited condition.

<u>Phosphorus</u> is an element, and as noted above, it is commonly accepted as being the nutrient that limits algal biomass in freshwater systems. Total phosphorus (TP) in the water column is a

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[9] Page 640 *in* Wetzel, R. G. 1975, Limnology. W.B. Saunders Co. 743 p.

direct measure of all forms of phosphorus present in a given volume of water (usually expressed as µg/L or parts per billion). Over the years of sampling lakes, most Agency samples have been analyzed for total phosphorus using a colorimetric method (method 365.4, EPA, 1979).[10] The Agency is most interested in measurements of TP.

Additional analysis of phosphorus is operationally separated into particulate or dissolved categories when the sample is filtered. A filter with a standard pore size of 0.45 microns (µm) is usually used. Particulate phosphorus is that phosphorus attached to particles larger than 0.45 µm and retained by the filter; dissolved phosphorus is the phosphorus in the water that passed through the filter. Total, particulate and dissolved phosphorus can be further subdivided analytically into three chemical types: reactive, acid-hydrolysable and organic. These specific forms of phosphorus are typically not measured in eutrophication studies but rather used for detailed studies on the chemical reactivity of phosphorus.

General eutrophication studies can include analysis of TP and total dissolved phosphorus. Total dissolved phosphorus provides an indication of phosphorus that is immediately available for algal uptake. Bio-available phosphorus (BAP) is an estimate of the fraction of total phosphorus that is available for algal growth generally in less than 30 days and is typically greater than total dissolved phosphorus. The percent of BAP varies depending on the phosphorus source. Exhibit EU-6 includes best estimates of the bioavailability of TP by source categories (shown below), and a more detailed discussion of BAP. Bio-available phosphorus assessments are used infrequently and typically only in complex studies where detailed source categorization is needed to evaluate trophic response.

Source Category	TP fraction that is bio-available
Commercial/Industrial WWTP effluent	0.88
POTW Effluent	0.85
Crop Land Runoff	0.58
Forested Land	0.44

As stated, for the purpose of the proposed eutrophication standards and assessing the trophic status of lakes, the Agency is most interested in total phosphorus; and the proposed phosphorus standards are expressed as **Total Phosphorus.** The reasons are summarized below:

- TP indicates the overall trophic condition of an aquatic resource and is used in load response modeling in lake studies;
- Chemical and biological process in lakes allow for the conversion of TP to BAP;
- TP exhibits strong correlations with the amount of algae and water clarity;
- TP is the form typically measured in lakes and in point and nonpoint source load assessments; and
- The extensive state TP data base is the basis for the proposed standards.

[10] Total phosphorus in lakes is measured from an unfiltered surface water sample, usually collected from a boat at the deep point in the lake, or mid-lake, using a 2-meter PVC tube. The tube, called an integrated sampler, is open at both ends and is allowed to fill as it is lowered vertically into the water. With the upper end just below the surface, a stopper is placed into the upper opening; the sampler is raised out of the water and the contents poured into a bottle. The result is an "integrated sample" of the top 2 meters of the lake.

Chlorophyll-a* Chlorophyll is a green pigment in plants including algae. The concentration of chlorophyll-a, one of several green pigments, provides an indirect measurement of the abundance of algae in surface waters. It is a very useful indicator of lake trophic status.

Secchi disk transparency* is a measurement of water clarity. The Secchi disk is a white or white and black disk, suspended in the center on a calibrated rope, such that the disk hangs perpendicular to the rope. The Secchi depth is determined by lowering the disk into the water from a boat until it can no longer be seen. This depth is noted on the calibrated rope; the disk is raised until it is visible again and that depth noted. The average of these two depths is the Secchi disk transparency or Secchi depth. The greater the Secchi disk reading the clearer the water. Secchi depth is inversely correlated with concentrations of TP and chlorophyll-a.

The proposed eutrophication standards are for total phosphorus, chlorophyll-a and Secchi depth. Because these three terms will be used so frequently throughout this SONAR, they will be abbreviated as:

TP	**Total Phosphorus**
Chl-a	**Chlorophyll-a**
SD	**Secchi disk transparency or Secchi depth**

Algae and algae blooms* Algae are very important to lake ecosystems. Like all green plants, they use the sun's energy to grow. They are the foundation of the aquatic food chain: algae → zooplankton → macroinvertebrates (aquatic insects and crustaceans) → small fish → large fish.

Excess nutrients in a lake can result in undesirable amount of algae called "algae blooms", which give the water a green color and reduce water clarity. Algae blooms are all too obvious to lake users in Minnesota. Blooms range from an occasional "nuisance" bloom to very severe blooms that may persist most of the summer. Nuisance or mild blooms are characterized by an obvious green tint to the water and the possibility of thin and patchy accumulations of algae on the surface (e.g. on the windward side of the lake). Mild to moderate blooms often are limited to the latter half of the summer. Severe blooms produce very objectionable green opaque water, floating mats of dead and dying algae (usually dominated by a few species) and unpleasant odors. Also, severe blooms can adversely affect fish populations. As algae die and decay, dissolved oxygen is consumed and it can be reduced below levels needed to support fish. Some algal species associated with severe algae blooms are toxic to animals and humans if ingested. Numerous animal deaths, mostly dogs, have been recorded in Minnesota as a result of ingesting lake water that contained algal toxins.[11]

Aquatic plants or macrophytes – Macrophytes are the submerged or emergent green plants that grow in essentially all lakes. These plants, sometimes inaccurately called "weeds", are a natural and important part of the lake ecosystem. They provide oxygen to the water through photosynthesis; cover for minnows and other small fish, nursery areas for young game fish; and habitat for numerous invertebrates and other fish food organisms. Macrophytes also dampen the

[11] See Web page: http://www.pca.state.mn.us/water/clmp-toxicalgae.html.

erosional impact of waves on the shoreline by absorbing wave energy. Aquatic plants can become very lush in the shallow parts of eutrophic lakes and may become a nuisance to lake users. Because of their value to lakes, particularly to fish populations, the Department of Natural Resources regulates the removal of aquatic plants by lakeshore property owners. In very eutrophic lakes, aquatic plants may die due to the shading effect of the abundant algae; and with the macrophytes suppressed or gone, the severity of algae blooms may be exacerbated.

Trophic status* – Trophic status of a lake refers to the productivity or fertility of a lake. It is typically determined by measuring the concentrations of TP, Chl-a and SD. Trophic status is also reflected in the type of fish and aquatic invertebrate community the lake supports. Lakes are divided into four main trophic categories described below.

Oligotrophic – Oligotrophic lakes have low or very low levels of nutrients. Oligotrophic lakes typically have an algal community low in abundance (low Chl-a levels), very good water clarity, and a less productive fishery, relative to lakes richer in nutrients. Oligotrophic lakes usually maintain dissolved oxygen in the hypoliminion (see below) throughout the summer, and can support native or stocked populations of cold-water fish such as trout. Examples: Lake Superior and Burntside Lake near Ely.

Mesotrophic – Mesotrophic lakes have moderate levels of nutrients and low to moderate levels of Chl-a. Mesotrophic lakes typically have SD readings in the 12 to 20 foot range. Some of Minnesota's most well known and popular fishing and recreational lakes are in this category. Algae blooms will be absent or very rare. Examples: Mille Lacs, Otter Tail, Gull and White Bear Lakes.

Eutrophic – Eutrophic lakes have high levels of nutrients. Water clarity and Chl-a levels are usually acceptable for recreation (swimming) at least part of the summer. Fishing is often very good. Examples: Lake Minnetonka and Bald Eagle Lake in the metro area.

Hypereutrophic – Hypereutrophic lakes have very high levels of nutrients and Chl-a, and poor water clarity. Recreation will be limited most of the summer, algae blooms will be frequent and may be severe. There is a risk of blooms of toxic blue-green algae. The fishery may be dominated by less desirable species, such as bullhead and carp. Example: Como Lake in St. Paul.

As noted, most of the very popular fishing and recreational lakes in Minnesota tend to be mesotrophic to mildly eutrophic. Lakes in these categories can be very susceptible to small increases in TP loading; that is, a small increase in loading can be reflected in a noticeable increase in algae and reduced transparency.

Eutrophication# – Eutrophication refers to the increased productivity of the biological community in waterbodies in response to increased nutrient loading. Eutrophication is usually characterized by increased growth and abundance of algae and other aquatic plants, reduced water clarity, reduction or loss of dissolved oxygen in the hypolimnion, and other chemical and biological changes. If eutrophication proceeds too far, the recreational and aesthetic beneficial uses we expect our lakes to provide can be lost.

Lakes in a completely natural environment (i.e., no human activity) establish a condition of "trophic equilibrium" with the surrounding watershed. That is, lakes establish a natural trophic condition that depends on the morphometry of the lake and the characteristics of the surrounding watershed. The natural trophic condition can range from oligotrophic to eutrophic depending on these variables. The balanced condition persists over the long-term, and eutrophication proceeds very slowly over a time span measured in thousands of years (even millions of years in the case of the rare very old lakes such as the large and deep Lake Baikal in Siberian Russia). The gradual increase in plant productivity in natural lakes seems to be due in part to the gradual filling in of the lake basin by sedimentation and subsequent loss of depth, rather than from an increased rate of nutrient flux from the surrounding undisturbed watershed. As a lake becomes shallower and the water volume decreases, there tends to be an increase in the rate of cycling of available nutrients. It is a fallacy, however, to believe that left alone and without any influence from humans, all Minnesota lakes would become eutrophic in a matter of a few hundred years. After all, Minnesota's lakes have been around for at least 9,000 years (see Section VI.C.3).

<u>Cultural Eutrophication</u># – This term is used to describe the acceleration of eutrophication due to excess nutrient loading from human sources and activities. Lakes in much of the state suffer from cultural eutrophication, usually a result of a combination of point and nonpoint sources of nutrients attributable to human activities. In some cases the acceleration of eutrophication has been very rapid, dramatic and noticeable to even the most casual observer. Lakes that received inadequately treated municipal wastewater such as Lake Washington in Seattle, Minnetonka in the Twin Cities and Shagawa at Ely are good examples. Cultural eutrophication can and has caused a degradation of lake quality and the loss of beneficial uses.

<u>Summer stratification (mixing status</u>*) – Lakes that are deep, relatively small in size, or protected from strong prevailing winds will thermally stratify in the summer months. In such lakes two distinct and separate water layers are maintained by temperature differences throughout the summer. The warmer surface water (<u>epilimnion)</u> is lighter and "floats" on the colder and heavier deeper water (<u>hypolimnion)</u>. A middle zone characterized by a rapid temperature transition, called the thermocline, separates the upper and lower layers. The temperature difference between the epilimnion and hypolimnion often ranges from 10 to 15 ^{o}C, and the resulting difference in density between the warm and cold water makes the stratification quite resistant to destruction by wind energy.

Opposing biological activities take place in the two zones. The epilimnion is the zone of photosynthesis, productivity and growth. Light penetrates the epilimnion, it is in contact with the air, and it tends to circulate and mix within itself from wind energy. The hypolimnion is cut off from the atmosphere and light, and is a zone of decomposition. Because the hypolimnion is cut off from the surface and the light needed to support oxygen producing photosynthesis, the store of oxygen it starts with in early summer is not replenished as long as stratification persists. The supply of hypolimnetic oxygen is progressively depleted by decomposition. In all but oligotrophic lakes the depletion progresses until oxygen is too low to support fish. Thus, fish are restricted to the epilimnion and thermocline in most Minnesota lakes in the summer. Sustaining adequate dissolved oxygen in the hypolimnion is the critical consideration in the development of the proposed eutrophication standards for lakes that support trout species (see Section VI.E).

Low productivity in the epilimnion of oligotrophic lakes means a low decomposition rate in the hypolimnion and a slower rate of oxygen depletion. This allows the oxygen stored in the hypolimnion to last throughout the summer, which allows trout and other fish that need cold water temperatures to live in the hypolimnion. This is the reason oligotrophic trout lakes need to be protected from even a slight increase in productivity, because it could result in depletion of the hypolimnetic oxygen and loss of the trout population (see Section VI.E and Figure II-7).

After ice-out in the spring and before ice-up in the fall, when water temperatures are the about the same from top to bottom, all the water in the lake can mix and circulate in response to wind energy. This is called the spring and fall "turnover." Turnover restores oxygen to the whole water column in lakes that stratify.

Lakes that are shallow and exposed to wind energy typically do not stratify. A temporary stratification may become established during a period of relative calm only to be destroyed when the wind picks up. A pattern of periodic temporary stratifications followed by mixing in some lakes can increase the amount of "internal loading" of TP to the water column from phosphorus-rich bottom sediments. Phosphorus is released to the anoxic water immediately above the sediments during the short periods of stratification, and this TP is then mixed with the whole lake when wind energy breaks down the relatively weak temporary stratification. The released TP is thereby made available to algae for growth. Internal loading can be an important source of TP to consider when identifying sources of TP loading to certain lakes.

<u>Lake morphometry</u>* – Morphometry refers to the physical characteristics and shape of lake basins, such as surface area, maximum depth, mean depth, percent littoral zone and shoreline complexity. These and other factors affect the natural trophic status of a lake, and they can affect how a lake responds, or its vulnerability, to nutrient loading. For example, shallow lakes tend to be more eutrophic than deep lakes.

It is unlikely the average person needs a definition of "lake", but for the purposes of the proposed rule, the following terms will be defined to differentiate lakes, from shallow lakes, reservoirs and wetlands.

<u>Lake</u># – A lake is defined as an enclosed basin filled or partially filled with standing fresh water with a maximum depth greater than 15 feet. Most lakes have natural outlets and inlets, but some may have one but not the other or neither.

<u>Shallow lake</u># – A shallow lake is defined as an enclosed basin filled or partially filled with standing fresh water with a maximum depth of 15 feet or less, or where 80 percent or more of the lake area is littoral (shallow enough to support emergent and submerged rooted aquatic plants). Shallow lakes typically do not thermally stratify during the summer. Shallow lakes may need to be differentiated from wetlands and deeper lakes on a case-by-case basis. It is particularly difficult to define reliable criteria that will work in all cases to separate shallow lakes from wetlands. Shallow lakes and wetlands are not static. A waterbody may fit the definition of shallow lake one year and the definition of wetland the next, depending on many factors, not the

least of which is the amount of rainfall. Wetlands are already defined in the existing rule (Minn. R. 7050.0186, subp. 1a).

Reservoir# – A reservoir is a waterbody in a natural or artificial basin or watercourse where the outlet or flow is artificially controlled by a structure such as a dam. Run-of-the-river reservoirs are distinguished from river systems by the length of time the water resides in the reservoir before continuing on downstream. Reservoirs may not respond to nutrient enrichment the same way or to the same degree a natural lake does, and reservoirs have limnological attributes that are different from lakes (Exhibit EU-17, pages 3-4). For this reason site-specific eutrophication standards will often need to be determined for reservoirs on a case-by-case basis. The narrative portion of the proposed eutrophication standards will state this (Section VI.L.6).

Reference lake* – A reference lake is a lake minimally impacted by point or nonpoint sources of pollution. They are representative of the ecoregion in which they are located, and they are used as a base for comparing the quality of other lakes in the same ecoregion or geographical area. Reference lakes are often not the most pristine lakes in the ecoregion.

Summer-average* – Lakes are sampled during the summer growing season, typically from late May through September. A common lake sampling regime is one sample per month of the surface water through the summer, or about four to five samples per year. Total phosphorus, Chl-a and SD and other water quality characteristics are measured at each visit and the results are averaged to obtain "summer average" values. Summer averages for two or more years may then be averaged together for comparison to the eutrophication standards.

Ecoregion* – Ecoregion is not a limnological term but the ecoregion concept is central to the development of proposed eutrophication standards for Minnesota, and the term will be frequently mentioned in this SONAR (see Section III.D.2). Ecoregions are areas with similar ecological systems and characteristics such as surface geology, soils, land use, and native vegetation. Minnesota has seven ecoregions.

C. LAKE STANDARDS, A BRIEF HISTORY AND THE 2003 RULEMAKING [II. background]

The Agency is proposing numeric eutrophication standards for lakes in this rulemaking. In the assessment factor rulemaking, completed in 2003, the Agency added substantial detail to the long-standing but brief narrative nutrient standard in existing Minn. R. 7050.0150. The purpose was to make the assessment process for determining the impairment of lakes due to excess nutrients more transparent by including the criteria (or factors) used in the assessment process in the rule, which was why this was called the "assessment factor" rulemaking. That rulemaking laid much of the groundwork for the promulgation of numeric standards in this rulemaking. The proposed eutrophication standards, like the existing narrative standard, are designed to protect the designated beneficial uses which lakes provide, including water-related recreation, fishing and aesthetic enjoyment. The promulgation of eutrophication standards in this rulemaking is the culmination of 20 years of research and planning by the Agency leading up to adoption of numeric standards for lakes. This is not a new undertaking by the Agency.

The Agency explored options for the adoption of nutrient standards for lakes in the mid-1980s. A report issued by an Agency nonpoint source standards work group in January 7, 1986 recommended the adoption of standards for lakes and outlined a plan to accomplish that, which is remarkably similar to what the Agency is now proposing (Exhibit EU-7). The report:

- Noted the concern expressed to the Agency by citizens about deteriorating lake water quality;
- Recommended numeric standards over enhanced narrative standards;
- Recommended standards for phosphorus, chlorophyll-a and possibly Secchi depth;
- Noted that the natural variability in lake quality must be addressed as part of the standards;
- Noted that the ecoregion concept (new at the time) might provide at least a partial solution to the lake diversity issue; and
- Noted the actions of other states that had adopted nutrient standards of various types.

This report laid out a time-table for action and called for final adoption of numeric lake standards by May of 1989. Needless to say, the recommendations of this report were not acted upon in this time frame.

The effort to develop and promulgate lake standards was taken up again by the Agency in the mid-1990s, due in part to the growing problem of eutrophication of Minnesota's lakes. A memorandum from staff member Steven Heiskary to the manager of the Monitoring and Assessment Section in January, 1995 recommended the adoption of numeric, ecoregion-based eutrophication standards (Exhibit EU-8). This memo suggested the formation of two work groups within the Agency, one to review the existing phosphorus effluent limit and one to review ambient eutrophication standards. Mr. Heiskary's memo also discussed plans for involving interested parties and the public at large in the process, and it established a schedule leading up to rulemaking. The standards would be based on data from the Agency's lake monitoring program. The work of the two workgroups was summarized in a 20-page report issued in 1996 (Exhibit EU-9). Other priorities for water quality standards rulemaking once again forced the postponement of the promulgation of eutrophication standards[12]. Both Heiskary's memo and the report discuss some of the attributes of numeric standards and the issues that need to be addressed in the development of eutrophication standards, which are still relevant today. In particular, the report addressed:

- "Citizens, local units of government, and other state agencies all look to us [the Agency] for leadership on this issue." The issue referred to in this quote is nutrient loading to lakes, particularly from nonpoint sources.
- The positive link between lake standards and the basin planning process that has highlighted nutrient loading as an important issue in several watersheds;
- The cultural eutrophication of rivers;
- Using the ecoregion framework as a basis for separating lakes into categories;

[12] The major rulemaking priority in the 1990s for Minnesota was the adoption of the federally mandated Great Lakes Initiative, Minn. R. ch. 7052.

- The large variability in quality and characteristics among lakes; and
- Standards will be exceeded in a large number of lakes, and TMDLs may be required for waterbodies that don't meet the standards.

The Agency's response to the recommendations in the 1996 report was to focus attention on the implementation of the 1 mg/L TP effluent limit in existing Minn. R. 7050.0211, subp. 1a. Another work group was set up to prepare a more detailed "Phosphorus Strategy" (Strategy) in the late-1990s. The purpose of developing the Strategy was to clarify, for Agency staff as well as outside parties, how the Agency planned to implement the TP limit for point source discharges in the future. The Strategy (Exhibit PL-1c) will be discussed in more detail in Section IX.C.

Following the completion of the Strategy in 2000 and the placement of lakes on the 2000 and 2002 303(d) lists due to excess nutrients (see Section IV.C), outside parties asked the Agency to adopt the "assessment factors" into rule. As mentioned above, this rulemaking was completed in 2003 and included the adoption of detailed assessment guidance or "factors" that greatly expanded on the general narrative standard that prevents excess plant growth due to nutrient loading. The broadly worded narrative standard is quoted below. It has not changed since it was adopted as part of the first state-wide water quality rule in 1967.

> [Minn. R. 7050.0150, subp. 3] …*there shall be no material increase in undesirable slime growths or aquatic plants, including algae,…*

Important principles and issues surrounding the assessment of lake trophic status were discussed in the SONAR for the assessment factor rulemaking and in Agency response to comments. The assessment factors that were adopted and the rulemaking record established an important record for the proposed numeric standards in this rulemaking (Exhibits EU-46a, EU-46b and EU-46c). The narrative standard as it reads now after the 2003 rulemaking is shown below:

> *Subp. 5.* ***Impairment of waters due to excess algae or plant growth.*** *In evaluating whether the narrative standards in subpart 3, which prohibit any material increase in undesirable slime growths or aquatic plants including algae, are being met, the commissioner will use all readily available and reliable data and information for the following factors of use impairment:*
>
> *A. representative summer-average concentrations of total phosphorus and total nitrogen measured in the water body throughout the summer growing season;*
> *B. representative summer-average concentrations of chlorophyll-a measured in the water body throughout the summer growing season;*
> *C. representative measurements of light transparency in the water body, as measured with a Secchi disk in lakes or a transparency tube in rivers and streams, throughout the growing season; and*
> *D. any other scientifically objective, credible, and supportable factor.*
> *A finding of an impaired condition must be supported by data showing elevated levels of nutrients in item A, and at least one factor showing impaired conditions resulting from nutrient over-enrichment in items B and C. The trophic status data described in items A to D must be assessed in light of the magnitude, duration, and frequency of nuisance*

algae blooms in the water body; and documented impaired recreational and aesthetic conditions observed by the users of the water body due to excess algae or plant growth, reduced transparency, or other deleterious conditions caused by nutrient over-enrichment.

Assessment of trophic status and the response of a given water body to nutrient enrichment will take into account the trophic status of reference water bodies; and all relevant factors that affect the trophic status of the given water body appropriate for its geographic region, such as the morphometry, hydraulic residence time, mixing status, watershed size, and location. The factors in this subpart apply to lakes and, where scientifically justified, to rivers, streams, and wetlands.

In summary, the expanded narrative standard added the following concepts into Minn. R. 7050.0150:

- In assessing the trophic status of lakes, the Agency must compare eutrophication criteria to the in-lake measurements of TP, Chl-a and SD **averaged** over the summer growing season.
- An impaired condition must be supported by TP concentrations above appropriate criteria (causal factor), **and** either elevated Chl-a concentrations, or poor water clarity as measured by SD (response factors).
- The magnitude, duration and frequency of algae blooms, and the recreational suitability and aesthetic conditions reported by lake users are valid data (user perception data).
- Assessment of a lake must take into account all the factors that affect trophic status, such as lake morphometry, location, mixing status and watershed size.

In addition, nine definitions specifically related to the assessment of lake trophic status were added to Minn. R. 7050.0150, subp. 4 in this rulemaking. Again, the definitions for these terms, now in rule, are critical to the proposed numeric eutrophication standards. The Agency is proposing to add six more definitions to Minn. R. 7050.0150, subp. 4, as part of the proposed eutrophication standards (Table II-2).

Table II-2. Terms Currently Defined and Proposed New Definitions in Minn. R. 7050.0150, subp. 4 Associated with Proposed Eutrophication Standards.

Definitions Adopted in 2003	Definitions Proposed as Part of this Rulemaking
Chlorophyll-a	Eutrophication and cultural eutrophication
Ecoregion	Lake
Hydraulic residence time	Measurable increase or impact
Lake morphometry	Natural causes
Mixing status	Reservoir
Nuisance algae bloom	Shallow lake
Secchi disk transparency	
Summer average	
Trophic status	

As noted, the Agency acted on a recommendation of the 1996 report by establishing a work group to prepare a more detailed "Phosphorus Strategy." The Strategy laid the foundation for the proposed extension of the TP effluent limit to new and expanding dischargers greater than a certain size (Exhibit PL-1c). The Strategy is discussed in Section IX.C.

III. EPA GUIDANCE, EPA AND AGENCY NUTRIENT CRITERIA

A. EPA GUIDANCE [III. EU criteria & guidance]

The U.S. Environmental Protection Agency (EPA) reports that excess nutrient loading is one of the leading causes of impairment of the nation's surface waters, based on their review of state lists of impaired waters (Exhibit EU-16).[13] In 1987, the North American Lake Management Society (NALMS) established a task force on Lake Water Quality Standards to determine the thinking of states regarding the need for lake standards, and to gather information related to existing lake standards. NALMS issued a report in 1992 summarizing the information assembled by the committee, which used the work of seven states including Minnesota as examples (Exhibit EU-25).[14]

The re-authorized Clean Water Act of 1987 (Section 319) established the need to develop new or implement existing standards as a basis for submitting and evaluating clean-lakes projects eligible for 319 funding. EPA began a nutrient criteria development program in the 1990s, and moved quickly from 1998 to 2001 to publish a number of documents, including a nutrient strategy, nutrient criteria for lakes and rivers, technical guidance for states and tribes, fact sheets and policy memos, which are the exhibits listed below.

Exhibits:

- EU-10. EPA National Nutrient Strategy
- EU-11. EPA Lakes and Reservoirs in Nutrient Ecoregion VI, NGP and WCBP
- EU-12. EPA Lakes and Reservoirs in Nutrient Ecoregion VII, NCHF
- EU-13. EPA Lakes and Reservoirs in Nutrient Ecoregion VIII, NLF
- EU-14. EPA Fact sheet, Ecoregional Nutrient Criteria, Oct. 2002
- EU-15. Federal Register, notice of final nutrient criteria, January 9, 2001
- EU-16. EPA Nutrient Criteria Technical Guidance Manual, Lakes and Reservoirs EPA-822-B00-001
- EU-17. EPA Memo from Geoffrey Grubbs to Water Directors, etc. Development and adoption of nutrient criteria into water quality standards, November 14, 2001.

Numeric water quality criteria should reflect the latest scientific knowledge on the identifiable effects of pollutants on public health and welfare, aquatic life, and recreation. Water quality criteria are qualitative estimates of the concentration of a water constituent, which when not exceeded, will ensure water quality sufficient to protect a designated water use. Nutrient criteria are developed in a very different way than traditional toxicity-based criteria (see Section III.E).

It is worth mentioning that the latest round of nutrient criteria from the EPA is not the first time nutrient criteria have been issued by that agency. In a letter dated April 20, 1973, EPA recommended that the Agency adopt TP standards for both flowing water and lakes by 1983

[13] The 305(b) and 303(d) reports, compiled by states and authorized tribes every two years, as required by the Clean Water Act (see SONAR Book I, Section II.B).
[14] NALMS committee chaired by Steven Heiskary of the Agency staff.

(Exhibit EU-18). The recommended TP values were 200 µg/L for free flowing streams and 50 µg/L for lakes. The recommended values were a little more lenient than the criteria in the support document attached to the letter, which were 100 µg/L for free flowing streams, 50 µg/L in any stream where it enters a reservoir or lake, and 25 µg/L in any reservoir or lake[15]. The support document stressed that these numbers were strictly guidance to states, and the criteria adopted could be more or less stringent depending on the local conditions in each state. The support document also discusses issues relevant today, such as the need to address situations when standards cannot be met and the variability in trophic condition among lakes.

The EPA expects states to adopt nutrient criteria[16] into their state water quality rules (e.g. see Exhibit EU-49). The EPA has indicated a willingness to step in and promulgate nutrient criteria for any state that fails to take action on their own (Exhibits EU-10, page 6; EU-15, page 1674; EU-17, page 3). At the same time, EPA repeatedly emphasizes the importance of states developing the nutrient standards that best fit the resources and nutrient source issues in their state. EPA intends for states to use the nutrient criteria, published under section 304(a) of the Clean Water Act, as guidance in the development of their own proposed nutrient standards (Exhibits EU-11, EU-12 and EU-13). EPA is providing states considerable flexibility, as the following quote from EPA's 2002 fact sheet indicates (Exhibit EU-14):

> *What are EPA's expectations for these* [nutrient] *criteria?*
>
> *EPA expects that states and tribes will use these three ecoregional nutrient criteria documents as starting points to identify more precise numeric levels for nutrient parameters needed to protect aquatic life, recreation, or other uses on site-specific or subregion-specific conditions. EPA expects these more precise numerical levels to be developed on a smaller geographical scale than the ecoregional values presented in the nutrient water quality criteria documents. States and tribes may also develop criteria using other scientifically defensible methods and appropriate water quality data or simply adopt EPA's recommended water quality criteria in their water quality standards.*

The above quote sums up exactly what the Agency has done to develop the proposed eutrophication standards. Key aspects of EPA's statement above are *"more precise numerical levels to be developed on a smaller geographical scale"* and the protection of uses *"on site-specific or subregion-specific conditions"*. The combination of the Agency's ecoregion-specific approach, plus the division of lakes into four types (lake trout, stream trout, lakes in general plus reservoirs and shallow lakes), is entirely consistent with EPA's guidance. In addition, the specific beneficial uses emphasized, within the overall Class 2 aquatic life and recreation umbrella, are tailored to the characteristics of each lake type.

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[15] The 1973 criteria seem to be loosely based on recommendations in, *Water quality criteria, Report of the National Technical Advisory Committee* (Federal Water Pollution Control Administration, Washington DC, page 56, commonly referred to as the "Green Book"). Subsequent EPA criteria were in the form of a narrative ("Blue Book," 1972), or a repeat of the 25/50/100 µg/L criteria (see text) in the 1986 EPA "Red Book."

[16] Throughout this document the terms "nutrient" and "eutrophication", when associated with "criteria" or "proposed standards", are used essentially interchangeably. EPA uses the term "nutrient" in referring to their criteria, which include criteria for chlorophyll-a and a measurement of water clarity (e.g., Secchi depth) as well as the nutrients phosphorus and nitrogen. The Agency prefers the term "eutrophication" to reflect the fact that the proposed standards are not just for nutrients; this is the term we associate with the proposed standards.

Specifically, EPA recommended the following three options, in order of preference as guidance to the states (Exhibit EU-15, page 1673).

1. Develop nutrient criteria that fully reflect local conditions and protect specific designated beneficial uses, using processes described in EPA's technical guidance. Nutrient standards the states adopt can be either numeric [as proposed by the Agency] or procedures to translate a narrative standard into a quantitative endpoint.

2. Adopt EPA's Section 304(a) criteria, either as numeric standards or as procedures to translate a narrative standard into a quantitative endpoint.

3. Develop nutrient criteria protective of designated beneficial uses, using other scientifically defensible methods and appropriate water quality data.

In Mr. Grubbs' memo (Exhibit EU-17, page 6), EPA presents a somewhat different set of three options. In Exhibit EU-17 the first option is the same as above, the second option is the same as number three above, and the third option is to carry out use attainability analyses (UAA) to refine beneficial uses. The Agency prefers not to use the UAA option as part of any general approach to setting eutrophication standards. The Agency is concerned that the UAA approach would require a huge and completely unacceptable amount of staff time. Given the hundreds if not thousands of waterbodies that potentially might require a UAA, and the fact that a change in use classification requires rulemaking, with an uncertain outcome, the UAA option is considered impractical.

The Agency used a combination of EPA's options one and three listed above to develop the proposed eutrophication standards (Exhibit EU-14). The Agency's proposed eutrophication standards reflect:

- Localized conditions in Minnesota, including the diversity within the state (ecoregions);
- Levels of TP, Chl-a and SD designed to protect a range of designated Class 2 beneficial uses; and
- Scientifically defensible methods and a very robust and multifaceted Minnesota water quality data base upon which the proposed numeric standards are based.

B. RTAG MEETINGS [III. EU criteria & guidance]

As EPA started to develop nutrient criteria for the nation they also formed Regional Technical Assistance Groups (RTAG), also called "regional nutrient teams" (Exhibit EU-10). The RTAGs consist of state and tribal representatives that met with staff from EPA and other federal agencies to develop more refined and localized nutrient criteria using approaches described in the EPA technical guidance (Exhibit EU-16). Minnesota was part of the EPA Region 5 RTAG group, which usually met in Chicago[17]. The Region 5 RTAG continues to meet today. As part of

[17] EPA Region 5, based in Chicago, includes Minnesota, Wisconsin, Michigan, Ohio, Indiana and Illinois.

RTAG, EPA designated a regional nutrient coordinator for each of the 10 EPA regions[18]. Their function was to facilitate the collection and analysis of local nutrient data, provide technical assistance to the states on criteria development, report progress to EPA Headquarters in Washington D.C., and award financial assistance. EPA encouraged states to have their RTAG provide a technical review of proposed state nutrient standards.

The Minnesota local data-driven and ecoregion-based approach is recognized as a model by EPA. The Agency started monitoring lakes, developed nutrient criteria, and using them in lake programs and impairment assessments ahead of most other states. Minnesota has shared this experience with RTAG, the North American Lake Management Society (NALMS) and with other limnological organizations at a variety of local and national conferences on numerous occasions, including a recent NALMS meeting in Madison, Wisconsin in November, 2005, and at the All States National Criteria meeting in Dallas, Texas in February, 2006. Steve Heiskary of the Agency staff is a past president of NALMS, has published numerous papers on limnological topics, was one of the authors of the EPA nutrient criteria technical guidance (Exhibit EU-16), and he served on a panel of experts that provided an external peer review of EPA's criteria documents (Exhibits EU-11, EU-12 and EU-13).

C. STATE NUTRIENT PLANS [III. EU criteria & guidance]

The EPA proposed a simple two-step process for the states to follow that would culminate in the adoption of nutrient standards by the state (Exhibit EU-17). Step one was for each state to submit a plan to EPA that described how the state proposed to develop nutrient criteria and a schedule for adoption. Step two was the promulgation and adoption of the nutrient criteria into the state's rules.

The Agency submitted a final plan for EPA's consideration in April 2003 (Exhibit EU-19a; cover letter, Exhibit EU-20). The plan has undergone periodic updating since; for example, see Exhibits EU-22a and 22b. The most recent version of the plan is Exhibit EU-19b. In its plan the Agency outlined:

- A strategy for developing eutrophication standards for lakes and rivers,
- The causal (TP) and response variables (Chl-a and SD) for which standards will be proposed,
- A description of the Agency's approach and data utilized to arrive at the proposed standards (Attachment I to the plan), and
- A time-table for adopting the standards.

The EPA approved Minnesota's 2003 plan in a letter dated May 5, 2003 (Exhibit EU-21), and EPA has approved the most recent update as well (September 2006). In Exhibit EU-21, EPA reiterates the possibility of promulgating nutrient standards for Minnesota, if the Agency fails to meet the terms agreed upon in the plan. The Agency is lagging behind the schedule provided in the 2003 plan for adoption, but EPA wants states to complete their own adoption process, and so

[18] The EPA Region 5 coordinator, formally Dr. Candice Bauer, is now Edward Hammer (February 2006).

far EPA has not indicated it plans to take action. The 2006 update reiterates the Agency's intension to adopt the proposed eutrophication standards in this rulemaking.

D. EPA NUTRIENT (EUTROPHICATION) CRITERIA [III. EU criteria & guidance]

1. Introduction [III.D. EU criteria & guidance]

The EPA developed nutrient criteria under the authority of Section 304(a) of the Clean Water Act. EPA's nutrient criteria are unlike essentially all other 304(a) criteria. Most EPA 304(a) criteria developed over the years are for toxic substances. Because nutrients are not regulated as toxins, the data and methods used to establish nutrient criteria are very different from the data and methods EPA uses to develop criteria based on the toxicity of a substance to aquatic life, humans or wildlife. Nutrient criteria are based on trophic condition monitoring data from lakes and reservoirs across the nation. Toxicity-based criteria are based mostly on laboratory derived, toxicity test data for aquatic organisms. Also, EPA's nutrient criteria are regional, specifically tailored to ecoregions, whereas most EPA 304(a) criteria are applicable nation-wide.

2. Ecoregions [III.D. EU criteria & guidance]

Dividing the nation geographically into zones with similar geological and ecological characteristics called **ecoregions** is fundamental to the development of nutrient criteria by EPA and the Agency's proposed eutrophication standards. Lake characteristics reflect the ecoregion in which they are located. Ecoregions have been mapped by the EPA for the lower 48 states based on overlaying maps of land form, soil type, land use, and potential natural vegetation. Ecoregions are areas where these features and surface water resources are similar. The Agency added a definition for ecoregions in the 2003 rulemaking as follows:

> [Minn. R. 7050.0150, subp. 4] *B. Ecoregion means an area of relative homogeneity in ecological systems based on similar soils, land use, land surface form and potential natural vegetation.*

Minnesota is characterized by seven ecoregions (Exhibit EU-23), four of which contain 98 percent of Minnesota's lakes; these four are the:

- Northern Lakes and Forests (NLF),
- North Central Hardwood Forests (NCHF),
- Western Corn Belt Plains (WCBP), and
- Northern Glaciated Plains (NGP) ecoregions

Eutrophication standards are proposed for these four ecoregions, but the proposed standards for the WCBP and NGP ecoregions in southern Minnesota are the same. Thus, in effect, the proposed standards can be summarized as applicable to the lakes in the following two distinct regions with a transition zone in between:

- Northeastern Minnesota forests, NLF

- Southern Minnesota prairie, WCBP and NGP
- A transitional zone of predominately deciduous forest, NCHF

Major drainage basins within the state may drain water from one or more ecoregions. For example, the Lake Superior basin drains a portion of just one ecoregion, NLF, while the Red River Basin drains portions of five ecoregions. Ecoregions are the framework of choice for developing nutrient criteria as per the EPA technical guidance (Exhibit EU-16).

The EPA ecoregion-based nutrient criteria relevant to Minnesota are found in three documents, Exhibits EU-11, EU-12 and EU-13. The EPA national nutrient criteria were developed for 14 "aggregate" ecoregions. The EPA aggregate ecoregions include one or more "sub-ecoregions", called level III ecoregions. The level III ecoregions are what the Agency is using. Table II-3 lists the EPA aggregate ecoregions and the smaller scale level III ecoregions in Minnesota for which eutrophication standards are being proposed.

Table II-3. EPA Aggregate Ecoregions and Corresponding Minnesota (Level III) Ecoregions. Ecoregions in Bold Contain 98 Percent of Lakes in Minnesota.

EPA Aggregate or "Nutrient" Ecoregions			**Includes these Level III Ecoregions in Minnesota**	
No.& Ex.	Name	General Description	No.	Name
VI (Ex.EU-11)	Corn belt and northern great plains	Rolling plains dominated by moist fertile soils and highly productive cropland	46	**Northern glaciated plains**
			47	**Western corn belt plains**
			48	Lake Agassiz plain (Red River valley)
VII (Ex.EU-12)	Mostly glaciated dairy region	Rolling till plains and hills, largely forested, dairy and livestock farming	51	**North central hardwood forest**
			52	Driftless area
VIII (Ex.EU-13)	Nutrient poor largely glaciated upper Midwest and northeast	Extensively forested, nutrient-poor soils, cool and moist, limited cropland, short growing season.	50	**Northern lakes and forest**
			49	Northern Minnesota wetlands

No.: EPA assigned Roman numerals to aggregate ecoregions and Arabic numbers to level III ecoregions.
Ex. means Exhibit.

3. <u>EPA Nutrient Criteria</u> [III.D. EU criteria & guidance]

To develop the numeric nutrient criteria, EPA applied an empirical, statistically-based approach to the lake data for each aggregate and level III ecoregion. They used data spanning a 10-year period for lakes and selected percentile values from the distribution of that data, to arrive at numeric criteria.

EPA developed criteria for TP, Chl-a and SD. In addition, EPA developed criteria for total nitrogen, total kjeldahl nitrogen, and nitrite plus nitrate. The EPA TP, Chl-a and SD criteria are of most interest to the Agency. The Agency is not proposing any nitrogen standards, mainly because TP is almost always the limiting nutrient in Minnesota lakes, and we have a 20 year history of assessing lake trophic status using TP (and Chl-a and SD) data.

The EPA criteria are intended to represent conditions that are minimally impacted by human activity, and to be protective of aquatic life and recreational uses. The EPA criteria documents provide details on how the criteria were developed, including data sources, QA/QC procedures, number of data points for each parameter and their statistical methods (Exhibits EU-11, EU-12 and EU-13). The EPA approach can be summarized as follows:

- Assembled representative data for lakes and reservoirs for a 10-year period (1990-1999), for TP, Chl-a and SD (plus nitrogen) data for each aggregate ecoregion.
- Data collection and analysis followed QA/QC procedures; it was screened for duplication, and data for waterbodies receiving a permitted discharge were not used. Data spanning all four seasons, or three seasons if winter data were missing, was used in the analysis.
- All data was from STORET[19], and much of the data was the product of state monitoring programs.
- Used the data to establish reference conditions for lakes in each ecoregion. Reference site conditions are based on a population distribution of the data. Models were not used.
- Reference conditions were defined as the 75th percentile values from the distribution of a subset of data representing **reference lakes**; or the 25th percentile values from the distribution of the data representing **all lakes** in the aggregate ecoregion.

The EPA's preferred method for determining the criteria was to use the 75th percentile value from lakes identified as minimally impacted, the reference lakes. The second option was to use the 25th percentile value from data for all lakes. The fact that reference lakes are typically not identified in most of the aggregate ecoregions, precluded EPA from using the preferred approach. They anticipated that the states would provide information on reference lakes. EPA compared 25th percentile values for all lakes to the 75th percentile values from reference lakes, including data from Minnesota, and concluded that the 25th percentile (all lakes) was a reasonable approximation of the 75th percentile (reference lakes). Table II-4 summarizes the EPA nutrient criteria for Minnesota ecoregions based on the 25th percentile values.

[19] STORET means EPA water quality data STOrage and RETrieval system.

Table II-4. EPA Nutrient Criteria for Aggregate Ecoregions (shaded rows) and for the Four Level III Ecoregions in Minnesota; 25th Percentile Values (see text).

Ecoregion: Aggregate, Level III	**Ecoregion Name**	**Parameter**		
		TP, µg/L	**Chl-a, µg/L See note**	**SD, meters**
Aggregate, VI	Corn belt	37.5	8.59	1.36
Level III, 46	NGP	90	6.5	1.46
Level III, 47	WCBP	55	14.6	1.23
Aggregate, VII	Dairy region	14.75	5.23	3.33
Level III, 51	NCHF	20	5.0	3.20
Aggregate, VIII	Nutrient poor	8.00	2.39	4.93
Level III, 50	NLF	9.69	2.46	4.2

Chl-a values measured by the spectrophotometric method with acid correction.

E. AGENCY NUTRIENT (EUTROPHICATION) CRITERIA [III. EU criteria & guidance]

1. Development of Agency Nutrient Criteria [III.E. EU criteria & guidance]

Minnesota's lakes and reservoirs are currently protected from cultural eutrophication by a narrative standard in Minn. R. 7050.0150, subp. 5 (Section II.C). As already mentioned, this standard was substantially enhanced in the assessment factor rulemaking. The story of the development of the Agency's nutrient (eutrophication) criteria is really the story of the development of the proposed eutrophication standards (Exhibit EU-1). The criteria have been refined and expanded (e.g., addition of separate standards for shallow lakes), but the nutrient criteria developed in the late-1980s are clearly the precursors of the proposed standards. For this reason, the development of the criteria is introduced here and described in more detail in Section VI.D.

In the mid-1980s the Agency started applying the newly published ecoregion framework to existing lake water quality data. Distinct regional patterns in lake trophic status, morphometry and fishery ecological class were identified (Exhibits EU-24 and EU-27). This led to the selection of several reference lakes in each ecoregion for further monitoring. Reference lakes are minimally impacted by human activity but representative of lakes in the respective ecoregions. Data for the reference lakes was analyzed by ecoregion and the results reported in 1990, in the form of an Agency guide for lake assessments (Exhibit EU-28). Examples of how the reference lake data have been used as a basis for evaluating lake condition are in Exhibit EU-29. These data were particularly useful for establishing criteria for TP and the relationships between TP and the frequency and severity of nuisance algal blooms (Exhibit EU-30).

The 1990 ecoregion-based TP criteria are shown in Table II-5. The overall approach used to develop these criteria is consistent with current EPA guidance in Exhibit EU-16, which came later.

Table II-5. Ecoregion-based Total Phosphorus Criteria for Minnesota Lakes.

Ecoregion	Use and Level of Support	TP Criterion
Northern Lakes and Forests	Cold water fishery Full support	< 15 µg/liter
Northern Lakes and Forests	Primary-contact recreation and aesthetics Full support	< 30 µg/liter
North Central Hardwood Forests	Primary-contact recreation and aesthetics Full support	< 40 µg/liter
Western Corn Belt Plains and Northern Glaciated Plains	Primary-contact recreation, Full support	< 40 µg/liter
Western Corn Belt Plains and Northern Glaciated Plains	Primary-contact recreation, Partial support	< 90 µg/liter

Following closely behind the development of the ecoregion-specific TP criteria, the Agency developed criteria for Chl-a and SD (response variables, Exhibit EU-1).

2. Criteria for Causal and Response Variables [III.E. EU criteria & guidance]

Excess nutrients, particularly phosphorus are the **cause** of eutrophication. Algae growth, green water, algae blooms and floating mats of blue-green algae, loss of water clarity and possible loss of aquatic life and recreational uses are the **response** to the nutrients. As stated, standards are being proposed for one causal variable, TP and two response variables, Chl-a and SD. The Agency believes it is important to have both the cause and the response represented in the numeric standards; and to have standards for two response variables. While rare in lakes, it is possible for the cause (TP) to be at high concentrations, but not completely expressed in the normal response. This is the reason the Agency is proposing the TP standard plus just one of the two response standards must be exceeded to have an exceedance of the standard (Section VI.L.3).

3. <u>Use of Agency Nutrient Criteria</u> [III.E. EU criteria & guidance]

Since their establishment in 1988, the TP criteria have been used in a variety of lake programs. Nutrient criteria have played an important role in the protection and restoration of lake water quality in Minnesota. The criteria can be used with existing regulatory, management, and educational programs. Beginning in 2002 the three criteria (TP, Chl-a and SD) have been used to assess lakes for possible impairment due to excess nutrients for listing on the impaired waters list (303(d)). Below is a list of programs where the TP and response criteria have been used.

1. Assess condition of lakes for the 305(b) water quality status report to EPA and Congress, and the 303(d) impaired waters list.

2. Use in prioritizing and selecting nonpoint source projects to be funded through the Clean Water Partnership Program (Minn. Stat. §§115.091 to 115.103 (Supp. 1987)), and the federally funded Section 314 Clean Lakes and Section 319 Nonpoint Source Management Programs authorized by the Clean Water Act.
3. For use by resource managers in developing water quality management plans. For example, there are currently over 80 water management organizations in Minnesota preparing comprehensive local water management plans required or authorized under Minn. Stat. §473.878 or Minn. Stat. ch. 110B.
4. Use as an educational tool for communicating what can reasonably be expected in terms of lake quality in a given lake.
5. Serve as reasonable targets or goals for degraded lakes (e.g., 303(d) listed lakes).
6. Guide enforcement and permitting decisions (e.g. effluent limits, stormwater permits, feedlot and land application permits).
7. Help guide interpretations of nondegradation provisions.

IV. NEED FOR PROPOSED EUTROPHICATION STANDARDS

A. INTRODUCTION [IV. EU standards, need]

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the need for and the reasonableness of the rules as proposed. In general terms, "need" means that the Agency must present the reasons for making the proposed changes to Minn. R. ch. 7050, and for the proposed new Minn. R. ch. 7053. Also, need implies that a problem exists that needs to be fixed or dealt with through administrative attention. This Section of SONAR Book II will discuss why the proposed eutrophication standards are needed.

B. A TOOL TO HELP PROTECT VERY VALUABLE RESOURCES [IV. EU standards, need]

No one doubts the value and importance of lake resources to the state of Minnesota. From the Governor on down, people express the importance of clean lakes and good water quality (see Sections II.A and X.B). The proposed eutrophication standards will provide an important additional tool to help protect these resources from excess nutrient loading, the leading cause of lake impairment.

The Agency receives many calls from citizens with complaints about water quality conditions in specific lakes. Records from 1987, for example, show that the Agency received 338 complaints and 412 requests for technical assistance from citizens, lake associations, watershed districts, and other lake management groups. Analysis of 110 complaints showed the most commonly perceived problems were: (1) excessive algae and plants (42%), (2) lake water quality problems detrimental to human health (22%), and degraded lake water quality (12%). A significant number of citizens responding to questions about recreation suitability stated that their lake was greatly impaired for swimming or aesthetic enjoyment. Citizens attributed their lake problems to nonpoint sources of pollution in 88 percent of the complaints and to point sources in about 12 percent[20]. The two most commonly reported sources affecting lake water quality were failing septic tanks and feedlots.[21] About 74 percent of all complaints concerned lakes in the Central Hardwood Forest ecoregion, which contains 32 percent of Minnesota's lakes.

C. EXCESS NUTRIENTS ARE LEADING CAUSE OF IMPAIRED WATERS [IV. EU standards, need]

The Agency has been assessing lakes for the purpose of reporting the trophic condition of Minnesota lakes to EPA and the public since the mid-1980s. Results of these assessments first

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[20] Munson, W.J. 1988. Summary report of 1987 lake complaints. Minnesota Pollution Control Agency. St. Paul, MN.

[21] Perceptions do not necessarily reflect reality; failing septic systems and feedlots contribute 3.7 and 1.0 % of the total TP loading to Minnesota in an average flow year, respectively (Fig. EX-3 in Exhibit EU-6).

appeared in the Agency's 305(b) reports to EPA and Congress, and later in the 303(d) list of impaired waters. The impairment of lakes due to excess nutrient loading has been one of the leading causes of polluted conditions reported in the 305(b) reports. Listing of lakes not meeting the nutrient criteria in 305(b) reports does not have regulatory consequences; listing of lakes not meeting criteria in the 303(d) list does (see Section II.C in SONAR Book I). EPA must approve each state's 303(d) list. The Agency follows an established protocol when assessing waterbodies for potential impairment, which includes minimum data requirements, data quality assurance, and a review of the data and information for critical waterbodies by teams of experts.

The Agency first assessed lakes for impairment determinations for the draft 303(d) list scheduled to be submitted to EPA in 2000[22]. EPA informed the states that they were not required to submit a 303(d) list for 2000, so this list was never finalized. Data from the 2000 list are discussed here simply to illustrate trends in the numbers of lakes listed as impaired for excess nutrients. Table II-6 shows the number of lakes listed as impaired, the ranking of nutrients as a cause of impairment, and the percent of nutrient impaired lakes compared to other causes of impairments for the 2000 to 2006 lists. An increase in the number of lakes listed as impaired from one 303(d) list to the next is expected because, as more data is acquired over time, more lakes are assessed. And almost all lakes listed as impaired on one list are carried over to the next. The Agency expects the **rate of increase** in the number of listed lakes to remain essentially unchanged after the eutrophication standards are adopted.

Beginning in 2002 the Agency started listing individual waterbodies (mostly lakes) as impaired due to mercury in fish tissue. Mercury then became the pollutant responsible for the vast majority of all impairment listings (67% of all listings in 2004 and 58% in 2006). As a result, the percent of listings due to nutrients dropped accordingly from 2002 on. After mercury, excess nutrients (in lakes) was the leading cause of impaired waters, until high turbidity (in rivers) became the number one non-mercury cause in 2006. The percent of nutrient impaired waters among all listings (far right column in Table II-6) has been edging upward since 2002. The percentages in Table II-6 with and without mercury reflect a relatively small number of impairments due to other bioaccumulative pollutants like polychlorinated biphenyls included with mercury, but this has very little effect on the percentages.

Table II-6. Total Number of Lakes and Reservoirs Listed as Impaired on 303(d) Lists from 2000 to 2006; and the Ranking and Percent of Nutrient Impaired Lakes Compared to the Number of Impaired Waterbodies Listed for Other Pollutants.

303(d) List	**No. of Lakes and Reservoirs Listed as Impaired due to Nutrients**	**Ranking, w/o Mercury Listings**	**Ranking Among All Listings, Including Mercury**	**% of Listings, w/o Mercury**	**% of Total Listings, Including Mercury**
2000*	127	1	1	39.2	35.4
2002	108	1	2	26.3	6.1
2004	153	1	2	29.2	8.1
2006**	208	2***	3	25.2	9.0

[22] Both the 303(b) and 303(d) lists are prepared every other year, and submitted to EPA on even numbered years.

* 2000 list was not submitted to EPA and not finalized
** 2006 list was approved by EPA on June 1, 2006
*** 219 waterbodies listed as impaired for turbidity

D. PROMULGATION OF EUTROPHICATION STANDARDS AND THEIR LEGAL STATUS [IV. EU standards, need]

1. <u>Promulgation of the Nutrient Criteria is the Appropriate Step</u> [IV.D. EU standards, need]

As stated, nutrient criteria have been used by the Agency for years in a range of lake-related programs. The authority for use of the criteria rested on the narrative standard in Minn. R. 7050.0150, subp. 5. The Agency's use of the nutrient criteria as a "translation" of the narrative standard has regulatory and economic ramifications because of their use in the listing of lakes as impaired on the 303(d) list (see Section immediately above). It is the appropriate and responsible step for the Agency to promulgate an improved and expanded version of these criteria as numeric water quality standards. In general, the Agency feels an obligation to replace criteria that are in guidance documents with duly adopted standards in rules, particularly those that have been extensively used. The Agency has gained considerable experience over the years in implementing the criteria, and the adoption of them as standards in the water quality rule is needed and timely.

Promulgation as standards, of course, places significant burdens on the Agency to demonstrate the need for and reasonableness of the proposed standards, and to assess potential costs that might be incurred. The Agency could go on using the criteria as in the past and avoid much of the burdens associated with rulemaking. The Agency believes, however, that promulgation as numeric standards in rule is the appropriate step, and that standards in place of criteria will enhance their effectiveness in protecting lake resources.

2. <u>Eutrophication Standards as Legal Entities</u> [IV.D. EU standards, need]

Adopted numeric standards, as opposed to criteria in guidance, which is what we have now, will have greater legal standing, greater visibility and enhanced accessibility because they will be in legally adopted rules. This should encourage their use by other state agencies, consultants, local governments, lake associations and other organizations.

Standards in water quality rules are a more direct legal entity. For example, if a consultant hired today to review a nutrient loading problem in a particular lake looks in Minnesota's water quality rules for relevant nutrient standards, they will find only the narrative standard in Minn. R. 7050.0150, subp.5. The consultant may or may not have the wherewithal to follow through to the next step, which is to determine how the Agency has interpreted and implemented the narrative standard. Assuming the consultant knew to look further, they might contact Agency staff or find the numeric criteria in guidance, which is available through the Agency's Web pages but these resources are easily overlooked (Exhibit A-7). Having located the nutrient criteria, the consultant may not understand their legal standing and how the Agency has used them. After the proposed eutrophication standards are adopted, the consultant in this example will find the numeric standards in Minn. R. ch. 7050, and most of the follow-up research outlined above will be unnecessary.

In a similar example, numeric eutrophication standards in rules can be cited to county commissioners, managers of watershed districts and other local decision making bodies, if they are not already aware of them. No "translation" from narrative standards to numeric criteria will be needed. This will make eutrophication standards more difficult to gloss over or ignore than the current narrative standard. The direct applicability of numeric standards should help elected officials and zoning officers make better informed decisions, the goal of which is enhanced protection of lake resources under their jurisdiction. The Agency's intent is that adoption of the numeric eutrophication standards will augment their application by outside entities, such as consultants, other governmental entities, particularly at the county level, and lake associations.

Water quality standards can be used as educational tools. It is the intent of the Agency that the greater visibility of adopted standards will enhance their use as an educational tool, to help the public protect lake resources. Water quality standards in rules have an inherent "visibility" that criteria in guidance do not have. The standards can be used together with programs like the Citizens Lake Monitoring Program to help lake associations, lakeshore property owners and individual lake users make good decisions to protect lakes. The standards can serve as a benchmark to help lake associations assess the condition of "their" lake. The Agency hopes to enlist the help of lake organizations and other interested parties in this effort.

In conclusion, nutrient criteria based on the narrative standard have been widely used by the Agency and have worked well for the assessment of potentially impaired waters, but the Agency believes that numeric standards for lakes adopted into rules will do more to proactively protect lakes from the threat of eutrophication.

E. EPA GUIDANCE TO STATES, ADOPT NUTRIENT STANDARDS [IV. EU standards, need]

The EPA has made it very clear that they expect states to adopt eutrophication standards, and EPA has indicated a willingness to promulgate standards for those states that don't adopt them on their own (e.g., Exhibit EU-17). The Agency would much rather promulgate its own standards for lakes and reservoirs than have EPA promulgate the national criteria in Minnesota (see Section III.D and Exhibit EU-17). The Agency's proposed standards are tailored to Minnesota resources, based on the very robust local data sets, published scientific literature and years of experience implementing criteria. The EPA has approved the Agency's plans to adopt eutrophication standards (Exhibits EU-20 and EU-21). In a recent (May 25, 2007) memorandum EPA Assistant Administrator Benjamin Grumbles restates the magnitude of the nutrient pollution problem nation-wide and the high priority EPA attaches to state adoption of numeric nutrient standards (Exhibit EU-49). He urges states to accelerate the pace of adoption and reiterates EPA's offers of technical support and assistance to facilitate state action.

F. NEED FOR NUMERIC EUTROPHICATION STANDARDS [IV. EU standards, need]

It seems unlikely that any person would argue that improved standards of some sort are not needed to help protect Minnesota's lakes. The Agency believes strongly, however, that not only are better lake standards needed, but that **numeric** eutrophication standards are needed; and that numeric standards will be more effective in protecting lakes than an enhanced or more detailed narrative standard with a "translator" mechanism in guidance.[23] The Minnesota Environmental Science and Economic Review Board (MESERB) stated in a comment letter (Exhibit A-40a) that the Agency would be better advised to retain the existing narrative nutrient standards and the associated flexibility that goes with narrative standards. The Agency agrees that in general narrative standards offer flexibility but flexibility comes with a "cost." The costs, as discussed in this SONAR, include continued reliance on: standards with a less direct legal standing, standards less amenable for use by outside parties, and standards that usually need to be interpreted each time they are implemented, which can be time consuming and cost-ineffective. Narrative standards can be implemented by developing numeric criteria based on the narrative standard, which is what the Agency has done. Numeric standards offer other advantages as discussed in this SONAR. Attached to the MESERB letter was a review of eutrophication standards from states around the country, which discusses issues regarding narrative versus numeric approaches (Exhibit A-40b). The Agency's response to the MESERB letter is Exhibit A-41.

Comments received during the assessment factor rulemaking (Section II.C) that shallow lakes should be considered separately from "deep" lakes, helps establish the need for development and promulgation of separate standards for shallow lakes.

The Agency feels the adoption of numeric standards is critical to advancing the protection of lakes in Minnesota. However, numeric eutrophication standards tend to magnify issues faced by many Class 2 standards; but these issues are much less visible and less often encountered in the development and application of typical toxicity-based Class 2 standards. These issues, mentioned below as a reminder, will be discussed more thoroughly in the *reasonableness* sections.

- Tremendous variability in the water quality and trophic condition of Minnesota lakes;
- Some Class 2 uses may not be attainable in some lakes;
- Possible more frequent need for a site-specific modification of the standard;
- The need to consider additional variables in their application; and
- Consequences of excess nutrients on lake quality and lake uses are highly visible to the public (e.g. algae blooms).

For these reasons, the Agency is proposing several **narrative** statements to accompany the numeric standards. These narrative supplements are needed to properly interpret and apply the numeric standards (next Section and Section VI.L). The proposed eutrophication standards are shown in Table II-7.

[23] A translator is a set of procedures, usually in guidance, used to determine numeric criteria based on a narrative standard.

Table II-7. Proposed Eutrophication Standards by Ecoregion and Lake Type.

Ecoregion and Lake Type	**Total Phosphorus (TP)**	**Chlorophyll-a (Chl-a)**	**Secchi Depth (SD)**
Units:	µg/L	µg/L	Meters, Not less than:
Northern Lakes and Forests			
Lake trout lakes	12	3	4.8
Stream trout lakes	20	6	2.5
Deep and shallow lakes	30	9	2.0
Reservoirs	30	9	2.0
Central Hardwood Forest			
Stream trout lakes	20	6	2.5
Deep lakes	40	14	1.4
Shallow lakes	60	20	1.0
Reservoirs	40	14	1.4
Western Corn Belt Plains and Northern Glaciated Plains			
Deep lakes	65	22	0.9
Shallow lakes	90	30	0.7
Reservoirs	65	22	0.9

The Agency is aware that arguments can be made in favor of adopting only narrative standards plus a “translator” procedure instead of adopting numeric eutrophication standards (e.g. Exhibit A-40b). Both Wisconsin and Michigan, two states with similar water resources as Minnesota, plan to adopt numeric nutrient standards, probably for both lakes and rivers. Some other states around the country have chosen the “narrative” approach.

G. NEED FOR NARRATIVE PORTION OF EUTROPHICATION STANDARDS [IV. EU standards, need]

Eutrophication standards have many unique qualities that set them apart for most other Class 2 numeric standards. In addition to the items listed in the previous Section, which mostly relate to characteristics of the resources being protected, eutrophication standards:

- Are developed through a completely different process;
- Include a “causal” (TP) and “response” (Chl-a and SD) variables;
- Vary by ecoregion and lake type;
- Are implemented as summer season averages rather than 4-day or 30-day averages;
- Are aimed at protecting different sub-uses under the umbrella of aquatic life and recreational uses, and are also aimed at protecting aesthetic uses; and

- Need to protect lakes with water quality better than standards and accommodate lakes that cannot meet the standards due to natural causes.

These facts create a need to supplement the numeric eutrophication standards with narrative statements that provide information and guidance on these aspects. The Agency is proposing language to accompany the numeric standards that cover these issues. Because of the length of the narrative statements, the Revisor's Office recommended placing them in a new subpart located at the end of each of the tables of numeric standards for Class 2 subclasses, 2A, 2Bd and 2B, and designating the paragraphs in the new subpart as "items." The Agency agrees with this approach, which will make the tables of standards less cluttered. The narrative statements in proposed Minn. R. 7050.0222, subp. 4a (Class 2B eutrophication standards) are quoted below.

> [Minn. R. 7050.0222] *Subp. 4a.* ***Narrative eutrophication standards for Class 2B Lakes, Shallow Lakes, and Reservoirs.***
>
> *A. Eutrophication standards applicable to lakes, shallow lakes, and reservoirs that lie on the border between two ecoregions or that are in the Red River Valley, Northern Minnesota Wetlands or Driftless Area Ecoregions must be applied on a case-by-case basis. The commissioner shall use the standards applicable to adjacent ecoregions as a guide.*
>
> *B. Eutrophication standards are compared to data averaged over the summer season (June through September). Exceedance of the total phosphorus and either the chlorophyll-a or Secchi disk standard is required to indicate a polluted condition.*
>
> *C. It is the policy of the agency to protect all lakes, shallow lakes, and reservoirs from the undesirable effects of cultural eutrophication. Lakes, shallow lakes, and reservoirs with a baseline quality better than the numeric eutrophication standards in subpart 4 must be maintained in that condition through the strict application of all relevant federal, state, and local requirements governing nondegradation, the discharge of nutrients from point and nonpoint sources, and the protection of lake, shallow lake, and reservoir resources, including, but not limited to:*
>
> *(1) the nondegradation requirements in parts 7050.0180 and 7050.0185;*
> *(2) the phosphorus effluent limits for point sources, where applicable in chapter 7053;*
> *(3) the requirements for feedlots in chapter 7020;*
> *(4) the requirements for individual sewage treatment systems in chapter 7080;*
> *(5) the requirements for control of stormwater in chapter 7090;*
> *(6) county shoreland ordinances; and*
> *(7) implementation of mandatory and voluntary best management practices to minimize point and nonpoint sources of nutrients.*

D. Lakes, shallow lakes, and reservoirs with a baseline quality that is poorer than the numeric eutrophication standards in subpart 4 must be considered to be in compliance with the standards if the baseline quality is the result of natural causes. The commissioner shall determine baseline quality and compliance with these standards using summer-average data and the procedures in part 7050.0150, subpart 5. Natural causes is defined in part 7050.0150, subpart 4, item N.

E. When applied to reservoirs, the eutrophication standards in this subpart and subpart 4 may be modified on a site-specific basis to account for characteristics of reservoirs that can affect trophic status, such as water temperature, variations in hydraulic residence time, watershed size, and the fact that reservoirs may receive drainage from more than one ecoregion. Information supporting a site-specific standard can be provided by the commissioner or by any person outside the agency. The commissioner shall evaluate all data in support of a modified standard and determine whether a change in the standard for a specific reservoir is justified. Any total phosphorus effluent limit determined to be necessary based on a modified standard shall only be required after the discharger has been given notice to the specific proposed effluent limits and an opportunity to request a hearing as provided in part 7000.1800.

The narrative statements for Class 2Bd waters are the same as quoted above. The narrative for trout waters (Class 2A) differs slightly from the above because the standards are tied to the trout classification (waters designated as trout waters by the MDNR), rather than to ecoregions. Therefore item “A” shown above is not needed for trout waters and is absent from proposed Minn. R. 7050.0222, subp. 2a.

In conclusion, there is a need to include the proposed narrative to accompany the numeric eutrophication standards to address their unique characteristics. The reasonableness of each paragraph is discussed in Section VI.L.

H. CONCLUSIONS [IV. EU standards, need]

Numeric eutrophication standards are needed for the following reasons:

- Lakes are an extremely important and valuable resource to the state and numeric standards will be an important tool to help protect this resource from impairment due to excess nutrients.
- Nutrient enrichment is a leading cause of impaired water quality in lakes, which leads to unacceptable algae blooms, reductions in water clarity and possible loss of beneficial uses.
- Promulgation and adoption into rule of the (refined) nutrient criteria, which have been used for years in lake programs, is the appropriate and responsible action for the Agency to take.

- Numeric standards have a direct legal standing and will be more visible to interested parties than the existing criteria in guidance, which are based on a narrative standard.
- EPA expects states to adopt lake standards and has indicated its intent to promulgate standards for those states that do not.

V. REASONABLENESS OF PROPOSED EUTROPHICATION STANDARDS, REQUIRED INFORMATION

A. INTRODUCTION [V. EU standards, reasonableness]

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the reasonableness of the proposed rules. “Reasonableness” means: 1) that there is a rational basis for the Agency’s proposed actions, 2) that the Agency’s proposed amendments are appropriate and consistent with its mandate to protect Minnesota’s water resources, and 3) due consideration has been given to the potential economic impacts of the proposals. The reasonableness of the proposed rule amendments is explained in this Section and Section VI.

Minnesota Stat. § 14.131 requires that this SONAR include information about the following 11 issues. The discussion in this Section pertains only to the proposed eutrophication standards.

B. CLASSES OF PERSONS AFFECTED BY THE PROPOSED RULE AMENDMENTS, INCLUDING THOSE CLASSES THAT WILL BEAR THE COSTS AND THOSE THAT WILL BENEFIT [V. EU standards, reasonableness]

Essentially all the citizens of Minnesota could be affected by, and benefit from, the proposed eutrophication standards for lakes, shallow lakes and reservoirs. Some of the benefits to people in general are intangible, such as just the notion that Minnesota will remain a land of valuable lake resources. A more tangible benefit will be a continued robust water-orientated tourism and recreational industry in Minnesota, which the proposed standards should help protect. The many people that fish, swim, boat and simply enjoy the aesthetic quality of lakes will benefit. Counties, cities and other local governments could benefit from the proposed standards by increased tax revenues, increased tourism dollars, added jobs and related benefits (see Section X.B). Also, lakeshore property owners could see a real monetary benefit if the water quality of their lake improves; and, to the contrary, they may see a monetary loss if the water quality of their lake declines.

Potential costs to any party attributed to the eutrophication standards are difficult to quantify, but estimates of possible costs to point source dischargers are discussed in Section X.D.

Other state agencies with a responsibility for programs involving lakes should benefit from the eutrophication standards. In particular, the Minnesota Department of Natural Resources that has the responsibility to enhance and manage the sport fishery in lakes, protect water quality, and protect shallow lakes and wetlands, will benefit because the standards will give them an added tool to carry out their mission.

The Environmental Protection Agency (EPA) has an interest in these proposed amendments. The EPA has been an active partner in the promulgation of Minnesota’s standards for lakes through the EPA Region 5 nutrient coordinator and the RTAG meetings. Also, under the Clean

Water Act, the EPA Regional Administrator must approve all changes to Minnesota's water quality standards (40 CFR 131.5).

C. ESTIMATE OF THE PROBABLE COSTS TO THE AGENCY AND OTHER AGENICES OF IMPLEMENTING AND ENFORCING THE RULE AMENDMENTS, AND ANY ANTICIPATED EFFECT ON STATE REVENUES [V. EU standards, reasonableness]

The proposed eutrophication standards will not significantly affect Agency staff needs or work loads and overall Agency costs. It is possible that state revenues could be positively impacted if the standards, as intended, play a role in helping to protect lakes from eutrophication and help to maintain Minnesota as an attractive destination for water oriented tourism.

There is a possibility that the Agency will incur some minor added costs in the future as a result of the proposed eutrophication standards. For example, it's possible that once the standards are adopted and more visible, lake associations, watershed districts, county Water and Soil Conservation Districts, consultants, and other outside parties might inquire about their application and how they might be applied to their lake of interest. It is possible that requests for information and involvement or actions by the Agency may increase. This is the response the Agency is hoping for. Any added costs would be absorbed into the work loads of the current staff, and Agency budgets will not be affected.

The process of assessing lakes for possible impairment due to excess nutrients will continue as it has since 2002 essentially unchanged. Proposed eutrophication standards will replace the nutrient criteria in the assessment process, and this by itself, will **not** result in an increase in 303(d) nutrient-impairment listings. With some refinements (explained in later sections) the criteria, upon which assessments have been based to date, are being codified as water quality standards. Assessment protocols will not change. Furthermore, assessments are limited by the availability of adequate data and staff resources. Adoption of the criteria as standards will not change these facts. The Agency expects the number of lakes listed as impaired will continue to increase at the pace it has over the last four years as more data become available and lakes previously listed on the 303(d) list remain on the list pending the completion of a TMDL (see Section IV.C and Table II-6).

The Minnesota Department of Natural Resources (MDNR) was consulted on a regular basis as the proposed eutrophication standards were developed. In particular, the MDNR played an important role in defining shallow lakes, and in defining the ecological beneficial uses the proposed shallow lake standards are designed to protect. The MDNR has an active shallow lakes program.

The Agency does not believe any other state or federal agency will incur any significant added costs in the future due to the proposed eutrophication standards.

D. DETERMINATON OF WHETHER THERE ARE LESS COSTLY OR LESS INTRUSIVE METHODS FOR ACHIEVING THE RULE AMENDMENT'S PURPOSE [V. EU standards, reasonableness]

There are options open to the Agency that would at least partially achieve the goal of improving our ability to protect lakes, which the Agency rejected in favor of the proposed combination of numeric and narrative eutrophication standards. It is conceivable that the rejected options could be somewhat less costly and less intrusive, but the Agency believes that it is equally possible that these options might be even more costly than the proposed approach. The two most logical options are:

1. Enhance or expand the narrative nutrient standard now in Minn. R. 7050.0150, subp. 5
2. Adopt numeric standards for certain lakes statewide, but continue to use the narrative standard to protect the remaining lakes. For example, it has been suggested that numeric standards should apply only to lakes deeper than 15 feet and that shallow lakes continue to be protected by the narrative standard on a case-by-case basis using a site-specific numeric translator.

First of all the Agency does not believe that either of these options would be as effective as the proposed numeric standards in satisfying the need for standards specifically designed to protect lakes from cultural eutrophication. The EPA has concurred with the Agency and supported the adoption of numeric standards in Minnesota.

The first option is essentially a "do-nothing" option. The Agency believes that the additions to the narrative nutrient standard made in 2003 enhanced the narrative standard about as much as possible, short of actually adopting numeric standards. This option would not advance the ability of the Agency, local governments, citizens or other parties to actively protect lakes.

An argument could be made that option one is less costly because a narrative standard is not as obvious a legal entity as numeric standards and it may not generate as many requests for staff involvement. Also, the Agency's use of nutrient criteria to date, in a regulatory context, has been mostly limited to assessing waters for potential impairment and 303(d) listing. In general, nutrient criteria have not been used as the basis for setting a TP effluent limit in a permit, which is the most direct regulatory function of water quality standards. It is likely that the proposed numeric standards will be used to set some TP effluent limits resulting in costs to dischargers (see Sections VI.M.4 and X.C). For the same reason, option one might be somewhat less "intrusive" because narrative standards are less visible and less likely to be effective in the protection of lakes, whether it's through a protective zoning decision by a county, use of the standards by a consultant, or other activity.

A counter argument might be made that option one is more costly to the Agency because of the need to "re-translate" the narrative standard to a numeric criterion for each lake to which the standard is applied, or anywhere a phosphorus effluent limit is needed. However, this argument is mitigated in the case of the nutrient narrative standard because of the well established nutrient criteria the Agency has in place, which have been widely used by the Agency.

The second option is a "combination" approach; i.e., the adoption of numeric standards for most lakes, but not all lakes. It has been suggested by some outside parties that the Agency should not adopt numeric standards for shallow lakes, and that standards for shallow lakes can be developed on a case-by-case basis when needed.[24] Thus, one approach for option two (the Agency has not considered any others) is to not propose numeric standards for shallow lakes.

The development of a separate set of numeric standards specifically for shallow lakes was the direct result of comments and recommendations made by MESERB during the assessment factor rulemaking. Shallow lakes are a very important and numerous subset of lakes in Minnesota, and numeric standards that apply to this category are needed and reasonable. The standards the Agency is proposing for shallow lakes are targeted at protecting the ecological uses of these lakes (see Sections VI.G and VI.K.4).

The Agency believes that option two could result in substantial added costs for the Agency, albeit these costs might be reduced by the factors discussed in the next paragraph. A requirement that the Agency must develop a site-specific standard for each and every shallow lake will mean incurring the expense of gathering data and developing the site-specific standard, and possible costs associated with unnecessary delays in taking action. Also, it could be a strong disincentive to protect shallow lakes from eutrophication because of the costs and time needed to treat each one case-by-case. Numeric standards for all lakes, tailored by ecoregion and lake type, will be more visible and applicable legal entities. The Agency will not be obligated to determine a site-specific standard in each case before action can be taken, but the Agency has the option of modifying a standard on a site-specific basis if necessary (see Section IV.F).

It is not likely that option two would be much less intrusive than the Agency's proposal to have standards for all lakes because the lakes most often assessed, and the lakes for which we most often have data, are lakes greater than 15 feet deep – the lakes more likely to be used extensively for fishing and recreation. Most of the lakes the Agency has assessed for possible impairment are deeper than 15 feet deep. It is deeper lakes that are more likely to have a concerned citizenry, or have participated in an Agency lake study and restoration program.

The potential costs associated with the eutrophication standards are discussed in Section X.C.

E. DESCRIBE ANY ALTERNATIVE METHODS FOR ACHIEVING THE PURPOSE OF THE PROPOSED RULE AMENDMENTS THAT THE AGENCY SERIOUSLY CONSIDERED AND THE REASONS WHY THEY WERE REJECTED IN FAVOR OF THE PROPOSED AMENDMENTS [V. EU standards, reasonableness]

The Agency has not seriously considered alternatives to the numeric eutrophication standards as proposed, except as discussed in the previous Section.

The proposed numeric standards have a very long history, beginning with the TP criteria from the late-1980s. The proposed numeric standards and the associated narrative statements have

[24] Viewpoint expressed by MESERB at the October 13, 2005 meeting with the Agency.

evolved over the three years this rulemaking has been in development, sometimes as a direct result of public comments. The Agency, with the help of EPA, has been on a path to adopt numeric standards for lakes for some time.

F. ESTIMATE OF THE PROBABLE COSTS OF COMPLYING WITH THE PROPOSED RULE AMENDMENTS, INCLUDING COSTS BORNE BY CATEGORIES OF AFFECTED PARTIES [V. EU standards, reasonableness]

The possible costs to outside parties due to the eutrophication standards are discussed in Section X.C.

G. ESTIMATE OF THE PROBABLE COSTS OF NOT ADOPTING THE PROPOSED RULE AMENDMENTS, INCLUDING COSTS BORNE BY CATEGORIES OF AFECTED PARTIES [V. EU standards, reasonableness]

In general, it is unlikely that there will be direct costs to most outside parties if the eutrophication standards are not adopted. Were it not for the availability of the existing nutrient criteria, the job of some outside parties could be made more difficult (and possibly more expensive) if the narrative standard had to be re-interpreted on a case-by case basis for each application.

Groups that possibly could see monetary losses are lakeshore property owners, resort owners and others that depend on lakes to make a living. A decline in water quality could negatively impact these groups. For example lakeshore property values have been shown to decline if the water quality in the lake declines (Exhibit EU-39).

The Agency believes there could be an intangible “cost” to Minnesota if the standards are not adopted. Because Minnesota and the quality of life of its citizenry is so closely identified with lakes, it is not far fetched to assume that, as lake resources continue to degrade, there could be both a tangible and intangible cost to the state. This assumes, as the Agency intends, that the proposed standards will be more effective in protecting lakes than the current narrative standard.

H. DIFFERENCES BETWEEN THE PROPOSED RULE AND EXISTING FEDERAL REGULATIONS AND THE NEED FOR AND REASONABLENESS OF EACH DIFFERENCE [V. EU standards, reasonableness]

The proposed eutrophication standards are consistent with federal regulations and guidance. In fact EPA has used the Agency’s approach as an example of how nutrient standards can be developed using a state’s local lake data.

I. CONSIDERATION AND IMPLEMENTATION OF THE LEGISLATIVE POLICY UNDER MINN. STAT. §§ 14.002 AND 14.131 [V. EU standards, reasonableness]

Minnesota Stat. §§ 14.002 and 14.131 require state agencies, whenever feasible, to develop rules that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

The proposed numeric eutrophication standards are "prescriptive" as are all numeric standards. However, because lake standards are unique in several respects, greater flexibility is built into these standards than into most numeric standards (see Sections IV.F and IV.G). First, separate standards have been developed for four ecoregions and four lake types to accommodate the regional patterns and variability in lakes statewide. Secondly, accompanying the numeric standards are narrative statements that provide important information on how the numeric standards are to be interpreted and implemented, plus a reminder that site-specific standards should be considered, particularly for reservoirs.

The general concepts of how prescriptive or flexible a rule should be are discussed more extensively in SONAR Book I, Section VIII.I.

J. ADDITIONAL NOTIFICATION OF THE PUBLIC UNDER MINN. STAT. §§ 14.131 AND 14.23 [V. EU standards, reasonableness]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

The Agency described its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I. The Agency has gone well beyond the statutory requirements in its efforts to involve the public in this rulemaking. The Agency has made significant changes to the scope and content of the proposed amendments in response to public comments.

The Agency intends to send a copy of the Notice of Hearing to the following people and organizations.

- All parties who have registered with the Agency for the purpose of receiving notice of rule proceedings, as required by Minn. Stat. § 14.14, subd. 1a;
- All individuals and representatives of associations the Agency has on file as interested and affected parties; and
- The chairs and ranking minority party members of the legislative policy and budget committees, with jurisdiction over the subject matter of the proposed rule amendments, will receive a copy of the proposed rule amendments, SONAR and notice, as required by Minn. Stat. § 14.116.

Minnesota Stat. § 115.44, subd. 7 states that notices required under sections 14.14, subd. 1a, and 14.22 must also be mailed to the governing body of each municipality bordering or through which the waters for which standards are sought to be adopted flow. The Agency intends to hold public hearings, therefore, section 14.22 does not apply. To comply with Minn. Stat. § 115.44, subd. 7, the Agency shall provide a copy of the notice to the following:

- Mayors of cities in Minnesota
- Minnesota County Commissioners Chairs
- Minnesota Township Chairs
- Soil and Water Conservation Districts
- County Water Planners
- Watershed Districts
- Water Management Organizations
- NPDES/SDS industrial permittees
- POTW permittees

Additionally, the Agency will provide notice to:

- Environmental Justice Advocates of Minnesota
- Council of Asian-Pacific Minnesotans
- Chicano-Latino Affairs Council
- Council of Black Minnesotans
- Minnesota Indian Affairs Council
- EPA Tribal Liaison, and the Indian Tribes in Minnesota:
    - Boise Fort Band of Chippewa
    - Fond du Lac Reservation
    - Grand Portage Reservation
    - Leech Lake Reservation
    - Lower Sioux Indian Community
    - Mille Lacs Band of Chippewa
    - Prairie Island Community
    - Red Lake Nation – Red Lake Band of Chippewa
    - Shakopee Mdewakanton Sioux (Dakota) Community
    - Upper Sioux Community
    - White Earth Reservation

The Agency will issue a press release at the time the notice of proposed rule adoption is published in the *State Register*. The press release will include the dates, times and locations of the public hearings, and information on how the public can submit comments. In addition, a copy of the notice, proposed rule amendments and SONAR will be posted on the Agency's public notice Web site at: http://www.pca.state.mn.us/news/index.html. Due to the large number (and large size of some), the exhibits will not be made available on the Agency's Web pages. Any exhibit can be made available upon request.

Pursuant to Minn. Stat. § 14.14, subd. 1a, the Agency believes its regular means of notice, including publication in the *State Register* and on the Agency's public notice Web page will adequately provide notice of this rulemaking to persons interested in or potentially affected by these rules.

K. CONSULTATION WITH THE COMMISSIONER OF FINANCE REGARDING FISCAL IMPACTS ON LOCAL GOVERNMENTS [V. EU standards, reasonableness]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance the Agency will provide the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office for approval prior to publication in the *State Register*. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

L. AGENCY DETERMINATION REGARDING WHETHER COST OF COMPLYING WITH PROPOSED RULE IN THE FIRST YEAR AFTER THE RULE TAKES EFFECT WILL EXCEED $25,000 [V. EU standards, reasonableness]

The Administrative Procedures Act was amended in 2005 to include a section on potential first-year costs attributable to the proposed amendments (Minn. Stat. § 14.127, subd. 1 and 2). This amendment requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees.

Conceivably hypothetical situations could be devised that would result in the two entities listed above incurring costs as a result of the adoption of the eutrophication standards in the first year. There is no way to estimate or quantify these potential first-year costs and no way to know if they might exceed $25,000. Any projected added costs would be outside the impaired waters and TMDL programs because these potential costs are being incurred now through the application of the existing narrative eutrophication standard and the Agency's numeric criteria (existing Minn. R. 7050.0150, subp. 5).

An example of a hypothetical situation might be a small business such as a bait shop adjacent to a lake (located in the shoreland impact zone) that is being required by a county or other regulatory entity to implement a set of best management practices to reduce TP enriched runoff from reaching the lake. For this business to incur costs attributable to the proposed eutrophication standards pursuant to this statute, several things need to fall into place: 1) the governmental entity must be aware of the eutrophication standards and have the will and authority to implement them, 2) implementation of the standards results in more expensive BMPs being required, 3) monitoring data for the lake may be needed to relate its trophic condition to the standards, and 4) these events would have to take place in the first year after the standards are adopted and the added costs exceed $25,000.

While we cannot dismiss the possibility of such costs being incurred, the Agency believes that these situations will be unusual in the first year after adoption. Any attempt to quantify such hypothetical costs is too speculative to have any meaning. The Agency has estimated potential costs to point source dischargers as a result of the eutrophication standards and this could include small cities if they have sanitary sewers and a discharge from a wastewater treatment plant (see Section X.D).

VI. REASONABLENESS OF PROPOSED EUTROPHICATION STANDARDS

A. INTRODUCTION [VI. EU standards, reasonableness]

The development of the proposed eutrophication standards is described in detail in Exhibit EU-1. This publication discusses the sources and types of data used to develop first the nutrient criteria then the proposed eutrophication standards, how the data were analyzed, and the uses the standards are designed to protect. The *reasonableness* section of the SONAR will provide an outline of that process, and many topics covered in this SONAR are discussed in more detail in Exhibit EU-1. To avoid repetition, citations to this exhibit will be kept to a minimum, but its relevance throughout can be assumed.

As a reminder, the following abbreviations will be used extensively:

- TP phosphorus and total phosphorus
- Chl-a chlorophyll-a
- SD Secchi depth or Secchi transparency

The Agency's lake Web pages contain a great deal of information about lake programs, such as accessing lake data, the assessment of lakes, the Secchi disk volunteer monitoring programs, lake protection and stewardship; and PDF files of numerous Agency publications related to lakes. Some of these publications are exhibits to this SONAR. The "home" lake Web page is: http://www.pca.state.mn.us/water/lake.html.

The eutrophication standards the Agency is proposing are Class 2, aquatic life and recreation, standards. This means the proposed standards are designed to protect lakes for a healthy aquatic community and for aquatic recreation of all kinds, including swimming where that use is attainable. Standards for different lake types (e.g., trout and shallow lakes) focus on particular "sub-uses" under the broader umbrella of aquatic life and recreation (Class 2) standards (Section VI.K).

While not specifically set in order to protect aesthetic uses, the eutrophication standards will provide protection for aesthetics. Aesthetic qualities are very closely tied to recreational uses when it comes to the trophic condition of lakes, and in this context aquatic life and aesthetic uses are closely linked (Exhibit EU-48). For example, a lake that is pea-green with algae is unacceptable both recreationally and aesthetically. Aesthetics are protected under use Class 5, rather than Class 2, but **all** surface waters are protected for Class 5 uses (Minn. R. 7050.0410 and 7050.0430).

Lakes that are protected for use as a domestic drinking water supply (Class 1) are important community resources. Class 2A and 2Bd lakes are also Class 1 waters. The proposed eutrophication standards do not address drinking water uses directly, and drinking water uses will not be discussed in this book of the SONAR. However, similar to aesthetics, the proposed eutrophication standards will help protect drinking water uses where applicable because protecting one use serves to protect the other. Certain algae species when numerous can impart unpleasant tastes and odors to drinking water. Generally, the less eutrophic the drinking water source, the less extensive and less costly the water treatment needs to be to provide safe and good tasting and smelling finished water to the public. A good example of this was the announcement by the City of St. Paul in February 2006 of costly improvements to the city's drinking water treatment system to reduce or eliminate the city's occasional taste and odor problems[25]. St. Paul's drinking water, much of which comes from the Mississippi River via a conduit, travels through the Vadnais chain of lakes prior to withdrawal for treatment, which provides the opportunity for certain species of algae to impart unpleasant tastes or odors to the raw water.

B. DEFINITIONS [VI. EU standards, reasonableness]

As part of the promulgation of eutrophication standards the Agency is proposing to add definitions for six terms pertinent to the numeric standards into Minn. R. 7050.0150, subp. 4. The terms defined are:

- 122-day, 10-year low flow or $122Q_{10}$
- Eutrophication
- Lake
- Natural causes
- Reservoir
- Shallow lake

The need and reasonableness of the definitions is discussed in SONAR Book I, Sections VI.B (*need*) and X.B (*reasonableness*).

C. DATA SUPPORTING THE PROPOSED NUMERIC EUTROPHICATION STANDARDS [VI. EU standards, reasonableness]

1. <u>Phosphorus, Chlorophyll-a and Secchi Depth Data for Minnesota Lakes</u> [VI.C. EU standards, reasonableness]

The Agency has been monitoring lakes for trophic conditions since the 1970s. Over the years analytical methods have improved and sampling procedures have been standardized. Around 1990 improvements were made on several fronts, including laboratory analysis and in overall quality assurance and quality control. Thus, data collected from this date forward can be combined and used with confidence. The older data can be used together with the newer data with caution.

The Agency has grouped the data used to develop, first the nutrient criteria then the proposed eutrophication standards, into several categories. These data sets have been supplemented by the

[25] St. Paul Pioneer Press, February 7, 2006

user perception data and the historical trophic status estimates using diatom “shells” in bottom sediments, discussed in the next sections. As an example, the TP data from these data sets is compared by ecoregion in Table II-8.

Assessment Database. This large data set extends back to 1970 and includes data for at least one trophic variable, TP, Chl-a or SD. It contains data for about 2,790 lakes. These data have been used for years to assess the trophic status of Minnesota lakes for the 305(b) report, and more recently for the 303(d) list.

Reference Lake Database by Ecoregion. Taking advantage of the newly developed ecoregion concept as a logical way to separate lakes into similar geographical areas. In the mid-1980s the Agency selected about 90 “reference lakes" in four Minnesota ecoregions for more intensive sampling. Lakes minimally impacted by point and nonpoint sources of nutrients were selected as reference lakes. The Minnesota Department of Natural Resource (MDNR) area fishery managers assisted in the identification of lakes that were minimally impacted but still representative of the ecoregion in terms of lake morphometry and fish community characteristics. The reference lake data were particularly useful for establishing relationships between TP and the frequency and severity of nuisance algal blooms (Exhibit EU-30).

EPA Nutrient Criteria Database. This is the data base EPA used to develop their ecoregion-based criteria (Exhibits EU-11, EU-12 and EU-13). Much of the EPA data is from Minnesota’s assessment database, but it does include data for lakes outside Minnesota that are in the same ecoregion.

Citizens Lake Monitoring Program (CLMP). This program of monitoring the water clarity of lakes by a network of volunteers was started in Minnesota by Dr. Joseph Shapiro, a retired University of Minnesota limnology professor. The program was transferred to the Agency to administer in 1978. Many states have adopted similar programs. The program has grown over the years; in 2005, 978 volunteers monitored 888 Minnesota lakes. Volunteers take SD measurements periodically throughout the summer, rate the aesthetic and recreational quality of their lake (next Section), and report the results to the Agency. The program is a huge success for several reasons:

- It provides valuable water clarity data to the Agency and others at very little cost to the state. For many lakes the CLMP SD data is the only water quality data available.
- It provides valuable “user perception” data.
- It promotes interest among citizens in lake resources.
- It serves as an educational tool as citizens become aware of the relationships between water clarity, nutrients and the link between water quality and human activities on the land.
- It is a valuable resource for people shopping for lakeshore property.

CLMP data is entered into the EPA water quality data storage system (STORET) and it has been incorporated into the assessment database for lakes.

Table II-8. Comparison of 25-75 Percentile Ranges of Total Phosphorus Data (µg/L) for Agency Reference, Agency Assessed, EPA Assessed and Pre-Settlement (Diatom Estimated) Data Sets for Three Ecoregions.

Ecoregion	**Total Phosphorus µg/L, 25-75 Percentile Range**			
	Agency Reference	**Agency Assessed**	**EPA Assessed**	**Diatom-TP (1750-1800)**
NLF	14 – 27	13 – 30	10 – 30	11 – 16
NCHF	23 – 50	28 – 120	20 – 100	18 – 26
WCBP	65 – 150	130 – 325	80 – 290	38 – 56

2. <u>User Perception Data</u> [VI.C. EU standards, reasonableness]

The Secchi disk volunteers are asked to rate the water quality conditions in their lake each time they take a SD reading. Based mostly on water clarity and the amount of algae present at the spot where the reading is taken (mid-lake or over the deepest part of the lake), volunteers rate aesthetic conditions and suitability for swimming on a scale of 1 to 5, with 1 being the best. The rating questions are shown below (Exhibit EU-34):

(A) Which one best describes the physical condition of the lake water:
1 = Crystal clear water
2 = Not quite crystal clear - a little algae present/visible
3 = Definite algae green, yellow, or brown color apparent
4 = High algal levels with limited clarity and/or mild odor apparent
5 = Severely high algae levels with one or more of the following: massive floating scums on the lake or washed up on shore, strong, foul odor, fish kill

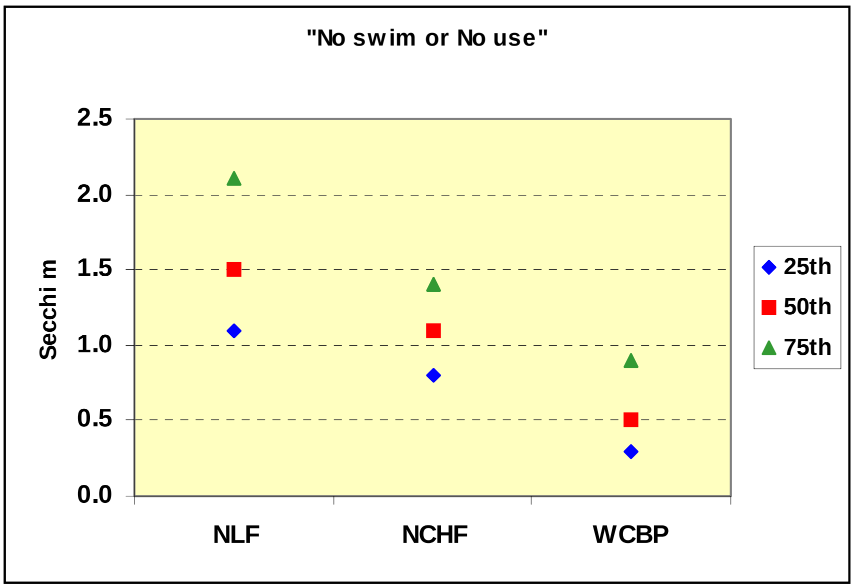
(B) Which one best describes your opinion of how suitable the lake is for recreation and aesthetic enjoyment:
1 = Beautiful, could NOT be better
2 = Very minor aesthetic problems; excellent for swimming, boating
3 = Swimming and aesthetic enjoyment slightly impaired because of algae levels
4 = Desire to swim and level of enjoyment of the lake substantially reduced because of algae levels (i.e., would not swim, but boating is okay)
5 = Swimming and aesthetic enjoyment of the lake nearly impossible because of algae levels

The subjective volunteer responses to these questions, when assembled for many lakes across the state and cross-tabulated with SD and Chl-a data, provide a quantitative basis for defining acceptable and unacceptable Chl-a and SD levels. The data show clear regional difference in user perception (Figure II-1). Where lakes tend to be cleaner, user expectations of water quality are higher. Water clarity that might be acceptable for swimming in southern Minnesota, for example, may not be acceptable to people in northern Minnesota.

Analysis of user perception data from nearly 500 Minnesota and Vermont lakes reaffirmed the pattern of regional differences in both states (Exhibit EU-33). User perception data have been used in the development of lake water quality standards in Vermont. EPA cites it as a reasonable basis for nutrient criteria development (Exhibit EU-16). The individual and collective perceptions of "swimmability" are tied directly to recreational beneficial uses. Closely parallel to "swimmability" are the perceptions of "physical qualities," which relate directly to aesthetic uses (Class 5).

In summary, user perception data are very helpful in defining the thresholds of water quality condition people find acceptable and unacceptable. The data help to establish the TP, Chl-a and SD thresholds where beneficial uses will be lost. These data are well grounded with SD data; they are scientifically credible, reproducible, and have been published in the scientific literature.

Figure II-1. User Perceptions of Secchi Depths Associated with Unacceptable Conditions for Swimming in Three Ecoregions. Twenty-fifth, 50th and 75th Quartile Selections of Condition "5" to Question "B" (see text, Exhibit EU-1 and Exhibit EU-33).



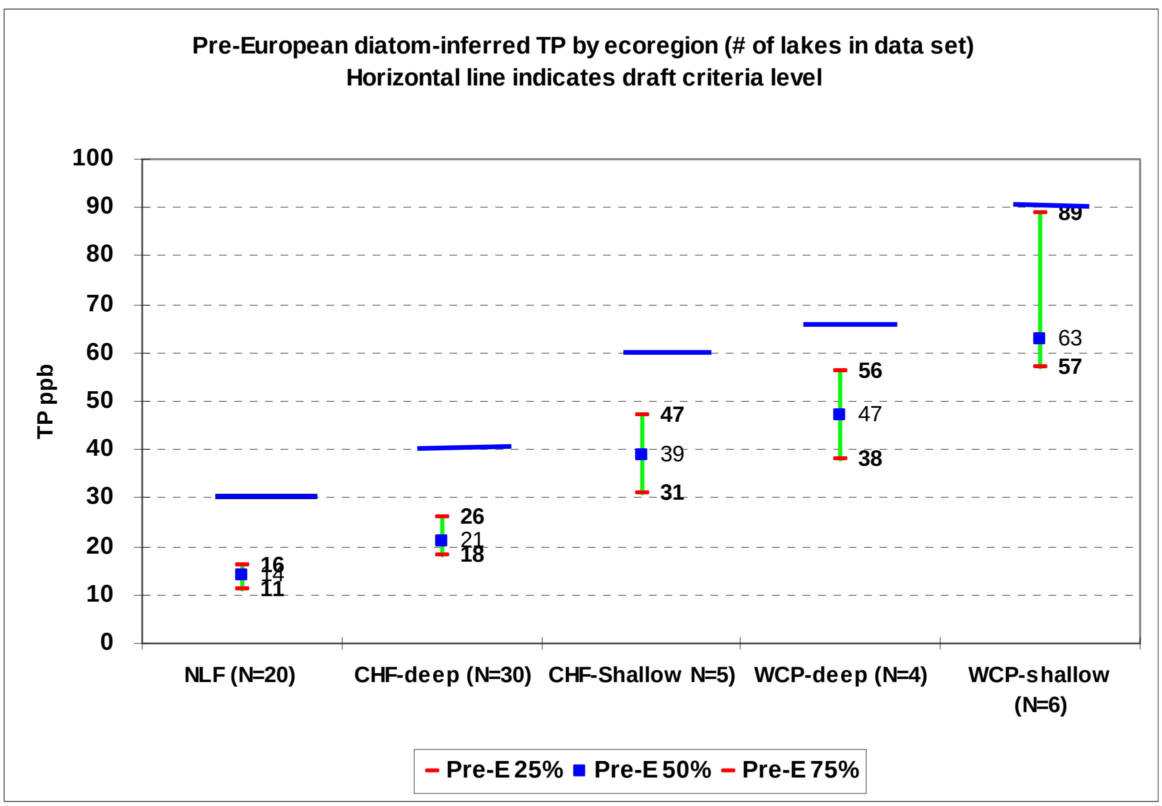
3. Historical Trophic Conditions, Diatom Reconstruction Data [VI.C. EU standards, reasonableness]

In establishing eutrophication standards, it is useful to know what the trophic status of Minnesota lakes was in the early-1800s, prior to European settlement, and before the extensive changes in the Minnesota landscape due to logging, agriculture, mining and urban development. Historical trophic conditions can be estimated by examining "fossil" diatom shells found in bottom sediments of lakes. Diatoms are a type of algae that form hard silicon (glass-like) shells. Different diatom species produce shells of different shapes and surface patterns, making it possible to identify species of diatoms by their shells. When diatoms die their shells sink to the bottom of the lake where they persist in the bottom sediments for hundreds of years. Because sediments are laid down in layers, one layer per year much like tree rings, the age of the diatoms shells can be determined. Different assemblages of diatom species are associated with discrete trophic conditions (i.e., oligotrophic to eutrophic). By comparing the diatom species assemblage that lived in the lake in the past to assemblages in the lake today with known trophic condition, the trophic history of the lake can be estimated. This work is called diatom reconstruction (Exhibit EU-35).

Exhibit EU-36 is a study of 55 lakes from across Minnesota; it provides some insight into pre-European lake trophic status for three ecoregions. Following this study, additional shallow lakes in southern Minnesota were sampled for diatom reconstruction analysis.

The ranges of total phosphorus concentrations based on the diatom reconstructions are consistently lower than the modern-day data sets, even when compared to reference lake data (Table II-8 and Figure II-2). However, this difference is less pronounced in the NLF and NCHF ecoregions. The diatom reconstruction results show that the regional patterns in lake trophic status seen today existed prior to European settlement (Figure II-2). Figure II-2 also shows that historically, shallow lakes were more eutrophic than deeper lakes in the NCHF and WCB ecoregions. It also shows that the proposed TP standards are well above pre-settlement TP levels.

Figure II-2. Estimated Historic TP Levels in Deep and Shallow Lakes in Three Ecoregions Compared to Proposed TP Standards (horizontal lines).



Note: Some numbers in Figure II-2 may be hard to read: the 25th, 50th and 75th percentile values for the NLF are 11, 14 and 16; and for the NCHF are 18, 21 and 26, µg/L TP, respectively.

In conclusion, the diatom reconstruction data provide valuable insights that help place present-day data sets and proposed TP standards in perspective. The results clearly support using the ecoregion framework for the proposed standards. And it is apparent that the proposed TP standards are not overly protective or stringent. Many lakes in the NLF ecoregion, as shown in Table II-8, are near pre-settlement conditions, and the Agency will do all it can to keep those lakes in their near-pristine state. On the other hand, the Agency realizes that it is not reasonable to base the proposed TP criteria on the trophic status of lakes 200 years ago. Given the modern-day realities of land use by more than 4.5 million Minnesotans, it is not realistic to expect lakes in most parts of the state to meet pre-settlement conditions. The diatom reconstruction data provide a means to put the proposed standards in perspective.

4. <u>Fish Communities in Lakes</u> [VI.C. EU standards, reasonableness]

Because the fishery resource in Minnesota lakes is considered such a valuable natural resource, it is important in developing TP standards for lakes that we examine how in-lake phosphorus concentrations relate to the lake fish communities, particularly game fish. Nutrient loadings and eutrophication may affect the type and abundance of game fish; and, alternately, some fish species may impact lake water quality. The Agency worked closely with the Minnesota Department of Natural Resources (MDNR) to associate TP, Chl-a and SD conditions to fish communities. These relationships can impact the management of desirable game fish populations in lakes that range widely in trophic condition.

Lakes in the North American temperate zone are extremely variable with regard to their biological productivity and fish community structure. This variability is due in large part to the tremendous diversity in the nature of lake watersheds and lake basin morphometry. Studies of the relationship between lake morphometry, lake water chemistry and fish yield have generally shown that more nutrient-rich, shallower lakes are typically more biologically productive with higher fish yields per unit area than deeper, less fertile lakes (Rawson, 1952; Ryder, 1965; Matusek, 1978; Hanson and Leggett, 1982; as cited in Exhibit EU-1; also see Figure 13 in Exhibit EU-1).

In qualitative terms, there is also a shift in the composition of fish species along the productivity continuum ranging from oligotrophic through hypereutrophic. Associated with the various lake categories is a corresponding and predictable fish community, which is optimal for the resources the lake provides. In broad terms, hypereutrophic waterbodies are often dominated by bottom feeding fish such as bullhead and carp, while waterbodies classified as eutrophic are often populated by largemouth bass, sunfish, minnows and other warm water species. Trout and whitefish inhabit coldwater oligotrophic lakes. In the middle of the trophic spectrum, walleye, northern pike, and white suckers typically thrive in mesotrophic to mildly eutrophic lakes. These patterns helped in the development of the proposed eutrophication standards. The proposed standards for trout lakes and shallow lakes, in particular, reflect this relationship between the fish community and trophic condition.

In summary, as lakes become more eutrophic, there is a clear change in fish communities. Likewise, lake fisheries have been demonstrated to respond positively to nutrient reductions. The Lake Sallie case study on page 50 of Exhibit EU-1 is an example of a demonstrated shift from undesirable to more desirable species following nutrient reductions.

D. DEVELOPMENT OF PROPOSED EUTROPHICATION STANDRDS [VI. EU standards, reasonableness]

The process used to arrive at the proposed numeric eutrophication standards for TP, Chl-a and SD will be outlined in this Section. Exhibit EU-1 and the other Exhibits cited should be consulted for details. The proposed standards for trout lakes, deep lakes, shallow lakes and reservoirs will be discussed in the sections that follow.

Water quality standards should reflect the latest scientific knowledge on the effects of pollutants on public health and welfare, aquatic life, and recreation. The development of the proposed ecoregion-based eutrophication standards is based on a rigorous examination of Minnesota lake water quality data, taking into account the beneficial uses lakes provide, user perceptions of those uses, fisheries data and other relevant information. Broadly speaking, the development of the proposed standards (and the nutrient criteria before them) was an iterative process. The individual data sets within the whole body of lake information were evaluated in the context of the other pieces. A range of reasonable TP, Chl-a and SD "criteria" was narrowed down through a "feed-back" process of fitting the information together, to refine the criteria and arrive at final proposed standards.

As described, the development of eutrophication standards began with the development of ecoregion-based total phosphorus (TP) criteria. Because of regional diversity in lake and watershed characteristics, it was felt that a single total phosphorus value would not be workable as a statewide criterion (Exhibit EU-24). The methodology for establishing the original phosphorus criteria in Minnesota considered the following (Exhibit EU-30):

- Impacts of TP on lake condition, as measured by Chl-a, bloom frequency, water clarity, and hypolimnetic oxygen depletion.
- Impacts on lake uses, recreation, fisheries and aesthetics.
- Appropriateness of the TP levels as related to watershed characteristics, regional phosphorus export values, lake morphometry, etc.
- This work clearly established that the ecoregion framework was a reasonable way to deal with the variability in lake conditions across Minnesota.

The resulting TP criteria provided a scientifically sound and reasonable foundation for the proposed eutrophication standards.

Using these ecoregion-based TP criteria as a starting point, relationships between TP and Chl-a and TP and SD were developed. The relationship between TP and Chl-a, TP and SD and Chl-a and SD, based on the reference lake dataset are shown in Figures II-3, II-4 and II-5, respectively. These relationships helped establish the levels of the "response" variables, Chl-a and SD that correspond to the ecoregion-based TP criteria. Another means of linking the TP criteria to levels of Chl-a and SD readings is the Carlson Trophic State Index (TSI). The Carlson index takes TP, Chl-a and SD data and calculates a trophic condition score from 1 to 100; the higher the number the more eutrophic the lake (see page 12 in Exhibit EU-1). If the relationships between trophic indicators were perfect (which is highly unlikely for any biological relationship), the TSI values calculated separately for TP, Chl-a and SD for a given lake would be the same. By assembling the TSI data for the three parameters for many lakes in an ecoregion, the TP levels in a certain range of TSIs can be used to predict the Chl-a and SD values that correspond to the same range, and vise versa. This helps cement the relationships between the causal (TP) and response (Chl-a and SD) variables.

Preliminary TP, Chl-a and SD criteria were then refined by reviewing TP concentrations and the frequency and severity of algae blooms, user perception data, and the diatom reconstruction data. The relationship between TP and Chl-a (i.e., algae blooms) provides a risk analysis in the sense that, as TP levels increase there is a greater risk that the frequency and severity of blooms will increase also (Exhibit EU-30). At some TP level, algae growth and resulting blooms become unacceptable, and beneficial uses are compromised or lost altogether. The relationship between TP concentrations and the expected magnitude (severity) and frequency of algae blooms (in percent) can be plotted (Figure II-6). The graphical representation of these relationships in Figure II-6 helps visualize potential thresholds of TP levels at which conditions become unacceptable.

Figure II-3. Relationship of Summer-Mean Log TP and Chl-a Based on Reference Lake Data.

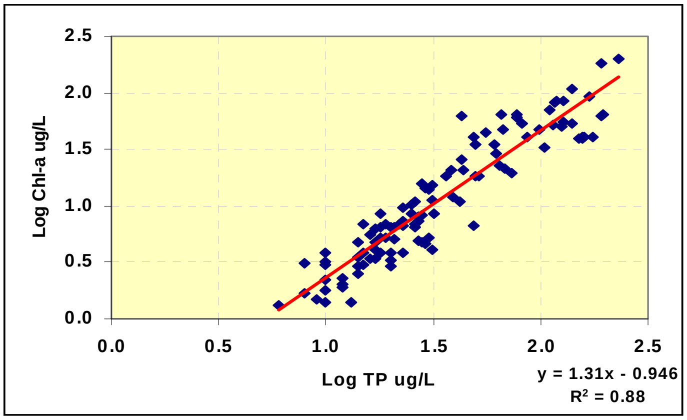


Figure II-4. Relationship of Summer-Mean Log TP and SD Based on Reference Lake Data.

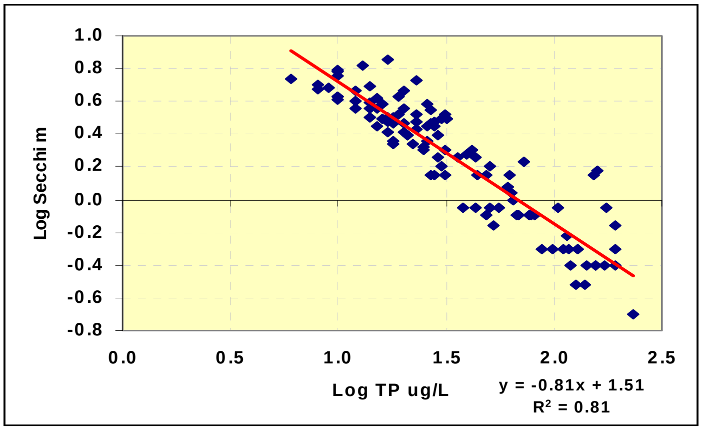


Figure II-5. Relationship of Summer-Mean Log Chl-a and SD Based on Reference Lake Data.

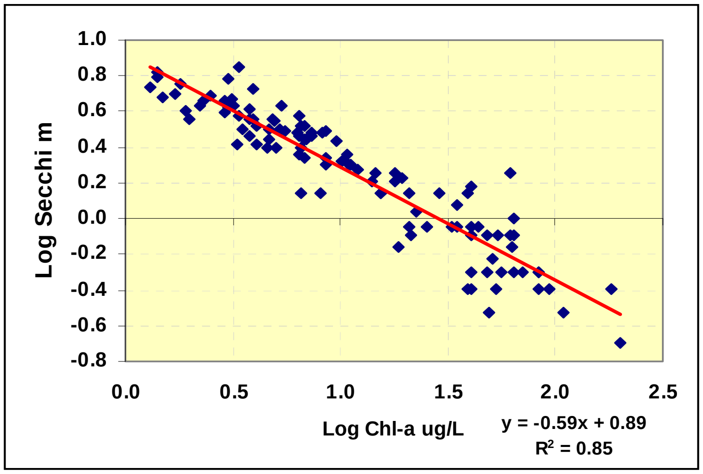
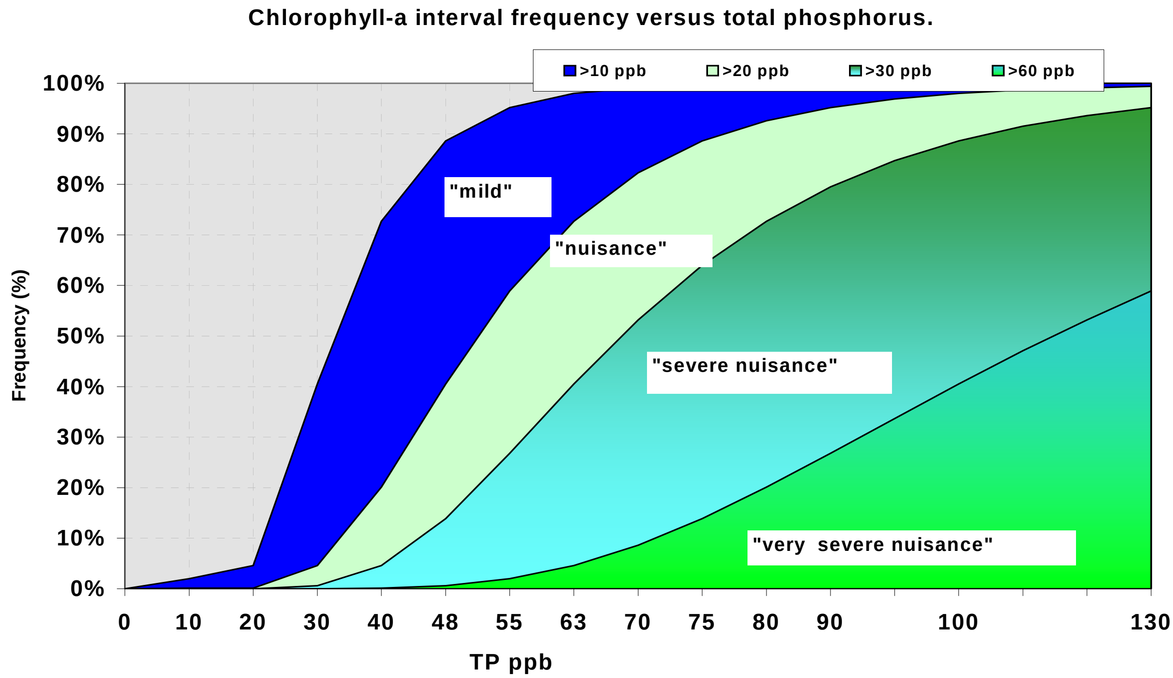


Figure II-6. Frequency and Severity of Algae Blooms (Chlorophyll-a) Versus Total Phosphorus in µg/L Based on Reference Lake Data from 1985-1988.



E. PROPOSED EUTROPHICATION STANDARDS FOR TROUT WATERS [VI. EU Standards, reasonableness]

1. Introduction [VI.E. EU standards, reasonableness]

For purposes of the proposed eutrophication standards, trout lakes are divided into two categories, those that support native lake trout and those that support a "stream" trout fishery. The goal of the proposed eutrophication standards for both types of trout lakes is the protection of the sensitive coldwater fishery.

2. Lake Trout Trout Lakes [VI.E. EU standards, reasonableness]

Minnesota has about 110 lakes that support populations of native **lake trout**, *Salvelinus namaycush.* Almost all of these lakes are in NE Minnesota in northern Lake and Cook Counties near the Canadian border.[26] Lake trout have quite specific temperature and dissolved oxygen requirements. Only nutrient poor or oligotrophic lakes provide these conditions. Even a slight shift to a more eutrophic condition could put the lake trout population in jeopardy. Therefore, the proposed standards reflect the need to protect these oligotrophic conditions; and, accordingly, they are the most stringent set of eutrophication standards the Agency is proposing.

[26] Siesennop, G. D.2000. Estimating potential yield and harvest of lake trout *Salvelinus namaycush* in Minnesota's lake trout lakes, exclusive of Lake Superior. MDNR Investigative Report 487.

Maintaining adequate dissolved oxygen (DO) in the cool hypolimnetic waters is essential. Optimal conditions for lake trout occur in the part of the lake having more than 6 mg/L DO and a temperature less than 10 ^{o}C. Some populations can be successful at higher temperatures under some circumstances. Late summer is the critical period for determining whether suitable habitat is present because stratification has been firmly established in the lake for several weeks, and no new oxygen has been introduced into the hypolimnion. If the lake becomes more eutrophic and more algae grow, die and decompose in the hypolimnion, further demands are placed on the finite store of hypolimnetic DO.

The Agency assembled the available trophic data for lake and stream trout lakes. There is some overlap in the data because some lakes may contain both lake and stream trout. These data are summarized in Table II-9; the proposed standards for trout waters are shown for comparison.

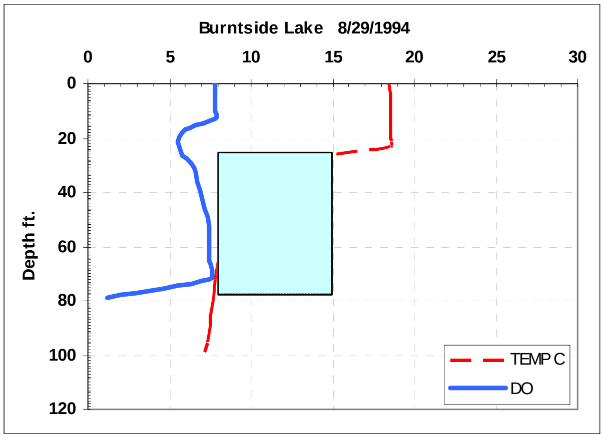
Table II-9. Trophic Data for Lake Trout and Stream Trout Lakes from Assessment Data Base.

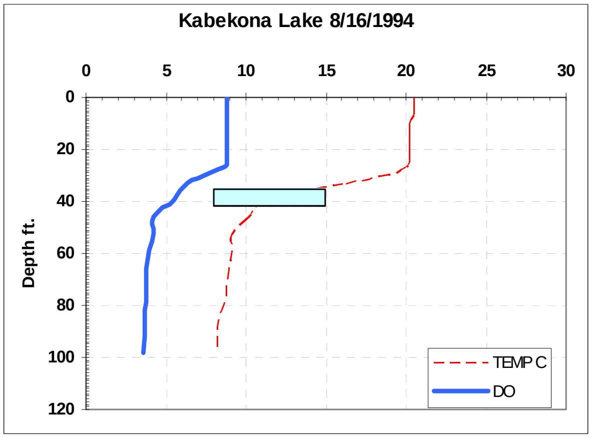
Parameter	Proposed Standard	No. of Values	Minimum	25th %tile	Median	75th %tile	Maximum
Lake Trout Lakes							
TP (µg/L)	12	75	2.0	9.0	12	16	69
Chlorophyll-a (µg/L)	3	57	0.5	1.5	2.3	3.3	24.3
Secchi (m)	4.8	299	2.1	4.1	5.0	5.8	10.4
Stream Trout Lakes							
TP (µg/L)	20	103	5	10	15	21	67
Chlorophyll-a (µg/L)	6	51	0.7	1.9	3.2	6.3	45
Secchi (m)	2.5	125	1.1	3.3	4.4	5.4	10.9

These data were used to establish relationships between TP, Chl-a and SD for trout lakes. Comparison of Carlson TSIs for the three variables also helped establish the relationships. For the most part, the proposed standards fall between the median and 75th percentile values, or between the median and 25th percentile values in the case of SD.

The Agency conducted late summer DO and temperature profiles for 15 lake trout lakes to determine if there appeared to be a "refuge" in these lakes where temperatures between 8-15 ^{o}C and a DO greater than 5 mg/L was maintained. Figure II-7 shows DO levels and temperatures plotted against depth for two lakes as examples. The "refuge" zone is shown as the box within the graph. A lake with a larger refuge (e.g., Burntside in Figure II-7) is more likely to sustain a healthy population of lake trout. The trophic conditions of the lakes that supported the necessary refuge provided further insight into the TP, Chl-a and SD conditions needed to protect lake trout. It appears that summer-mean Chl-a should remain below 3 µg/L, and maximum values should generally remain below about 4 µg/L to minimize the impact of decaying algae (organic matter) on hypolimnetic DO concentrations. This Chl-a range, 3 to 4 µg/L, is close to the recognized limit between oligotrophy and mesotrophy. The basis for the proposed standards for lake trout lakes is discussed in more detail in Exhibit EU-1.

Figure II-7. Late Summer DO and Temperature Profiles for Burntside and Kabekona Lakes. Box in Graph Represents the Portion of the Lake where Optimal DO and Temperature Conditions for Lake Trout Exist (horizontal axis: DO in mg/L and temperature in ^{o}C).





3. <u>Stream Trout Lakes</u> [VI.E. EU standards, reasonableness]

The basis for the proposed eutrophication standards for **stream trout** lakes is the same as that for lake trout lakes; i.e., to protect a sensitive population of coldwater fish. However, the target DO and temperature conditions do not need to be as stringent for stream trout. Thus, the proposed standards for stream trout lakes are somewhat more lenient than the lake trout lake standards.

Minnesota has 161 designated stream trout lakes. Stream trout are either brook trout, brown trout, rainbow trout or splake (cross between a brook trout and a lake trout). Stream trout are primarily stocked in lakes that provide adequate conditions for survival, but stream trout are not expected to reproduce naturally in lakes. Since these lakes are primarily stocked, the concern is only with adult habitat requirements. The data for stream trout lakes, shown in Table II-9, was used to associate the trophic conditions in MDNR trout lakes successfully managed for stream trout. The proposed standards for stream trout lakes are based on maintaining relatively low TP and Chl-a and high SD in order to provide an adequate temperature and DO "refuge" for the stream trout.

In summary, the proposed eutrophication standards for trout lakes reflect the TP, Chl-a and SD conditions that support the required hypolimnetic DO and temperature conditions that allow lake trout to reproduce and grow, and allow adult stream trout to thrive. The MDNR managed stream trout lakes are listed in Minn. R. 6264.0050; the list is updated periodically. The Agency takes the MDNR list and adopts it into Minn. R. 7050.0470 (see SONAR, Book III, Section X.C). All lake trout lakes listed in Minn. R. 7050.0470 are designated as outstanding resource value waters (restricted category, Minn. R. 7050.0180, subp. 6).

F. PROPOSED EUTROPHICATION STANDARDS FOR NON-TROUT LAKES, MAXIMUM DEPTH GREATER THAN 15 FEET [VI. EU standards, reasonableness]

1. Northern Lakes and Forest Ecoregion [VI.F. EU standards, reasonableness]

The proposed eutrophication standards for deep (> 15 feet deep) and shallow lakes in the NLF ecoregion are the same. They are:

- Total phosphorus, 30 µg/L
- Chlorophyll-a, 9 µg/L
- Secchi Depth, 2.0 meters minimum

A TP concentration of 30 µg/L corresponds to the 75th percentile for the Agency and EPA assessment databases (Figure II-9). This concentration is only slightly above the pre-European and reference lake 75th percentiles. Thirty µg/L is a reasonable level for the proposed standard given the predominantly forest and wetland vegetation that characterize most of this ecoregion. From a fisheries, standpoint TP concentrations of 30 µg/L or less seem to support robust fish communities that tend to favor walleye, northern pike and perch; in contrast to common carp and bullhead species. A TP concentration of 30 µg/L is often used as a boundary between mesotrophic and eutrophic conditions.

Based on the Agency's experience monitoring and assessing lakes, Chl-a levels greater than about 10 µg/L are perceived as a bloom condition; and Chl-a levels greater than about 20 µg/L are associated with nuisance to severe nuisance blooms in this ecoregion. At a summer-mean Chl-a of 10 µg/L we expect about 40 percent of summer period will exhibit Chl-a of 10 µg/L or greater, but maximum Chl-a concentrations should remain below 20 µg/L (Exhibit EU-1, Figure 5b). A reasonable goal for the NLF would be to minimize events of 10 µg/L Chl-a or greater, which corresponds to a TP concentration of 30 µg/L or less. A summer-mean Chl-a in the 8 – 10 µg/L range is near the 75th percentile for the Agency reference and assessed databases and the EPA assessment database (Exhibit EU-1, Figure 29). The proposed Chl-a standard of 9 µg/L is often used as a boundary between mesotrophic and eutrophic conditions.

The proposed Secchi depth standard of 2.0 meters (about 6.5 feet) begins with the relationship between Chl-a and SD (figure II-5) in the Agency reference and assessed data sets. This relationship is cross-checked with the Carlson Trophic State Indices for TP, Chl-a and SD. The user perception data provides a means to ground the Chl-a/SD relationship with real-life attitudes about water clarity and swimming use. In the NLF ecoregion, user responses of "definite algal green" or "use slightly impaired" are associated with SD reading of about 2 to 2.2 meters (Section VI.C.2). The "no swimming" response is linked to a SD of about 1.5 meters. Given our primary goal to protect the recreational uses of "deep" lakes (Section VI.K), it is reasonable to maintain SD readings at 2.0 meters or more as a seasonal mean. A 2.0 meter mean will minimize the occurrence of SD readings in the range of 1.5 meters at some times during the summer.

A mean SD of 2.0 meters corresponds to a TP concentration of about 25 µg /L and Chl-a concentration of about 7 µg/L. These values are slightly lower than the proposed standards of 30 and 9 µg /L, respectively, but the Agency believes a proposed SD standard of 2.0 meters is reasonable to provide conditions acceptable for swimming use (Exhibit EU-1, page 112).

2. North Central Hardwood Forest Ecoregion [VI.F. EU standards, reasonableness]

The proposed standards for lakes in the NCHF ecoregion with a maximum depth greater than 15 feet are:

- Total phosphorus, 40 µg/L
- Chlorophyll-a, 14 µg/L
- Secchi Depth, 1.4 meters minimum

Applying the EPA criteria development approach as a starting point, the 25th percentile TP value for the Agency and EPA assessed data (20 and 28 µg/L) and the 75th percentile for the reference lakes (50 µg/L) suggest that an appropriate TP standard may lie within a range of about 25 to 50 µg/L (Exhibit EU-1, Figure 30). Within this range possible TP standards were refined by considering the TP/Chl-a and TP/SD relationships.

The 75th percentile Chl-a, value from the reference lakes and the 25th percentile value from the Agency's assessed data, indicate a potential range for the Chl-a standard of 5 – 22 µg/L. Based on NCHF user perception data, Chl-a values greater than about 20 µg/L are typically perceived as a nuisance bloom and values greater than about 30 µg/L as a severe nuisance bloom. For deep lakes in this ecoregion, a reasonable goal is to minimize bloom events of 20 µg/L or greater. At a summer-mean of 15 µg/L, 70 percent of the summer period would have Chl-a greater than 10 µg/L, 20 percent would be greater than 20 µg/L, and the maximum Chl-a should remain below 25 µg/L (Exhibit EU-1, Figure 5b). The Agency's proposed Chl-a standard of 14 µg/L is in the range indicated above; it should protect lakes in the NCHF ecoregion from nuisance blooms most of the summer period, and protect the swimming beneficial use.

For Secchi depth, 50 percent of volunteer observers in the NCHF ecoregion associate responses of "definite algal green" or "use slightly impaired" with SD readings of 1.3 meters or less. Responses of "no swimming" correspond to SD readings of about 1.0 meter or less. A reasonable goal in this ecoregion would be to minimize the frequency of SD readings below 1.5 meters and avoid occurrence of SD readings less than 1.3 meters. A summer-mean TP concentration of 40 µg/L equates to SD readings less than 1.0 meter about five percent of the summer, and readings less than 2.0 meters about 50 percent of the summer (Exhibit EU-30). Considering user perception information and 75th percentile values for the NCHF ecoregion (Exhibit EU-1, Figure 30), a summer-mean SD of 1.2 - 1.5 meters is appropriate. The Agency is proposing a standard of 1.4 meters, which corresponds to a summer-mean TP of about 35 - 40 µg/L.

3. <u>Northern Glaciated Plains and Western Corn Belt Plains Ecoregions</u> [VI.F. EU standards, reasonableness]

The proposed standards are:

	Deep Lakes	Shallow Lakes
• Total phosphorus:	65 µg/L	90 µg/L
• Chlorophyll-a:	22 µg/L	30 µg/L
• Secchi Depth, minimum	0.9 meters	0.7 meters

Most lakes in the WCBP and NGP ecoregions are shallow; thus the standards for both are shown above even though the discussion here focuses on the standards for deeper lakes. Shallow lakes are discussed separately in the next Section. The deeper lakes will tend to have lower TP concentrations than the typical shallow lake in both ecoregions, but all lakes in the reference and assessment data bases in these ecoregions would be considered eutrophic to hypereutrophic.

Again using the EPA approach as a starting point, the 75th percentile TP value for the reference lakes and the 25th percentile for the Agency assessed data would place potential TP standards in the 60 – 150 µg/L range in the WCP and 80 – 160 µg/L in the NGP. The proposed TP standards are based on a consideration of associated Chl-a and SD responses to TP levels in this range and an emphasis on protecting ecological beneficial uses.

Mean SD associated with a "no swimming" user perception is 0.6 meter in these two regions. A TP concentration range of 70 – 90 µg/L TP should yield SD readings greater than 0.5 meter over 90 percent of the summer. As TP increases above 80 – 90 µg/L blue-green algae may dominate, and above 100 µg/L nitrogen limitation is increasingly likely. These observations suggest that a TP concentration in the 70 – 90 µg/L range may be an appropriate criteria level for most lakes in these two regions. Also, this would be just below the approximate 100 µg/L boundary between eutrophic to hypereutrophic lakes. Further, as TP increases above 100 µg/L a decline in the number of fish species, reduced percentages of walleye, northern pike and largemouth bass, and increases in the abundance of carp and black bullhead can be expected.

The diatom reconstruction estimates of pre-European median TP concentrations in deep lakes (about 50 µg/L) versus shallow lakes (69 µg/L) in these ecoregions, along with the distribution of modern-day TP concentrations, suggest that it is appropriate to set a TP standard for deep lakes that is lower than for shallow lakes.

Based on user perceptions, a Chl-a level greater than 30 µg/L is perceived as a nuisance bloom and Chl-a greater than 60 µg/L as a very severe nuisance bloom. On average, a summer-mean Chl-a of 25 µg/L means that Chl-a will be greater than 20 µg/L about 60 percent, greater than 30 µg/L about 25 percent, and greater than 60 µg/L about five percent of the summer. A Chl-a concentration of 25 µg/L is probably too low a standard for shallow lakes in the WCBP and NGP ecoregions, and would correspond to TP concentrations in the 60 – 70 µg/L range. However, as mean Chl-a concentrations increase, the frequency and intensity of algal blooms and maximum Chl-a increase as well. Chlorophyll-a concentrations at the level of the proposed standard of 30 µg/L correspond to TP concentrations on the order of 90 µg/L, which is the proposed TP standard for shallow lakes. The current trophic condition in most NGP and WCBP lakes is in excess of these levels.

Secchi depth readings are quite low in most WCBP and NGP lakes, typically ranging between about 0.5 – 1.2 meters. In these ecoregions user responses of "definite algal green " or "use slightly impaired" correspond to SD readings of 0.8 meter or less for 50 percent of observers. Responses of "no swimming" correspond to SD readings of about 0.7 meter or lower. A reasonable goal in these regions may be to minimize frequency of SD below about 0.7 - 0.8 meter. Maintaining a summer-mean SD of 0.7 – 0.8 meter requires a TP concentration on the order of 65 – 70 µg/L, which is a reasonable range for the deeper lakes.

In summary, based on the data for reference and assessed lakes, various interrelationships among trophic status variables, user perceptions, fishery considerations, rooted plant metrics (as demonstrated in the shallow west-central NCHF lakes) and other considerations, it is appropriate to select proposed eutrophication standards for protection of aquatic recreation uses in deeper WCP lakes and emphasizing ecological considerations in shallow lakes that predominate in the WCP and NGP ecoregions.

G. PROPOSED EUTROPHICATION STANDRDS FOR SHALLOW LAKES [VI. EU standards, reasonableness]

1. <u>Introduction</u> [VI.G. EU standards, reasonableness]

The development of separate standards for shallow lakes by the Agency is a direct response to issues the Coalition of Greater Minnesota Cities (CGMC) and the Minnesota Environmental Science and Economic Review Board (MESERB) raised during the assessment factor rulemaking in 2003. In general, these groups questioned the Agency's use of the same criteria to assess shallow lakes for impairment due to excess nutrients that the Agency used to assess deeper lakes. They also questioned the beneficial uses assigned to shallow lakes, particularly the appropriateness of protecting shallow lakes for swimming. The Agency's response to these comments is touched upon in Sections VI.G and VI.K.4, the SONAR for the Session Law rulemaking (Exhibit A-4) and Exhibit A-36.

Because of the severe statutory limitations on making substantial changes in proposed rule language late in the rulemaking process (as well as fundamental disagreements with some of CGMC's positions), the Agency could do little to address these concerns in the 2003 rulemaking. However, their comments pointed out gaps in the Agency's nutrient criteria, and they prompted the Agency to begin a monitoring program specifically for shallow lakes. In particular, shallow lakes in the NCHF, NGP and WCBP ecoregions were sampled. The result is separate proposed standards for shallow lakes that are based more on protecting the important ecological uses shallow lakes provide, and de-emphasizing their potential use for swimming.

The results of the special shallow lake sampling is described in two Agency reports (Exhibits EU-37 and EU-38). How these data were used to develop the proposed shallow lake standards is briefly summarized here, but discussed in detail in Exhibit EU-1. From this work it was evident that the differences between deep and shallow lakes were particularly evident in the NCHF and WCBP ecoregions.

Lake sampling in the NLF ecoregion showed no consistent or significant difference between deep and shallow lakes in their trophic conditions. For this reason the Agency is not proposing separate standards for shallow lakes in the NLF ecoregion. The same set of standards will apply to both deep and shallow lakes. There are no lake trout or stream trout lakes that fit the definition of "shallow lake."

2. North Central Hardwood Forest Ecoregion [VI.G. EU standards, reasonableness]

The proposed standards for lakes in the NCHF ecoregion with a maximum depth of 15 feet or less are:

- Total phosphorus, 60 µg/L
- Chlorophyll-a, 20 µg/L
- Secchi Depth, 1.0 meter minimum

A subset of lakes in the assessed data base (supplemented with data from a study of lakes in west-central Minnesota) was evaluated to determine the proposed standards for shallow lakes in the NCHF ecoregion. For this purpose, data for lakes with a maximum depth of less than 20 feet were assessed as "shallow lakes." While the Agency subsequently decided, based on the weight of evidence, to define shallow lakes as those having a maximum depth of 15 feet, the data for these lakes are considered representative of lakes that meet the definition of shallow lakes (i.e., maximum depth of 15 feet or 80 percent or more of the lake littoral). Shallow lakes tend to be more nutrient-rich compared to the overall population of lakes in the NCHF ecoregion (Exhibit EU-38).

The range and distributions of TP and Chl-a data for the shallow lakes compared to the ranges and distribution of data for the reference and assessed data for all lakes was used to identify a range for possible TP and Chl-a standards. User perception data is helpful in associating the TP and Chl-a levels with conditions unacceptable for swimming and the associated SD readings. Secchi depth should remain above about 0.7 meter and ideally 1.0 meter or more to minimize the likelihood of a reduced number of rooted plant species. Based on the data from the NCHF assessed lakes, 0.7 meter and 1.0 meter correspond to about the 25th and 50th percentiles values respectively (Exhibit EU-1, Figure 30). A summer average transparency of 0.7 – 1.0 meter should allow submerged aquatic plants to colonize to a depth of about 1.5 – 2.0 meters based on equations developed by Canfield et al. (1985) and Chambers and Kalff (1985) as discussed in Exhibits EU-1 and EU-38. The proposed SD standard is 1.0 meter.

3. Western Corn Belt Plains and Northern Glaciated Plains Ecoregions [VI.G. EU standards, reasonableness]

The proposed standards for lakes in the WCBP and NGP ecoregions with a maximum depth of 15 feet or less are:

- Total phosphorus, 90 µg/L
- Chlorophyll-a, 30 µg/L
- Secchi Depth, 0.7 meter minimum

Based on the Agency's assessments it is estimated that perhaps 10 percent or less of the lakes in the WCP would be considered deep (> 15 feet deep), and virtually all lakes in the NGP are shallow. Agriculture is the dominant land use in these two ecoregions.

The new shallow lake data from the WCBP and NGP allowed the Agency to examine the relationship between TP and the frequency and magnitude of algae blooms (see Figure 6b, page 25 in Exhibit EU-1; it shows the same relationships for shallow lakes that is shown in Figure II-6 for deep lakes). For example, at TP concentrations in the 70-90 µg/L range, the frequency of severe nuisance blooms in shallow lakes is about 45 percent of the time in the summer, and very severe nuisance blooms is about 10 percent of the time. Above about 110 µg/L TP there is a large increase in the frequency of very severe nuisance blooms. A summer-mean P concentration of 90 µg/L should keep SD above 0.5 meter over 90 percent of the summer and over 1.0 meter about 60 percent of the summer (Exhibit EU-30).

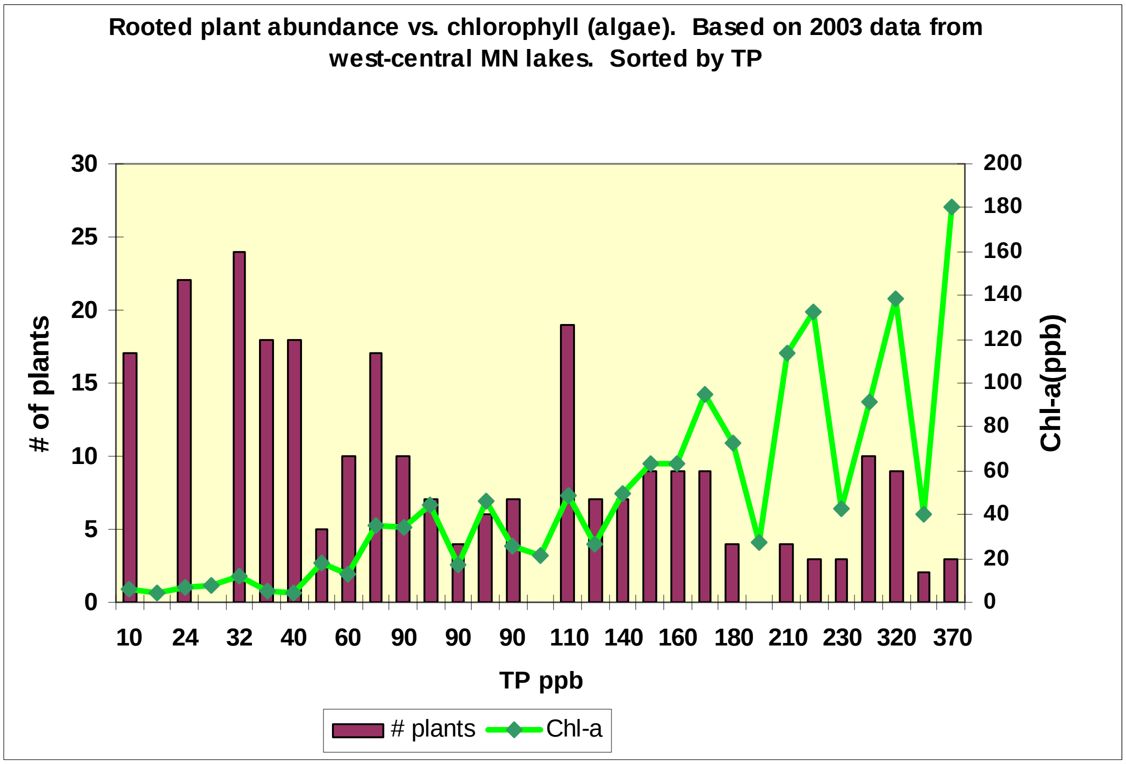
The Agency is targeting the proposed WCBP/NGP shallow lake standards at the threshold of trophic conditions where algae can become dominant at the expense of macrophytes. Figure II-8 shows a general decline, albeit with considerable variability, in the number of macrophyte species as TP concentrations increase, particularly as TP concentrations exceed 100 µg/L.

Two case studies on shallow lakes in Wisconsin and Florida illustrate how shallow lakes can show dramatic positive responses to nutrient reductions, not limited to just improvements in the macrophyte community (see shaded text that follows this Section). These studies show that nutrient reductions can:

- Be successfully combined with other improvement techniques (e.g., rough fish removal);
- Improve the macrophyte community;
- Reduce the frequency and magnitude of algae blooms; and
- Lower Chl-a levels and improve SD readings.

The Lake Apopka case study also shows that restoration to pre-settlement conditions is not a realistic goal and that a reasonable site-specific TP goal for this lake is 55 µg/L.

Figure II-8. Number of Species of Rooted Aquatic Plants Compared to Chlorophyll-a Concentrations in 27 Shallow West-central Minnesota Lakes (see Exhibit EU-38).



Macrophytes are essential to the overall ecology and stability of lakes – shallow lakes in particular. Macrophytes help to retard wave action, increase the settling of particulates in the water column, and enhance light penetration and water clarity. Also, macrophytes and algae attached to macrophytes can take nutrients from the water (luxury uptake), reducing the potential for algae growth; and they provide refuge for zooplankton and insects and provide fish habitat. It has been shown that shorelines with diverse submerged vegetation support significantly more fish than shorelines with little or no vegetation. Finally, macrophytes provide a valuable food source to waterfowl. While excessive rooted macrophytes in a lake may impede recreation for some, they provide many benefits to the overall ecology of the lake.

In conclusion, the proposed eutrophication standards for shallow lakes reflect the generally more eutrophic condition of these lakes compared to deeper lakes outside of the NLF ecoregion. They are targeted at levels needed to encourage macrophyte communities over an algae dominated condition. The proposed shallow lake standards for the NHF and WCBP/NGP ecoregions will not prevent algae blooms; however, they will serve to minimize the intensity and duration of the very severe nuisance blooms, which often make waters unusable (Exhibit EU-1).

<u>Case Studies on the Restoration of Two Shallow Lakes</u>

<u>Big Muskego Lake</u>, a large (2,177 acre) but very shallow (1.2 m maximum depth) lake in southeast Wisconsin is an example of a lake that has exhibited a significant increase in the amount of emergent and submergent vegetation as the combined result of drawdown, roughfish removal and reduced nutrient concentrations. Prior to these activities less than 10% of the lake was covered by emergent plants and water quality could be characterized as hypereutrophic with TP~120 ppb, chlorophyll-a ~44 ppb, and Secchi ~0.3 m. Severe blue-green and filamentous algal blooms were common. Following implementation of the above activities there was dramatic improvements in water quality with annual average TP ~40 ppb, chlorophyll-a ~ 9 ppb, and Secchi ~ 1 m, an increase in the number of rooted plant species and an expansion of the percent surface area coverage of emergent plants to 54%. Based on data collected over a period from 1988 (prior to) through 2004 (post restoration) an increase in Secchi transparency (0.3 m to 0.9 m) was noted as TP declined from roughly 100-200 ppb to about 60 ppb. For the period 1998-2004 TP has averaged 40-50 ppb and Secchi has ranged between 0.9-1.3 m as an annual average. [History on the restoration of Big Muskego Lake was summarized in three articles in NALMS LakeLine magazine. Vol. 23 (1) Spring 2003. Pages 21 – 36, Exhibit EU-44].

<u>Lake Apopka</u> is a very large (32,375 acre) shallow lake (1.7 m mean depth) located northwest of Orlando Florida. It can be described as hypereutrophic based on average TP = 200 ppb, chlorophyll-a =96 ppb, and Secchi =0.22 m (Lowe et al. 1999). The lake has been the subject of a state-sponsored restoration plan dating back to 1993. A primary focus of that effort was to return the lake to its approximate antecedent condition (state-of-the lake prior to large-scale agricultural development of its floodplain and concomitant eutrophication), which based on historic photos and other information would mean a return of the submergent vegetation that once covered much of the basin. Through a variety of techniques they identified a range of trophic status values that likely characterized antecedent condition in the lake as follows:
TP 32 - 51 ppb; chlorophyll-a 8 - 38 ppb and Secchi 0.76 – 1.39 m. They note further though that past conditions should not be construed as restoration goals. Instead, past conditions will be the foundation for consideration of other factors such as economics and constraints of law (Lowe et al. 1999). They go on to note that such consideration will often lead to goals that approximate, but do not duplicate, past conditions. It was likely this thinking that led the St. John's River Water Management District to set by rule (Section11.6, Applicant's Handbook. Management and Storage of Surface Waters) a TP criterion of 55 ppb (Coveney, 2005; personal communication; note have a draft memorandum to this effect).

H. PROPOSED STANDARDS COMPARED TO EPA CRITERIA [VI. EU standards, reasonableness]

As discussed in Section III.A, EPA guidance to states on the adoption of nutrient standards urges states to use an approach that best reflects local conditions and protects specific beneficial uses, based on local data and information (Exhibit EU-15). This is precisely what the Agency has done to develop the proposed eutrophication standards. The resulting proposed standards are not only ecoregion-based but reflect the beneficial uses most important to four lake types (lake and stream trout lakes, deep lakes, shallow lakes and reservoirs). The process EPA used to arrive at the nutrient criteria and the process the Agency used to arrive at the proposed standards differ in several important respects (i.e., EPA's statistical/percentile approach vs. the Agency's iterative approach using trophic relationships and multiple data sets).

The standards proposed by the Agency are generally higher or more lenient than the corresponding EPA ecoregion-based criteria as shown in Table II-10, but they were developed in a manner consistent with EPA guidance to the states. The Agency's approach reflects the use of the Minnesota database, separation of lakes by ecoregion and four lake-types; and, most significantly, the Agency's proposed standards are pegged to thresholds that will protect specific beneficial uses with no overt or clear margin of safety (next Section).

Table II-10. Agency Proposed Eutrophication Standards Compared to EPA Nutrient Criteria for Minnesota Ecoregions. Proposed Standards in Bold are Equal to or More Stringent than the Corresponding EPA Criterion.

Proposed Standards & EPA Criteria By MN Ecoregion	TP µg/L		Chl-a* µg/L		SD Meters	
	Agency	EPA	Agency	EPA	Agency	EPA
NLF						
Lake trout lakes	12	9.69	3	2.46	**4.8**	4.2
Stream trout lakes	20	9.69	6	2.46	2.5	4.2
Deep lakes and Reservoirs	30	9.69	9	2.46	2.0	4.2
Shallow lakes	30	9.69	9	2.46	2.0	4.2
NCHF						
Stream trout lakes	**20**	20	6	5.0	2.5	3.2
Deep lakes and Reservoirs	40	20	14	5.0	1.4	3.2
Shallow lakes	60	20	20	5.0	1.0	3.2
NGP						
Deep lakes and Reservoirs	**65**	90	22	6.5	0.9	1.46
Shallow lakes	**90**	90	30	6.5	0.7	1.46
WCBP						
Deep lakes and Reservoirs	65	55	22	14.6	0.9	1.23
Shallow lakes	90	55	30	14.6	0.7	1.23

*Chl-a values measured by the spectrophotometric method with acid correction.

Of the four proposed standards that are equal to or lower than the EPA criteria, two are applicable to trout lakes: the SD standard of 4.8 meters for lake trout lakes and the NCHF TP standard of 20 µg/L for stream trout lakes. The other two are the TP standards of 65 and 90 µg/L for the NGP ecoregion (Table II-10). The EPA criteria are based on a data set that includes data for lakes outside Minnesota. For example, the WCBP ecoregion covers most of Iowa and part of eastern Nebraska, as well as much of southern Minnesota (Exhibit EU-11). The Agency's proposed standards are based on Minnesota data only. Also the more stringent EPA Chl-a and SD criteria for the NGP ecoregion seem too low and "out of sync" with EPA's TP criterion of 90 µg/L. The Agency found no significant difference in lake data for the two "prairie" ecoregions (NGP and WCBP) in Minnesota, and combined these ecoregions into one geographical area for purpose of the standards. If the EPA TP criteria of 90 and 55 for these two ecoregions are averaged together, the result (72.5 µg/L) is less stringent only than the proposed TP standard for deep lakes in the two ecoregions. Lakes deeper than 15 feet are not very common in these two ecoregions, but those that exist often represent important local recreational resources.

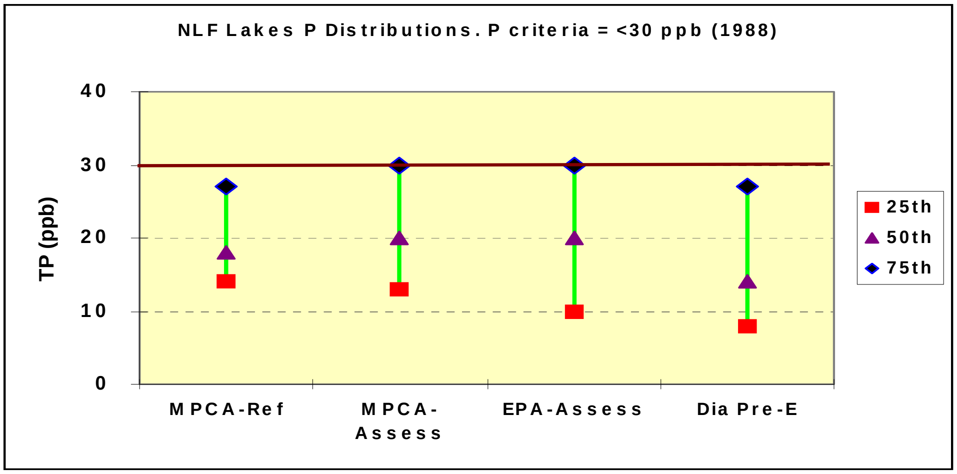
I. PROPOSED STANDARDS COMPARED TO PRESENT-DAY TROPHIC CONDITION OF MINNESOTA LAKES [VI. EU standards, reasonableness]

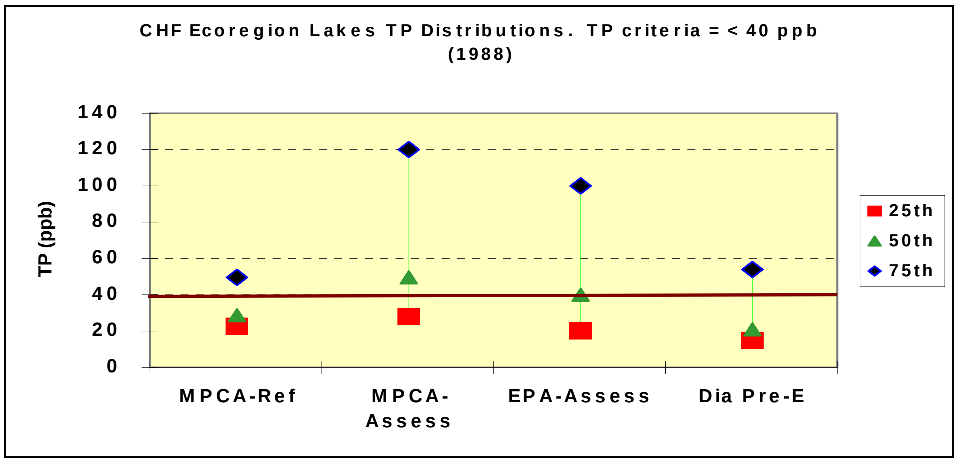
The comparison of the proposed ecoregion-based eutrophication standards to the current and historical trophic condition of lakes in Minnesota is instructive in several respects. The percent of lakes that exceed the proposed TP standards varies considerably from one ecoregion to another. It is clear that many lakes in their present trophic condition will not meet the proposed standards. It reinforces the need for the proposed language dealing with exceedances of the standards due to natural causes (Section VI.L.5). And it should reinforce the concern among governmental agencies, lakeshore property owners and the public in general about the poor trophic status of many Minnesota lakes, and the need to be proactive in their protection.

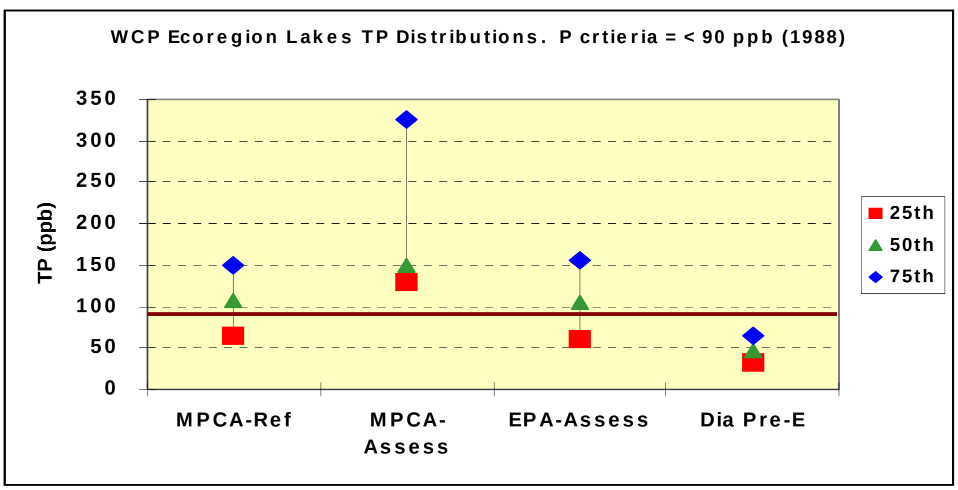
It is also important to emphasize, that in spite of the large number of lakes that exceed the proposed standards in some ecoregions, the standards are not overly stringent. The Agency's analysis of all the supportive information indicates that TP values much greater than those proposed would jeopardize the beneficial uses the standards are designed to protect.

Figure II-9 shows 25th, 50th and 75th percentile values for four data sets compared to the proposed TP standards for three ecoregions (Exhibit EU-1). The four data sets are: 1) the reference lakes, 2) the Agency's assessment data base, 3) the EPA assessment data and, 4) the diatom reconstruction data which estimates pre-European settlement trophic conditions (Section VI.C.3). The Agency's large assessment data set probably best represents the **average** condition of lakes in a given ecoregion.

Figure II-9. Summer-Mean 75th, 50th and 25th Percentile TP Values in µg/L from Four Lake Data Sets Compared to the Proposed TP Standards (solid horizontal line) for Three Ecoregions.







In the NLF ecoregion summer-mean percentile TP values are quite similar among the reference, Agency assessed and EPA assessed databases (Figure II-9). Further, the percentile ranges for these three data sets compare favorably with diatom-inferred pre-European TP concentrations, indicating that the trophic status of many lakes in this ecoregion probably has not been altered dramatically by human activity. The 75th percentile values in both the Agency and EPA assessment data fall on the proposed TP standard of 30 µg/L for the NLF ecoregion. This suggests that about 25 percent of the lakes in this ecoregion would have TP levels above the proposed standard (see discussions in Sections VI.L.5 and VI.M). In this ecoregion no distinction is made between "deep" lakes (> 15 feet deep) and shallow lakes.

The data in Figure II-9 for the NCHF ecoregion focuses on deep lakes. In this ecoregion we see a widening difference between the Agency and EPA assessment data bases and the reference and diatom reconstruction data bases. The two assessment databases exhibit somewhat similar TP percentile values with an overall range between the 75th and 25th percentiles of 84 and 80 µg/L, respectively. This large range is a function of the heterogeneity of the lakes in this ecoregion (e.g., variability in morphometry, watershed characteristics and anthropogenic impacts). The 50th percentile values from the two assessment data bases fall about on the proposed standard of 40 µg/L; thus, about half of the lakes in this ecoregion in their current condition would not be expected to meet the TP standard. The reference and diatom reconstruction data are similar and exhibit a smaller range. This indicates that lakes relatively free from anthropogenic impacts may not have changed very much in the last 200 years.

Because of similarities in land use, lake morphometry, water quality and user perceptions the WCBP and NGP ecoregions have been lumped together for the purpose of nutrient criteria and the proposed eutrophication standards. The WCBP and NGP ecoregions are characterized by relatively small data bases and they are in the same EPA aggregate ecoregion (Exhibit EU-11). Figure II-9 shows data from the WCBP ecoregion, which serves to illustrate the points made here (Exhibit EU-1, Figure 31; data for NGP is shown in Figure 32).

As stated, most lakes in these two ecoregions are shallow (< 15 feet deep). However, the selection of reference lakes tended to emphasize the deeper lakes in these areas, which is reflected in the lower range of TP values. Based on the larger Agency assessment data set most lakes in this ecoregion will not meet the proposed shallow lake TP standard of 90 µg/L. Comparison of the Agency's assessment data to the diatom reconstruction data suggests that human activities have had an impact on the trophic conditions of lakes in these two ecoregions (Figure II-9).

J. SUMMARY, PROPOSED EUTROPHICATION STANDARDS [VI. EU standards, reasonableness]

The eutrophication standards the Agency is proposing represent a significant advancement over the nutrient criteria used to determine impaired lakes for the 2002, 2004 and 2006 303(d) lists. This is because the proposed standards differentiate between trout, shallow and deep lakes, as well as ecoregions. The addition of a separate category for shallow lakes was an important advancement. For example, the proposed phosphorus standard of 60 µg/L for shallow lakes in the NCHF ecoregion is 50 percent higher than the criterion used previously for all lakes. And we are confident that for lakes consistently above the proposed standards, reducing TP and Chl-a to levels below the standards, will yield measurable and perceptible improvements in water quality (several of the case studies in Exhibit EU-1 illustrate this). The development of the TP, Chl-a and SD criteria/standards can be summarized as follows:

- TP data spanning many years are assessed by ecoregion, and the relationships between TP and lake morphometry, fisheries information and watershed characteristics is reviewed.
- The relationship between TP and intervals of Chl-a data is used to define different degrees of nuisance algal blooms, based upon Minnesota data and the literature.
- The strong relationships between levels of TP and Chl-a, and TP and SD, which is well established in the literature, is confirmed in the data for Minnesota lakes.
- Lake data for TP , Chl-a and SD is converted to the Carlson Trophic State Index as a means to cross-check relationships and to help establish trophic boundaries.
- The ecoregion-based TP, Chl-a and SD criteria are evaluated in light of the large data set of user-perception data from the Citizen Lake Monitoring Program and results from 20 years of lake-observer surveys, which indicate that the perception of what constitutes unacceptably low water clarity (SD) or severe algal blooms varies by ecoregion.
- The ecoregion-based TP, Chl-a and SD criteria are evaluated in light of the diatom reconstruction estimates of historical trophic conditions.
- The scientific literature and approaches taken by other states are reviewed.
- The Agency's approach has been cited by EPA as being a reasonable approach for development of nutrient criteria (Exhibit EU-16).

Again, this process is described in detail in Exhibit EU-1.

K. BENEFICIAL USES AND LAKE TYPES [VI. EU standards, reasonableness]

1. <u>Beneficial Use Class</u> [VI.K. EU standards, reasonableness]

The proposed eutrophication standards are properly assigned to the Class 2 use. The uses the standards are designed to protect are consistent with aquatic life and recreational uses, and the national goal in Section 101(a) of the Clean Water Act of achieving "fishable/swimmable" surface waters, where attainable.

Within the Class 2 aquatic life and recreation use are several "sub-uses" that broadly overlap but can differ depending on the type of surface water. For example, we expect wetlands to support a diverse aquatic community of plants and animals, but not a community that includes game fish, or possibly any fish at all. However, the wetland aquatic community may be just as sensitive to the effects of pollution as a community that include game fish. In another example, wetlands may not be an ideal place to go swimming in the traditional sense of "swimming", but they do provide other important forms of aquatic recreation that require the same level of protection afforded a typical swimming lake. On the other hand, swimming is often the primary "sub-use" in a good quality lake. This shift in emphasis among the various sub-uses from one type of waterbody to the next all fits under the broad umbrella of the aquatic life and recreation use.

The proposed eutrophication standards for the different lake types reflect such shifts in sub-use emphasis. That is, the standards are based on protecting a sensitive sub-use that must be protected if that lake type is to provide the uses we expect it to. Table II-11 shows the sub-categories of uses on which the standards are based.

Table II-11. Subcategories of Beneficial Uses within the Aquatic Life and Recreation (Class 2) Use that the Proposed Eutrophication Standards for Different Lake Types are Designed to Protect.

Waterbody type	**Uses. The more sensitive sub-use, which is the primary basis for the proposed standard, is listed as number 1. Other uses follow.**
Lake trout Lakes	1. Protection of sensitive cold water fishery. Specifically, maintenance of adequate dissolved oxygen below the thermocline needed to support lake trout 2. Water recreation of all types including swimming 3. Aesthetics
Stream trout lakes	Same as for lake trout lakes, except that the hypolimnetic dissolved oxygen requirements for stream trout are not as rigorous as for lake trout.
Lakes and reservoirs > 15 feet deep	1. Water recreation of all types including swimming, at least part of the summer season 2. Maintenance of a desirable cool or warm water game fishery 3. Aesthetics
Shallow lakes < 15 feet deep	1. Protection of aquatic community. Specifically the maintenance of a diverse community of emergent and submerged aquatic plants 2. Waterfowl and wildlife habitat 3. Water recreation of all types including primary body contact where usable 4. Aesthetics

The Agency has set the proposed standards at an appropriate and reasonable level that will protect the specific beneficial uses outlined in Table II-11. However, we also feel that based on the extensive body of Minnesota lake data, the proposed eutrophication standards are at the upper end of the range of values that are protective. In other words, the proposed standards represent the threshold for protection of specific uses shown in Table II-11, with no explicit margin of safety. Hence, there is a need to protect resources that are of a quality better than the proposed standards at that level, taking into account normal variability.

2. Lake Trout and Stream Trout Lakes [VI.K. EU standards, reasonableness]

The proposed eutrophication standards for trout lakes (both lake trout and stream trout, Sections VI.E. 2 and VI.E. 3) focus on maintaining a zone of acceptable temperature and dissolved oxygen conditions in the lake that allow lake trout to reproduce and grow, and allow adult stream trout to thrive. The primary basis for these standards is the protection of the sensitive coldwater fishery. Recreational uses, including swimming, are of secondary importance, but it is clear that if the required oligotrophic or near-oligotrophic conditions are maintained to protect the trout, that recreational uses will be protected as well.

3. Lakes Deeper than 15 Feet [VI.K. EU standards, reasonableness]

Most of the lakes in Minnesota that support a managed cool water fishery (e.g. walleye) or warm water fishery (e.g. largemouth bass) and a variety of aquatic recreational uses are “deep” lakes, or lakes and reservoirs with a maximum depth greater than 15 feet.

The proposed standards for lakes and reservoirs greater than 15 feet deep focus on maintaining conditions that will support aquatic recreation, particularly swimming (Table II-11). The process used to arrive at the ecoregion-based standards for this category is outlined in Sections III.E and VI.F. In summary, TP levels were associated with Chl-a and SD measurements and the frequency and magnitude of algae blooms (Figure II-6). The suggested standards for the four ecoregions were then fine-tuned with other information, including user perception data. The proposed standards are at the thresholds of trophic conditions, by ecoregion, that are acceptable for swimming and other forms of water-related recreation, with no explicit margin of safety. The Agency believes the proposed standards are very well founded and reasonable, and not overly protective.

4. Shallow Lakes [VI.K. EU standards, reasonableness]

Comments received during the assessment factor rulemaking prompted the Agency to re-think which Class 2 “sub-uses” are the most critical for shallow lakes. The result is proposed separate standards for shallow lakes that emphasize protecting the important ecological uses shallow lakes provide, while still protecting them for swimming and other recreational uses, where these uses are attainable.

Using the trophic data from the Agency’s shallow lake monitoring and the data and experience of MDNR staff that work in their shallow lakes program, thresholds were determined for the level of TP at which a shift from a desirable macrophyte community to a much less desirable algae dominated community is likely to occur. The proposed eutrophication standards for shallow lakes reflect an emphasis on an ecological “sub-use”; i.e., encouraging a macrophyte community over an algae-dominated community. The proposed shallow lake TP standards, particularly for the NGP and WCBP ecoregions, will not prevent nuisance algae blooms, or even the possibility of severe blooms, from occurring at least part of the summer. However, they should support trophic conditions for which macrophytes can successfully compete with the algae and recreational uses are possible (Exhibit EU-1).

5. Reservoirs [VI.K. EU standards, reasonableness]

The goal is to protect reservoirs for the same uses that “deep” lakes are protected for; i.e., a mix of aquatic life and recreational uses with the emphasis on swimming (Table II-11). We often think of reservoirs as a stream valley flooded by a dam, which creates a “lake” where none existed before. This type of reservoir is less common in Minnesota than elsewhere in the U.S. Examples are Lake Zumbro north of Rochester and Lake Byllesby near Cannon Falls.

Some of Minnesota's well known large lakes are technically reservoirs because they have at their outlet a structure that controls the flow of water from the "lake." Most of these "reservoirs" were natural lakes originally and often are not thought of as reservoirs. In some cases the control structure maintains a water level higher than the original natural level, and generally water levels are managed to support aquatic recreation, water storage and flood control. The MDNR Bulletin 25 inventory of Minnesota lakes[27] lists the 50 largest lakes in or bordering Minnesota – those with a surface area larger than 5,000 acres. Twenty four of the 50 are listed as reservoirs; included such well known lakes as Lake of the Woods, Rainy, Leech, Winnibigoshish, Gull, Pokegama, Big Sandy, Big Stone and Pepin.

If the maximum depth of the reservoir is less than 15 feet, it may be assessed as a shallow lake in terms of the Class 2 sub-uses that are emphasized; and the numeric standards for shallow lakes may be applied. This would be determined on a case-by-case basis (see next Section).

A key part of the definition of "reservoir" that is needed to separate reservoirs from rivers is the minimum hydraulic residence time of 14 days. The importance of using a standardized stream flow (the $122Q_{10}$ low flow) to determine the minimum residence time is discussed in Sections VI.B.2 and X.B.5 of SONAR Book I (also see Exhibits EU-16, page 3-1, and PL-1c).

L. NARRATIVE PORTION OF EUTROPHICATION STANDARDS [VI. EU standards, reasonableness]

1. Introduction [VI.L. EU standards, reasonableness]

As already noted, the proposed eutrophication standards are unlike the typical Class 2 toxicity or human health-based standards (see Section IV.G). For these and the reasons discussed in this Section, it is particularly important for the Agency to add narrative to the proposed numeric eutrophication standards. Because of their length, the Revisor's Office recommended placing the narrative parts of the eutrophication standards in separate subparts following the listings of the Class 2 numeric standards (Class 2A, 2Bd and 2B). Each "item" of the proposed narrative will be discussed in the sections that follow.

2. Lakes in Other Ecoregions [VI.L. EU standards, reasonableness]

Eutrophication standards are proposed for the four ecoregions that include 98 percent of the lakes in Minnesota. Specific standards are not proposed for lakes in the other three ecoregions because there is insufficient data available on which to base standards. Standards for lakes in these ecoregions, when needed, can be developed on a case-by-case basis. The numeric standards in an adjacent ecoregion can be used as a "guide" or starting point. For example, it is reasonable to use the standards for the NLF ecoregion as a starting point in developing a site-specific standard for a lake in the Northern Minnesota Wetland ecoregion. It is possible that the NLF standards may prove to be appropriate as listed with no need for any adjustment; but if not, a site-specific standard will be developed. Similarly, if a lake lies on the border between two ecoregions, the

[27] MDNR 1968. An inventory of Minnesota lakes. Bulletin No. 25, Division of Waters, Soils and Minerals, Minnesota Conservation Department, St. Paul, MN.

standards for that lake will need to be considered on a case-by-case basis. This is a reasonable approach for the lakes in these three ecoregions and for lakes that straddle two ecoregions. The need to develop site-specific standards for these situations should be infrequent. The proposed language for Class 2B waters as an example follows.

> [Minn. R. 7050.0222] <u>*Subp. 4a.*</u> ***Narrative eutrophication standards for Class 2B Lakes, Shallow Lakes, and Reservoirs.***
>
> <u>*A. Eutrophication standards applicable to lakes, shallow lakes, and reservoirs that lie on the border between two ecoregions or that are in the Red River Valley, Northern Minnesota Wetlands or Driftless Area Ecoregions must be applied on a case-by-case basis. The commissioner shall use the standards applicable to adjacent ecoregions as a guide.*</u>

3. <u>Summer Season Average and Exceedance of Causal and Response Standards</u>
[VI.L. EU standards reasonableness]

It is the intent of the Agency that the proposed standards be compared to trophic conditions averaged over the summer growing season. The Agency made it clear in the assessment factor rulemaking that nutrient criteria were to be implemented as summer averages (Minn. R. 7050.0215, subp. 5). The proposed statement follows:

> <u>*B. Eutrophication standards are compared to data averaged over the summer season (June through September). Exceedance of the total phosphorus and either the chlorophyll-a or Secchi disk standard is required to indicate a polluted condition.*</u>

The Agency has compared the nutrient criteria (for TP, Chl-a and SD) to data averaged over the summer growing season to assess the trophic status of lakes since 2002, and before that, for other lake programs. It is the average (or other measurement of central tendency such as a median) trophic condition of a lake from June through September, rather than the conditions that exist on any given sampling day, that is of most interest to the Agency. Algal populations change in species composition and abundance over the course of the summer. Many lakes tend to become "more green" as the summer progresses, and less desirable blue-green (floating) algae may replace less problematic species in late summer. Other characteristics such as the amount of color in the water (which may increase or decrease in response to rainfall and runoff from the surrounding watershed), temperature changes, stratification, and the growth of macrophytes, will change over the course of the season. These complex patterns of change throughout the summer growing season in a wide range of lake types, make it very difficult to select a portion of the summer, or a given month, for example, during which all lakes should be assessed. It is more reasonable to average conditions over the whole summer. Also, by doing so, the Agency can make the best use of usually limited data. The minimum data needed in any one year to assess a lake for potential impairment is monthly sampling over the summer (i.e., four to five samplings spaced over the summer period). Data for at least two years is needed. The Agency's assessment guidance specifies the minimum data requirements (Exhibit A-7).

It is true that using a summer average condition may tend to mask periods of time when conditions in a lake may be at their worst and possibly unacceptable. In a marginally impaired lake, for example, conditions may be acceptable and within standards early in the summer, but gradually deteriorate to an unacceptable condition as the growing season progresses. Averaging the data for such lakes over the summer dampens the influence of the “good” as well as the “bad” conditions. This means that if conditions support beneficial uses for more than half the summer, the lake may be in compliance with standards. However, the development of the proposed standards and establishing the relationships between summer-mean TP and Chl-a considered the frequency and intensity (or risk) of severe algae blooms or extreme conditions during any part of the summer. That is, the standards take into consideration the range of likely values around, and particularly above or worse than, the summer-average conditions.

In summary, the Agency believes it is not representative or practical to assess lakes for only a part of the summer, for example in late summer when conditions are more likely to be at their worst. It is preferable, in the view of the Agency, to assess conditions over the course of the summer recognizing that conditions can change. Also, a summer-average maximizes the information that can be derived from limited data.

During the assessment factor rulemaking, the Agency adopted language that says for the narrative eutrophication standard to be exceeded, both the TP (cause) and either the Chl-a or SD (response) criteria must be exceeded (Minn. R. 7050.0150, subp. 5). The Agency believes that there should be a measurable negative response to the loading of TP into a lake or reservoir in order to have an exceedance of the standard. This is especially true when lakes are being assessed for impairment and potential 303(d) listing. It is unusual to have a measurable increase in TP loading or in-lake TP concentrations without a response, but it is possible. It is reasonable to require at least one of the response standards (Chl-a or SD) to show an exceedance, in addition to the TP standard, for the conditions to be considered an “exceedance” of the eutrophication standards.

The proposed narrative associated with the standards says that only one of the response standards must be exceeded for the eutrophication standards to be considered exceeded. Situations where the weight of evidence demonstrates impairment based on one response factor but not other will be rare, but examples do occur. The Agency’s proposed language shown above is consistent with the language in Minn. R. 7050.0150, subp. 5 in both these respects. It is reasonable to require exceedance of just one response standard for the reasons outlined below.

It is possible to have very high Chl-a concentrations indicating algae populations at bloom conditions and still have “acceptable” SD measurements. Certain species of blue-green algae, for example, can be numerous in the water column but because of their large size and distribution (some look like grass clippings suspended in the water), and because the water does not become an opaque green color, SD transparency is not reduced as much as the high Chl-a levels would suggest. In this case SD readings may misrepresent the true extent of the eutrophic condition. In other situations Chl-a levels may not reflect the true extent of eutrophication. Blue-green algae may float on the surface, creating surface scums, that if left undisturbed can greatly reduce SD measurements; but an integrated sample (sample averaged over the top 6 feet of water) may not show Chl-a levels that match the very poor SD measurements.

In another example, if a lake has an atypically reduced population of minnows and other small fish for any reason, the lack of predation on the zooplankton community by small fish can allow some zooplankton species (e.g., *Daphnia*) to become very numerous. An abundant population of algae-feeding zooplankton may selectively feed on smaller algae species, leaving behind the larger blue-green species. Again, this can allow for deceptively high SD readings.

Lakes with these, albeit unusual conditions, should be considered in violation of the standards based on high TP and high Chl-a levels **or** low SD readings. To require data showing exceedance of both response factors will probably result in some lakes not getting listed as impaired that truly are impaired. The Agency feels it is reasonable to require an exceedance of just one response factor.

4. <u>Lakes Better Than Standards, Nondegradation Policy</u> [VI.L. EU standards, reasonableness]

a) Nondegradation Policy

The fundamental principal of nondegradation is to keep waterbodies that have a water quality condition better than water quality standards in their current "better-than-standards" condition, and not allow them to be degraded. Some citizens, particularly members of lake associations that represent lakes with trophic conditions "better-than-standards" (high quality lakes), have voiced a concern that adoption of the eutrophication standards might send an unintentional negative message that degrading a high quality lake "down to" the level of the standards is acceptable. The Agency shares this concern. It is important to be very clear that the adoption of eutrophication standards does **not** mean that the trophic conditions in lakes that are better than standards can be "lowered" (i.e., concentrations of TP, Chl-a increased and SD readings reduced) to the standards because beneficial uses will still be protected. The maintenance of Minnesota's high quality lakes in their current "better-than-standards" condition is extremely important to the state's economy and to the general quality of life in Minnesota. With appropriate management, high quality lakes will provide recreational, aesthetic and economic value indefinitely into the future. Therefore, the Agency is proposing to include a strong nondegradation policy statement with the numeric standards, shown below.

> <u>*C. It is the policy of the agency to protect all lakes, shallow lakes, and reservoirs from the undesirable effects of cultural eutrophication. Lakes, shallow lakes, and reservoirs with a baseline quality better than the numeric eutrophication standards in subpart 4 must be maintained in that condition through the strict application of all relevant federal, state, and local requirements governing nondegradation, the discharge of nutrients from point and nonpoint sources, and the protection of lake, shallow lake, and reservoir resources, including, but not limited to:*</u>
>
> <u>*(1) the nondegradation requirements in parts 7050.0180 and 7050.0185;*</u>
> <u>*(2) the phosphorus effluent limits for point sources, where applicable in chapter 7053;*</u>
> <u>*(3) the requirements for feedlots in chapter 7020;*</u>
> <u>*(4) the requirements for individual sewage treatment systems in chapter 7080;*</u>

<u>(5) the requirements for control of stormwater in chapter 7090;</u>
<u>(6) county shoreland ordinances; and</u>
<u>(7) implementation of mandatory and voluntary best management practices to minimize point and nonpoint sources of nutrients.</u>

An example will help illustrate the importance of the nondegradation policy. Imagine a family that just spent $200,000 to purchase lakeshore property on a lake in the NLF ecoregion with an average SD of 5 meters (≈ 16.5 feet). According to the proposed standard, and ignoring applicable nondegradation and other protective provisions for the moment, the SD of this lake "could" be reduced to a summer mean of 2.0 meters (≈ 6.5 feet), with the associated increases in Chl-a and TP, and the lake would still meet the proposed NLF SD standard of 1.8 meters. It is very unlikely this family would be comforted by a response to their disappointment over the loss of water clarity in "their" new lake that the lake meets standards and is still usable for fishing and swimming – at least for most of the summer.

This family's disappointment might be even more tangible if they decide to sell and move to a different high quality lake. It is very likely that the value of their property declined with the decline in water clarity. A recent Minnesota study that relates lakeshore property values to water quality indicates that, other things being equal, such a reduction in water clarity alone would reduce the value of this family's investment by about $207.00 for each frontage foot of lakeshore they own ($69.00 for each meter loss in water clarity, Exhibit EU-39).[28] While the targeted beneficial uses for this lake should still be met because the standards are met, it is unlikely that this dollar figure would completely reflect this family's sense of loss; the loss of swimming and aesthetic enjoyment that a lake with a 5 meter SD provides compared to a lake with a 2 meter SD.

The proposed nondegradation language, quoted above, starts with a statement that it is the Agency's policy to protect all lakes from cultural eutrophication. The language then says that lakes better than standards will be protected through the strict application of all applicable federal, state and local nondegradation provisions, and through application of existing TP reduction requirements for point and nonpoint sources of nutrients. Examples of these provisions are listed in subitems 1 to 7.

It is reasonable to list examples of the requirements the Agency has in mind to prevent an increase in nutrient loading to high quality lakes. In lakes where a decline in water quality can be documented due to anthropogenic nutrient sources, but the lake is still "better-than-standards", reductions in nutrient loading may be needed to halt the decline. What is listed in the proposed rule are existing rule provisions and treatment requirements already adopted and in place. The nondegradation policy statement establishes **no new authority** for the Agency or any other governmental entity. It relies on existing nondegradation provisions in Minn. R. 7050.0180 and 7050.0185, and provisions in other existing rules, as well as local ordinances.

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[28] Krysel, C., et al. 2003. Lakeshore property values and water quality: evidence from property sales in the Mississippi headwaters region. A publication of the Mississippi River Headwaters Board. The dollar loss used in this example is the median loss for the 37 lakes in the study. Actual loss depends on the individual lake characteristics and location.

For example, the Agency cannot use this language to stop future growth and development unless existing provisions (state or federal) already in place allow the Agency to do so.

The Agency proposes to include the word "strict" in the language (…*condition through the **strict** application of all relevant federal, state and local requirements…*, emphasis added). The Agency feels that this is an important and reasonable addition, because it reflects the importance of the resource. High quality lakes are very valuable economically and socially. The application of nondegradation provisions is case-by-case and site-specific. This gives the Agency some latitude, when implementing nondegradation, to interpret and tailor the nondegradation requirements based on the concerns of local citizens, vulnerability of the lake and importance of the resource. Thus a "strict" application could result in greater protection of the resource than a "casual" application, in a specific situation. Again, the existing nondegradation requirements must be applied within the limitations of the authority granted by the provisions in rule. Similarly, the application of zoning and shoreland development ordinances is very site-specific. County commissioners that make these decisions have some flexibility to interpret and enforce shoreland ordinances; and certainly they have considerable latitude in whether or not to grant a variance to a land owner whose project may compromise water quality or aesthetics. Here again, a "strict" application of these provisions by local governments may be more protective of high quality lakes than a "less strict" application. It is assumed that both the strict or lenient interpretations are within the letter of current laws, rules or ordinances. It is the Agency's intent that the proposed eutrophication standards promote a strict or high level of protection to these important resources.

b) Determination of Current Trophic Status

The Agency recognizes that to keep a lake that is in a "better-than-standards" condition, in that condition, we must know what the current trophic status is. This is not a new concept for the Agency – establishing the existing trophic status of a given lake is an important first step in many lake programs. The assessment guidance manual (Exhibit A-7) specifies minimum data requirements needed to carry out an impairment assessment. Essentially the same guidelines are recommended in this context; i.e., to establish the existing conditions in a high quality lake.

Characterization of existing conditions must account for within season variability and year to year variability. In most situations, the following monitoring regime is considered the minimum needed to provide enough data to establish background trophic conditions.

- Morphometric information;
- Watershed size and characteristics;
- 12 samples each for TP, Chl-a and SD (for determination of summer averages);
- Other water quality data and indicators of trophic status, such as dissolved oxygen/temperature profiles, color, etc; and
- Data that is representative of trophic conditions over at least a two-year period.

Again, the Agency's clearly stated goal for high quality lakes is that there should be **no** negative shift in trophic status. In practice, however, in determining whether trophic conditions have changed, the Agency must look for measurable changes over time, supported by a weight of evidence. The expected variability in the data must be addressed when comparing data over time. The Agency will use whatever assessment, statistical or modeling tools are available and appropriate for the situation to document any change.

In the past the Agency has used standard error of the mean (standard deviation divided by $\sqrt{N}$) and coefficient of variation of the mean (standard error divided by the mean) as ways of expressing variation around the means of TP, Chl-a and SD data. This in turn provides a basis to determine if there may be significant differences in means (e.g., as may be the case when comparing the observed mean to a mean predicted by a model). We have also used the deviation of annual means from a long-term mean (residuals analysis) as a basis for assessing typical annual variability and for detecting trends over time. These tools have proven useful in assessing the variability in relatively small data sets, and in looking for trends.[29] A practical management goal, for example, might be annual means plus or minus typically observed variation as expressed by one of the tools just mentioned. It is important to emphasize, however, that a statistically significant change in trophic status is **not** required, for the Agency to conclude that a change in trophic status has taken place. These decisions are normally based on a "weight of evidence" analysis. The limited quantity of data often available to the Agency, and the variability seen in natural systems may make the application of statistical tests impractical.

5. <u>Lakes Not Able to Meet Standards Due to Natural Causes</u> [VI.L. EU standards, reasonableness]

a) Natural Causes

While it is very important to protect lakes that are better than standards, the Agency also realizes that some lakes can never attain the proposed eutrophication standards due to natural causes. Lakes determined to be unable to meet standards due to natural causes will **not** be considered "in violation" of the eutrophication standard. The proposed language is below:

> <u>*D. Lakes, shallow lakes, and reservoirs with a baseline quality that is poorer than the numeric eutrophication standards in subpart 4 must be considered to be in compliance with the standards if the baseline quality is the result of natural causes. The commissioner shall determine baseline quality and compliance with these standards using summer-average data and the procedures in part 7050.0150, subpart 5. Natural causes is defined in part 7050.0150, subpart 4, item N.*</u>

The key to this concept, of course, is determining whether the trophic condition in a given lake is the result of natural causes alone, or the result of the combination of natural TP loading plus loading from human activities in the watershed. The determination will require lake-specific monitoring data, historical information, watershed data and other relevant information. Input from local organizations and units of government and the public could be very important as well.

[29] Relatively small compared to the amount of data usually preferred by statisticians.

The Agency is proposing to include a definition of “natural causes” in Minn. R. 7050.0150 (see SONAR Book I, Sections VI.B.5 and X.B.8). The proposed definition is:

> [Minn. R. 7050.0150, subp. 4] *N. “Natural causes” means the multiplicity of factors that determine the physical, chemical, or biological conditions that would exist in a water body in the absence of measurable impacts from human activity or influence.*

It is important to discuss the Agency’s concept of natural causes in the context of the eutrophication standards and potential TMDLs for nutrient impaired lakes. Figure II-10 helps illustrate how the Agency is interpreting natural causes.

The total loading of TP to any lake can be broadly categorized as follows:

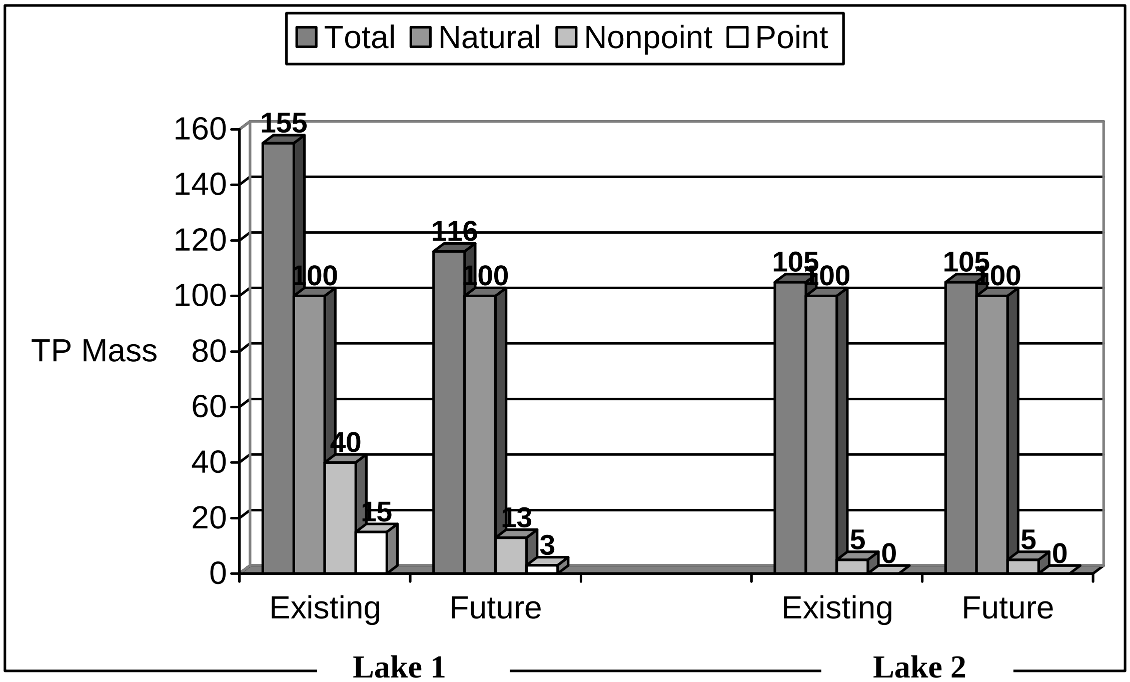
- Loading from natural causes or natural background.
- Loading from nonpoint sources resulting from human activities.
- Loading from point source discharges of treated wastewater.

Loading from natural causes is the loading the lake receives or would receive from the surrounding watershed with essentially no influence from human activity. The result is the trophic status the lake has, “in the absence of measurable impacts from human activity.” This ultimately is the condition the lake was in 200 years ago, prior to European settlement. Pre-settlement trophic conditions can be estimated using proven methods. Diatom reconstruction analysis is one such method (Section VI.C.3). The prediction of trophic condition using nutrient export coefficients developed for undisturbed landscapes supporting the vegetation native to the watershed in which the lake is located is another approach.

Sources of anthropogenic TP loading include uncontrolled or poorly controlled runoff from urban landscapes, agricultural land, construction sites and other altered landscapes. These point and nonpoint sources are generally controlled through application of best management practices (BMP), as required in a permit (e.g., urban stormwater or construction site permits) or through the application of voluntary BMPs. Point source loading includes discharges from municipal and industrial wastewater treatment plants, discharges from permitted stormwater systems, feedlots, and failing individual septic systems. Again, TP in point sources is generally controlled through application of some type of wastewater treatment usually under the terms of a permit.

Figure II-10 illustrates the TP loading to two hypothetical lakes that do not meet the proposed eutrophication standards. The TP loading to both lakes from natural causes is the same (100 mass units). Lake number 1 in its existing condition receives anthropogenic TP loading from nonpoint sources (40 mass units) and point sources (15 mass units) in addition to the natural loading, for a total loading of 155 mass units. Lake number 2 receives a very small amount of TP loading from anthropogenic nonpoint sources (5 mass units) and no loading from point sources for a total loading of 105 mass units. The combined loadings are enough to cause exceedances of the proposed eutrophication standards. For this hypothetical example, the TP mass loading values are selected simply to illustrate these concepts (units are not important).

Figure II-10. Phosphorus Loading to Two Hypothetical Lakes Not Meeting Proposed Standards Showing Existing and Projected Future Conditions (see text).



In the example, the trophic condition of lake 1 can be improved by a combination of point and nonpoint source measures to reduce nutrient loading. Through application of appropriate best management practices in the shoreland and throughout lake 1's watershed, nonpoint source loading is reduced by two thirds (to 13 mass units); and through the implementation of TP wastewater treatment by the point sources in the watershed, the point source loading is reduced from 15 to 3 mass units (Figure II-10, Lake 1 future conditions). The Agency may seek TP reductions from the point sources in the watershed under one or more of the following: 1) the requirements of existing Minn. R. 7050.0211, 2) the extension of TP limits to new and expanding facilities proposed as part of this rulemaking, 3) application of biological phosphorus treatment technologies, 4) implementation of phosphorus management plans as required by a permit, and 5) any voluntary steps taken to reduce effluent TP in response to nutrient reduction goals established for the watershed by state or local entities, or other nutrient management plans (e.g. the St. Croix basin). In the context of the proposed rule language dealing with impairment due to natural causes, it is assumed that the future trophic status of lake 1 is still in exceedance of the standards, even though it has been measurably improved as a result of the point and nonpoint source improvements. Whether it is the natural loading alone or the combination of natural plus the remaining anthropogenic loading that is causing the exceedance of standards in future lake 1 would be important if lake 1 is on the 303(d) list and a TMDL study is underway.

b) Essentially Irreversible TP Loading

After applying all required, reasonable and practical efforts to minimize point and nonpoint source TP loading to lake 1, 16 mass units of anthropogenic TP remain and continue into the future (Figure II-10). The Agency would review the lake-specific information for lake 1 and determine if further reductions in anthropogenic loading are achievable without heroic and possibly cost ineffective measures. If the Agency determines that further reductions in anthropogenic loading are not feasible, the remaining anthropogenic loading to lake 1 is considered to be due to “essentially irreversible” human induced changes, the lake would be considered in compliance with the standards. Essentially irreversible changes in the watershed are relatively permanent man-made alterations such as dams on major reservoirs, or lakes surrounded by extensive urbanization or agricultural land use. These determinations will need to be made on a case-by-case basis.

The Agency cannot expect all lakes in Minnesota to exhibit the same water quality and trophic conditions they had prior to European settlement.[30] We must recognize that some level of anthropogenic loading cannot be reasonably remedied in the foreseeable future in some situations. On the other hand, we can’t say with certainty that further reductions may never be possible and practical in the future. Unforeseen advances in treatment technologies, advances in agricultural practices, future land set-aside programs, and TP reduction programs that may seem unlikely now are a possibility in the future; and the public’s attitudes evolve over time. We have seen several examples of these changes over the last 30 years. Phosphorus was taken out of detergents in the late-1970s, biological wastewater treatment technologies that remove TP from point source effluents became popular in the 1990s, and, recently, phosphorus was banned from fertilizers for most home use. The Agency cannot rule out the possibility that further TP reductions will be made in the future, even in situations that seem essentially irreversible now. The Agency understands that it may be difficult to identify the “essentially irreversible” human induced changes, and that it must be done on a site-specific basis using a weight of evidence approach.

Lake 2 in Figure II-10 receives essentially all its nutrient loading from natural causes and the TP loading in the future is the same as the existing loading. The small increment of TP loading from anthropogenic nonpoint sources (5 mass units) is considered to be essentially irreversible and not amenable to reduction at the present time; and it may not be consistently measurable above background variability. Lake 2 is an example of a lake that does not meet the standards due to natural causes, and it would not be considered in violation of the standards. However, the Agency cannot rule out the possibility that even this small amount of anthropogenic loading might be reducible in the future.

In recognizing that some “essentially irreversible” anthropogenic loading may be unavoidable in some situations, at the present, it is important to be clear that this is the loading that occurs after all required, reasonable and practical efforts have been made to minimize nutrient loading from both point and nonpoint anthropogenic sources. Thus, all applicable point source controls and

[30] Although many lakes in the NLF ecoregion have changed very little in 200 years; see Figure II-9.

requirements have been implemented, and all reasonable, appropriate and practical best management practices have been implemented throughout the lake's watershed, to minimize nutrient loading. It is only after these conditions have been met that the remaining anthropogenic loading can be considered essentially irreversible. The goal remains to achieve the best quality feasible in lakes that cannot meet standards.

This concept applies in the present context – the protection of naturally "poor" quality lakes from becoming worse through cultural eutrophication. The concept also could enter into the TMDL analysis for a lake listed as impaired. That is, if after all the required and reasonable point and nonpoint source remediation measures have been carried out, the lake still cannot meet the eutrophication standards, application of Minn. R. 7050.0170 (natural conditions) or development of site-specific eutrophication standards may be appropriate to address the essentially irreversible loading, as long as the modified standards support the designated uses. Alternately, a use attainability analysis may be appropriate to address the essentially irreversible loading if the lake cannot support the Class 2 designated uses. Using lake 2 in Figure II-10 as an example, site-specific standards for TP, Chl-a or SD could be considered that equate to the total loading of 105 mass units of TP, thus accommodating the essentially irreversible loading in the site-specific standards. Similarly, a site-specific standard could be developed for lake 1 that equates to the future total loading of 116 mass units of TP remaining after remedial measures are in place. The Agency intends to use adaptive management techniques in the TMDL process to periodically review "essentially irreversible" determinations and apply site-specific management strategies as necessary.

In conclusion, some lakes in Minnesota will not meet the proposed standards due to natural causes (see Section VI.M). The Agency also recognizes that the trophic status of some lakes will reflect TP loading from essentially irreversible human induced changes in the watershed that are not amenable to remediation in the foreseeable future. Such lakes will not be considered to be in violation of the proposed eutrophication standards. The Agency does not rule out the possibility that unforeseen factors may provide a practical method for reducing essentially irreversible loading in the future. Development of a site-specific standard may be at least a partial solution in such situations.

6. <u>Reservoirs and Site-specific Standards</u> [VI.L. EU standards, reasonableness]

The Agency recognizes that reservoirs are a special category of waterbodies, and that the eutrophication standards as listed in the rule may not be the correct standard for a given reservoir. While the rule already provides the authority to develop site-specific Class 2 standards for reservoirs or any waterbody (existing Minn. R. 7050.0222, subp. 8), the Agency believes it is important and reasonable to mention the site-specific option in the context of the eutrophication standards. Including it serves to emphasize the definite possibility that site-specific standards for reservoirs may become more the "rule" than the exception. Also, including it is a helpful reminder to the reader that they may want to consider a site-specific standard and that the option is available.

Reservoirs have many unique characteristics that can cause them to react somewhat differently to nutrient loading as compared to natural lakes (Exhibit EU-16, page 3-4). Examples of these factors are mentioned in the proposed language, as shown below:

> *E. When applied to reservoirs, the eutrophication standards in this subpart and subpart 4 may be modified on a site-specific basis to account for characteristics of reservoirs that can affect trophic status, such as water temperature, variations in hydraulic residence time, watershed size, and the fact that reservoirs may receive drainage from more than one ecoregion. Information supporting a site-specific standard can be provided by the commissioner or by any person outside the agency. The commissioner shall evaluate all data in support of a modified standard and determine whether a change in the standard for a specific reservoir is justified. Any total phosphorus effluent limit determined to be necessary based on a modified standard shall only be required after the discharger has been given notice to the specific proposed effluent limits and an opportunity to request a hearing as provided in part 7000.1800.*

It is logical for the Agency to use the eutrophication standards for the ecoregion in which the reservoir is located as the applicable standard until evidence is obtained and reviewed that shows the listed standards are not appropriate and that site-specific standards are needed. As in the case for any site-specific standard, if it becomes the basis for an effluent limit the regulated party can ask for a contested case hearing, and the facts upon which the site-specific standard is based can be part of what is contested.

7. Narrative Language, Conclusions [VI.L. EU standards, reasonableness]

The proposed eutrophication standards are unique among numeric standards for several reasons, but mostly because the resource they protect is highly variable, application is different than most other standards, and exceedances of the standards are very obvious to the casual observer. For these reasons, the Agency feels it is very important to include narrative statements with the numeric standards. These statements cover:

- Site-specific standards for lakes in three ecoregions that do not have specific standards, and for lakes that straddle two ecoregions;
- Standards are compared to lake data averaged over the summer growing season;
- Lakes with better-than-standards water quality will be maintained in that condition through nondegradation;
- Lakes that do not meet standards due to natural causes are not in violation of the standards; and
- Standards for reservoirs may need to be developed on a case-by-case basis.

It is important and reasonable to include a narrative portion with the numeric eutrophication standards. The Agency's proposed wording is consistent with past use of the nutrient criteria, the assessment of lakes for impairment, and the foundation for the eutrophication standards established by the 2003 assessment factor rulemaking.

M. IMPLEMENTATION [VI. EU standards, reasonableness]

1. Introduction [VI.M. EU standards, reasonableness]

Once adopted, the eutrophication standards will be used very much like other water quality standards (see Section II.B.8 in SONAR Book I). In some respects, adoption may cause little notice because the Agency will use the standards in much the same way it has used the nutrient criteria over the years, which is:

- To serve as goals for lakes in the Clean Water Partnership and Clean Lakes programs;
- As thresholds for determination of impaired waters for the 305(b) report;
- As thresholds for determination of impaired waters for the 303(d) list; and
- As the goal for the restoration of impaired waters through the TMDL process.

It is the Agency's intent, however, that the eutrophication standards will receive greater exposure and be more widely implemented than the current nutrient criteria. In addition, the proposed eutrophication standards will provide a more direct link to possible TP effluent limits for a small subset of dischargers (see Section VI.M.4 and X.D). For the most part to date, the nutrient criteria have not been used as the basis for setting TP effluent limits in NPDES permits, although this regulatory application of the criteria would very likely increase in the future independent of the eutrophication standards.

It is worth summarizing in the *implementation* section, the Agency's response to the fact that a large number of Minnesota lakes, based on the Agency's lake data sets, are projected to exceed the proposed standards (Figure II-9).

As noted in Section VI.I, current TP concentrations in about 25 to 90 percent of Minnesota non-trout lakes, depending on the ecoregion, exceed the corresponding proposed ecoregion TP standard. This does not mean that all of these lakes belong on the impaired waters list. Even if we had data for every lake in Minnesota (we currently have data for about 14 percent of all lakes), many would not be considered impaired due to one or more of the following considerations:

- Natural background exceeds the standard;
- A site-specific modification of the standard indicates the lake is not impaired;
- A use attainability analysis (UAA) shows that an important beneficial use does not exist or is unattainable; or
- The use classification of the lake has been changed through rulemaking.

All of these options require a site-specific analysis of some type, but they vary in complexity and number of administrative steps involved. For example, if the natural background conditions are shown to exceed the standard, the background can be used as the standard under Minn. R. 7050.0170 and no additional steps are required. On the other hand if the UAA option is selected, the site-specific analysis must demonstrate that the beneficial use (e.g., swimming) is not attainable; and, if it does not exist, a use classification change through rulemaking is required.

2. <u>Expected Compliance Goal for Eutrophication Standards</u> [VI.M. EU standards reasonableness]

Typically, associated with Class 2 water quality standards are stated compliance or protection level goals. Some goals are quite specific and some are more general. For example Minn. R. ch. 7050 specifies:

- The dissolved oxygen standard is to be met in rivers 50 percent of the days at flows equal to the $7Q_{10}$ (Minn. R 7050.0222, subp. 2 to 5). [For assessment of potentially impaired waters the dissolved oxygen standard must be met 90 percent of the time at **all** flows greater than the $7Q_{10}$ (i.e., the standard is exceeded in more than 10 percent of the samples taken, Exhibit A-7)].
- And in Minn. R. 7050.0217 subp. 2:
    1. Protection of the aquatic community from toxic substances means the protection of no less than 95 percent of the species in a given aquatic community;
    2. Human exposure to noncarcinogenic chemicals through the consumption of fish (and drinking water) must be below levels expected to produce known adverse effects;
    3. The cancer risk to humans through the consumption of fish (and drinking water) must not exceed one in 100,000; and
    4. Protection of wildlife that eat aquatic organisms means the protection of the most sensitive wildlife species or population.

As explained in Section IV.G, the proposed eutrophication standards are different from standards for toxic chemicals in several respects. The proposed standards for TP, Chl-a and SD are not based on the protection of the aquatic community from toxics or the protection of human health.[31] The "endpoints" driving the proposed eutrophication numbers are very different (e.g., the frequency and magnitude of algae blooms, see Section VI.D). This has significant implications when considering compliance expectations for the eutrophication standards. A very high level of compliance such as 95 percent, needed to protect the integrity of an aquatic community from toxicants, is not realistic for eutrophication standards, and it is not the Agency's intent.

Explicitly stated in the proposed narrative associated with the standards is that they are summer-average values; that is, they are to be compared to data averaged over the course of a summer. Thus, it is clear that the Agency intends the proposed eutrophication standards to apply to the trophic conditions averaged over at least one year.

Year to year variability in trophic conditions is expected. So, if one year trophic conditions equal the standards, the following year conditions may be better than standards and the year after that they may be worse than standards, and so on. Compliance with the standards means that the

[31] The health of animals and humans is a factor if trophic conditions allow the growth of toxic blue-green algae.

conditions averaged over the long-term will be better than the standards. However, the Agency usually does not have the luxury to wait five or ten years for long-term data to become available to make a decision about compliance. The impairment assessment guidance (Exhibit A-7) calls for a minimum of 12 samples taken over two to three summer seasons. Also, decisions concerning the success of remedial actions taken to reduce nutrient loading in the context of a TMDL may be called for in two or three years. The Agency believes that a two to three year period will be adequate to assess compliance in most cases. Typically, compliance will be evaluated on a lake-by-lake basis. The Agency will need to use trophic condition data, relevant watershed information, rainfall/flow data (wet, dry or average year), modeling tools, etc. to predict compliance over the long-term. The Agency's compliance expectations over the long-term are to maintain and protect the Class 2 "sub-use" that is the focal point for the particular lake type.

3. Use of Eutrophication Standards [VI.M. EU standards, reasonableness]

The intended uses for the proposed eutrophication standards discussed in this Section are uses other than the determination of impaired lakes and reservoirs, which is occurring now under the narrative standard.

If the eutrophication standards are to be effective in helping to protect lakes, they will need to be used, not only by the Agency, but by many other entities as well. The Agency's intent is that the new standards will be used by a diverse combination of federal, state, county and other local governmental entities; soil and water conservation districts; watershed districts; consulting firms; lake associations; and interested individuals. As discussed in Section IV.D, the greater accessibility, visibility and legal status should enhance their use. Progress in slowing cultural eutrophication of lakes and reservoirs will require a wide range of mandatory and voluntary activities that reduce nutrient loadings.

Federal agencies such as the U.S Fish and Wildlife Service and the U.S. Geological Service may find the standards useful as a benchmark to compare to their water quality and biological monitoring activities, and in their investigations of pollutant loadings in Minnesota. The Minnesota Department of Natural Resources (MDNR) has responsibilities for lakes that relate to water quality and extend beyond just managing the sport fishery; for example, the MDNR answers citizen complaints, investigates fish kills, provides information on lake and lakeshore protection, etc.[32] Depending on the location, county Soil and Water Conservation Districts can have active lake sampling and protection programs. Numeric standards could be useful in these activities.

A description of some hypothetical situations might help convey what the Agency has in mind in terms of expanded applicability of the standards. County zoning officers and county boards of commissioners have substantial decision-making authority and responsibility in matters that impact Minnesota's lake resources. They enforce the shoreland ordinances, they make decisions on the types of development to allow in the shoreland zone, whether to require restitution or penalties if shoreland zoning laws are violated, whether or not to grant variances, etc.

[32] http://www.dnr.state.mn.us/lakes/index.html

Assume a lakeshore property owner proposes a development project on his/her property that would increase the runoff of phosphorus contaminated stormwater to the lake, and the lake in question is on the threshold of exceeding the eutrophication standards. Awareness of the numeric standards and the lake's current trophic status might move the county commissioners to be more inclined to deny the project, or to require modifications to avoid the additional TP loading, so the lake will not exceed the standards. In a variation of this example, if the lake's trophic status is much better than the standards, knowledge of that condition relative to the standards, and the proposed narrative nondegradation policy, could help the commissioners make more informed decisions. On the other hand, if the lake standards are already exceeded, appropriate actions would need to be taken to assure that any permitted activities would not worsen existing trophic conditions.

Similarly, if a consultant was asked to review a project adjacent to a lake for potential environmental impact, knowledge of the eutrophication standards and their application would be an important part of the analysis, and help the consultant make recommendations to the client.

Coalitions of lake associations or individual lake associations could use the standards as an additional tool in their efforts to maintain the quality of "their" lake(s). They could be included in the discussions among the members, or part of the information brought to the county commissioners, or to other groups. The Agency visualizes the standards being an aid to educating lakeshore property owners of their responsibilities to protect the lake they love, and for which they have probably paid a very high price to enjoy.

Some parties have expressed concern that the Agency will misapply the eutrophication standards to very shallow lakes, lakes smaller than 10 acres, golf course ponds, farm ponds, etc. (e.g., Exhibit A-35 and Agency response, A-36). There are many lakes less than 10 acres in size (including a couple of designated trout lakes) that support the same beneficial uses provided by larger lakes, which the standards are designed to protect. It is impossible for the Agency to know beforehand whether or not the protected uses logically apply to each and every one of the thousands of lakes less then 10 acres in size. Size, depth and appearance can be very deceiving when it comes to how lakes are used by the public, especially children. From a merely practical standpoint placing limitations on the applicability of the standards to a subset of lakes would require a very large body of data on that subset to support the case; and it might require an individual analysis of each lake to be excluded – potentially hundreds or thousands of waterbodies – at great expense. Also, as a matter of policy, the Agency seldom assesses lakes smaller than 10 acres in size for impairment; a few have been assessed but none has been proposed for the 303(d) list (Exhibit A-7). The Agency simply does not have water quality data for most lakes smaller than 10 acres.

The Agency has broad statutory authority and responsibility to protect all waters of the state (Minn. Stat. ch. 115). Any limits placed on that authority, such as establishing a minimum lake size or minimum depth, below which the standards would not apply, would at least need to be accomplished through rulemaking, if not by a change in state or federal law. A much more reasonable and practical approach in the opinion of the Agency is a site-specific analysis to address the local concerns. That is, if implementation of the eutrophication standards causes unnecessary expense or hardship to any party in the future, a site-specific modification of the standard may be appropriate or an individual use attainability assessment can be carried out on the waterbody in question. The Agency is opposed to the eutrophication standards being limited to only certain lakes, shallow lakes or reservoirs.

4. Basis for a Phosphorus Effluent limit [VI.M. EU standards reasonableness]

It is likely that the proposed eutrophication standards will become the basis for setting a phosphorus effluent limit in an NPDES permit in a limited number of situations. The current and proposed technology-based TP effluent limit in Minn. R. 7053.0255 will remain the primary basis for setting TP limits in NPDES permits even after the eutrophication standards are adopted. Any limits based on the proposed eutrophication standards would most likely be for facilities that already have a 1 mg/L limit based on the existing rule, and a limit more stringent than 1 mg/L is needed to meet the standards.

Since the Phosphorus Strategy was approved in 2000, the Agency adopted a policy of strongly discouraging the permitting of any new discharges directly to a lake. Dischargers proposing a lake discharge, which has always been relatively rare, are being advised to seek an alternative place to discharge, if at all possible. Also, it is becoming Agency policy to freeze the TP loading for any facility that wishes to expand and discharges directly to or “affects” a downstream lake or reservoir. With these policies in place, it makes it difficult to attribute an economic impact to the proposed eutrophication standards, in terms of how often they will be the basis for dischargers getting TP limits more stringent than 1 mg/L. The Agency has made some assumptions about the number of facilities that could be affected in the next five years in its assessment of costs described in Section X.D.

In spite of strongly discouraging any new lake dischargers, the Agency cannot totally rule out the possibility that a new facility might be allowed to discharge directly to a lake (e.g., a very small facility with no alternative but to discharge to a large lake). In such an unlikely situation, the proposed effluent limit might be close to or equal to the TP standard for the ecoregion in which the lake is located, taking into account the limitations of TP removal technologies currently available.

Under the existing TP limit rule[33], the Agency has issued limits more stringent than 1 mg/L on two occasions. The city of Ely, which discharges directly to Lake Shagawa, has an effluent limit of 0.3 mg/L. The city of Bemidji discharges to the Mississippi River immediately upstream of Lake Bemidji, and they also have an effluent limit of 0.3 mg/L. Adoption of the eutrophication standards will not result in either city automatically getting an effluent limit of 0.03 mg/L, the proposed TP standard for the NLF ecoregion. Both lakes are meeting the proposed in-lake standards. It is likely, however, that under the second policy mentioned above, that future permits for both cities would cap their TP loadings at current levels. If either city expanded, that would require a lower TP concentration in the effluent to keep the mass load constant. This almost certainly would happen regardless of the adoption of the standards.

[33] See last paragraph in existing Minn. R. 7050.0211, subp. 1a.

The Agency envisions effluent limits more stringent than 1 mg/L based on the proposed eutrophication standards as being required in the following situations:

1. If the receiving lake or downstream lake is on the impaired waters (303(d)) list due to excess nutrients, federal Clean Water Act requirements form the basis for permitting existing, expanding or new discharges.[34] These federal requirements say that effluent limits must control the discharge of pollutants to an impaired waterbody at a level that will not cause or contribute to an exceedance of a state water quality standard. To comply with these federal requirements, the Agency proposes to freeze the permitted mass loading of an existing discharger that wishes to expand. New dischargers would be given a 1 mg/L limit but the entire new mass loading would need to be offset by another mechanism, such as through trading.[35]

2. If the receiving lake or downstream lake is not on the impaired waters list, but the new or expanding discharge is projected to cause an exceedance of the eutrophication standards, a limit lower than 1 mg/L may be imposed. In these case-by-case situations, the limit could be lowered to the level necessary so the standards will be met in the downstream lake. But, again under the Agency's described policies, the mass of TP discharged would probably be capped anyway. The same is true for the next two situations.

3. If the new or expanded discharge will not cause an exceedance of the standard, but the increased loading of TP to the lake is projected to have a measurable impact on the trophic status of the downstream lake, a limit more stringent than 1 mg/L is possible.

4. If the new or expanded discharge will not cause an exceedance of the standard, and the increased TP loading to the downstream lake is not projected to have a measurable impact (above normal variability); the application of nondegradation provisions or watershed nutrient minimization goals, or citizen concerns about the increased loading, particularly if the existing water quality of the lake in question is very good, a limit of 1 mg/L (or lower) is a possibility.

The possible costs to dischargers based on these scenarios are discussed in Section X.D.

5. <u>Phosphorus Limits Determined by a TMDL</u> [VI.M. EU standards, reasonableness]

The Agency has been listing nutrient impaired lakes and reservoirs on the 303(d) list since 2002. As stated, the assessment thresholds have been the nutrient criteria based on the narrative eutrophication standard (existing Minn. R. 7050.0150, subp. 5). Adoption of numeric standards will not change the assessment process. That is, the protocols used to determine impairment now using the nutrient criteria will not change under the eutrophication standards, and the pace of adding new lakes and reservoirs to the list will not change because the pace is governed by the availability of data and staff time needed to carry out the assessments. The adoption of

[34] Code of Federal Regulations, 40 CFR 122.4(i) and 40 CFR 122.44(d)(1).

[35] The May 17, 2007 decision by the State Supreme Court on the Annandale/Maple Lake case means that TP trading is an option. The Agency plans to develop a trading policy and prepare protocols to guide TP trading in the future (see Section XI.F).

eutrophication standards will have little impact on this regulatory function of standards (impairment listings and TMDLs).

The TMDL will determine the relative contribution of TP loading from point and nonpoint sources, and the implementation plan will specify the loading reductions from these sources that will be needed to restore the waterbody. Point source TP limits more stringent than 1 mg/L are a possibility. But, again these limits would be imposed whether or not the standards are adopted. The Agency is preparing a detailed lake TMDL strategy document that will provide guidance on how TMDLs for lakes should be carried out.

In summary, the Agency believes the application of the eutrophication standards as the basis for a TP effluent limit more stringent than 1 mg/L is likely to happen but will be a rare occurrence. Requiring a limit lower than 1 mg/L would only happen if one of the four scenarios listed above apply.

N. EUTROPHICATION STANDARDS OF OTHER STATES AND PROVINCES [VI. EU standards, reasonableness]

As discussed in Section III.A, EPA is asking states to adopt nutrient standards on their own or face possible promulgation by EPA (e.g., Exhibit EU-10). Many states are likely to follow essentially the same sequence of steps listed below that Minnesota did leading up to the adoption of nutrient standards.

1. Gather nutrient, trophic condition and water clarity (e.g., SD or turbidity) data, and biological and other data in streams, rivers and lakes;
2. Analyze the data to find relationships between levels of nutrients and a negative response, such as changes in biological communities or water quality;
3. Identify nutrient (TP and possibly nitrogen) "thresholds" or levels that show a significant shift in biological or water quality response; and
4. Selection of criteria or draft nutrient standards based on a combination of data-driven thresholds, and policy decisions on the function of nutrient standards in the state. For example, a state may decide the standards should be set at the point where a significant biological response occurs. Or they may decide to set the standard at a point where beneficial uses are potentially of actually lost. These "endpoints" may or may not be at the same nutrient concentrations, and they certainly will vary with the type of surface water under consideration (lakes or rivers), morphometric characteristics or watershed size, and location. These decisions hinge to some extent on how a state plans to use the standards, particularly in a regulatory context.

Based on progress reports given by many states at an EPA-state nutrient criteria conference held in Dallas, Texas in February 2006, many states are in steps 1, 2 and 3. A few have adopted numeric criteria at this time and several have some type of narrative eutrophication standard. EPA estimates that about half of the states will have promulgated nutrient standards, or will be well on the way by 2008. Among the states in EPA Region 5, Minnesota is in the lead in terms of a time frame for adoption of numeric standards, at least for lakes. It appears that only one

EPA Region 5 state (Ohio) is considering adopting the EPA nutrient criteria for lakes or rivers "as is." Below is a summary of the progress the five Region 5 states are making in this process (some information was updated following the February 2007 RTAG meeting in Chicago).

Illinois is gathering nutrient data for rivers and streams. They have compared nutrient levels to indices of biotic integrity (IBI) measured in streams. Measured nutrient levels are high and they feel that nutrients almost never are the limiting factor for algae blooms in streams; that poor habitat is more likely the cause of poor IBI scores. For this reason nutrient standards for streams may not be practical in Illinois. Later information (February 2007) suggests they plan on adopting nutrient standards by fall of 2009. They are considering a site-specific approach to nutrient criteria for lakes because of the small number of natural lakes and the prevalence of reservoirs.

Indiana, the U.S. Geological Survey is helping Indiana assemble nutrient data and look for thresholds of effects at various nutrient levels in both steams and lakes. They have been monitoring lakes for a long time, and they have developed some preliminary TP criteria for Indiana lakes. Indiana does not plan to adopt the EPA nutrient criteria and hope to begin rulemaking in 2009.

Michigan, as of early 2006, Michigan was on a very fast track to propose and adopt nutrient standards for both lakes and streams. Subsequent information indicates that they plan to be in rulemaking in 2008. Michigan is not planning on adopting the EPA nutrient criteria. The Michigan Department of Natural Resources enlisted the help of Michigan State University faculty and students to assemble and analyze nutrient data for both streams and lakes. They have used several regression techniques with the data to identify TP and total nitrogen "break points", or levels at which they see a definite biological response, such as a shift in IBI scores for fish, invertebrates and algae communities. They are seeing TP/bio-response thresholds at 15, 40 and 80 µg/L TP for streams and rivers depending on their size and location; and thresholds of about 10, 20 and 30 µg/L TP for lakes. These TP thresholds for lakes are lower than what the Agency is proposing. Based on our understanding of the data upon which Michigan's stream and lake preliminary thresholds are based, they do not necessarily coincide with a loss of beneficial use (whereas Minnesota's proposed standards are linked to loss of use). Michigan has not decided at this time (March, 2006) if these thresholds will become the proposed standards.

Ohio is acquiring data on nutrients and dissolved oxygen levels in streams, and they will be looking for any relationship between high nutrient levels and low DO readings. Because they lack data on their lakes they may consider using the EPA criteria.

Wisconsin is near the end of their data acquisition phase and they plan (as of early 2006) to publish a report with their results in 2006. Wisconsin is not planning on adopting the EPA nutrient criteria. They plan to propose numeric criteria for both lakes and small streams and promulgate them in 2008. Their work so far indicates that separation of streams by ecoregion does help explain the variability and relationships they see between TP and biological responses.

Outside EPA Region 5 some states have adopted numeric or narrative nutrient standards or are taking other actions to reduce nutrient loading. Information about a few states, and British Columbia, that appear to be more advanced in the process, is summarized below.

California is using a risk-based approach to define beneficial uses; level I is no risk, level II is possible risk and level III is definite risk to beneficial uses. Level I or II Chl-a criteria are 5 µg/L for cold water fish and 10 µg/L for warm water fish. Level II or III Chl-a criteria are 10 µg/L for cold water fish and 20 – 25 µg/L for warm water fish.

Maine implemented a narrative standard in 1986 requiring a "stable or declining [improving] trophic status" for its lakes. This standard, in effect, does not allow changes in the land use in the watershed of a lake that may adversely impact the trophic status of the lake. Maine is using nutrient and Chl-a criteria to identify streams that appear to be impaired due to nutrients but require more study.

Massachusetts, 56 of Massachusetts' 116 POTWs that range in size from 0.02 to 350 mgd have TP effluent limits ranging from 0.1 to 1.0 mg/L. Those with limits more stringent than 1 mg/L break down as follows:

- 0.1 mg/L – four plants
- 0.2 mg/L – six plants
- 0.75 – 1.0 mg/L – 34 plants; 11 of these are slated for upgrades to 0.2 mg/L and two to 0.1 mg/L.

Limits lower than 1.0 mg/L are applicable from April through October; a 1 mg/L limit applies the rest of the year. Massachusetts is looking at multi-point chemical addition and sand filtration as well as new and innovative treatment technologies that they feel will achieve TP effluent concentrations in the 0.05 to 0.1 mg/L range. Massachusetts has developed site-specific criteria for total nitrogen which they use to help restore impaired estuaries. They use historical information to establish "background" conditions and use models to develop the site-specific targets and nitrogen reductions needed to achieve the target.

Missouri plans to develop and adopt nutrient criteria for lakes in 2006 and for streams in 2008.

Oklahoma adopted a TP criterion of 37 µg/L for their scenic rivers, which they apply as a 30-day geometric mean.

Tennessee has worked extensively on nutrient criteria for small streams. They have associated total nitrogen and TP to negative changes in streams. They use the 90th percentile values from reference sites as a basis for impairment determinations. Application of Tennessee's original narrative nutrient standard was successfully challenged in court as being overly broad. Also Tennessee failed in their first attempt to adopt numeric nutrient standards. They have refined their narrative standard and are using numeric "translators" to identify nutrient levels that cause harm.

British Columbia established phosphorus criteria to protect the most sensitive uses of lakes in that province, citing in particular, drinking water or recreation and aesthetics. Among the most sensitive uses is the protection of a coldwater fishery, for which they have a criterion of 10 µg/l TP.

O. REASONABLENESS OF EUTROPHICATION STANDARDS, CONCLUSIONS [VI. EU standards, reasonableness]

The Agency's proposed eutrophication standards are based on nearly 20 years of work developing and implementing nutrient criteria on behalf of Minnesota's lake resources. The Agency has analyzed data on over 2,000 lakes, assessed the relationships between nutrient levels and response variables using a variety of data and approaches, reviewed the published literature (and contributed to that body of literature with scientific articles by Agency staff), worked closely with EPA on the development of nutrient criteria and kept abreast of what other states are doing. The Agency has acquired a great deal of credibility and experience through the development and implementation of the nutrient criteria, including using them to identify impaired waters. The proposed eutrophication standards are built on this solid foundation and represent a refinement of the nutrient criteria developed in the late-1980s.

The proposed eutrophication standards are:

- Broken out by four ecoregions (standards for two are the same) and four lake types;
- Proposed for shallow lakes as a separate category (one of the four lake types) at the urging of interested parties;
- Consistent with EPA guidance to states on the development of nutrient criteria using local data;
- Generally less stringent than EPA criteria;
- Established at the thresholds for protecting Class 2 uses with no overt or clear margin of safety; and
- Based on protecting sub-uses within the Class 2 beneficial use according to the lake type.

Also it is reasonable to supplement the numeric standards with a narrative portion of the standard because:

- Of the great natural variability of lake characteristics and lake trophic status;
- Of the importance of protecting high quality lakes from eutrophication through a clearly stated nondegradation policy;
- Not all lakes can achieve the standards due to natural causes, and as a result of "essentially irreversible" human-induced changes;
- The implementation of eutrophication standards is different than other Class 2 standards; and
- Site-specific standards may be needed for reservoirs.

The proposed eutrophication standards are needed and reasonable.

VII. NEED FOR PROPOSED EXTENSION OF PHOSPHORUS EFFLUENT LIMIT

A. INTRODUCTION [VII. TP limit, need]

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the need for and the reasonableness of the rules as proposed. In general terms, “need” means that the Agency must present the reasons for making the proposed changes to Minn. R. ch. 7050, and for the proposed new Minn. R. ch. 7053. Also, need implies that a problem exists that needs to be fixed or dealt with through administrative attention.

The Agency is proposing that municipal and industrial facilities that expand or build new after May 1, 2008, and discharge more than 1,800 pounds of phosphorus per year, treat and remove phosphorus to 1 mg/L. This Section of SONAR Book II will discuss why the proposed amendment to the phosphorus effluent limit is needed.

B. PETITIONS TO ADOPT RULES [VII. TP limit, need]

1. <u>Introduction</u> [VII.B. TP limit, need]

While still in the planning stages for this rulemaking the Agency received two formal petitions from outside parties to consider rule-language changes pertaining to the 1 mg/L phosphorus effluent limit currently in Minn. R. 7050.0211, subp. 1a. The first petition was from the Coalition of Greater Minnesota Cities (CGMC), the Minnesota Environmental Science and Economic Review Board, the League of Minnesota Cities, and the Minnesota Association of Small Cities (referred to as the CGMC petition). The CGMC petition and cover letter from Flaherty & Hood, P.A. dated December 15, 2003 is Exhibit A-28. The Agency’s response letter dated January 13, 2004 is Exhibit A-29. The CGMC petition prompted the Agency to review its approach to the setting phosphorus effluent limits under the current rule and the Phosphorus Strategy. Staff recommended to Agency management that the phosphorus limit should be extended to new and expanding facilities that discharge more than 1,800 pound of phosphorus per year (Exhibit PL-9).

The second petition was from the Minnesota Center for Environmental Advocacy (MCEA). The MCEA petition and cover letter dated July 27, 2004 is Exhibit A-30. The Agency’s response letter dated August 18, 2004 is Exhibit A-31.

2. <u>CGMC Petition</u> [VII.B. TP limit, need]

The CGMC petition asked the Agency to define the following three terms in the context of existing Minn. R. 7050.0211, subp. 1a:

- Lake
- Reservoir
- Affects

The petitioners suggested language (underlined) follows:

> [Minn. R. 7050.0211, subp. 1a.] ***Total phosphorus effluent limits.*** *Where the discharge of effluent is directly to or affects a lake or reservoir, phosphorus removal to one milligram per liter shall be required. <u>For purposes of this rule, "lake or reservoir" means a body of water with an average annual hydraulic residence time exceeding 14 days, and the term "affects" means the measurable impact of an individual facility's phosphorus discharge on scientifically- documented algal growth in a lake or reservoir.</u> The limit must be a calendar month arithmetic mean unless the commissioner finds, after considering the criteria listed in items A and B, that a different averaging period is acceptable. …*

The Agency, in its response to CGMC and the other petitioners (Exhibit A-29), said that it intended to define the three terms mentioned in the petition but preferred to do it as part of this triennial review of water quality standards rather than enter into a separate rulemaking that would address only the petitioner's request. Given the time and costs associated with even a minor rulemaking, this was a reasonable and prudent response.[36]

More importantly, the Agency believes that to do **only** what the CGMC petition asks with regard to the existing TP effluent limit could undermine the progress made in reducing TP loading from point sources over the last six years under the Phosphorus Strategy (Exhibit PL-1c). It could result in a step backwards in the control of point source phosphorus. The Phosphorus Strategy (Strategy) has been the impetus for assigning TP effluent limits to 35 to 40 facilities across the state since 2000, including situations where the downstream "affects" due to the added TP may not have been measurable. The Agency wants to continue this six-year record of progress. The Agency feels that the best way to do that is to "codify" in rule portions of the Strategy by proposing to extend the phosphorus effluent limit to new and expanding dischargers above a certain size.

The Agency is proposing definitions for "reservoir" and "affects" that are similar to what the petitioners suggest. That is, our definition of "reservoir" includes a minimum residence time of 14 days, and our definition of "affects" clarifies that the TP loading causing the affect is from an individual point source discharger. The Agency is proposing separate definitions for lakes and shallow lakes, plus the terms, "$122Q_{10,}$" "eutrophication" and "natural causes" (see Sections VI.B and X.B in SONAR Book I).

While the Agency is proposing definitions for two of the three terms that are similar to the petitioner's suggested language, there are some details in the latter with which the Agency disagrees. The first pertains to lumping lakes and reservoir together and defining lakes only on the basis of a 14-day residence time. A reference to a minimum residence time is not needed in the definition of "lake," and the definition needs to include other lake attributes. The Agency staff is not aware of any examples of natural lakes (or lakes with controlled outlets) with a

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[36] The relatively minor "assessment factor" rulemaking, which was in response to a petition from essentially the same parities plus the Minnesota Farm Bureau required two years to complete.

residence time as short as 14 days. Any waterbody with a residence time approaching 14 days would clearly be a run of the river reservoir.

Secondly, while the petitioners and the Agency agree on the minimum hydraulic residence time of 14 days used to distinguish between reservoirs and rivers, we disagree on the flow used to determine the residence time. The petitioners suggest an average flow and the Agency is proposing a lower flow, the four-month summer average low flow with a once in ten-year recurrence interval (122-day Q_{10}). This is analogous to the use of the $7Q_{10}$ low flow used to define allowable dilution in the control of toxic pollutants. Phosphorus loading to a reservoir typically requires near-stagnant (lake-like) conditions for 14 days or longer to be fully manifested in increased algal growth. Clearly the greater the flow moving through the reservoir, the shorter the length of time the water spends in the reservoir and the less time the algae have to take full advantage of the available TP. The Agency's proposed use of the $122Q_{10}$ is more protective than an average flow. The Agency is using a $122Q_{10}$ for this purpose now under the Phosphorus Strategy. For example, this flow was used by the Agency to determine the residence time for the Mississippi River Coon Rapids pool in the contested case hearing related to St. Cloud's NPDES permit. In this instance, the residence time for the Mississippi River pool up stream of the Coon Rapids dam was shorter than 14 days at the $122Q_{10}$. The pool behind the dam did not meet the requirements to be considered a reservoir[37]. The rationale for using the 122-day low flow is also discussed in Section X.B.5 in SONAR Book I.

The third point of disagreement, albeit minor, is the petitioner's inclusion of the words "scientifically-documented" in the suggested definition of "affects." The Agency's decisions on the effects of phosphorus loading on downstream resources and whether or not a limit should be imposed ("affects") are always data-driven and scientifically-documented. The Agency's proposed definition for "affects" does not use the term "scientifically-documented" but goes one step further by providing examples of the type of scientific data needed to show effects, such as increases in Chl-a, reductions in water clarity and an increase in algae blooms. The Agency feels the addition of the suggested term is unnecessary.

As noted, both the petitioner's and Agency's proposed definition of "affects" clarify that when assessing the need for a TP effluent limit it is the effects from the individual point source that is considered. The Agency's proposed definition is below:

> [Minn. R. 7053.0255, subp.2] <u>*B. "Affects" means a measurable increase in the adverse effects of phosphorus loading as determined by monitoring or modeling, including, but not limited to, an increase in chlorophyll-a concentrations, a decrease in water transparency, or an increase in the frequency or duration of nuisance algae blooms, from an individual point source discharge.*</u>

[37] City of St. Cloud NPDES/SDS Permit, *MCEA v. MPCA and City of St. Cloud*, 696 N.W. 2d 398 (Minn. Ct. App. 2005).

3. <u>MCEA Petition</u> [VII.B. TP limit, need]

The petition from the Minnesota Center for Environmental Advocacy (MCEA, Exhibit A-30) includes several suggested changes to what the Agency proposes, which the Agency rejected in its response (Exhibit A-31). The Agency will respond to MCEA's main suggestion, but not to all the claims in their petition, in this SONAR, (see Exhibit A-31). The heart of the MCEA proposed language is quoted below.

> [Minn. R 7050.0211] *Subp. 1a.* ***Total phosphorus effluent limits.*** *Phosphorus removal to one milligram per liter shall be required of all discharges where the discharge of effluent contributes phosphorus, excess algae, or excess Biological Oxygen Demand to a downstream nutrient-impaired lake or reservoir.* …

In essence, the MCEA suggested approach would have the Agency:

- Continue to focus the setting of TP limits on the interpretation of "affects;"
- Assign TP effluent limits based on the "affects" of cumulative TP loading from all point sources in the watershed; and
- Link the setting of TP limits for discharges only when the receiving waterbodies have been determined to be impaired.

The setting of TP effluent limits based on the current rule for a discharge not directly to a lake relies on the demonstration of individually measured "affects" in the downstream lake or reservoir. These determinations are made for each applicable permit on a case-by-case basis. The process requires a considerable amount of data and staff time for the analysis, including modeling the projected impacts and, finally, a decision as to whether the added load exceeds a threshold of measurable effects. These demonstrations have proven to be a source of uncertainty, potential controversy, and an invitation for litigation. For example, in the last several years MCEA has contested several NPDES permits when the Agency determined that the threshold of measurable effects from the individual source had not been exceeded and no TP limit was imposed.[38] The Agency believes that the MCEA proposal could acerbate the problems of resolving the "measurable affects" question, particularly when the cumulative effects of all point sources must be assessed. This could increase the uncertainties in the analysis and expand opportunities for controversy, delay and potential litigation.

The MCEA proposal includes the word "contributes," which we interpret to mean that any discharger that contributes any amount of TP to the downstream lake or reservoir would get a TP limit. That is, the "affects" analysis would be expanded to consider the cumulative load from all point sources in the watershed. As noted, this could further complicate the "affects" analysis. Or, the result could be that even the smallest discharge would get a TP limit regardless of how small they are and how little they contribute to the cumulative load. While any addition, no matter how small, contributes to the cumulative load, controlling the very small sources may not be cost effective and might drain resources from the more significant larger sources (see percent

[38] NPDES permits for Mankato, St. Cloud, Faribault and Owatonna.

contribution from small point sources in Tables II-13 and II-14). Also, this might force small dischargers to seek a variance from this provision on the basis of economic hardship.

MCEA's proposal appears to apply TP limits only in situations where the discharge is to a waterbody already impaired due to excess nutrients. This is a curious proposal given MCEA's mission. Certainly the Agency does not want to wait until a lake becomes impaired before a TP limit is imposed for a discharger that impacts a downstream lake, and we do not believe that is MCEA's goal either.

MCEA also suggested deleting the Agency's proposed definition of "affects," and suggested changes to the proposed definitions of "lake," "shallow lake" and "reservoir." The need for a definition of "affects" became apparent in the assessment factor rulemaking, and it is an important part of the Agency's proposal. The separation of shallow lakes (< 15 feet deep) from lakes in general is an integral part of the Agency's proposed eutrophication standards. Also, the 14-day residence time is a vital component of the Agency's proposed definition of "reservoir." The Agency rejected these proposals (see Exhibits A-30 and A-31).

The Agency believes that its proposal is a better approach to advancing reductions in point source TP loading in the future at less cost in time and money to the Agency, and possibly less cost to outside parties as well by avoiding protracted contested case hearings or litigation. The Agency's approach is much more clear-cut and easy to implement. It requires neither a demonstration of "affects," nor an assessment of cumulative loading.

In summary, the Agency decided not to adopt the suggestions of either the CGMC or MCEA petition in favor of the Agency's own proposal.

C. CONTRIBUTION OF PHOSPHORUS FROM POINT SOURCES [VII. TP limit, need]

Phosphorus entering surface waters comes from both point and nonpoint sources. Point sources of phosphorus are relatively constant over time while nonpoint sources are largely dependent on the amount of precipitation falling on the landscape. The TP Loading Study introduced in SONAR Section II.A (Exhibit EU-6) estimated the amount of phosphorus entering Minnesota's surface waters from both point and nonpoint sources under three flow conditions, low, average and high. Total phosphorus (TP) and bioavailable phosphorus (BAP) contributions were evaluated in this study. TP is all forms of phosphorus present in water (unfiltered sample) while BAP is the fraction of total phosphorus that is more readily available for algal growth. Table II-12 shows the relative contributions of TP loading from point and nonpoint sources at the three flow conditions.

The study estimated phosphorus loading three ways.

1. Loading estimates using TP concentrations assuming TP in wastewater treatment plant effluents remains at their current reported levels;
2. Loading estimates using only the fraction of BAP in the point and nonpoint sources; and

3. Loading estimates using TP concentrations assuming all point source effluent concentrations were at 1 mg/L.

Significantly, the relative contribution of TP from point sources is reduced by half, and even more during high flow, when it is assumed that all point sources are meeting 1 mg/L. The relative contribution from point sources goes up by 13 - 17 percent when only BAP is considered in the analysis. This points out that more of the TP in point source effluents in readily available for algae growth than the TP from nonpoint sources.

Table II-12. Point Source TP and BAP Loads as a Percent of Total Load to Minnesota Surface Waters (Exhibit EU-6).

Conditions	River Flows		
	Low	Average	High
Loadings at current effluent flow and TP concentrations	45%	31%	19%
Loadings at current effluent flow and BAP concentrations	62%	47%	32%
Loadings at current effluent flow but effluent TP at 1mg/L	23%	15%	8%

The TP Loading Study also provides information of the relative contribution of TP to surface waters based on the size of the wastewater treatment plants. Table II-13 shows the greatest number of facilities are small in size (less than 0.2 mgd AWWDF). Relatively few small facilities have 1 mg/L TP effluent limits while 44 percent of medium and 62 percent of large facilities have 1 mg/L limits (two have lower limits).

The very large Metro Plant (Metropolitan Council Environmental Services, MCES) alone was 41 percent of the total statewide point source load. On December 31, 2005 the Metro Plant was required to meet a 1 mg/L effluent limit. The facility actually reduced effluent concentrations from 2.9 mg/L to less than 1 mg/L a year earlier. Because of the size of this single facility (251 mgd AWWDF), there are separate columns in Table II-13 to show relative loads with this facility at 2.9 mg/L and at 1 mg/L effluent TP concentrations. Among point sources, the greatest relative TP load is from large domestic facilities, industrial facilities have the second largest, and medium size domestic facilities contribute the third largest load.

Table II-13. Number of Facilities and Point Source TP Loads by Category as Percent of Point Source Total Load (Exhibit EU-6).

Facility Size and Type	No. of facilities:		Percent TP Loading at Current Plant Flows, And:		
	Total	With TP limits (% with limits)	Current effluent concentrations & Metro Plant at 2.9 mg/L	Current effluent concentrations & Metro Plant at 1 mg/L	Effluent concentrations, all facilities at 1 mg/L
POTW, Small (< 0.2 mgd)	316	49 (15%)	3%	4%	3%
POTW, Medium (0.2 – 1.0 mgd)	149	65 (44%)	7%	10%	7%
POTW, Large (> 1.0 mgd)	68	42 (62%)	72%	61%	69%
Privately Owned WWT Systems for Domestic Use	na	Na	< 1%	< 1%	< 1%
Commercial & Industrial WWT Systems	na	Na	18%	25%	21%

na = not available

The data in Table II-14 show the TP load reductions that would be achieved if **all** facilities met 1 mg/L TP at their current discharge flow rates now. Load reductions of nearly 50 percent for all point source categories would be expected if all current discharges were to discharge at 1 mg/L TP. The greatest reduction in TP load is from large POTWs followed by industrial facilities (Exhibit EU-6).

Table II-14. Percent TP Load Reduction by Category of Point Sources if All Point Sources Met a 1 mg/L Effluent Concentration (Metro Plant at 1 mg/L).

Category	Percent Reduction in TP Loading at Current Effluent Flow and TP Concentration of 1 mg/L
Small POTWs (< 0.2 MGD)	2 %
Medium POTWs (0.2 – 1.0 MGD)	6 %
Large POTWs (> 1.0 MGD)	26 %
Privately Owned WWT Systems for Domestic Use	< 1 %
Commercial Industrial WWT Systems	14 %
Total	49 %

The proposed extension of the TP limit will require 1 mg/L limits as facilities expand or build new, if they discharge more than 1,800 pounds of TP per year. We have equated an annual load of 1,800 lbs. to an AWWDF of 0.2 mgd. Thus, based on these data, the Agency's proposal could reduce TP loading by as much as 47 percent if fully implemented across the whole state. This is probably a best-case figure however as explained in the next paragraph.

A number of factors complicate estimating just how much the proposed extension of the TP limit will reduce TP loading in the future. Some factors result in an increase in TP loading while others do the opposite. It is important to understand that future **new** discharges will mean a TP **load increase** to surface waters, although at a reduced rate due to the 1 mg/L effluent limit under the Agency's proposal. Expanding dischargers getting a 1 mg/L effluent limit probably will result in overall load reductions since in most cases the expected concentration reductions will be greater than the flow increases. For example, a doubling in design flow combined with a four fold (e.g., 4 mg/L to 1 mg/L) reduction in TP concentrations would cut the load in half. Expansions will result in load reductions smaller than those shown in the Table II-14 however because the percentages in Table II-14 are calculated at current plant flows. Also, the rule as proposed will allow facilities that already have a 1 mg/L effluent limit to expand with no change in effluent concentration, resulting in a load increase to surface waters. However, other considerations could result in an effluent limit lower than 1 mg/L, such as a freeze of the mass loading or a more stringent limit required to meet the proposed eutrophication standards (Sections VI.M.4 and X.D). Finally, new TP limits will be phased in within the five-year life of the NPDES permits for the impacted facilities. While the proposed extension of the 1 mg/L effluent limit will achieve nutrient load reductions to the state's surface waters, at some future time the reduction gains achieved will be at least partially offset by continued population growth (particularly in the attractive lake-rich counties) and the resulting need to increase wastewater flows.

D. IMPACTS OF NUTRIENTS IN RIVERS AND STREAMS [VII. TP limit, need]

No one questions the impact excess nutrients can have on lakes and other static bodies of water, but it is less well known that excess nutrients can have significant impacts on rivers and streams. A common misconception is that, while nutrients (i.e., phosphorus) may be present in relatively high concentrations in moving water systems, because the water is moving there is not enough time for the plant community to "take advantage" of the extra nutrients; and that most of the TP load is flushed out and moved harmlessly downstream. Aquatic scientists have reported for decades that nutrients impact rivers and streams.[39] But until recently these impacts have gone largely undocumented, at least by governmental water quality monitoring programs. The increased nutrient and biological monitoring of rivers and streams by the Agency, other states and federal agencies is providing new documentation of negative impacts of nutrients on rivers and streams.

The Agency has nutrient and algal abundance data from several rivers and streams around the state that show excess phosphorus increases the abundance of suspended algae in rivers. Recent studies and monitoring data on river systems consistently show negative impacts from nutrients where in the past it might have been assumed impacts would be negligible. In one case, the lower Minnesota River, excess phosphorus and very abundant algae have caused dissolved

[39] For example, Hynes, H.B.N. 1970. The ecology of running water. University of Toronto Press. 555 p.

oxygen levels to fall below standards. This led to the Minnesota River being listed as impaired due to nutrients and the subsequent TMDL. The effects of excess nutrients in the lower Minnesota River was manifested by low dissolved oxygen (DO) levels caused by algal respiration and the die-off and decay of algae, which consume oxygen.

In a published journal article and subsequent report, Agency staff members Heiskary and Markus looked at the impacts of nutrients on several medium to large rivers throughout Minnesota (Exhibits PL-7 and PL-8). Monitoring took place over three years. They document several impacts, such as relationships between increased phosphorus with increased algae (Chl-a), increased in-river biochemical oxygen demand (BOD_5), increased daily DO changes and poorer fish and invertebrate indices of biological integrity (IBI). Highly significant regression equations were established between TP, Chl-a and BOD_5. Summer average Chl-a concentrations ranged from about 3 to 120 µg/L in the water column of rivers sampled (1999 and 2000). As stated, as algal biomass increases the demand on oxygen resources also increases. The direct relationship between river TP and Chl-a has been documented in other published research as well[40]. Also other states, as part of their programs to develop and adopt nutrient standards for rivers, are documenting similar relationships between increased nutrients and negative responses in rivers and streams.

The increased amplitude of daily DO cycles also is an indicator of increased algal growth. Abundant algae generate oxygen during the day through photosynthesis driving concentrations up; at night photosynthesis stops but respiration continues dropping DO concentration to low levels. Of the variables reviewed, Chl-a and BOD_5 exhibit the highest correlation (inverse relationships) with indices (IBI scores) measuring the quality of the fish and invertebrate communities, although IBI scores are also influenced by habitat quality. Based on these negative responses related to changes in TP concentrations, the report recommends a strategy of maintaining existing TP concentrations for protection of good quality resources; and reductions in TP to achieve improved BOD_5 and Chl-a levels, reductions in the magnitude of DO cycles, and improvements in other response variables in impacted waterbodies.

Excess phosphorus loading to rivers and streams is likely to increase the growth of attached algae as well, which appears as the green “slime” or long green filaments growing on rocks and other substrates. This is a more typical response to added nutrients in smaller, shallower streams than in larger rivers. Impacts to the rivers themselves is a concern, but several major river systems in Minnesota eventually drain to a lake or reservoir, such as Lake Pepin, Lake of the Woods or Lake Winnipeg in Manitoba. Once there, the phosphorus loading can be expressed in the well known negative effects of cultural eutrophication in static waterbodies, such as algae blooms and loss of water clarity.

Algal growth does not cease during the winter season. While most assessments on river trophic conditions focus on warmer seasons, algal growth can also be excessive in winter. Algae can grow under the ice in rivers and in backwater areas, depending on light conditions. Monitoring of the Minnesota River at river mile 39.4 (39.4 miles upstream from the mouth) showed algal bloom conditions throughout the winter of 1990/1991. Average Chl-a at this site was 177 µg/L

[40] For example, Van Nieuwenhuyse and Jones 1996, and Basu and Pick 1996.

in December through February with a maximum concentration of 454 µg /L. These Chl-a levels indicate severe to very severe algae bloom conditions. BOD_5 concentrations were also elevated during this time, and daytime DO was higher than saturation levels. Diurnal DO change was not monitored but can be expected to be large with such algal populations. This is not an isolated condition at this one monitoring location. Additional river monitoring locations exhibit elevated winter Chl-a concentrations, although not every winter season.

Phosphorus discharged in the winter can adhere to particulates. As particulates move downstream some will settle to the bottom in slack-water reaches and pools in the river system. Depending on where these particulates settle out, the attached phosphorus may become resuspended or released and available for algal growth during the summer months. The Mississippi River, for example, has extensive backwater areas, which respond more like lakes to nutrient inputs than rivers. Backwater areas often act as sinks for sediments rich in nutrients, which can contribute to eutrophication during the summer.

Minnesota has the enviable position geographically of being "upstream" of much of the rest of North America. Minnesota is home to the headwaters of three major river basins, the Mississippi, Red/Rainy and Lake Superior. This means that, for most of the state, we don't have to be concerned about pollutant loading via rivers from states or provinces upstream of us. However, our downstream neighboring states or provinces may have cause to be concerned about what we send downstream to them. Minnesota has an obligation to consider the downstream ramifications of our actions. Nutrients that are carried downstream beyond Minnesota's borders can have impacts far downstream. For example, the load of nitrogen and phosphorus from the Minnesota River contributes to the hypoxia problem (a large zone of low oxygen levels) far downstream in the coastal waters off the mouth of the Mississippi River.

In conclusion:

- The deleterious impacts excess nutrients have on rivers, streams and run-of-the-river reservoirs has been known for decades and is being well documented with new data. Organisms at all levels of the food chain, algae, higher plants, invertebrates and fish, can be negatively impacted.
- The Agency has documented negative responses in Minnesota rivers. High Chl-a, loss of dissolved oxygen and wide swings in daily dissolved oxygen levels, for example, have been documented.
- Impacts are not limited to the warmer months. Winter nutrient loading can result in spring blooms of diatoms, zooplankton, and bacteria. These blooms, through their release of bio-available nutrients can exacerbate summer blooms further downstream.

E. PROMULGATION APPROPRIATE ACTION [VII. TP limit, need]

In general the Agency has an obligation to promulgate in rule policies and practices it has implemented based on guidance and policy documents. Implemented policies that have economic repercussions especially should be adopted into administrative rules. The acceptance of 1 mg/L TP limits under the Phosphorus Strategy by dischargers (for a variety of reasons) has made this a very successful policy for over five years. It has resulted in dramatic reductions in the amount of TP discharged, but it has had economic ramifications as well. This policy was formally approved by the Agency Board in March 2000 which enhanced its authority. Promulgation of the Strategy is the proper course of action. The rulemaking process means the Agency must:

- Follow the requirements of the Administration Procedures Act (Minn. Stat. ch. 14);
- Assess the economic impacts;
- Contact all potentially impacted parties;
- Provide ample opportunity for public involvement;
- Publish a formal notice in the *State Register*;
- Hold public hearings; and
- Respond to comments.

By promulgating what essentially is being implemented now under the Strategy, the Agency is assuming the responsibility to meet all the burdens listed above. Most significantly, this process guarantees public exposure and the assessment of costs, steps that go beyond what the Agency felt obligated to do for the development and implementation of the Strategy.

F. CONSOLIDATION OF EXISTING AND PROPOSED TP LIMITS [VII. TP limit, need]

This Section is largely a repeat of Section V.E.10 in SONAR Book I that discusses the need for consolidating and reorganizing all the phosphorus effluent (TP) limit provisions in one place, including those now in Minn. R. ch. 7065. Consolidation is associated with the proposed extension of the TP limit to new and expanding dischargers. The proposed additions and changes to the TP effluent limit provisions, including possible exemptions to the extension of the TP limit, requiring treatment to the fullest practicable extent and options for effluent limit averaging periods, are treated separately in Sections VII.G to VII.J.

The consolidation of all TP limit provisions in a newly created subpart of Minn. R. 7053.0255 will bring all the provisions that deal directly with TP limits into one place in the proposed new rule, Minn. R. ch. 7053. The separation of Minn. R. ch. 7050 into two rules provides an ideal time to consolidate the TP effluent limit requirements in one place and to repeal the outdated Minn. R. ch. 7065 (see Sections VI.J.3 and X.J in SONAR Book I).

The title of proposed Minn. R. 7053.0255 includes the terms "*point source discharges of sewage, industrial, and other wastes*" consistent with existing rule language. The definition of "other wastes" is broadly inclusive and some of the sources listed in the statutory definition could be interpreted as nonpoint sources (Minn. Stat. § 115.01, subd. 9). Proposed Minn. R. 7053.0255 in its entirety follows.

7053.0255 PHOSPHORUS EFFLUENT LIMITS FOR POINT SOURCE DISCHARGES OF SEWAGE, INDUSTRIAL, AND OTHER WASTES.

*Subpart 1. **Scope**. The phosphorus effluent limits in this part are in addition to the effluent limits specified elsewhere in this chapter. In the event of any conflict between this part and other applicable regulations, the more stringent requirement applies.*

*Subp. 2 **Definitions**. For the purposes of this part, the following definitions apply. Other relevant definitions are found in part 7050.0150, subpart 4.*

A. "122-day ten-year low flow" or "$122Q_{10}$" means the lowest average 122-day flow with a once in ten-year recurrence interval. A $122Q_{10}$ is derived using the same methods used to derive a $7Q_{10}$, and the guidelines regarding period of record for flow data and estimating a $7Q_{10}$ apply equally to determining a $122Q_{10}$ as described in part 7053.0135, subpart 3.

B. "Affects" means a measurable increase in the adverse effects of phosphorus loading as determined by monitoring or modeling, including, but not limited to, an increase in chlorophyll-a concentrations, a decrease in water transparency, or an increase in the frequency or duration of nuisance algae blooms, from an individual point source discharge.

C. "Expanded discharge" means a disposal system that after May 1, 2008, discharges more than 1,800 pounds of total phosphorus per year to a surface water on an annual average basis, and increases in wastewater treatment capacity as indicated by an increase in the:

(1) design average wet weather flow for the wettest 30-day period for point source dischargers of sewage with a continuous discharge, typically a mechanical facility;

(2) design average wet weather flow for the wettest 180-day period for point source dischargers of sewage with a controlled discharge, typically a pond facility; or

(3) design average daily flow rate for dischargers of industrial or other wastes.

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

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

F. "New discharge" means a discharge that was not in existence before May 1, 2008, and discharges more than 1,800 pounds of total phosphorus per year.

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

H. "Shallow lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the summer. The quality of shallow lakes will permit the propagation and maintenance of a healthy indigenous aquatic community and they will be suitable for boating and other forms of aquatic recreation for which they may be usable. For purposes of this chapter, shallow lakes will be differentiated from wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186, subpart 1a.

*Subp. 3. **Total phosphorus effluent limits**.*

A. Phosphorus removal to one milligram per liter is required when subitem (1), (2), or (3) applies:

(1) the discharge of effluent is directly to or affects a lake, shallow lake, or reservoir;

(2) the discharge is to the specific basins and water bodies designated in subpart 5; or

(3) the discharge is new or expanded as defined in subpart 2 except when the discharger can demonstrate to the commissioner that the discharger qualifies for an alternative phosphorus limit as provided in subpart 4.

B. ~~In addition,~~ If a phosphorus effluent limit is required under item A, removal of nutrients from all wastes ~~shall~~ must be provided to the fullest practicable extent wherever sources of nutrients are considered to be actually or potentially detrimental to preservation or enhancement of the designated water uses. Dischargers required to control nutrients ~~by~~ under this ~~subpart~~ part are subject to the variance provisions of ~~part~~ parts 7000.7000 and 7053.0195.

*Subp. 4. **Alternative phosphorus effluent limits for new or expanded discharges**. New or expanded discharges subject to a one milligram per liter phosphorus effluent limit in subpart 3, item A, subitem (3) may request an alternative limit or no limit if one or more of items A to C apply. New or expanded discharges are defined in subpart 2.*

The exemptions in this subpart do not apply to facilities that discharge directly to or affect a lake, shallow lake or reservoir or to discharges to the waters listed in subpart 5. Dischargers seeking an alternative limit due to very high per capita treatment costs or economic hardship must apply for a variance under parts 7000.7000 and 7053.0195.

The information submitted to the commissioner for consideration of an alternative limit must include, at a minimum, a description of the treatment technology used, influent and effluent total phosphorus concentrations, a phosphorus management plan for the facility, descriptions of any measures already taken to reduce phosphorus sources to the facility, and expected reductions in phosphorus concentrations following implementation of the phosphorus management plan. The discharger may qualify for an alternative total phosphorus limit or no limit if it can demonstrate:

A. the discharge is to or upstream of a water body listed on the applicable impaired water list, section 303(d) of the Clean Water Act and the total maximum daily load study is complete and approved by the United States Environmental Protection Agency at the time the new or expanding facility is in the planning and design phase. The total maximum daily load study must have considered impacts from phosphorus loading on the impaired water body. In this case the total maximum daily load study will determine the applicable phosphorus effluent limit;

B. the environmental benefits to be achieved by meeting a phosphorus limit are outweighed or negated by the environmental harm caused by meeting a limit; or

C. the treatment works, regardless of the type of treatment technology, must use chemical addition to achieve compliance with the one milligram per liter limit, and the discharge is to a receiving stream in a watershed listed in subitems (1) to (3). In this case the discharger may be granted a seasonal one milligram per liter limit, applicable from May 1 through September 30 and not applicable from October 1 through April 30:

(1) the lower Mississippi River and its tributaries from the mouth of the Chippewa River in Wisconsin to the Minnesota border;
(2) the Bois de Sioux and Red Rivers and their tributaries from the southern end of Lake Traverse at Browns Valley to the Canadian border; and
(3) the Missouri, Des Moines, and Cedar Rivers and their tributaries in Minnesota.

Subp. 5. ***Designated waters****. The one milligram per liter phosphorus limit established in subpart 3 applies to the waters designated in items A to F.*

A. All intrastate waters lying within the drainage basin of Lake Superior in the counties of Aitkin, Carlton, Cook, Itasca, Lake, Pine, and St. Louis (Townships 45 to 65 North, Ranges 7 East to 23 West).

B. The interstate waters of Lake St. Croix in Washington County (Townships 26 to 30 North, Range 20 West).

C. The St. Louis River from its source at Seven Beaver Lake (Township 58 North, Range 12 West) to and including St. Louis Bay (Townships 49 and 50 North, Ranges 14 and 15 West) and Superior Bay (Townships 49 and 50 North, Ranges 13 and 14 West).

D. The Mississippi River from its source to the Blandin Dam at the outlet of Paper Mill Reservoir in the City of Grand Rapids approximately 400 feet upstream from the bridge on U.S. Highway 169 including Lake Andrusia (Township 146 North, Range 31 West), Lake Bemidji (Townships 146 and 147 North, Range 33 West), Cass Lake (Townships 145 and 146 North, Ranges 30 and 31 West), Lake Itasca (Township 143 North, Range 36 West), Pokegama Lake (Townships 54 and 55 North, Ranges 25 and 26 West), and Winnibigoshish Lake (Townships 145, 146, and 147 North, Ranges 27, 28, and 29 West).

E. The Little Minnesota River and Big Stone Lake from the South Dakota border crossing to the outlet of Big Stone Lake at the dam immediately upstream from the U.S. Highway 12 bridge in Ortonville.

F. Albert Lea Lake (Township 102 North, Ranges 20 and 21 West) in Freeborn County.

*Subp. 6. **Averaging period for phosphorus limit**. The phosphorus limit required under subpart 3 must be a calendar month arithmetic mean unless the commissioner finds, after considering the criteria listed in items A and B, that a different averaging period is acceptable. In no case shall the one milligram per liter limit exceed a moving mean of 12 monthly values reported on a monthly basis, or a simple mean for a specified period, not to exceed 12 months. Calendar month effluent limits in effect on February 7, 2000, must remain in effect unless an assessment of the criteria listed in items A and B indicate a different averaging period is acceptable. An ~~different~~ averaging period other than monthly is acceptable when:*

A. ~~the effects of the phosphorus loading from the facility on the receiving water or downstream water resources is generally not measurable.~~ there is no measurable or predictable difference in the adverse effects of the phosphorus loading from the facility on the receiving water or downstream water resources compared to the loading that would result using a 30-day average limit; and

B. the treatment technologies being considered offer environmental, financial, or other benefits

In summary, the consolidation of the TP limits in one place is needed. This will simplify application of TP limits as they become more commonplace in permits. A reorganization of the TP limits is needed to accommodate the proposed extension of the TP limit and the proposed move of the waterbody-specific limits, now in Minn. R. ch. 7065, into Minn. R. 7053.0255.

G. NEW LANGUAGE, SCOPE AND DEFINITIONS, MINN. R. 7053.0255, SUBP. 1 AND 2. [VII. TP limit, need]

Proposed subpart 1 of Minn. R 7053.0255 is a brief statement of the scope of this part, followed by eight pertinent definitions in subpart 2. The definitions are for terms used in Minn. R. 7053.0255 as listed below. The need for these definitions is discussed in Section VI.B of SONAR Book I.

- $122Q_{10}$
- Affects
- Expanded discharge
- Lake
- Measurable increase or measurable impact
- New discharge
- Reservoir
- Shallow lake

H. NEW LANGUAGE, EFFECTIVE DATE, TP LIMITS AND EXEMPTIONS, MINN. R. 7053.0255, SUBP. 3. [VII. TP limit, need]

1. <u>Effective Date of May 1, 2008</u> [VII.H. TP limit, need]

The proposed date of May 1, 2008 at which the proposed extension of the TP limit will take effect was established by statute during the 2007 legislative session (2007 Minn. Laws, ch. 131, art. 1, § 81).

2. <u>TP Limits</u> [VII.H. TP limit, need]

Proposed new Minn. R. 7053.0255, subp. 3 contains the 1 mg/L TP limits for three categories of waterbodies or situations (see language in Section VII.F).

The first category (subitem (1)) is the TP limit applicable to discharges directly to or affecting a lake, shallow lake, or reservoir. This is the existing TP limit that has been in Minn. R. ch. 7050 since 1973. This provision is not being changed but is being moved to the new location. The term “shallow lake” is being added because the Agency plans to make a distinction between “shallow” and “deep” lakes in the proposed eutrophication standards. The application of the existing TP limit (existing Minn. R. 7050.0211, subp. 1a) has not differentiated lakes by depth in the past. This addition is needed to be sure the existing TP limit continues to be applicable to all lakes, both deep and shallow, as has been the case since 1973. This addition does not change the existing TP limit or how it is applied.

The second category (subitem (2)) is the TP limit applicable to dischargers to any of the specific waterbodies listed in the existing Minn. R. ch. 7065. The Agency proposes to move these TP limits from Minn. R. ch. 7065 to Minn. R. 7053.0255, subp. 5. Again, this will consolidate the

TP limits in one place and allow for the repeal of Minn. R. ch. 7065 (see Sections VI.J.3 and X.J in SONAR Book I).

The third category (subitem (3)) is the proposed 1 mg/L TP limit applicable to new or expanding discharges that discharge more than 1,800 pounds of TP per year. This subitem references the three possible exemptions from a TP effluent limit that a new or expanding facility may qualify for upon request. The exemptions in Minn. 7053.0255, subp. 4 are needed to allow dischargers potential relief from a TP limit in certain situations.

3. <u>Possible Exemption to TP Limit if TMDL is Complete</u> [VII.H. TP limit, need]

Proposed Minn. R. 7053.0255, subp. 4, item A states that if a TMDL for a waterbody impaired due to nutrients or a nutrient-related pollutant has been completed, and the new or expanding facility is in a planning or design phase, the TMDL may determine the TP effluent limit to be included in the NPDES permit for that discharger (see language in Section VII.F). It should be noted that TMDL implementation applies to any discharger within its scope, not just those that are new or expanding, but the context for the proposed rule discussed here is only new or expanding discharges above the *de minimis* TP load.

The waterbody must be on the 303(d) list because of exceedance of the eutrophication standards or because the excess nutrients have caused exceedances of another standard, such as dissolved oxygen. This provision applies in situations where the TMDL is complete and approved by EPA, and the reductions in TP loading from point sources needed to restore the waterbody has addressed the possible need for permit limits. The new or expanding facility must be in a planning and design phase at the time the TMDL is approved to incorporate the TMDL's recommendations into the permit. The TMDL-determined limit may be 1 mg/L or lower than 1 mg/L. And, while probably less likely, if the TMDL determines that a limit more lenient than 1 mg/L or no limit at all is needed then the permit will reflect those recommendations. This potential exemption applies to any facility that discharges to the impaired waterbody or to an upstream waterbody flowing into the impaired waterbody.

Originally the Agency had proposed rule language that automatically allowed the TMDL to determine the TP effluent limit if certain conditions were met. That is, dischargers would not have to petition for the TMDL exemption. However, as the Agency has gained more experience with nutrient-caused or nutrient-related TMDLs, it has become clear that the solutions recommended by a TMDL are complex, somewhat site-specific, and may not be applicable to all discharges in the watershed. Developing rule language that tries to cover all the possible situations and conditions becomes too complex and awkward. Therefore, the Agency is now proposing to include the "TMDL exemption" as one of three potential exemptions to the TP limit that a discharger can apply for. The Agency believes that this is the best way to deal with the site-specific aspects of each TMDL situation (see *reasonableness* section, Section IX.H.3).

In summary, a provision is needed that allows, upon request, the TMDL to determine a TP limit if certain conditions are met. The basic conditions are:

- The discharge is to or upstream of a waterbody listed on the 303(d) impaired waters list;

- The total maximum daily load has considered impacts from phosphorus loading on the impaired waterbody;
- The total maximum daily load is complete and approved by the EPA at the time the new or expanding facility is in the planning and design phase; and
- The phosphorus loading from the new or expanding discharge is included as part of the point source waste load allocation in the total maximum daily load study. In other words, this exemption does not apply to discharges upstream of the impaired waterbody but outside the scope of the TMDL study.

The purpose of TMDLs is to assign point and nonpoint source loading reductions necessary to bring the impaired water into compliance with standards. If the TMDL is approved at the time the expansion or new construction is being planned, and the other site-specific conditions are met, it is appropriate for the TMDL to determine the TP permit limit. By placing the burden on the discharger to request a TMDL-related exemption, the Agency is not trying to put roadblocks in the way of dischargers, or discourage dischargers from petitioning the Agency. If it is clear that the TMDL-determined limits are appropriate in a particular case, the Agency will advise the discharger to submit a petition. The granting of an exemption in these situations should be straightforward and proceed smoothly.

4. <u>Possible Exemption to TP Limit if Environmental Harm Outweighs Gain</u> [VII.H. TP limit, need]

The Agency's overall goal and purpose is to improve water quality and environmental conditions through its regulations and programs. If it can be demonstrated that an action, in this case the imposition of a TP permit limit, results in net harm to the environment, then that action should be modified or not be taken at all, consistent with federal and state laws. The opportunity to demonstrate such a situation is needed in the context of the proposed extension of the TP effluent limit. The wording of this exemption is simple and straightforward, and it gives the Agency the latitude needed to evaluate the data presented and decide if the exemption should be granted. The Agency believes latitude is needed in this context because each situation will be unique and must be evaluated on a case-by-case basis (language in Section VII.F). The Agency Citizens' Board may be asked to approve the staff decision on an exemption and the permittee can contest the decision through the permit process.

5. <u>Possible Exemption to TP Limit, No Winter Limit in Certain Watersheds</u> [VII.H. TP limit, need]

Excess nutrients may be less of a concern during the winter months in some Minnesota watersheds than in others. The Agency is proposing to provide the opportunity for a discharger that must use chemicals to meet the TP limit to show that a winter limit (from October 1 through April 30) is not needed. This potential exemption is needed because there may be evidence available that shows the loading of TP during the winter in the designated watersheds does not contribute to an excess nutrient problem downstream (language in Section VII.F). The watersheds, which includes all their tributaries in Minnesota, are shown below.

- Lower Mississippi River below Lake Pepin to the Iowa border;

- Bois de Sioux and Red Rivers to the Canadian border;
- Missouri, Des Moines, and Cedar Rivers to the Minnesota border.

It is important to restate that this exemption, and the exemptions discussed in the previous sections, is not automatically granted. The discharger must request an exemption and submit the data the Agency will need to evaluate the merits of the request.

I. CLARIFICATION OF FULLEST PRACTICABLE EXTENT LANGUAGE, MINN. R. 7053.0255, SUBP. 3. [VII. TP limit, need]

The Agency believes that with the proposed extension of the TP limit to new and expanded dischargers there is a need to clarify the "fullest practicable extent" language in Minn. 7053.0255, subp. 3, item B. This provision, which has been in the water quality rules since 1971, says that wastewater treatment plants should remove TP from the effluent to the "fullest practicable extent." The provision showing the proposed changes is shown below.

> [Minn. 7053.0253, subp. 3] *B. ~~In addition,~~ If a phosphorus effluent limit is required under item A, removal of nutrients from all wastes ~~shall~~ must be provided to the fullest practicable extent wherever sources of nutrients are considered to be actually or potentially detrimental to preservation or enhancement of the designated water uses. Dischargers required to control nutrients ~~by~~ under this ~~subpart~~ part are subject to the variance provisions of ~~part~~ parts 7000.7000 and 7053.0195.*

There has been some question and disagreement about whether this provision:

- Applies to any and all dischargers regardless of whether or not they have a 1 mg/L TP limit, or
- Applies only to dischargers that have a 1 mg/L permit limit.

The Agency believes strongly that the latter interpretation is the correct one and this interpretation needs to be clarified (see discussion of history in Section IX.G.4). It can be clarified with minor changes to the paragraph.

J. CLARIFICATION OF AVERAGING PERIOD FOR TP LIMITS, MINN. R. 7053.0255 SUBP. 6. [VII. TP limit, need]

In 2000 the Agency added language to Minn. R. 7050.0211, subp. 1a that allowed the option of setting TP effluent limits in NPDES permits that could be averaged over a period longer than the previously required one month. TP limits with a longer averaging period are usually 12-month moving averages; or, in a few cases, the limits are simple calendar-year averages. Since this change to the rule, approximately 35 municipal dischargers and several industrial discharges have been given a 1 mg/L TP limit with an averaging period longer than one month (numbers include both interim and final TP permit limits).

The Agency is proposing to clarify one of the two criteria the Commissioner can use to decide when a TP limit with a longer averaging period is appropriate, and to make some very minor clarifying language changes. The proposed changes, which will be in the new Minn. R. 7053.0255, subp. 6 are repeated below:

<u>Subp. 6.</u> ***<u>Averaging period for phosphorus limit</u>***. *The <u>phosphorus</u> limit <u>required under subpart 3</u> must be a calendar month arithmetic mean unless the commissioner finds, after considering the criteria listed in items A and B, that a different averaging period is acceptable. In no case shall the one milligram per liter limit exceed a moving mean of 12 monthly values reported on a monthly basis, or a simple mean for a specified period, not to exceed 12 months. Calendar month effluent limits in effect on February 7, 2000, must remain in effect unless an assessment of the criteria listed in items A and B indicate a different averaging period is acceptable. A<u>n</u> ~~different~~ averaging period <u>other than monthly</u> is acceptable when:*

A. ~~the effects of the phosphorus loading from the facility on the receiving water or downstream water resources is generally not measurable.~~ <u>there is no measurable or predictable difference in the adverse effects of the phosphorus loading from the facility on the receiving water or downstream water resources compared to the loading that would result using a 30-day average limit; and</u>

B. the treatment technologies being considered offer environmental, financial, or other benefits.

As mentioned before, the proposed consolidation of TP limits into one part, plus the other proposed changes to the TP effluent limit rule, provide an opportunity to make this proposed clarification. The change will not affect the process the Agency uses now to decide case-by-case when a longer averaging period is appropriate.

The purpose of proposing the longer averaging period is summed up by the following two quotes from the SONAR for the 1999 triennial review of Minn. R. ch. 7050.

> Page 25. "This change is needed to encourage the use of treatment technologies other that chemical addition to remove phosphorus, specifically to encourage the use of the biological phosphorus removal process, and to promote the implementation of the Agency's phosphorus reduction strategy."
>
> And on page 91: "In conclusion, the proposal to allow a longer averaging period for the phosphorus limit of 1 mg/L is reasonable because it will, 1) facilitate the reduction of phosphorus loading to watersheds, 2) encourage the use of the Bio-P technology, 3) facilitate the implementation of the Agency's phosphorus control strategy, and 4) allow flexibility in the implementation of, and choice of treatment options to meet, the phosphorus limit."

The language in the existing Minn. R. 7050.0211, subp. 1a includes two criteria the Commissioner and his/her staff uses to determine when the longer averaging period is appropriate. The existing first criterion, *"the effects of the phosphorus … is generally not measurable"* seems inconsistent in general with the way the current TP limit has been implemented over the years, which is to require a demonstration of measurable "affects" in the downstream resource due to the TP loading from the individual discharger.

The Agency is proposing to clarify the language in the first criterion so that the lack of a measurable or predictable impact (e.g., though modeling) relates to the difference in the loading that would occur with a limit averaged over a longer period compared to the loading that would occur with a monthly limit. This clarification is needed in light of the Agency's proposed definition of the word "affects" and the extension of the TP limit to new and expanded dischargers that discharge more than 1,800 pounds of TP per year. The Agency is proposing no change to the second criterion.

K. SUMMARY, NEED [VII. TP limit, need]

In summary, the Agency's fundamental rationale for the proposed extension of the phosphorus limit is listed below:

- To help reduce phosphorus loading to essentially all watersheds in Minnesota in the knowledge that anthropogenic phosphorus contributes to water quality degradation.
- To be proactive in the effort to protect waterbodies that are not impaired.
- To help achieve watershed-specific or TMDL driven nutrient reduction goals.
- To help protect downstream water resources including those beyond Minnesota's borders.
- To support and encourage consideration of the phosphorus removal capabilities using biological phosphorus removal treatment technologies.
- To codify in rule the progress in phosphorus removal that has taken place since March 2000 under the Phosphorus Strategy.
- Implementation is straightforward, which should help reduce the number of contested case hearings and legal challenges.
- The proposal is consistent with statewide efforts to improve Minnesota's water quality through major initiatives at the executive and legislative levels of state government.

VIII. REASONABLENESS OF PROPOSED EXTENSION OF PHOSPHORUS EFFLUENT LIMIT, REQUIRED INFORMATION

A. INTRODUCTION [VIII. TP limit, reasonableness]

Minnesota Stat. § 14.131 requires that this SONAR include information about 11 aspects of the potential impacts of this rulemaking. The discussion in Sections VIII.B to VIII.L that follows pertains only to the proposed extension of TP limits to new and expanded discharges above a certain size.

B. CLASSES OF PERSONS AFFECTED BY THE PROPOSED RULE AMENDMENTS, INCLUDING THOSE CLASSES THAT WILL BEAR THE COSTS AND THOSE THAT WILL BENEFIT [VIII. TP limit, reasonableness]

Most citizens of Minnesota should benefit from the proposed extension of the TP limit to new and expanded discharges that discharge more than 1,800 pounds of TP per year. The benefits will be largely intangible, and the expected improvements in water quality are likely to go unnoticed by most Minnesotans. Reduced loading of TP from point sources should reduce the growth of attached algae in streams and rivers, and suspended algae in larger rivers, and it could improve dissolved oxygen conditions in rivers already impacted by excess nutrients. The Agency realizes that the costs of meeting TP limits for new and expanding facilities will not be borne equally by Minnesota citizens. People living in communities just large enough to surpass the *de minimis* load of 1,800 pounds per year (equates approximately to a population of 2000) as a result of a planned expansion or new wastewater treatment plant, could see higher costs than those living in larger communities, or people in rural areas with individual septic systems.

A conservative or high estimate of the total capital and total annual operation and maintenance (O&M) costs (i.e., annual O&M costs for five years) for 35 POTWs in a range of sizes, projected to be impacted by the proposed change to the TP limit over the next five years, is estimated to be about $134 million. The number of POTWs (35) projected to be impacted in the next five years is based on the number of new and expanding facilities that got TP limits from March 2000 through December 2005. The $134 million figure assumes that the limits for all 35 facilities go into effect today, and all use chemical addition as the sole means of meeting a 1 mg/L limit with no benefit from Bio-P. To repeat, this figure is the total capital and total annual O&M costs for all 35 POTWs projected to be impacted over the next five years. Most of these TP treatment costs will be incurred regardless, even if the Agency did not propose the extension of the TP limit, as explained in Section XI.F.

A conservative or high estimate of the total capital and total O&M costs to industries to be impacted by the proposed change to the TP limit over the next five years, is estimated to be about $5 million. This estimate is based on projections of six new or expanded facilities in seven industrial categories getting TP limits over the last five years. Similar to the estimates for POTWs this figure assumes that the limits go into effect today, and all use chemical addition to meet a 1 mg/L limit.

The municipal and industrial costs and the methods used to arrive at the estimates are discussed in detail in Sections XI.D and XI.E, respectively.

C. ESTIMATE OF THE PROBABLE COSTS TO THE AGENCY AND OTHER AGENICES OF IMPLEMENTING AND ENFORCING THE RULE AMENDMENTS, AND ANY ANTICIPATED EFFECT ON STATE REVENUES [VIII. TP limit, reasonableness]

The proposed extension of the TP limits will not significantly affect Agency staff needs or work loads and overall Agency costs. As stated, to a large extent the Agency has been implementing the proposed extension of the TP limit for the last five years under the Phosphorus Strategy. The Agency has two staff people whose primary responsibility is to review permits being reissued, particularly the permits for new or expanding facilities, for possible inclusion of a TP limit in the NPDES permit. This level of staff commitment is not likely to change due to the proposed extension of the TP limit.

No other state or federal agency will incur any costs due to this proposed change, because it is the sole responsibility of the Agency to issue NPDES permits and to determine the appropriate effluent limits (subject to public comments, possible contested case hearings, and EPA review). The Department of Natural Resources regularly reviews NPDES permits when they go on public notice, and they often provide comments to the Agency. The MDNR looks for consistency between the proposed effluent limits and their policies and responsibilities for protection of surface waters. This is an ongoing activity by the MDNR and the proposed change should not change their current staff and time requirements. There should be no impact on state revenues.

The Environmental Protection Agency (EPA) has an interest in these proposed amendments. The EPA has been an active partner in the promulgation of Minnesota's standards for lakes. Under the Clean Water Act, the EPA Regional Administrator (Region 5 in Chicago) must approve all changes to Minnesota's water quality standards (40 CFR 131.5).

D. DETERMINATON OF WHETHER THERE ARE LESS COSTLY OR LESS INTRUSIVE METHODS FOR ACHIEVING THE RULE AMENDMENT'S PURPOSE [VIII. TP limit, reasonableness]

To not promulgate the proposed extension of the TP effluent limit to new and expanding dischargers might prove to be less costly and less intrusive. In all probability, however, the Agency will continue to put TP limits in NPDES permits based on the Phosphorus Strategy as we have been doing for the last six years. Also, the setting of TP limits is very likely to continue to expand regardless, due to existing rules, large-scale nutrient related TMDLs, watershed nutrient reduction goals and the other reasons discussed in Sections IX.D and XI.F.

The Agency believes that inaction risks losing the momentum for point source TP reductions established under the Strategy. Continued reliance on guidance (the Strategy) in the absence of rules sets up the possibility of retreat from the gains achieved. As explained, the Agency believes that codification of the Strategy is the more straightforward course of action.

E. DESCRIBE ANY ALTERNATIVE METHODS FOR ACHIEVING THE PURPOSE OF THE PROPOSED RULE AMENDMENTS THAT THE AGENCY SERIOUSLY CONSIDERED AND THE REASONS WHY THEY WERE REJECTED IN FAVOR OF THE PROPOSED AMENDMENTS [VIII. TP limit, reasonableness]

The Agency evaluated the options suggested in the CGMC and MCEA petitions, but neither option would achieve the purpose of the rule amendments as effectively in the opinion of the Agency. The Agency's reasons for rejecting the petitioner's approaches are described in Section VII.B. Other than doing nothing, the options presented by the petitioners are the only options the Agency has seriously considered outside of what is being proposed.

F. ESTIMATE OF THE PROBABLE COSTS OF COMPLYING WITH THE PROPOSED RULE AMENDMENTS, INCLUDING COSTS BORNE BY CATEGORIES OF AFFECTED PARTIES [VIII. TP limit, reasonableness]

The estimated costs to outside parties due to the proposed extension of the TP limits are discussed in detail Section XI.

G. ESTIMATE OF THE PROBABLE COSTS OF NOT ADOPTING THE PROPOSED RULE AMENDMENTS, INCLUDING COSTS BORNE BY CATEGORIES OF AFECTED PARTIES [VIII. TP limit, reasonableness]

In general it is unlikely that there would be any direct costs to any party if the proposed extension of the TP limit was not adopted. However, the proposed rule is clear in its application and implementation will be straightforward. Because of this, it is not unreasonable to assume that there could be cost savings to some outside parties and the Agency due to fewer contested case hearings and less litigation under the proposed rule.

Some unquantifiable and intangible "costs" may be borne by the public in general if they perceive that the lack of action, real or imagined, will perpetuate or exacerbate poor water quality conditions in rivers and streams.

H. DIFFERENCES BETWEEN THE PROPOSED RULE AND EXISTING FEDERAL REGULATIONS AND THE NEED FOR AND REASONABLENESS OF EACH DIFFERENCE [VIII. TP limit, reasonableness]

There are no specific federal regulations that the Agency is aware relevant to the extension of TP limits to new or expanding discharges that discharge more than 1,800 pounds of TP per year.

I. CONSIDERATION AND IMPLEMENTATION OF THE LEGISLATIVE POLICY UNDER MINN. STAT. §§ 14.002 AND 14.131 [VIII. TP limit, reasonableness]

Minnesota Stat. §§ 14.002 and 14.131 require state agencies, whenever feasible, to develop rules and that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

The proposed extension of the TP limits combines a "prescriptive" component with a more flexible component. The former is the 1 mg/L limit itself, which is prescriptive. The latter is exemplified by the three possible exemptions available to dischargers, which allows them to request an alternative limit or no limit at all. Any petition the Agency receives from a discharger for relief under one of the exemptions (Section IX.H) will need to be reviewed and processed on a case-by-case basis. The Agency will have discretion as to the disposition of future petitions. It may be prudent for the Agency to establish a policy framework for the consideration of petitions, and to write technical guidance to help dischargers prepare a petition is a possibility.

The general concepts of how prescriptive or flexible a rule should be are discussed more in SONAR Book I, Section VIII.I.

J. ADDITIONAL NOTIFICATION OF THE PUBLIC UNDER MINN. STAT. §§ 14.131 AND 14.23 [VIII. TP limit, reasonableness]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

The Agency has outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I. As noted, the Agency has gone beyond these statutory requirements in its efforts to involve the public in this rulemaking. The Agency has made significant changes to the scope and content of the proposed amendments in response to public comments.

Section V.J lists all the parties the Agency intends to send a copy of the notice of intent to adopt the rule amendments to and includes other information about public notice that is not repeated here. A copy of the notice, proposed rule amendments and SONAR will be posted on the Agency's public notice Web site at: http://www.pca.state.mn.us/news/index.html.

Pursuant to Minn. Stat. § 14.143, subd. 1a, the Agency believes its regular means on notice, including publication in the *State Register* and on the Agency's public notice Web page will adequately provide notice of this rulemaking to persons interested in or potentially regulated by these rules.

K. CONSULTATION WITH THE COMMISSIONER OF FINANCE REGARDING FISCAL IMPACTS ON LOCAL GOVERNMENTS [VIII. TP limit, reasonableness]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

L. AGENCY DETERMINATION REGARDING WHETHER COST OF COMPLYING WITH PROPOSED RULE IN THE FIRST YEAR AFTER THE RULE TAKES EFFECT WILL EXCEED $25,000 [VIII. TP limit, reasonableness]

The Administrative Procedures Act was amended in 2005 to include a section on potential first-year costs attributable to the proposed amendments (Minn. Stat. § 14.127, subd. 1 and 2). This amendment requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees.

The Agency believes it is highly unlikely that the cost of complying with the proposed extension of the TP limit to new and expanding dischargers will exceed $25,000 in the first year after it takes effect, for the two categories of outside parties listed above, for two reasons.

First, the proposal will not impact most small business and small cities due to the *de minimis* threshold of 1,800 pounds of TP discharged in one year. An annual discharge of 1,800 pounds of TP equates to cities with a population of about 2000 at a TP concentration of 3 mg/L, which is roughly the median TP effluent concentration for POTWs without TP removal. Agency staff contacted representatives of the League of Minnesota Cities and the Minnesota Association of Small Cities and, while there are no hard data they could point to, based on their experience both (independently) felt that cities with fewer than 10 employees generally had populations in the 1000-1200 range. A city with a population of 1200 would need a TP effluent concentration of about 5 mg/L to exceed the 1,800 pound *de minimis* threshold. An analysis of 2005 effluent TP data for municipalities without TP removal, 20 out of 111 (18%) had an average TP effluent concentration greater than 5 mg/L. Thus, few small cities, those with fewer than 10 employees, are likely to trigger the *de minimis* threshold.

Second, the number of parties of any size that will incur costs in the first year after adoption is likely to be small because of the time it takes to issue permits for new or expanding facilities and the time it takes for the city or business to let contracts for planning, design and construction of the new facilities. Estimated municipal and industrial costs are discussed in Sections XI.D and XI.E.

IX. REASONABLENESS OF PROPOSED EXTENSION OF PHOSPHORUS EFFLUENT LIMIT

A. INTRODUCTION [IX. TP limit, reasonableness]

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the reasonableness of the proposed rules. "Reasonableness" means: 1) that there is a rational basis for the Agency's proposed actions, 2) that the Agency's proposed amendments are appropriate and consistent with its mandate to protect Minnesota's water resources, and 3) due consideration has been given to the potential economic impacts of the proposals.

The Agency is proposing that municipal and industrial facilities that expand or build new after May 1, 2008, and discharge more than 1,800 pounds of phosphorus per year, treat and remove phosphorus to 1 mg/L. This Section of SONAR Book II will discuss why the proposed amendment to the phosphorus effluent limit is reasonable.

B. BACKGROUND AND HISTORY [IX. TP limit, reasonableness]

The Agency has a long history of controlling the discharge of phosphorus from point sources. The following chronology outlines the major steps in the evolution the 1 mg/L TP limit. Also discussed are other provisions or rules pertaining to the control of nutrients.

1. The Phosphorus Rule [IX.B. TP limit, reasonableness]

June 1967, WPC 15[41]. Water quality standards and treatment requirements for discharges to **interstate** waters are adopted. This first version of WPC 15 included a 1 mg/L TP effluent limit applicable to any discharge to a dilution-limited receiving water. That is, a TP limit was applicable to any discharger that must provide better than minimum secondary treatment of its wastewater in order to protect downstream water quality standards under low flow conditions.

The 1967 language is quoted below.

> *"In any instance where it is evident that natural mixing or dispersion of an effluent is not effective in preventing pollution, …. In addition, the following effluent standards may be applied without any allowance for dilution where stream flow or other factors are such as to prevent adequate dilution or where it is otherwise necessary to protect the interstate waters for the stated uses:*
> …
> *Total phosphorus   1 mg/L "*

[41] WPC means "Water Pollution Control".

It is worth emphasizing that this early 1 mg/L limit applied to any discharger discharging to a receiving water with limited dilution regardless of whether the discharge was to a lake or affected a downstream lake or reservoir.

August 1967, WPC 14. Water quality standards and treatment requirements for discharges to **intrastate** waters are adopted with the same TP limit shown above for WPC 15. WPC 14 and 15 together are the state's first statewide water quality rules.

July 1969, WPC 15. Language was added to the standards for interstate waters (but not to WPC 14, intrastate waters) to supplement the 1 mg/L limit applicable to discharges to low flow situations. The new language immediately follows the numeric effluent limits for BOD, TSS and TP in the rule, and is:

> *"It is the intent of the Agency to require the removal of nutrients from* ***all sources*** *to the fullest practicable extent whenever sources of nutrients are considered to be actually or potentially inimical to preservation or enhancement of the designated uses."* (emphasis added)

As in 1967, the context of this statement is effluent limits applicable to discharges with limited dilution, to which the 1 mg/L TP limit applies. This would seem to confirm that the 1 mg/L was more applicable to discharges to rivers than discharges to lakes, because, unlike rivers, lakes do not have a "low flow." Also, the 1969 language included the words "all sources;" whereas in 1967 "sources" seemed to be implied by the context.

A statement in a 1973 document[42] prepared for the proposed 1973 amendments to WPC 15 suggests that the Agency, at this early date, intended for nutrients to be removed wherever necessary to preserve and enhance the designated water uses. It is not entirely clear at this time whether or not the Agency intended the removal of nutrients to apply broadly; i.e., to discharges to low flow rivers (and lakes?) from all sources. However, following the 1973 amendments and subsequent amendments, plus the Agency's history of applying the TP limit after 1973, a more narrow interpretation emerged as the intent of the Agency, as described below.

October 1973, WPC 14 and WPC 15. Both the intra- and interstate water quality rules were amended to change the applicability of the TP limit from any discharger with limited dilution to facilities discharging directly to or affecting a downstream lake or reservoir. The TP limit was moved from the part of the rule containing advanced treatment requirements (low dilution situations) to the part of the rule containing minimum technology-based (secondary treatment) requirements. The 1973 TP language is quoted below:

> *Phosphorus*** *1 milligram per liter*
>
> *** Where the discharge of effluent is directly to or affects a lake or reservoir. Removal of nutrients from all wastes shall be provided to the fullest practicable extent wherever*

[42] MPCA 1973. Statement for Public Hearing on Proposed Revisions to Regulation WPC 15.

sources of nutrients are considered to be actually or potentially detrimental to preservation or enhancement of the designated water uses.

This is the introduction of the requirement that has become known as the "phosphorus rule" or "P rule" that is still in place today. The P rule has been the cornerstone for the Agency's efforts to reduce point source nutrient loading to the state's lakes and reservoirs for over 30 years. The P rule has resulted in 1 mg/L TP limits in the permits of about 148 POTWs.[43] This is about 25 percent of all permitted domestic facilities. But when this percentage is put in terms of the amount of treated wastewater that receives TP removal relative to the total amount of treated domestic wastewater statewide, it jumps to about 72 percent.[44] Thus, TP is being removed from nearly three fourths of all the treated domestic wastewater covered by NPDES permits in Minnesota. The removal of TP at the MCES Metro plant in St. Paul, by far the state's largest with an AWWDF of 251 mgd, is a major reason this figure is as high as it is.

There were other changes made in 1973 worth noting. Also moved from the part of the rule specifying requirements for dischargers to low-dilution situations to the secondary treatment requirements was the "*Removal of nutrients from all wastes shall be provided to the fullest practicable, extent*" language. The "fullest practicable extent" (FPE) language follows immediately after the TP limit as part of the double asterisk footnote shown above. Also, the wording of the FPE clause was changed from the 1969/1971 version. The earlier version said the Agency required nutrient removal from "*all sources*;" the 1973 version requires nutrient removal from "*all wastes*" to the fullest practicable extent wherever "*sources*" are detrimental. Thus, in 1973 the FPE language becomes closely associated only with situations that require the 1 mg/L limit. From this time forward the Agency has been consistent in its interpretation of the FPE language as applicable to those facilities that have a TP limit and not all facilities (see Section VII.I). The FPE language has been used as the basis for requiring TP limits more stringent than 1 mg/L.

The Agency modified the P rule language in subsequent rulemakings – amendments completed in 1984, 1988, 1990, and 1994. The details of these mostly minor changes are not important for this discussion and rulemaking. In 2000 the Agency added the option of allowing an averaging period for the TP limit longer than one month, up to one year. At the same time the FPE language become a separate paragraph. Through all these amendments the heart of the P rule remained the same. That is, a 1 mg/L TP limit applied to discharges directly to, or discharges that significantly impact a downstream lake or reservoir, and the FPE provision applied only to dischargers that received a TP limit due to the "to or affects" language.

<u>February 1971, WPC 27, 28 and 30</u>. Former WPC 27 is a reflection of Canadian and U.S. efforts to protect the Great Lakes from eutrophication in the late-1960s and early-1970s. To reduce the loading of nutrients, states bordering the Great Lakes adopted basin-wide 1 mg/L TP effluent limits applicable to all dischargers in watersheds draining to the lakes. Minnesota adopted WPC 27 in February 1971 to protect the Minnesota portion of the Lake Superior basin; it established a 1 mg/L limit for all point source dischargers in the basin. Michigan, for example, requires

[43] Current as of July 2006. In the last 6 years some of the 148 limits would be attributable to the Phosphorus strategy and pemittee/Agency negotiations.
[44] This percentage is based on treatment plant design flows, not actual flows.

essentially all point source dischargers in the state to meet a 1 mg/L TP limit because the entire state (except for a tiny portion in the SW corner) drains to one of the Great Lakes. A limit of 1 mg/L has been widely adopted because it can be achieved by proven and readily implementable treatment technologies (chemical addition).

TP limits were adopted for other basins or waterbodies in Minnesota at the same time in separate rules, WPC 28 and 30. These two rules plus WPC 27 are now combined in existing Minn. R. ch. 7065. The combined rule establishes a 1 mg/L TP effluent limit for discharges in: 1) all waters in the Lake Superior basin, 2) portions of the upper Mississippi River, Lake St. Croix, and 3) the Little Minnesota River, Big Stone Lake and Albert Lea Lake. The Agency is proposing to combine all TP limits now in Minn. R. ch. 7050 and 7065 into new Minn. R. 7053.0255 (Section VII.F, and Section V.E.10 of SONAR Book I).

2. <u>Other Provisions and Rules With Phosphorus Control Measures</u> [IX.B. TP limit, reasonableness]

Several parts of existing Minn. R. ch. 7050, outside of Minn. R. 7050.0211, subp. 1a, incorporate phosphorus or nutrient control for point source dischargers. For the most part these provisions refer back to the 1 mg/L TP limit in existing Minn. R. 7050.0211, subp. 1a and the "to or affects" language. Table II-15 is a list of these provisions. Again, the TP provisions in existing Minn. R. ch. 7050 are to be moved into the proposed new Minn. R. ch. 7053.

Table II-15. References to Point Source Phosphorus Effluent Limits in Existing Minn. R. ch. 7050 and Proposed New Minn. R. ch. 7053.

Existing Minn. R. ch. 7050	Proposed New Minn. R. ch. 7053	Provision; References are to Proposed Minn. R. 7053
7050.0211, subp. 1a	7053.0255	Phosphorus rule
7050.0212, subp. 2a	7053.0225, subp. 3	Exempts dredge disposal return water from the phosphorus limit, contingent on certain conditions.
7050.0212, subp. 4	7053.0225, subp. 4	Industries must meet requirements of Minn. R. 7053.0255
7050.0213	7053.0235, subp. 1	Advanced treatment requirements include limits in Minn. R. 7053.0255
7050.0214, subp. 1	7050.0245, subp. 1	Treatment requirements for discharges to limited resource value waters include limits in Minn. R. 7053.0255
7050.0215, subp. 2 (also 7020.2003, subp. 3)	7050.0305, subp.2	Treatment requirements for animal feedlots include limits in Minn. R. 7053.0255, except feedlots are not included in the definitions of "new" or "expanding" discharges.
7050.0216, subp.3, item B	7050.0405, subp.3, item B	Requirements for aquaculture facilities include the requirements in 7053.0405, subp. 3, which in turn refers back to the phosphorus limit in Minn. R. pt. 7053.0255.
7050.0216, subp. 5, item E	7050.0405, subp.5, item E	Closure plan for abandoned aquaculture facilities; must restore the affected waterbody back to its mean pre-aquaculture trophic condition.

The parts of existing Minn. R. ch. 7050 listed below contain general narrative provisions dealing with nutrient control. Also, the nondegradation evaluations include an assessment of potential impacts of nutrients on outstanding resource value waters and all waters of the state.

- Minn. R. pt. 7050.0210, subp.2. Nuisance Conditions Prohibited. No point or nonpoint sources should cause pollution resulting in excessive plant growth
- Minn. R. pt. 7050.0222, subp. 7. Additional Standards. There should be no material increase in undesirable slime growth or aquatic plants including algae to Class 2 waters.
- Minn. R. pt. 7050.0180. Nondegradation for Outstanding Resource Value Waters.
- Minn. R. pt. 7050.0185. Nondegradation for All Waters.

Existing Minn. R. 7100.0210 (Nutrient Limitation) limits the nutrient (phosphorus) content of cleaning products. The Agency is not proposing any changes to this rule.

Minnesota Stat. § 18C.60 restricts the use of lawn fertilizers containing phosphorus to certain special situations, such as new lawns or where a soil test indicates that the home owner's soil is deficient in phosphorus.

C. AGENCY'S PHOSPHORUS STRATEGY [IX. TP limit, reasonableness]

In 1996, in response to the threat to the state's water resources from phosphorus loading, the Agency set out to develop a comprehensive Phosphorus Strategy (Strategy), Exhibits PL-1a is a copy of the Strategy Web page, PL-1b is a fact sheet and PL-1c is the complete Strategy with the decision tree. The "decision tree" guides the reader through the steps to determine when a phosphorus limit is called for. The purposes of the Strategy are to:

- Promote the reduction of TP loading from both point and nonpoint sources to lakes and reservoirs;
- Provide a consistent framework for applying phosphorus controls (primarily the P rule) in setting TP limits in NPDES permits;
- Serve as a guide to Agency staff and to outside parties on how TP issues will be addressed, particularly in NPDES permits;
- Clarify or define terms that have been used in setting TP limits for years, such as "affects," "lake" and "reservoir;" and
- Define new concepts introduced as part of the Strategy such as *de minimis* loading.

In the fall of 1999, the Agency held informal meetings with interested parties such as watershed districts, environmental groups, cities, lake associations and other state agencies to discuss the Strategy. The Agency received hundreds of comments, and several changes were made to the Strategy as a result (Exhibit PL-1b).

The Strategy also laid out seven action steps to be taken by the Agency to reduce the loading of TP from both point and nonpoint sources; they are:

1. Develop education/outreach information on environmental impacts of phosphorus.
2. Co-sponsor basin-wide phosphorus forums.
3. Use basin management as the main policy context for implementing the phosphorus strategy.
4. Broadly implement Minnesota's point-source phosphorus controls.
5. Broadly promote lake protection activities.
6. Address phosphorus impacts on rivers.
7. Modify water-quality standards if necessary.

Action steps 4 and 7 are the most relevant to this rulemaking. Eutrophication water quality standards are being "modified" by proposing numeric eutrophication standards to supplement the existing narrative standards. The proposed extension of the TP limit to new and expanded facilities will broaden the implementation of the P rule.

The Citizens' Board approved the Strategy as Agency policy in March 2000. At that time the Board expressed interest in adopting a "universal" 1 mg/L phosphorus effluent limit for all discharges. The Agency's proposed extension of the P Rule is consistent with the Strategy's general purpose and goals; and more specifically, it incorporates into the rule the *de minimis* threshold for implementation of TP limits for new or expanding dischargers. The proposed extension of the phosphorus limit is to a large extent being implemented now under the Phosphorus Strategy. The proposed rule represents a codification of the strategy except the rule will allow certain exemptions (see Section IX.H).

By any measure, the Strategy has been very successful. Under the Strategy dischargers that previously may not have had to reduce effluent phosphorus have, 1) accepted a 1 mg/L TP limit, 2) adopted treatment options that reduce effluent phosphorus such as Bio-P, or 3) taken other measures to reduce effluent TP. As permits come up for reissuance, Agency staff evaluates them for possible TP limits. Over the last five to six years there has been a clear trend that when new facilities are built or existing facilities expand, 1 mg/L TP limits have been added to the permit. Since March 2000, about 34 POTWs that have design flows (AWWDF) greater than 0.2 mgd have gotten limits that are attributed to the Strategy (Exhibit PL-10). An additional nine POTWs with AWWDFs less than 0.2 mgd have gotten limits under the Strategy. Facilities smaller than 0.2 mgd may be below the *de minimis* loading of 1,800 pounds per year (depending on effluent TP concentrations); if so, they would not be impacted by the proposed extension of the TP limit. Such facilities may, however, continue to get TP limits in the future for other reasons including the Strategy.

Also under the Strategy, in addition to or in lieu of a numeric limit, many dischargers were asked to develop and implement a phosphorus management plan (PMP) when their permit was reissued. A PMP asks the facility to monitor influent and effluent TP, monitor the contributions of TP from industries or other sources discharging to the POTW and identify sources with high TP concentrations. Major sources are asked to review their practices and use of phosphorus containing products, and to make changes or product substitutions if possible to reduce the discharge of TP to the sanitary sewer. The Agency has used an average effluent TP concentration of 4 mg/L as a rule-of-thumb threshold for requiring a PMP in a permit (Exhibit

PL-1c). Recent data assembled for POTWs with mechanical treatment (continuous discharges) and with no TP limit indicate that 54 percent have TP effluent concentrations greater than 4 mg/L.[45] In general, the lower the concentration of influent TP, the lower the concentration of effluent TP. As of July 2006 nearly 74 percent of all NPDES permittees (424 out of 577) are required to prepare a PMP; 26 percent have actual TP limits.

The Strategy for all its effectiveness and public involvement is not a rule; it has no intrinsic authority. The proposed extension of the phosphorus limit will codify what has taken place under the Strategy, and continue the gains made in reducing phosphorus loadings state-wide. Critical elements of the Strategy will become rule as part of this rulemaking (Exhibit PL-1b).

In summary, the proposed extension of the 1 mg/L phosphorus limit is, to a large extent, being implemented now under the Phosphorus Strategy. This is due at least in part to the popularity and inherent advantages of the Bio-P technology. Depending on the watershed in which they are located, many communities are already being encouraged if not mandated under the terms of a TMDL, for example, to reduce effluent TP as they build new facilities or expand (next Section). Also, the proposal seeks to protect major watersheds **before** they become impaired and a TMDL is required. If society waits until a waterbody is impaired (i.e., water quality standards are exceeded and beneficial uses are actually or potentially lost), not only will water quality of surface waters suffer, but the cost to bring these waterbodies back to health, if possible at all, is usually far more than the cost of preventive measures. The Agency believes it is reasonable to codify portions of the Strategy in rule.

D. ONE MG/L PHOSPHORUS LIMITS BEING INPLEMENTED NOW THROUGHOUT MUCH OF STATE [IX. TP limit, reasonableness]

The removal of phosphorus from point sources is required now in several major watersheds in Minnesota. The proposed extension of the TP limit to new and expanding facilities will have no impact in these watersheds. In other major watersheds in Minnesota pending TMDLs, adopted nutrient reduction goals, watershed management plans or downstream concerns about the impact of nutrient loading is likely to result in additional limits for facilities in these watersheds independent of the proposed extension of the TP limit. While some focus more on non-point sources of nutrients rather than point sources, the basin management plans for the Rainy, Red, Lower Mississippi and Cedar River watersheds have established nutrient management goals for the protection of surface waters[46]. Also, essentially every permittee is being asked to do a phosphorus management plan (to look for ways to reduce influent TP) whether or not they get a numeric TP limit.

<u>Lake Superior Basin and Lake St. Croix</u>. As described in Section IX.B, rules adopted in 1971 require all dischargers in the Lake Superior basin, discharges to Lake St. Croix and to several other specific waterbodies, to meet a 1 mg/L effluent limit. And, as stated, the limits in existing Minn. R. ch. 7065 are proposed to be moved into the new Minn. R. 7053.0255.

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[45] MPCA, February 2006. Phosphorus performance of mechanical facilities. Marco Graziani.
[46] See Agency Basins/Watersheds Web page, http://www.pca.state.mn.us/water/basins/index.html

Minnesota River TMDL. Requirements for phosphorus removal at facilities throughout the Minnesota River are being driven by the lower Minnesota River dissolved oxygen TMDL. The implementation plan for the Minnesota River TMDL includes a general permit that establishes seasonal TP limits applicable from May through September for the 40 largest facilities in the basin (> 1,800 pounds TP/yr.). However, the two largest discharges, the MCES operated Seneca and Blue Lake plants, will have year-round limits in 2008. Also, two new ethanol facilities with individual permits will have essentially year-round limits. Under the proposed rule, if facilities in the basin with seasonal limits expand in the future (to over 1,800 pounds TP/yr.), they would be subject to a year-round limit, unless they qualify for one of the proposed exemptions (Section IX.H).

It should be noted that the Minnesota River TMDL is a result of exceedances of the Class 2 dissolved oxygen (DO) standard in the lower 22 miles of the Minnesota River under low flow conditions. The low DO is caused by the decay of the abundant algae which result from excess phosphorus. This has a bearing on the fact that the general permit includes seasonal TP limits rather than year-round limits. The low DO is a side effect of excess nutrients but low DO itself is usually not a problem in rivers during the winter (except sometimes under total ice cover). Cold water holds more DO than warm water before it becomes saturated, and the metabolic rate of living organisms is much slower at cold temperature reducing their DO requirements. Also, warm water fish are not spawning in the winter, thus the more low-DO-sensitive early life stages are not present in the winter. The problem to be remedied in the lower Minnesota is a DO problem not a eutrophication problem *per se*. Year-round limits might be appropriate if the impairment was based on exceedance of nutrient criteria. Nutrient loading during the winter months can have direct negative impacts, and phosphorus that attaches to particulates in the winter can settle to the bottom and become available for algal growth the following summer.

At the present time rivers are not being directly assessed for impairment due to excess nutrients because the Agency has not developed numeric nutrient criteria applicable to rivers as it has for lakes.

Upper Mississippi River Basin and Lake Pepin TMDL. Lake Pepin is a natural lake on the Mississippi River downstream from Red Wing, Minnesota. Lake Pepin exceeds the Agency’s nutrient criteria for lakes and is impaired due to excess nutrients (also impaired for turbidity). Lake Pepin was added to the impaired waters list in 2004. The watershed above Lake Pepin includes about half of the area of Minnesota. The Lake Pepin nutrient TMDL is well underway but the implementation plan will not be complete for some time. In all likelihood, however, the implementation phase of this TMDL will call for TP limits for at least the larger discharges in the watershed that do not already have them.

St. Croix Basin. An interstate agreement to achieve ambitious nutrient reduction goals for the St. Croix basin was signed by the Commissioner of the Agency and the Secretary of the Wisconsin Department of Natural Resources on April 6, 2006 (Exhibit PL-2b). The Agreement formalizes a 20 percent TP loading reduction goal for the St. Croix basin. Achievement of this goal will reduce TP levels in Lake St. Croix to 1950 levels, which is projected to mean a decrease in the current average TP concentration of 50 µg/L to about 40 µg/L (Exhibit PL-2b). An earlier

Report (August 2004) containing the recommended water quality goals of the St. Croix Basin Water Resources Planning Team established the same goal of a 20 percent reduction TP loading to Lake St. Croix (Exhibit PL-2a).

Phosphorus limits are commonly issued to dischargers in the St. Croix basin now because of the importance of this national scenic and recreational river and the sensitivity of Lake St. Croix to impacts from excess nutrients. The recently sanctioned nutrient reduction goals can only increase the likelihood that point sources will get TP limits when their permits come up for reissuance, independent of the proposed extension of the TP limit to new and expanding dischargers.

Rainy River Basin. Lake of the Woods is an important recreational lake in northern Minnesota and is an international border water. Limited monitoring was conducted historically to assess lake conditions; however, lake monitoring has increased in intensity the past three years due to concerns over periodic algae blooms. A 2005 lake trophic status report shows mean TP, Chl-a and Secchi depth in the lake are near the proposed NLF ecoregion standards.[47] Additionally, occasional high concentrations of Chl-a are found in the lake and the algal community is dominated by the less desirable blue-green algae most of the time. Follow-up sampling was conducted in 2006 to determine whether the lake should be placed on the 2008 impaired waters list. There is an extensive volunteer monitoring network on the Canadian side of the lake and the water quality in this portion is often better than the more southerly portion of the lake. The Rainy River is the largest water source entering the lake, making up 80 percent of the lake's drainage basin. The 2005 report (footnote 46) documents that TP concentrations in the Minnesota portion of the lake reflect the TP concentration in the Rainy River. Additional lake monitoring is being conducted that will facilitate 303(d) assessment in 2008. Maintaining or improving the quality of Lake of the Woods will require management of phosphorous loads in the Rainy River upstream of the lake.

Red River Basin. The high level of suspended sediments and turbidity in the Red River appears to reduce the impact of nutrient loading to the river itself. The proposed third exemption is in partial recognition of this situation (Section IX.H.5). Downstream, however, Lake Winnipeg in Manitoba is becoming eutrophic.[48] Manitoba has adopted a Lake Winnipeg Action Plan that, among other things, calls to:

> *"identify further actions necessary to reduce nitrogen and phosphorous to pre-1970 levels in the lake" and "commencement of cross-border nutrient management discussions"*.[49]

The Red River flows into Lake Winnipeg downstream from the city of Winnipeg. Clearly Manitoba and the city of Winnipeg have a large stake in slowing and reversing the eutrophication of this large lake (about the size of Lake Erie). The city of Winnipeg has three wastewater treatment plants. One plant (west end) has a permit requirement to meet a 1 mg/L TP

[47] http://www.pca.state.mn.us/publications/reports/wq-lar39-0002.pdf.
[48] http://www.lakewinnipeg.org/web/downloads/Nutrient_Literature_Review_LakeWinnipeg_Final_May_2006.pdf.
[49] http://www.gov.mb.ca/waterstewardship/water_quality/lake_winnipeg/action_plan.html

limit that became effective at the end of 2006. Limits for the other two plants will follow.[50] Because the Minnesota portion of the Red River basin is upstream of Lake Winnipeg, reducing the TP loading from Minnesota will help Canada in its efforts to improve the water quality in Lake Winnipeg.

Des Moines Basin. Heron Lake in the Des Moines River Basin has a history of excess nutrients, resulting in an overabundance of algae that shade the growth of rooted aquatic plants. This has had serious detrimental effects on duck populations on this historic prime waterfowl resource. The lake has been on the impaired waters list since 2002. The lower reaches of the Des Moines River have been on the impaired waters list for dissolved oxygen since 1994. Recent evaluations suggest high levels of algae in the river that stagnate behind small main-stem dams as a possible cause of the low DO. Nutrient reductions may be necessary to mitigate the low DO problem in the river as is the case in the lower Minnesota River Dissolved Oxygen TMDL.

Lower Mississippi River Basin (below Lake Pepin). Nutrients influence the function of the diverse surface water resources in the Lower Mississippi River Basin. The basin contains the Mississippi River, which is a large floodplain river, and tributaries, such as the Zumbro, Whitewater, and Root. There are many trout streams which drain the bluffs of the "Driftless Area" ecoregion. Lakes are most prevalent in the western portion of the Cannon River Watershed. Development of river nutrient standards will help us determine the ultimate nutrient goals for the waters of the Lower Mississippi River Basin.

The Mississippi River is an extremely productive river that contains a mosaic of impounded areas, side channels, backwaters and main channel habitats. The portion of the Mississippi River downstream of Lake Pepin is part of the Upper Mississippi River National Wildlife Refuge. The river serves as a nationally important resting area for migratory birds, a productive fishery and a navigational channel for the upper Midwest. The implications of nutrient loading to this system are not fully understood, but there are several indications that nutrients are an issue of concern for riverine health. Excess algal production can be detrimental to submersed aquatic plants (in shallow backwater and impounded areas) which are very important to the ecology of the Mississippi River. Wisconsin has recently expressed concern regarding excessive amounts of filamentous algae which may be negatively impacting submersed aquatic plants. Concentrations of TP often exceed 200 µg/L in the main channel and backwaters of the Mississippi River downstream of Lake Pepin. Average Chl-a levels exceed 50 µg/L especially during spring and summer. Concentrations of Chl-a can exceed 100 µg/L in channel areas during low flow conditions.

Algal growth occurs in winter, but it is difficult to determine its significance as a contributor to low dissolved oxygen in relatively isolated backwaters due to high densities of submersed aquatic vegetation that are also present in these areas. Also, it is difficult to determine the impact of winter TP influx due to a large pulse of water that is routed through the riverine systems during spring flooding. Relatively isolated backwaters are flushed during this period. Detention time in most areas in the Lower Mississippi Basin are generally measured in days rather than weeks. Low DO is less problematic in channel areas and some fish can move to channel

[50] E-mail from Dwight Williamson, Director Water Science and Management Branch Manitoba Water Stewardship, May 9, 2005.

habitats during periods of low dissolved oxygen in backwaters, but fish such as bluegills and largemouth bass typically do not move due to low temperatures and high water velocities which they prefer to avoid in the winter.

Two lakes on the impaired waters list, Lakes Byllesby and Zumbro are located in the lower Mississippi Basin. The TMDLs for these waterbodies will determine the significance of winter discharges of TP above these lakes.

Cedar and Missouri Basins. The Cedar and Missouri Basins in Minnesota are smaller geographic headwater areas of the state and are characterized by small tributaries. As a result, fewer nutrient assessments have been undertaken in these basins. However, select assessments in these areas are of note. Excess nutrients were evaluated in a Clean Water Partnership project for Lakes Okabena, Ocheda and Bella near Worthington. Nutrient goals were established in these projects. The Iowa Department of Natural Resources has developed a TMDL for Little Spirit Lake on the Iowa Minnesota border in the Missouri River Basin. The TMDL is for impairments of algae and turbidity due to excess nutrient (phosphorus) loading to the lake. A 60 percent phosphorus load reduction is needed to meet the TMDL and achieve the designated use for Little Spirit Lake. A general review of water quality data shows elevated phosphorus and chlorophyll concentrations in the rivers in these basins. Considering the close proximity of these basins to the Minnesota River Basin and the land use similarity between the basins it is not unexpected that river nutrient conditions are similar.

E. COMMENTS FROM MESERB [IX. TP limit, reasonableness]

The Minnesota Environmental Science and Economic Review Board (MESERB) commented in letters (Exhibits A-34 and A-35) that Minn. Laws 2005 ch. 1, art. 2, § 151 Subdivision 1.(g) prevents the Agency from adopting the proposed extension of the TP limit to new and expanding discharges above a certain size.[51] The part of the Session law that MESERB cites is shown below:

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Sec. 151.  [WATER QUALITY ASSESSMENT PROCESS.]
Subd. 1.   [RULEMAKING]

(g) The rules must provide that the agency, in considering impairment
due to nutrients and application of nutrient objectives and effluent
limitations related to riverine systems or riverine impoundments, must
consider temperature and detention time effects on algal populations
when the discharge of nutrients is expected to cause or contribute to
algal growth that impairs existing or attainable uses.
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The Session law says the Agency must take the effects temperature and hydraulic detention time have on algae populations into account when considering effluent limits for dischargers to “riverine systems” and river impoundments when the discharge is expected to cause or contribute to impairment of existing or attainable uses.

[51] The rulemaking required by this Session Law was adopted by the Agency Board in October 2006. The SONAR for the separate Session Law rulemaking is Exhibit A-4.

It is the opinion of the Agency that this part of the Session Law does not preclude the Agency from promulgating the changes to the 1 mg/L phosphorus effluent limit as proposed (Exhibit A-36). The Session Law mandated a rulemaking separate from this proposed rulemaking. The Session Law pertained to the current phosphorus rule, which relies on a demonstration of measurable "affects" on a downstream lake or reservoir due to the TP loading – a demonstration that considers the effects temperature and, where relevant (reservoirs), residence time have on effects of TP loading. The Agency has always addressed these two factors where relevant irrespective of the Session Law, and will continue to do so in implementing the current phosphorus rule (existing Minn. R. 7050.0211, subp. 1a). The Session Law does not preclude the Agency from taking an action, separate from the Session Law, to regulate the discharge of phosphorus to sustain the progress in point source TP reductions started under the policy of the Phosphorus Strategy. The proposed extension of the TP effluent limit is not keyed to a finding of measurable impacts from the additional TP load on riverine or lake systems.

Apart from MESERB's issues regarding Agency authority to set effluent limits, the Agency believes that MESERB's basic concern about TP limits being imposed in situations where no negative impacts have been demonstrated are substantially mitigated by the facts presented in the *reasonableness* section of this SONAR as highlighted below.

- Under the proposal TP limits will not apply to small dischargers (more than half of all POTWs) – those discharging less than 1,800 pounds of TP in a year (next Section).
- Twenty six percent of all POTWs have TP limits now (about 72 percent of the total volume of treated wastewater in Minnesota).
- The Proposal is being substantially implemented now under the Phosphorus Strategy. Over the five-year period following adoption of the Strategy (March of 2000) about 34 POTWs (> 0.2 mgd) got TP effluent limits years that may not have gotten limits before.
- TP effluent limits are already required in much of the state due to existing rules, nutrient - related TMDLs or nutrient reduction goals.
- Dischargers may request relief from the TP limit under one or more of the proposed exemptions. The third exemption provides for the possibility of summer-only limits in certain watersheds.

Phosphorus has been shown to be one of the most pervasive and damaging nontoxic pollutants the Agency deals with. Nutrient loading to rivers has negative impacts that often go unmeasured or undetected because of the lack of monitoring. Phosphorus is not degraded and it can be carried far downstream. Some portion of the TP released under conditions of high flow and low temperatures, if not manifested under these conditions, can contribute to a degraded condition when flows decline and temperatures increase.

In summary, the Agency has broad authority to set effluent limits to prevent the pollution of waters of the state and to prevent the physical chemical or biological degradation of receiving waters (Minn. Stat. § 115.03). The Session Law does not prevent the Agency from promulgating the extension of the TP limit to new and expanding discharges that exceed the *de minimis* TP load in a separate rulemaking because:

- TP limits in the rule required by the Session Law are dependant on a finding of impacts to the receiving water due to the TP load.
- The proposed TP rule is a separate action. The proposed limits are not dependent on making a finding of measurable effects.
- The Session Law does not say the Agency can only set effluent limits when there is a demonstration of effects. It did not preclude the Agency from proposing rulemaking that takes regulatory actions beyond the 1973 TP rule.

F. *DE MINIMIS* SIZE EXEMPTION [IX. TP limit, reasonableness]

Included in the proposed extension of the TP effluent limit to new and expanded discharges is a *de minimis* mass TP loading from point sources. Municipal and industrial facilities that discharge less than the *de minimis* load, 1,800 pounds of TP per year, are not subject to the proposed 1 mg/L effluent limit. Wisconsin adopted a *de minimis* of 1,800 pounds in their "P-rule" (Exhibit PL-13), and the Agency used the Wisconsin experience as a starting point in their own investigation of an appropriated *de minimis*.

The selection of 1,800 pounds of TP per year is a result of research carried out for the development of the Strategy (Exhibit PL-1c, page 3). This analysis was completed in 2000. The concept of *de minimis* in the context of TP loading implies a diminishing return that would be realized if TP limits were to be applied to facilities discharging this amount or less. The *de minimis* loading does not apply to dischargers to or affecting a lake, shallow lake or reservoir, or waterbodies covered by existing Minn. R. ch. 7065, as is the case today.

Exhibit PL-1c describes in detail the data and the analysis that supports the selection of the *de minimis* amount. In brief, data for publicly owned treatment works (POTW) in three major basins were investigated (Upper Mississippi, Minnesota, and St. Croix basins). The data for the POTWs in these three watersheds are assumed to be representative of POTWs state-wide. The data used includes:

- Size of the treatment facility as indicated by the monthly average wet weather design flow (AWWDF), which is used to divide POTWs into two categories: those with AWWDFs $\leq$ 0.2 mgd and > 0.2 mgd;
- Number of mechanical and pond treatment systems;
- Population served;
- Effluent TP concentrations; and
- TP mass loading.

The AWWDF of 0.2 mgd is used as a convenient estimate of the size facility that will discharge about 1,800 pounds of TP per year, or be at the threshold of the *de minimis* loading. Table II-16 shows the data from the three watersheds used in the Strategy to estimate the number of POTWs likely to be above and below the *de minimis* loading. Also included in Table II-16 is more recent data for all POTWs state-wide. These data show that the majority of all POTWs have AWWDFs less than 0.2 mgd. Mechanical wastewater treatment plants have a continuous discharge and tend to be the treatment choice of larger communities. The typical stabilization pond discharges twice per year for about two to three weeks in the spring and fall. Stabilization ponds are more likely to be the choice of smaller communities. This is reflected in the data in Table II-16. Roughly a third of all mechanical POTWs and over 80 percent of all pond systems will be exempt from the proposed extension of the TP limit to new and expanded discharges.

Table II-16. Number of All, Mechanical, and Pond POTWs with Average Monthly Wet Weather Design Flows Below 0.2 mgd (percentages in parentheses).

POTW Category*	Data Used in the Strategy, Exhibit PL-1c			State-wide Data
	Upper Miss. R. Basin	Minn. R. Basin	St. Croix R. Basin	
No. of POTWs				
Total, All	123	133	23	566
Less than 0.2 mgd	69 (56%)	85 (64%)	17 (74%)	347 (61%)
Total, Mechanical	65	56	6	279
Less than 0.2 mgd	24 (37%)	25 (45%)	2 (33%)	100 (36%)
Total, Ponds	57	77	17	295
Less than 0.2 mgd	45 (79%)	60 (78%)	11 (65%)	242 (83%)

* Number of facilities in each category will vary slightly depending on how some less typical facilities are counted, and the plant design flows were not available for a few facilities.

The information in Table II-17 shows that the mass loading of phosphorus from POTWs smaller than the *de minimis* loading (0.2 mgd) represents a small fraction of the total basin-wide loading from all sources, point and nonpoint – about eight percent or less at low river flows and about two percent or less at average river flows. Thus, exempting small discharges from the proposal will have little impact on overall TP loading; and, conversely including them will gain little in the way of TP loading reductions basin-wide. The TP loading data in Table II-17 is based on median effluent TP concentrations and AWWDFs. Therefore, the percentages should be considered high-end estimates because plant design flows are larger than the actual plant flows (see Exhibit PL-1c for details).

Table II-17. Percent Mass Contribution of TP from Facilities with a Design Flow Less Than 0.2 mgd Relative to Basin-wide TP Loading.

Flow Conditions in Receiving Stream	Upper Miss. R. Basin	Minn. R. Basin	St. Croix R. Basin
Low Flow	6.5 %	8.2 %	2 %
Average Flow	1.8 %	1.3 %	1 %

The Strategy investigated TP loading data for industries located in the same three basins listed in Table II-17, plus industries in the Lower Mississippi, Cedar and Des Moines River basins. The Agency concluded that the 1,800 pound TP *de minimis* could be applied to industries as well as POTWs. In general, industries of all sizes contribute a very small fraction of the total TP loading in these watersheds (the Des Moines being the major exception). The contribution from industries with design flows below 0.2 mgd, of which there are very few in any basin, contributed less than 0.1 percent of the cumulative basin-wide TP mass loading. Also, the mean or median effluent TP concentration of the industries below 0.2 mgd in size were less than 1 mg/L (Exhibit PL-1c, page 10).

In conclusion, the proposed extension of the TP limit to new and expanding dischargers will include a *de minimis* size facility; facilities below this size will not be impacted. This is a continuation of the policy adopted in the Phosphorus Strategy. Data for POTWs state-wide indicates that the proposal will not apply to more than half of all POTWs because of the *de minimis* threshold. Less than 20 percent of communities with pond systems will be impacted. Facilities discharging less than the *de minimis* (1,800 pounds TP per year or about 0.2 mgd AWWDF) contribute very little to the overall nutrient loading to rivers and streams. Excluding these facilities will not have measurable impact on the environment. Including a *de minimis* threshold in the proposal is a reasonable and cost effective means to assure that phosphorus removal dollars will be spent where they will have the greatest impact.

G. TP EFFLUENT LIMIT LANGUAGE CHANGES [IX. TP limit, reasonableness]

1 <u>Introduction and Proposed Language in Minn. R. 7053.0255</u> [IX.G. TP limit, reasonableness]

As described in the *need* section (Section VII.F), the Agency is proposing to consolidate all the TP effluent limits in one part of the proposed new rule, Minn. R. ch. 7053. All of proposed Minn. R. 7053.0255 is repeated below and should be referred to for the discussion of the six subparts in the sections that follow.

7053.0255 PHOSPHORUS EFFLUENT LIMITS FOR POINT SOURCE DISCHARGES OF SEWAGE, INDUSTRIAL, AND OTHER WASTES.

<u>*Subpart 1. **Scope**. The phosphorus effluent limits in this part are in addition to the effluent limits specified elsewhere in this chapter. In the event of any conflict between this part and other applicable regulations, the more stringent requirement applies.*</u>

<u>*Subp. 2 **Definitions**. For the purposes of this part, the following definitions apply. Other relevant definitions are found in part 7050.0150, subpart 4.*</u>

<u>*A. "122-day ten-year low flow" or "$122Q_{10}$" means the lowest average 122-day flow with a once in ten-year recurrence interval. A $122Q_{10}$ is derived using the same methods used to derive a $7Q_{10}$, and the guidelines regarding period of record for flow data and estimating a $7Q_{10}$ apply equally to determining a $122Q_{10}$ as described in part 7053.0135, subpart 3.*</u>

B. “Affects” means a measurable increase in the adverse effects of phosphorus loading as determined by monitoring or modeling, including, but not limited to, an increase in chlorophyll-a concentrations, a decrease in water transparency, or an increase in the frequency or duration of nuisance algae blooms, from an individual point source discharge.

C. "Expanded discharge" means a disposal system that after May 1, 2008, discharges more than 1,800 pounds of total phosphorus per year to a surface water on an annual average basis, and increases in wastewater treatment capacity as indicated by an increase in the:

(1) design average wet weather flow for the wettest 30-day period for point source dischargers of sewage with a continuous discharge, typically a mechanical facility;

(2) design average wet weather flow for the wettest 180-day period for point source dischargers of sewage with a controlled discharge, typically a pond facility; or

(3) design average daily flow rate for dischargers of industrial or other wastes.

D. “Lake” means an enclosed basin filled or partially filled with standing fresh water with a maximum depth greater than 15 feet. Lakes may have no inlet or outlet, an inlet or outlet, or both an inlet and outlet.

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

F. "New discharge" means a discharge that was not in existence before May 1, 2008, and discharges more than 1,800 pounds of total phosphorus per year.

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

H. “Shallow lake” means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the summer. The quality of shallow lakes will permit the propagation and maintenance of a healthy indigenous aquatic community and they will be suitable for boating and other forms of aquatic recreation for which they may be usable. For purposes of this chapter, shallow lakes are differentiated from wetlands and lakes on a case-by-case basis. Wetlands are defined in part 7050.0186, subpart 1a.

Subp. 3. **Total phosphorus effluent limits**.

A. Phosphorus removal to one milligram per liter is required when subitem (1), (2), or (3) applies:

(1) the discharge of effluent is directly to or affects a lake, shallow lake, or reservoir;

(2) the discharge is to the specific basins and water bodies designated in subpart 5; or

(3) the discharge is new or expanded as defined in subpart 2 except when the discharger can demonstrate to the commissioner that the discharger qualifies for an alternative phosphorus limit as provided in subpart 4.

B. ~~In addition,~~ If a phosphorus effluent limit is required under item A, removal of nutrients from all wastes ~~shall~~ must be provided to the fullest practicable extent wherever sources of nutrients are considered to be actually or potentially detrimental to preservation or enhancement of the designated water uses. Dischargers required to control nutrients ~~by~~ under this ~~subpart~~ part are subject to the variance provisions of ~~part~~ parts 7000.7000 and 7053.0195.

Subp. 4. Alternative phosphorus effluent limits for new or expanded discharges. New or expanded discharges subject to a one milligram per liter phosphorus effluent limit in subpart 3, item A, subitem (3) may request an alternative limit or no limit if one or more of items A to C apply. New or expanded discharges are defined in subpart 2. The exemptions in this subpart do not apply to facilities that discharge directly to or affect a lake, shallow lake or reservoir or to discharges to the waters listed in subpart 5. Dischargers seeking an alternative limit due to very high per capita treatment costs or economic hardship must apply for a variance under parts 7000.7000 and 7053.0195.

The information submitted to the commissioner for consideration of an alternative limit must include, at a minimum, a description of the treatment technology used, influent and effluent total phosphorus concentrations, a phosphorus management plan for the facility, descriptions of any measures already taken to reduce phosphorus sources to the facility, and expected reductions in phosphorus concentrations following implementation of the phosphorus management plan. The discharger may qualify for an alternative total phosphorus limit or no limit if it can demonstrate:

A. the discharge is to or upstream of a water body listed on the applicable impaired water list, section 303(d) of the Clean Water Act and the total maximum daily load study is complete and approved by the United States Environmental Protection Agency at the time the new or expanding facility is in the planning and design phase. The *total maximum daily load study must have considered impacts from phosphorus loading on the impaired water body. In this case the total maximum daily load study will determine the applicable phosphorus effluent limit;*

B. the environmental benefits to be achieved by meeting a phosphorus limit are outweighed or negated by the environmental harm caused by meeting a limit; or

C. the treatment works regardless of the type of treatment technology, must use chemical addition to achieve compliance with the one milligram per liter limit, and the discharge is to a receiving stream in a watershed listed in subitems (1) to (3). In this case the discharger may be granted a seasonal one milligram per liter limit, applicable from May 1 through September 30 and not applicable from October 1 through April 30:

(1) the lower Mississippi River and its tributaries from the mouth of the Chippewa River in Wisconsin to the Minnesota border;
(2) the Bois de Sioux and Red Rivers and their tributaries from the southern end of Lake Traverse at Browns Valley to the Canadian border; and
(3) the Missouri, Des Moines, and Cedar Rivers and their tributaries in Minnesota.

*Subp. 5. D**esignated waters**. The one milligram per liter phosphorus limit established in subpart 3 applies to the waters designated in items A to F.*

A. All intrastate waters lying within the drainage basin of Lake Superior in the counties of Aitkin, Carlton, Cook, Itasca, Lake, Pine, and St. Louis (Townships 45 to 65 North, Ranges 7 East to 23 West).

B. The interstate waters of Lake St. Croix in Washington County (Townships 26 to 30 North, Range 20 West).

C. The St. Louis River from its source at Seven Beaver Lake (Township 58 North, Range 12 West) to and including St. Louis Bay (Townships 49 and 50 North, Ranges 14 and 15 West) and Superior Bay (Townships 49 and 50 North, Ranges 13 and 14 West).

D. The Mississippi River from its source to the Blandin Dam at the outlet of Paper Mill Reservoir in the City of Grand Rapids approximately 400 feet upstream from the bridge on U.S. Highway 169 including Lake Andrusia (Township 146 North, Range 31 West), Lake Bemidji (Townships 146 and 147 North, Range 33 West), Cass Lake (Townships 145 and 146 North, Ranges 30 and 31 West), Lake Itasca (Township 143 North, Range 36 West), Pokegama Lake (Townships 54 and 55 North, Ranges 25 and 26 West), and Winnibigoshish Lake (Townships 145, 146, and 147 North, Ranges 27, 28, and 29 West).

E. The Little Minnesota River and Big Stone Lake from the South Dakota border crossing to the outlet of Big Stone Lake at the dam immediately upstream from the U.S. Highway 12 bridge in Ortonville.

F. Albert Lea Lake (Township 102 North, Ranges 20 and 21 West) in Freeborn County.

*Subp. 6. **Averaging period for phosphorus limit**. The phosphorus limit required under subpart 3 must be a calendar month arithmetic mean unless the commissioner finds, after considering the criteria listed in items A and B, that a different averaging period is acceptable. In no case shall the one milligram per liter limit exceed a moving mean of 12 monthly values reported on a monthly basis, or a simple mean for a specified period, not to exceed 12 months. Calendar month effluent limits in effect on February 7, 2000, must remain in effect unless an assessment of the criteria listed in items A and B indicate a different averaging period is acceptable. An ~~different~~ averaging period other than monthly is acceptable when:*

A. ~~the effects of the phosphorus loading from the facility on the receiving water or downstream water resources is generally not measurable.~~ there is no measurable or predictable difference in the adverse effects of the phosphorus loading from the facility on the receiving water or downstream water resources compared to the loading that would result using a 30-day average limit; and

B. the treatment technologies being considered offer environmental, financial, or other benefits.

2. Scope and Definitions, Minn. R. 7053.0255, Subparts 1 and 2 [IX.G. TP limit, reasonableness]

Proposed 7053.0255, subpart 1 outlines the contents of this new section.

Proposed 7053.0255, subp. 2 contains eight new definitions relevant to TP effluent limits. SONAR Book I describes the need and reasonableness of the proposed definitions (Sections VI.B and X.B. in SONAR Book I). Critical terms needing definitions are: "affects," "measurable increase" and "measurable impact," "lake" and "reservoir." The lack of definitions in rule has caused disagreement over the meaning of these terms, which has resulted in controversy and litigation. It is reasonable to define terms that have been used for decades but have not been defined in rule for future permitting decisions. It is also reasonable to define new terms relevant to the proposed extension of the TP limit to new and expanded dischargers; these are: "new discharge," "expanded discharge", $122Q_{10}$" and "shallow lake."

3. TP Effluent Limits, Minn. R. 7053.0255,subp. 3 [IX.G. TP limit, reasonableness]

Three bases for applying a TP effluent limit to a point source discharge are consolidated into this subpart. They are:

1. The discharge is directly to or affects a lake, shallow lake or reservoir. This is the existing P rule which is not being changed except for the addition of "shallow lake."

2. The discharge is to a specific basin or waterbody listed in existing Minn. R. ch. 7065. The TP limits in this rule are not being changed except to move the list of waterbodies affected to Minn. R. ch. 7053, subp. 5.

3. The discharge is from a new or expanding facility that discharges more than 1,800 pounds of TP per year. The proposal being considered in this part of SONAR Book II.

Minnesota R. 7053.0255, subp. 3 also contains proposed new language related to TP limits and TMDLs and proposed changes to existing language dealing with the "fullest practicable treatment" paragraph. These are discussed separately in the next two sections.

4. <u>Fullest Practicable Extent for TP Treatment Applies to Dischargers with a TP Limit</u> [IX.G. TP limit, reasonableness]

The proposed extension of the TP limit to new and expanded dischargers and the other changes that are part of the restructuring and consolidation of the TP limits provide a good opportunity to clarify this provision (Minn. 7053.0255, subp. 3, item B.). This long-standing provision says that wastewater treatment plants should remove TP from the effluent to the "fullest practicable extent." The provision showing the proposed changes is shown above.

As stated in the *need* section (Section VII.I), there has been some misunderstandings about the interpretation of this provision; i.e., whether it means all dischargers regardless of whether or not they have a 1 mg/L TP limit, or only dischargers with a TP limit, have to provide nutrient removal to the "fullest practicable extent" (FPE).

The Agency has interpreted FPE as applying only to facilities that have a TP limit. This is based on the context of the provision and the long history of how this provision has been applied for over 30 years. This paragraph was originally, and continues today, to be in the part of the rule that includes the TP effluent limit. This context clearly suggests that the paragraph is associated with TP effluent limits. The Agency has consistently interpreted this paragraph as applying only to dischargers that have a phosphorus limit. The following quote from the SONAR for the rulemaking completed in 2000 in which the option of a longer averaging period for TP limits was adopted illustrates this point.

> "Also it [TP limits with averaging periods longer than one month] is consistent with the existing narrative concerning nutrient removal **associated with the 1 mg/L phosphorus limit** which is quoted below." (emphasis added) [52]
>
> *"In addition, removal of nutrients from all wastes shall be provided to the fullest practicable extent wherever sources of nutrients are considered to be actually or potentially detrimental to preservation or enhancement of the designated water uses. Dischargers required to control nutrients by this subpart are subject to the variance provisions of part 7050.0190."*

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[52] SONAR, In the matter of proposed revisions of Minnesota Rules Chapter 7050, page 90, June 16, 1999.

The Minnesota Environmental Science and Economic Review Board (MESERB) commented that the intent of this paragraph needs clarification. The Agency agrees and that is what we are proposing. The Agency is reluctant, however, to completely remove the paragraph as suggested by MESERB (Exhibit A-34, page 3, no. 9). The Agency believes that removing the paragraph is neither needed nor desirable, as opposed to simply clarifying the language. The general concept of requiring a wastewater treatment plant to perform at their best is a sound policy and it has important environmental benefits. Also, the same provision, only applicable more broadly, is included in existing Minn. R. 7050.0210, subp. 4. The Agency's proposed clarification is reasonable.

5. Possible Exemptions from TP Limit [IX.G. TP limit, reasonableness]

The reasonableness of the three proposed exemptions to the 1 mg/L TP limit to new or expanded discharges is discussed in Section IX.H, below. The exemptions allow possible relief for dischargers impacted by the proposed extension of the TP limit.

6. Clarification of Criteria for Longer Averaging Period for TP Limits [IX.G. TP limit, reasonableness]

The Agency has the option of setting TP effluent limits in NPDES permits that can be averaged over a period longer than one calendar month, up to one year (Minn. R. 7053.0255 subp. 6). Permits with a longer averaging period are usually 12-month moving averages. Approximately 35 municipal dischargers and several industrial discharges now have 1 mg/L TP limits with an averaging period longer than one month. Such facilities typically use Bio-P technology to remove TP, but most use some chemical as well.

The Agency is proposing to clarify the first of two criteria the Commissioner can use to decide when a TP limit with a longer averaging period is appropriate, and to make some other very minor clarifying language changes. The need for this clarification is found in Section VII.J; the proposed language changes are shown above.

In retrospect, the language in the existing first criterion, *"the effects of the phosphorus … is generally not measurable"* (Minn. R. 7050.0211, subp. 1a, item A) seems to conflict with the way the current TP limit has been implemented over the years. That is, in order for a limit to be issued, regardless of the averaging period, the impacts of the phosphorus loading should be measurable in the downstream lake or reservoir. This is consistent with the way the Agency proposes to define the word "affects."

The proposed new language will indicate that the lack of a measurable impact or predictable impact (e.g., though modeling) refers to the difference in the loading that would occur with a limit averaged over a longer period compared to the loading that would occur with a monthly limit. Thus, a discharger with a longer averaging period should not have a greater impact on the downstream resources than they would have if the limit were a monthly average; that is, any difference should not be discernable. The duration of the TP limit should not have a significant or measurable difference in downstream trophic conditions. However, the longer averaging period provides permittees with a possible “compliance cushion,” and it allows operators to place greater confidence in the performance of Bio-P – that over the long-term the 1 mg/L limit can be met. This was the intended outcome when the longer averaging period was adopted in 2000.

It is the Agency’s intent that the option of a longer averaging period for a TP limit should apply to any TP limit issued under proposed Minn. R. 7053.0255; i.e.:

- When the discharge is to or affects a lake, shallow lake or reservoir;
- New and expanded dischargers (> 1,800 pounds TP per year);
- To the specific waterbodies listed in the current Minn. R. ch. 7065.

The Agency’s reasoning regarding the 1 mg/L limits in existing Minn. R. ch. 7065 when the longer averaging period was proposed was that no averaging period was specified for the limits in this rule. The Agency believed that it was reasonable, since the rule is silent as to any averaging period, that assignment of an averaging period is left to the discretion of the Commissioner. The Agency suggested that the same criteria included in the proposed rule language (as revised in this rulemaking) would apply to the dischargers to the waterbodies listed in Minn. R. ch. 7065. Thus, averaging periods longer than a calendar month would be a possibility. The Agency believes that it is reasonable to extend this option to any facilities impacted by the proposed extension of the TP limit as well.

7. TP Limits Applicable to Limited Resource Value Waters [IX.G. TP limit, reasonableness]

Limited resource value waters (Class 7) are surface waters able to support only a very limited aquatic community, and offer only very limited opportunities for water recreation. Most are short headwater stream segments, usually channalized ditches that often have no flow in dry years. They range in length from less than a mile to about 20 miles. Class 7 waters are not afforded the same level of protection for aquatic life and recreation that Class 2 waters are. All candidate Class 7 waters undergo a use attainability analysis and the change in classification must be adopted through rulemaking (see SONAR Book III, Section XI).

Despite the limited beneficial uses assigned to Class 7 waters the Agency believes that the proposed extension of the TP limit to new and expanding dischargers should apply to dischargers to Class 7 waters. Class 7 dischargers have not been exempt from TP limits under the current rule. Fourteen of the 96 POTWs that currently discharge to Class 7 waters have TP limits. This course of action is consistent with the fact that phosphorus is conservative (not degraded), and it will move downstream potentially impacting downstream Class 2 resources. Most Class 7 reaches are only a few miles in length, thus the possibility for downstream impacts is real. Existing Minn. R. 7050.0214, subp. 3 provides for the protection of downstream Class 2 waters and associated beneficial uses.

From a practical standpoint probably less than half of the existing dischargers to Class 7 waters will be eligible for a TP limit, at least in the foreseeable future, because most will not exceed the *de minimis* loading of 1,800 pounds per year. Using current design flows, 55 of the total of 96

POTWs than discharge to Class 7 waters are below 0.2 mgd, 41 are equal to or greater than 0.2 mgd. Nine of the 14 discharges that have TP limits now are in the larger size group.

Dischargers to Class 7 waters can petition for relief under one or more of the proposed exemptions. While each request will be evaluated individually and protection of the downstream Class 2 water must be considered, dischargers to Class 7 waters may be able to bolster their case for an exemption simply by the fact that the receiving waterbody is a limited resource value water.

H. POSSIBLE EXEMPTIONS TO 1 MG/L TP LIMIT [IX. TP limit, reasonableness]

1. Introduction and Removal of an Originally Proposed Exemption [IX.H. TP limit, reasonableness]

The proposed extension of the 1 mg/L TP limit to new and expanded dischargers larger than 1,800 pounds TP per year provides options for dischargers to seek relief from the requirement if they meet certain criteria. Dischargers may request a TP limit more lenient than 1 mg/L (alternative limit) or no limit at all. The potential exemptions are also called “off ramps.” The three proposed off ramps are not mutually exclusive; that is, a discharger may indicate in their request that they qualify for relief under one or more. Each will be discussed in turn.

The Agency is aware that the proposed extension of the TP limit may result in a limit being imposed in situations where the benefits will not be discernable, or meeting the limit may not seem cost-effective. This does not mean that there is no environmental gain in reducing TP from wastewater treatment plant effluents, even when the improvements to the receiving stream may not be measurable. In general, the less TP discharged to receiving waters the better. However, the Agency believes that there will be situations when the imposition of a TP limit may have minimal benefits for the environment, and the proposed rule needs to provide for these situations. The Agency intends to evaluate each request for an exemption on a case-by-case basis using a weight of evidence approach, consistent with the fundamental rationale and goal of the proposed extension of the phosphorus limit, which is to prevent the eutrophication of surface waters by reducing the loading of TP from point sources.

The Agency originally proposed an exemption that has now been removed and is no longer part of the proposed rule. The draft rule amendments that have been available to interested parties for about the last two years included the now deleted off ramp. In November 2006 after final discussions among the staff, the Agency decided that one of the three original off ramps was unworkable. This off ramp allowed for no limit if the amount of TP discharged in one year without a limit was essentially the same (no more than five percent more) as the amount of TP that would be discharged with a limit. The off ramp was aimed at facilities that use biological phosphorus removal technologies (Bio-P) that might not be able to consistently meet a 1 mg/L limit. The Agency continues to be encouraged by the promise of Bio-P technologies, partly because it can achieve low effluent TP while minimizing the use of chemicals. But we felt this off ramp as worded was unworkable and not needed. The Agency decided to remove it for the reasons outlined below.

1. The off ramp required the Agency to predict TP removal performance with and without a limit before the facility was operational. While confidence seems to be growing that Bio-P facilities can and will achieve TP effluent concentrations of about 1 mg/L without chemical addition, it would be difficult to predict beforehand whether any facility could achieve essentially the same TP removal with or without a permit limit. Each facility is unique and many variables influence TP removal performance.
2. The proposal to allow up to five percent more TP discharged without the limit is too small a difference to measure consistently and it provides almost no real "relief" to the discharger.
3. It would be difficult (and time consuming) to develop a more realistic and supportable "no-limit" cap to replace the five percent cap, based on the experience to date of TP removal performance of Bio-P plants in Minnesota.
4. Effluent limits must be met virtually 100 percent of the time for the facility to remain in compliance with a monthly mean limit (or as an annual mean for many Bio-P facilities). It is a well accepted concept that the permit limit is a strong incentive for operators to provide better wastewater treatment over the long-term in order to stay in compliance. Given the uncertainties and variability associated with the wastewater treatment process, it is common for wastewater treatment plant operators to produce an effluent that is considerably better in quality than the permit allows to provide a margin of compliance safety. This is true generally for any pollutant controlled by a permit limit, not just TP. The off ramp as proposed gave up much of this inherent advantage and the resulting reduction in TP loading to the receiving stream.

The other proposed off ramps can accommodate situations where relief for a Bio-P facility is warranted.

2. <u>Exemption Rule Language, General</u> [IX.H. TP limit, reasonableness]

The proposed exemptions are loosely based on the exemptions included in Wisconsin rules, Chapter NR 217 adopted in 1992 (NR 217.04(2), Exhibit PL-13, see Section IX.J). The Agency's proposed exemptions represent a consolidation and, we believe, a logical and appropriate refinement of the exemptions adopted by Wisconsin. The exemptions in Chapter NR 217 are not applicable to dischargers in Wisconsin's Lake Superior and Lake Michigan watersheds (NR 217.04(2)(B)1). Similarly, the proposed exemptions in Minn. R. 7053.0255 do not apply to dischargers in Minnesota's Lake Superior basin or the other waterbodies listed in existing Minn. R. ch. 7065, or dischargers that discharge "to or affect" a lake or reservoir. The Wisconsin Department of Natural Resources developed an implementation guidance document that outlines how the four exemptions in NR 217 will be administered (Exhibit PL-14). The Agency will consider developing a similar guidance document for Minnesota.

It is our belief that the three proposed off ramps, plus the variance option, can adequately address the anticipated variety of situations – that they are broad enough to apply to a wide range of individual situations. It is impossible to anticipate every scenario that might warrant an alternative limit or no limit. In this situation it is appropriate to provide enough flexibility in the rule language to accommodate the inevitable unforeseen situations.

Alternative limits granted under an exemption can be a monthly average or an annual average if appropriate under Minn. R. 7053.0255, subp. 6.

Once granted, an exemption is not necessarily permanent. Situations can change and the Agency may have reason to revoke an exemption in the future. For example a future TMDL may call for all discharges in the watershed to implement treatment for TP. Revocation of an exemption and the addition of a TP limit would be done at the time the permit is reissued, or through a permit modification if necessary, as with any change to a permit condition. Such changes are made in consultation with the discharger and their consultants. The public at large will have the opportunity to comment on the change as part of the NPDES permit process.

The granting of an exemption is in the context of the proposed extension of the TP limit to new or expanding facilities. The exemptions are not applicable to facilities that already have a TP limit. Antibacksliding provisions would apply to facilities with existing TP limits unless they expand. Expansion (> 1,800 pounds TP/yr.) triggers the proposed TP limit, and expansion generally negates antibacksliding requirements; therefore, the exemptions would be applicable. However, it is unlikely that an expanding facility that already has a TP limit would be a candidate for an exemption.

The proposed exemptions in Minn. R. 7053.0255, subp. 4 are repeated below in the context of the proposed reorganization of the TP limits in Minn. R. ch. 7053.

[Minn. 7053.0255] *Subp. 3. **Total phosphorus effluent limits**.*

A. Phosphorus removal to one milligram per liter is required when subitem (1), (2), or (3) applies:

(1) the discharge of effluent is directly to or affects a lake, shallow lake, or reservoir;

(2) the discharge is to the specific basins and water bodies designated in subpart 5; or

(3) the discharge is new or expanded as defined in subpart 2 except when the discharger can demonstrate to the commissioner that the discharger qualifies for an alternative phosphorus limit as provided in subpart 4.

B. ~~In addition,~~ If a phosphorus effluent limit is required under item A, removal of nutrients from all wastes ~~shall~~ must be provided to the fullest practicable extent wherever sources of nutrients are considered to be actually or potentially detrimental to preservation or enhancement of the designated water uses. Dischargers required to control nutrients ~~by~~ under this ~~subpart~~ part are subject to the variance provisions of ~~part~~ parts 7000.7000 and 7053.0195.

Subp. 4. ***Alternative phosphorus effluent limits for new or expanded discharges***. *New or expanded discharges subject to a one milligram per liter phosphorus effluent limit in subpart 3, item A, subitem (3) may request an alternative limit or no limit if one or more of items A to C apply. New or expanded discharges are defined in subpart 2. The exemptions in this subpart do not apply to facilities that discharge directly to or affect a lake, shallow lake or reservoir or to discharges to the waters listed in subpart 5. Dischargers seeking an alternative limit due to very high per capita treatment costs or economic hardship must apply for a variance under parts 7000.7000 and 7053.0195.*

The information submitted to the commissioner for consideration of an alternative limit must include, at a minimum, a description of the treatment technology used, influent and effluent total phosphorus concentrations, a phosphorus management plan for the facility, descriptions of any measures already taken to reduce phosphorus sources to the facility, and expected reductions in phosphorus concentrations following implementation of the phosphorus management plan. The discharger may qualify for an alternative total phosphorus limit or no limit if it can demonstrate:

A. the discharge is to or upstream of a water body listed on the applicable impaired water list, section 303(d) of the Clean Water Act and the total maximum daily load study is complete and approved by the United States Environmental Protection Agency at the time the new or expanding facility is in the planning and design phase. The total maximum daily load study must have considered impacts from phosphorus loading on the impaired water body. In this case the total maximum daily load study will determine the applicable phosphorus effluent limit;

B. the environmental benefits to be achieved by meeting a phosphorus limit are outweighed or negated by the environmental harm caused by meeting a limit; or

C. the treatment works, regardless of the type of treatment technology, must use chemical addition to achieve compliance with the one milligram per liter limit, and the discharge is to a receiving stream in a watershed listed in subitems (1) to (3). In this case the discharger may be granted a seasonal one milligram per liter limit, applicable from May 1 through September 30 and not applicable from October 1 through April 30:

(1) the lower Mississippi River and its tributaries from the mouth of the Chippewa River in Wisconsin to the Minnesota border;
(2) the Bois de Sioux and Red Rivers and their tributaries from the southern end of Lake Traverse at Browns Valley to the Canadian border; and
(3) the Missouri, Des Moines, and Cedar Rivers and their tributaries in Minnesota.

3. Possible Exemption to TP Limit if TMDL is Complete [IX.H. TP limit, reasonableness]

The Agency believes it is important for the rule to state how the proposed extension of the TP limit to new and expanding facilities will be implemented in conjunction with nutrient-related TMDLs. A TMDL is required when a waterbody is listed as impaired. Impairment means a water quality standard is exceeded and beneficial uses are actually or potentially lost. The addition of a paragraph in the rule that addresses TMDLs and the proposed extension of the TP limit was in response to public comments mostly from MESERB. The proposed language is shown in the previous Section (Minn. R. 7053.0255, subp. 4, item A).

As explained in the need section (Section VII.H.3) the Agency's original proposal was to have relevant TMDLs determine the TP limits for affected dischargers without the dischargers needing to make a request. However, rule language that would allow an automatic TMDL exemption that covers all possible situations and TMDL conditions proved to be unworkable. The Agency believes now that the petition process will facilitate the site-specific aspects of deciding whether the TMDL exception is applicable to a particular discharger. Therefore, the Agency is now proposing to include the "TMDL exemption" as one of three potential exemptions to the TP limit that a discharger can apply for. The reasons for this change will be discussed in this Section.

The proposed language says that if the discharge is to or upstream of a waterbody impaired due to exceedance of the eutrophication standards (or the precursor nutrient criteria) or other nutrient-related standard, and the TMDL is complete and approved by EPA at the time a new or expanding discharger is in the planning and design phase, then the TMDL will determine the need for and magnitude of the TP effluent limit. Also, the discharge in question must be within the scope of the TMDL study. The TMDL study first quantifies nutrient loading from both point and nonpoint sources that caused the impaired condition. Next the TMDL study determines the load reductions needed from all sources to bring the waterbody back into compliance with standards. Reductions needed from point sources will be achieved through TP effluent limits in NPDES permits. Thus, if applicable, the TMDL will determine:

- If a limit more stringent than 1 mg/L is needed;
- If a 1 mg/L limit is needed;
- If a limit less stringent than 1 mg/L is adequate; or
- If no limit at all is needed.

If the timing of the TMDL and the plan to build new or expand coincide, it is logical and reasonable for the TMDL to be the basis for the TP limits for the affected dischargers assuming other conditions are met. The basic conditions that must be met are:

- The discharge is to or upstream of a waterbody listed on the 303(d) impaired waters list;
- The total maximum daily load has considered impacts from phosphorus loading on the impaired waterbody;
- The total maximum daily load is complete and approved by the EPA at the time the new or expanding facility is in the planning and design phase; and
- The phosphorus loading from the new or expanding discharge is included as part of the point source waste load allocation in the total maximum daily load study. In other words, this exemption does not apply to discharges upstream of the impaired waterbody but outside the scope of the TMDL study.

Discharge to or upstream of impaired waterbody. If the discharge is directly to the impaired waterbody, which currently is usually a lake, the discharge most likely has a TP limit under the current rule. In this situation, the TMDL is the appropriate means to determine new limits needed to restore the waterbody to compliance with standards. A limit more stringent than 1 mg/L is a strong possibility. A new discharger would be discouraged from discharging to an impaired lake or reservoir.

The situation is more complex if the new or expanded discharge is upstream of the impaired waterbody. To be eligible for the TMDL exemption, the discharge must be included among the discharges whose TP loading was assessed in the TMDL study. In other words, if the discharge is upstream of the impaired waterbody but so far removed as to be outside the scope of the TMDL (or beyond the scope for any reason), then the TMDL will not determine the TP limit for that discharge.

The Lake Pepin TMDL provides a good example of why the qualifications for the TMDL-related exemption are needed and reasonableness.

The upper Mississippi River watershed is so large that discharges far upstream of Lake Pepin, either on the main stem of the river or on a tributary, may be beyond the scope of the Lake Pepin TMDL. The TMDL study is about two to three years from completion, but at this time it is anticipated that the TP loading from point sources upstream of approximately Little Falls will not be included in the waste load allocation for this TMDL. If this holds true, the loading from discharges upstream of this point will be considered too inconsequential and too far upstream to impact Lake Pepin. The TMDL is likely be silent on the need for TP limits for facilities upstream of this point. The concern for the Agency is that, while the TP loading from these discharges may have very little impact on Lake Pepin, it very well could have an impact on the immediate receiving stream or other more local waterbodies within the Lake Pepin watershed. The upper Mississippi River watershed includes some highly valued and heavily used resources that should be protected from excess nutrients. Besides the head waters of the Mississippi River itself, examples of important tributaries are the Shell, Crow Wing, Boy and Prairie Rivers.

The Minnesota and St. Croix Rivers are part of the Lake Pepin watershed, but the point sources in these two major watersheds may not be included in the Lake Pepin TMDL. The Minnesota River is covered by its own nutrient-related TMDL. However, as discussed below, this TMDL may not fully address the eutrophication problems in the Minnesota River. The need to reduce phosphorus loading to the St. Croix basin from point sources is already being driven by the importance of protecting the trophic status of Lake St. Croix (plus the required 1 mg/L TP limit for discharges to Lake St. Croix under existing Minn. R. ch. 7065), and ambitious bi-state nutrient reduction goals and nondegradation requirements applicable to the watershed.

In summary, the focus of a TMDL is to restore the impaired waterbody to compliance with standards. The TP loading from dischargers far upstream in the watershed may have little impact on the impaired waterbody itself, but the discharge may impact the local receiving stream or other local resources not germane to the TMDL. It is reasonable to have the proposed extension of the TP limit apply to dischargers outside the scope of a nutrient-related TMDL.

The impairment must be nutrient-related. The TMDL must to be based on the exceedance of eutrophication standards (or the predecessor nutrient criteria) directly, or based on an impairment caused by excess nutrients. The Lake Pepin TMDL is an example of the former and the TMDL for the lower Minnesota River is an example of the latter.

When the TMDL is based on an exceedance of the eutrophication standards, the resulting TMDL becomes the direct basis for TP effluent limits for dischargers that are included in the scope of the TMDL analysis. Since eutrophication is the problem being addressed, the use of the TMDL as the basis for the permit limits should be straightforward. However, when the TMDL is based on the exceedance of a standard that is nutrient-related such as dissolved oxygen (DO), the recommendations of the TMDL may not fully address potential eutrophication problems in the watershed. Again the TMDL for the lower Minnesota River provides a useful example. This TMDL is complete and implementation has started.

The lower Minnesota River is impaired due to low DO traced to excess nutrients. The high levels of nutrients (phosphorus) produce a very abundant algal population, which, when the algae die and decay, create a demand for oxygen that the river cannot meet. The result is exceedances of the DO standard. Low DO in the lower Minnesota River is more likely to be a problem when temperatures are warm and flow is low. To correct the DO problem, reductions in phosphorus loading needs to occur in the summer months and possibly only during periods of relatively low-flow. The implementation plan for reducing point source TP loading in the watershed is to impose summer (May through September) TP limits on all the larger dischargers in the basin. The TMDL considers a five-year period and has set a goal to reduce TP loading to the lower river by 35 percent. The TMDL determined that the TP limits should be applicable at all flows. The point of this discussion is that, while the imposition of seasonal TP limits may be appropriate to solve the DO problem in the lower Minnesota River, seasonal limits may not be adequate to reduce the overall eutrophication problem in the Minnesota River. If impairment was based directly on the eutrophication of the river, year-round TP limits may have been the recommended TMDL solution. It is reasonable for these situations to be assessed on a case-by-case basis. Requiring the discharger to petition the Agency to consider relief under the TMDL exemption is an appropriate means to accomplish this.

The assignment of TP permit limits to future expansions or newly constructed facilities in a watershed once the TMDL is complete and implemented also helps make the case for a site-specific approach. Such "post-TMDL" TP limit questions are best evaluated on a case-by-case basis because the nature of the new point source(s) and possibly timing issues will affect how the TMDL addresses the new TP loading.

If the facility is all new (or the expansion is large) and the TMDL study is complete and being implemented, the facility represents a potential future increase in TP loading to the watershed that the TMDL did not directly consider. The TMDL has already allocated the acceptable point source TP loading in the watershed. Presumably the TMDL includes a process to deal with potential increases in future loadings. Future increases in TP loading may be accommodated by "using" some of the loading allocated to a "reserve capacity" by the TMDL, by a TP load trading process, or possibly absorbed as part of the TMDL "safety factor."[53] TMDLs are expected to allocate some loading to a reserve to accommodate future growth. The TMDL safety factor is typically not a quantifiable "reserve" but a margin of safety that reflects uncertainties in the analysis. However, the safety factor may help accommodate some future increases in loading.

If the post-TMDL change is an expansion of an existing facility, the TMDL most likely considered the loading from the existing facility in its point source waste load allocation. This may make it easier to accommodate the potential increased loading from the expanded facility within the waste loads considered by the TMDL. It is possible, however, that the expanded facility may be required to stay within the previously allocated load amount.

<u>Applicability of proposed TP limit if TMDL not complete</u>. The proposed rule says that the new or expanding facility must be in the planning or design phase at the time the TMDL is complete for the TMDL to determine the TP limit. The timing of TMDL completion and the timing of the design of the facility, therefore the applicability of the TMDL exemption, will be case-specific. As noted above, potential questions related to timing are another reason for a case-by-case approach.

If the new or expanded discharge is to, or upstream of, a nutrient-impaired waterbody (or a waterbody impaired due to exceedances of a standard caused by excess nutrients) and the TMDL study has not started or is incomplete, then the 1 mg/L TP limit applies to that discharger.[54] The Agency believes that the proposed extension of the TP limit and TMDLs must proceed independently except when the timing allows the TMDL to determine the limit. TMDLs are about restoring impaired waterbodies. The proposed phosphorus limit is about reducing phosphorus loading to surface waters, not only to help restore impaired waters but to help prevent waters from becoming impaired in the first place. Also, it will take decades to complete all the pending TMDLs. It is very likely that the number of waterbodies considered impaired due to eutrophication will continue to increase. This includes the possibility that more non-lake waterbodies will be listed in the future as impaired for nutrients or nutrient-related pollutants as more data, both chemical and biological, are accumulated showing the negative impacts of nutrients on rivers and streams.

The Agency believes it would be shortsighted to wait for a clear demonstration of impairment before action is taken, and then count on the TMDL to restore the waterbody to health. If we wait until a waterbody is impaired not only will more surface waters be in a degraded condition, but the cost to bring these waterbodies back to health, if possible at all, is usually far more than the cost of preventive measures.

The Agency will make the timing decisions. A decision will need to be made whether a nutrient-related TMDL that is pending approval from EPA, for example, will be available in time to determine the TP limit for a facility that has advanced through the planning and design phase and may be under deadlines to complete construction. The requirement that EPA must approve the

[53] The TMDL study assesses the loading of the pollutant causing the exceedance, determines the total load that will meet standards (and reductions needed to achieve that load), and "allocates" the acceptable load between point sources, nonpoint sources and a reserve for future growth, all with a margin of safety due to uncertainties.
[54] The federal requirements of 40 CFR 122.4(i) also apply.

TMDL helps establish a firm date for that part of the process. These decisions will be case-by-case and permit-specific. The Agency will make these decisions in consultation with the discharger and with other interested parties. The staff may ask the Agency Citizens' Board to approve a staff decision, and any decision can be challenged during the NPDES/SDS permit process.

Summary. The Agency is confident that the TMDL process will correctly determine the TP effluent limits needed to restore nutrient-impaired waterbody to health. However, a new or expanding discharger in the watershed of an impaired waterbody should get a 1 mg/L limit under the proposed extension of the TP limit if certain conditions are not met. Because each TMDL is potentially unique, the Agency believes that the assessment of whether the TMDL should or should not determine the TP limit needs to be done on a case-by-case basis. Requiring the discharger to petition for relief under the TMDL exemption will facilitate the case-by-case analysis. By placing the burden on the discharger to request a TMDL-related exemption, the Agency is not trying to put roadblocks in the way of dischargers, or discourage dischargers from petitioning the Agency. If it is clear that the TMDL-determined limits are appropriate in a particular case, the Agency will advise the discharger to submit a petition. The granting of an exemption in these situations should be straightforward and proceed smoothly.

The following is an outline of the basic steps that must be met for the Agency to consider using the TMDL as the basis for a TP limit.

1. The discharge will get a TP limit if it is new or expands after May 1, 2008 and the annual loading of phosphorus from the facility will exceed 1,800 pounds per year, unless: (To reiterate, the Agency's goal for this proposed change to the TP effluent limit is to maintain the gains in reducing point source TP loading made under the Phosphorus Strategy over the last six years, and to codify the Strategy in rule.)

2. The new or expanding discharge is to or upstream of a waterbody on the 303(d) impaired waters list (the other two potential exemptions are discussed in the next two sections); and:

3. The impairment is due to excess nutrients. The impairment may be due to the exceedance of the nutrient criteria or eutrophication standards directly, or due to exceedance of another standard caused by the excess nutrients such as dissolved oxygen; and:

4. The TMDL study for the impaired waterbody is complete and approved by EPA at the time the new or expanding discharger is in the planning or design phase; and:

5. TP loading from the discharge is included in the phosphorus waste load allocation for point sources upstream of the impaired waterbody. That is, the discharge in question must be included in the scope of the TMDL study; then:

6. The TMDL may determine the TP effluent limit for the new or expanding discharge pending the site-specific analysis. (Note: the context here is the proposed extension of the TP limit to new and expanding dischargers. A facility would not need to be new or expanding to be impacted by a TMDL.)

If the expansion or new construction occurs before the TMDL is complete and approved, or it is outside the scope of the TMDL, it is reasonable to require the 1 mg/L limit as a means to reduce phosphorus loading to Minnesota's receiving waters.

4. Environmental Harm Exceeds Gain [IX.H. TP limit, reasonableness]

The second proposed exception considers a situation where the environmental harm may outweigh or negate the environmental benefit from meeting a 1 mg/L TP effluent limit. The Agency is mindful that the removal of TP from wastewater does not come without costs, both environmental and monetary. Examples of environmental costs may include additional sludge production from chemical addition, energy consumption and nonrenewable resource depletion, and materials transport. Environmental benefits, besides reduced TP loading and improvements to water quality may include a generally better quality effluent all around and reduced concentrations and loadings of non-target (non-TP) pollutants (see next Section).

Under this off ramp, a discharger may be granted either an alternative limit less stringent that 1.0 mg/L or no limit. While the Agency has not specified a cap on an alternative limit, it is unlikely that any alternative limit would exceed 1.5 mg/L as a monthly mean or a mean for a longer period.

A situation in which this off ramp may be applicable, and the types of information that would be relevant in the request, is illustrated by the following hypothetical example.

A growing city discharges to a large river and needs to expand their wastewater treatment facility. The current population is about 3,000 and the current TP loading of about 3,200 pounds per year exceeds the *de minimis* of 1,800 pounds per year. The city decides to adopt biological phosphorus removal treatment technologies (Bio-P). This much information alone is not enough to qualify the city for this off ramp. However, if the following information is presented to the Agency, relief under the second exemption might be applicable.

- The receiving river provides extensive dilution even under low-flow conditions (e.g., > 100:1), and there are no lakes or reservoirs downstream.
- The city's contribution of the total TP loading to the river at the point of discharge is very small relative to all other sources.
- In spite of the increased flow due to the expansion, the adoption of Bio-P technology will reduce overall TP loading below current levels.
- The city has implemented a phosphorus management plan and can document reduced influent and effluent TP concentrations as a result.
- The capital and operation and maintenance costs of adding chemical treatment to guarantee meeting a 1 mg/L limit are relevant to the consideration of this (and any) off ramp, but economics may not be the deciding factor for this off ramp (see Section IX.H.6).
- The operator plans to use some chemical to assure compliance with the 12-month average 1 mg/L TP limit. Local options for disposal of additional sludge are limited and costly.
- The Bio-P technology will achieve an effluent TP concentration close to 1 mg/L without use of chemical.

The last bullet above merits some further explanation. The Agency believes that Bio-P treatment technologies have proven to be a very viable option for Minnesota POTWs and we wish to avoid any rule amendments that might be a disincentive for someone to consider Bio-P. Therefore, a new or expanded Bio-P facility that can demonstrate the ability to meet an effluent TP concentration of 1 mg/L without a limit and without the use of chemical addition might be a candidate for this off ramp, if other facts such as those outlined above also apply. Some pond systems may be able to qualify under this off ramp.

In conclusion, it is the intent of this exemption that achievement of a 1 mg/L TP effluent limit not be at the expense of other environmental considerations. The exemption provides an opportunity to consider in a more comprehensive or holistic manner the balance between environmental gains, and the environmental and monetary costs of a TP limit.

5. Potential Winter Exemption [IX.H. TP limit, reasonableness]

The third proposed exemption would allow a seasonal limit applicable only during the warm months rather than year-round in certain watersheds, and when chemicals need to be added to meet the limit. This exemption recognizes the relatively higher overall potential costs, both in dollars and environmentally, of removing phosphorus by chemical addition. Under this off ramp a discharger can request relief from a TP effluent limit from November 1 through April 30 each year; the limit would be enforced from May 1 through October 31. This off ramp is patterned after the seasonal TP limit in the general permit developed for the Minnesota River TMDL. The potential exempted winter months match those in the general permit. The watersheds this off ramp is applicable to are:

- The lower Mississippi River and its tributaries from the mouth of the Chippewa River in Wisconsin (below Lake Pepin) to the Minnesota border;
- The Bois de Sioux and Red Rivers and their tributaries from the southern end of Lake Traverse at Browns Valley, Minnesota to the Canadian border; and
- The Missouri, Des Moines and Cedar Rivers and their tributaries in Minnesota.

In general, these watersheds are proposed for this exemption because at the current time they do not include river segments with TMDLs for nutrients or nutrient-related pollutants. In general, they do not have major lakes or reservoirs immediately downstream, and none of the watersheds includes rivers with TP removal required by rule or recommended by major nutrient reduction agreements such as in place for the St. Croix River. The geography and land use patterns in these watersheds suggests that nonpoint sources of TP may overshadow the loading from point sources. Also, the rivers in these watersheds may have characteristics or factors that limit algal growth. For example, the turbidity of the Red and Bois de Sioux Rivers seems to limit algal growth such that TP loading may not have the same impact it would have in a less turbid river. The lower Mississippi River is a very large system with a large flow and most point sources represent a small fraction of the total TP loading to the main stem. Finally, the off ramp recognizes that TP loading is generally less likely to have as direct or obvious a negative impact when temperatures are cold.

In general, the Missouri, Des Moines and Cedar River watersheds have similar watershed and water quality characteristics as the adjacent Minnesota River watershed, and it seems reasonable to make this off ramp available to dischargers in these watersheds at this time.

It is worth emphasizing that this off ramp (as for the other off ramps) is not automatic, that dischargers must request the exemption and the Agency will need to evaluate each request. Otherwise the limit will be year-round. TP loading is an issue in essentially all watersheds; in fact the basin management plans for Lower Mississippi and Cedar Rivers list nutrients and phosphorus specifically as a pollutant of concern. Also, if the discharge impacts a trout stream in the lower Mississippi River watershed, the special importance and unique water quality concerns for these resources will need to be carefully considered as part of any request.

6. <u>Economic Hardship -Variance</u> [IX.H. TP limit, reasonableness]

The Agency believes that cities or industries seeking relief from the proposed 1 mg/L TP limit based wholly on economic concerns do so through the variance process (Minn. R. 7050.0190, Minn. R. 7053.0195 and 7000.7000). While economic issues are likely to be part of the justification for a request for an alternative limit under one of the exemptions discussed above, if the primary basis for the request is high treatment costs or economic hardship for the residents, then the variance is the proper approach. Example economic considerations would be the total or amortized capital and projected annual operation and maintenance costs to meet a 1 mg/L limit, the overall economic vitality of the community, the per capita treatment costs compared to the costs in similar sized communities, and the average or median household income.

The proposed rule language that suggests seeking a variance for economic concerns is in the first paragraph of Minn. R. 7053.0255, subp. 4.

7. <u>Review of Requests for an Exemption</u> [IX.H. TP limit, reasonableness]

The criteria the Agency staff will use to evaluate the requests are broadly articulated in the proposed rule language shown above. The criteria listed consider the overall environmental cost/benefit, facility operation, effluent quality and the type and location of the receiving water. Additional information likely to be needed by the Agency to make a decision includes influent and effluent TP data, the discharger's phosphorus management plan and progress made implementing it, water quality data for the receiving water, anticipated TP treatment costs, and the comments of concerned and interested parties.

There is no way to predict the number of requests for an alternative limit the Agency will receive, but based on the experience of the last six years under the Strategy, it is anticipated that utilization of these exceptions will be infrequent (i.e., anywhere from none to three per year). It is the Agency's intent to carefully review all requests, assess the merits of the request, and make a fair and reasonable decision, consistent with the stated overall purpose of the proposed extension of the TP limit, which is to prevent the eutrophication of surface waters through the reduction of TP loading from point sources. Depending on the number of requests and public input, the Agency may find it advantageous to prepare guidance that advises parties on how to prepare and support a request along the lines of the Wisconsin Department of Natural Resources guidance (Exhibit PL-14).

It is anticipated that the process for the review and disposition of requests will unfold more or less as follows.

1. A community or industry plans to build a new or expand an existing wastewater treatment facility which will exceed the *de minimis* loading of TP.
2. The responsible party is submitting a permit application and decides to request an alternative limit. The request can accompany the permit application or it can be submitted at any time prior to the permit being finalized. Logically the request would be made in the initial phase of preparing the permit and while the facility is in a planning or design phase prior to any construction.
3. The Agency receives the request which is forwarded to staff that review permits for possible TP limits, and permit engineers and writers, as needed.
4. The request is reviewed for completeness, and if found to be incomplete, the petitioner is contacted to obtain the needed information.
5. Once complete, Agency staff will complete their review and make a preliminary determination to grant or deny the request.
6. Discussions about the preliminary decision are held with the responsible party and the broader public, if appropriate.
7. If the request is denied the Agency will spell out its reasons in writing to the petitioner and provide the supporting data/information used to make the decision.
8. If denied, the permit is issued with the 1 mg/L TP limit.
9. The Commissioner may ask the Agency Board to approve a decision in certain cases.
10. Any party can comment on the limit during the public comment period for the permit, and any party can request a contested case hearing to have the limit reviewed.
11. If the exemption request is granted, the permit is issued with a more lenient limit or no limit, as appropriate, and steps 9 and 10 follow as outlined above.

Just as there is no way to know how many requests will be received, it is also impossible to guess how many requests might be granted or denied. But, as stated previously, it is the Agency's intent to seriously and carefully review all requests. While the goal is to reduce point source phosphorus loading, the Agency is not interested in requiring treatment when the weight of evidence suggests that there is little to be gained for the costs. Costs can be both environmental as well as monetary.

8. <u>Conclusions</u> [IX.H. TP limit, reasonableness]

The proposed rules requiring a 1 mg/L TP effluent limit for new and expanding discharges of greater than 1,800 pounds per year provide for the possibility of an alternate TP effluent limit or no limit. The Agency will review all requests consistent with the overall purpose of this provision, which is to reduce anthropogenic sources of phosphorus to the state's surface waters. The Agency does not anticipate getting a large number of petitions. The exemptions do not apply to discharges determined to be directly to or affecting a lake, shallow lake or reservoir or to waters listed in 7053.0255 Subpart 5 of the rule.

The first exemption allows the TMDL for a nutrient-impaired waterbody to determine the TP effluent limit if certain conditions are met. The second exemption considers environmental harm that may outweigh or negate environmental benefit from a 1 mg/L TP effluent limit. This exemption is applicable to situations where the discharger can demonstrate a net environmental disadvantage from the TP limit (including a consideration of costs). This exemption, under some conditions, might apply to Bio-P facilities that can achieve an effluent TP concentration of 1 mg/L without use of chemicals. An alternative limit or no limit is possible under this exemption. The third exemption recognizes the properties of certain watersheds that may minimize the impacts of TP loading in the winter months, and the greater requirements of TP removal by chemical addition. A variance is the proper avenue for dischargers if they are seeking relief mainly on economic considerations.

I. INCIDENTAL REDUCTION OF POINT SOURCE MERCURY [IX. TP limit, reasonableness]

Phosphorus removal from wastewater carries significant benefits beyond reductions in TP loading to surface waters. In general any wastewater treatment process that enhances the reduction of total suspended solids (TSS) will also reduce the levels of pollutants that adhere to particulates. Trace metals including mercury are good examples of such pollutants. Because both chemical addition and the Bio-P treatment technologies are efficient in removing solids, effluents from these facilities generally have low concentrations of mercury and other metals. The draft regional mercury TMDL identifies implementation of mercury minimization plans and **enhanced phosphorus removal** as the two means of achieving point source wasteload reductions of mercury (Exhibit M-2, page 37).

One of the advantages of the Bio-P treatment process is improved sludge handling qualities and reduced levels of suspended solids (see Section XI.B). Data from three facilities that use the Bio-P process show average total mercury effluent concentrations of 2.56, 3.26 and 3.65 ng/L. Wastewater treatment plants with conventional non-Bio-P secondary treatment average about 5.5 ng/L mercury in their effluents. These concentrations are below the current mercury water quality standard of 6.9 ng/L.

Mercury (shaded rows), phosphorus and TSS data from two Metropolitan Council Environmental Services (MCES) plants, Eagles Point and Metro are shown in Table II-18. Both plants use Bio-P. The Eagles Point data are shown graphically in Figure II-11. These data illustrate the effectiveness TP removal has in reducing effluent mercury concentrations.[55]

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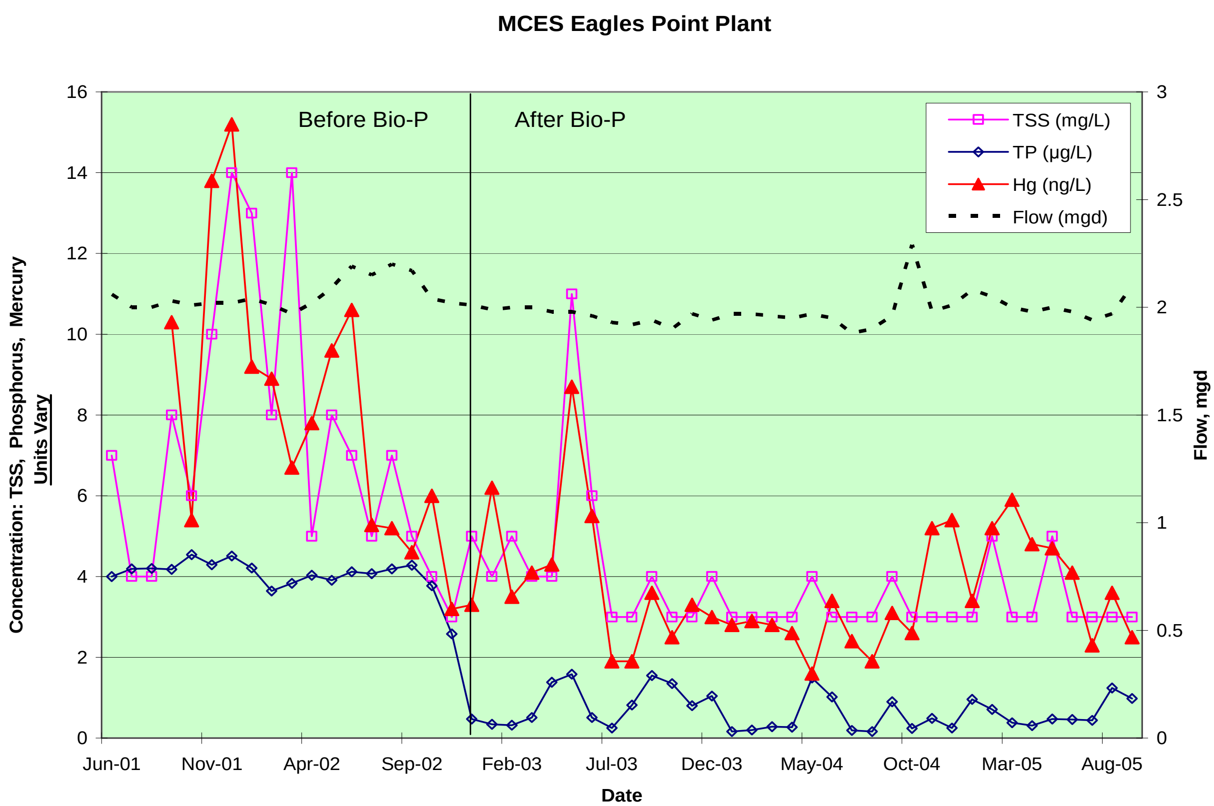
[55] It should be noted that the mean mercury concentration in the Metro plant effluent for the first six months of 2006 is 7.8 ng/L. We do not know the reason for this increase.

Table II-18. Mercury Concentrations in the Effluent of Two MCES Plants Before and After the Approximate Dates of Implementing TP Removal by Bio-P.

Parameter	Eagles Point		Metropolitan	
	Before June 2001 to December 2002	After June 2003 to September 2005	Before December 2001 to June 2003	After July 2003 to September 2005
Mercury, ng/L*				
Median	7.3	3.4	6.1	4.6
Mean	7.8	3.7	6.7	5.0
Total Suspended solids, mg/L				
Median	7.0	3.0	4.5	3.0
Mean	7.2	3.7	7.3	3.0
Phosphorus, µg/L				
Median	4.1	0.50	1.4	0.60
Mean	3.8	0.67	1.5	0.65

*Eagles Point and Metro plants have 6.9 and 9 ng/L monthly average mercury limits, respectively.

Figure II-11. Mercury, TP and TSS Data from the MCES Eagles Point Plant Showing Reductions in Effluent Mercury Concentrations After Bio-P was Initiated.



J. PHOSPHORUS LIMITS OF OTHER STATES [IX. TP limit, reasonableness]

Other states have adopted rules governing phosphorus discharges from wastewater treatment plants. Discussed below are phosphorus effluent limit requirements from the states of Wisconsin, Illinois and Massachusetts.

<u>Wisconsin</u> In 1973 the Wisconsin Department of Natural Resources (WDNR) adopted rules similar to those in Minnesota for dischargers tributary to the Great Lakes requiring a 1 mg/L TP effluent limit. In December 1992 the WDNR adopted a statewide 1 mg/L TP effluent limit applicable to municipal and industrial dischargers (chapter NR 217, Exhibit PL-13). The rule includes *de minimis* TP loadings, below which the rule does not apply. The *de minimis* TP loadings are 150 and 60 pounds of TP per month for POTWs and industries, respectively A loading of 150 pounds per month equates to 1,800 pounds per year. TP effluent limits have been incorporated into existing permits as they were reissued. Wisconsin currently has about 10 POTWs with TP limits in the 0.2 to 0.3 mg/L range (Jim Bauman at the February 2007 RTAG meeting).

The Wisconsin rule offers alternate effluent limits based on the following four considerations.

- Where achieving the 1 mg/L TP effluent limit is not practically achievable.
- Where the operation of specific biological phosphorus removal technologies will achieve a level of performance equivalent to a 1 mg/L TP effluent standard.
- Where phosphorus deficient wastewaters necessitate the addition of phosphorus to a biological treatment system to assure efficient operation and compliance with other effluent limits.
- Where achieving the 1 mg/L effluent standard will not result in an environmentally significant improvement in water quality.

Wisconsin published guidance for implementing NR 217 in 1999 (Exhibit PL-14). Statewide the rule has resulted in approximately 340 TP limits in NPDES permits. Of these about one third are industrial discharges and two thirds are municipal. About 100 of those with TP limits have alternate effluent limits greater than 1 mg/L. The majority of the alternate limits are based on the first two exemptions listed above. The third exemption is applicable to essentially only pulp and paper facilities (5 permits with effluent limits greater than 1 mg/L) which typically have very nutrient deficient wastewater. The final exemption has been used only once and is currently discouraged from consideration.

Alternate effluent limits are reevaluated with each permit reissuance. Over time the number of facilities with alternate effluent limits is decreasing and this trend is expected to continue. This is largely the result of facility upgrades and expansions, and improved understanding of treatment operations with biological phosphorus removal and resultant lower TP effluent concentrations.

As noted in Section IX.H the Agency carefully reviewed the exemptions in the Wisconsin rule and the similarities between that rule and the exemptions in the proposed Minnesota rule are apparent.

<u>Illinois</u> The Illinois Environmental Protection Agency (IEPA) has existing rules that require 1 mg/L TP effluent limits for discharges within the Lake Michigan Basin. Additionally, existing rules require 1 mg/L effluent limits for discharges to lakes or reservoirs of 20 acres of surface area or greater and their tributaries with the following considerations.

- Limits do not apply to lakes or reservoirs with mean hydraulic retention times of 18 days or less.
- Tributary limits apply only to discharges of 0.25 mgd or greater but not to third-stage treatment lagoon (pond) treatment systems.

Dischargers to lakes or reservoirs may apply for an adjusted effluent limit if it can be shown that the effluent resulting from the adjusted limit will not contribute to cultural eutrophication, unnatural plant growth or algal growth or dissolved oxygen deficiencies in the lake or reservoir.

New and more universal TP removal requirements were adopted by the IEPA on February 2, 2006 (Exhibit PL-15). These new amendments require removal of TP to 1 mg/L for new and expanding municipal discharges with a design flow of 1.0 mgd or greater, and treatment facilities other than those treating primarily municipal or domestic wastewater (i.e. industrial facilities) with a TP load of 25 lbs per day (equivalent to a flow of 1 mgd at a concentration of 3 mg/L) or more. New and expanding dischargers can be considered for an exemption from the 1 mg/L TP limit provided the discharger demonstrates that phosphorus from the treatment works is not the limiting nutrient in the receiving water. The rule lets IEPA set alternative TP limits where supportive information warrants the adjusted limit. This rule change is meant to be an interim requirement until numeric water quality standards for phosphorus are adopted by the state.

There are many similarities between Illinois' new rule and what the Agency is proposing for Minnesota. One obvious difference is the size of the facility that is exempt due to the *de minimis*, 1.0 vs. 0.2 mgd. Given the differences between Illinois and Minnesota in population density, overall land use and their water resources, we view this difference as understandable and not very significant.

<u>Massachusetts</u> The Massachusetts Department of Environmental Protection (MDEP) has been issuing NPDES permits with 1 mg/L TP effluent limits since the early-1970s. Presently the MDEP has included phosphorus effluent limits in permits for 56 of the 90 larger facilities in the state. Of the 56 with phosphorus effluent limits, 26 have limits more stringent than 1 mg/L, and four of these have a very low limit of 0.1 mg/L.[56]

Few discharges in the state go directly to lakes, rather they are to river systems that contain small impoundments where eutrophication is a concern. Recent efforts to meet water quality criteria in these impoundments has resulted in the low level TP effluent limits (less than 1 mg/L). Additionally, TMDL wasteload allocations are responsible for setting low level TP limits. In determining the lowest TP effluent limit to issue, the MDEP requires the "highest and best practicable treatment." A MDEP draft policy defines a TP effluent limit of 0.1 mg/L as achievable through the highest and best practicable treatment. Implementation of this draft policy has been the basis for the four 0.1 mg/L TP limits noted above. MDEP is adopting rules that codify this draft policy, and define "highest and best practicable treatment" and its relationship to "best available technology economically achievable" (the latter is EPA terminology in Section 301(b) of the Clean Water Act). The draft rules do not set a specific TP effluent concentration as meeting "highest and best practicable treatment." Instead it defines this term such that the rule will accommodate new treatment technologies that are capable of meeting low effluent concentrations.

The EPA Region 10 (AK, ID, OR and WA) recently published a report on advanced wastewater treatment to achieve low concentrations of effluent TP, which is summarized on their Web pages.[57] Twenty three municipal treatment plants in the U.S. were studied. They conclude that low levels can be achieved cost effectively (as low as 0.01 mg/L by some plants) using a range of technologies as discussed in Section X.D.2, including biological phosphorus removal technologies (Section XI.B). They also cite the secondary advantages of TP removal such as a

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[56] E-mail and information sent to Mark Tomasek (Agency staff) from Bryant Firmin, Massachusetts Department of Environmental Protection, July 26, 2006.
[57] http://yosemite.epa.gov/r10/water.nsf/2fb9887c3bbafaaf88256b5800609bf0/cb96b4286526ad4a882572b8006df9c 0!OpenDocument.

better quality effluent in general (e.g., lower BOD and TSS), and the environmental and economic benefits of biological TP removal such as reduced concentrations of toxics and pharmaceuticals (see Section IX.I).

K. SUMMARY, REASONABLENESS [IX. TP limit, reasonableness]

The Agency's fundamental rationale for the proposed extension of the phosphorus limit to new and expanding dischargers that discharge more than 1,800 pounds TP per year is listed below:

- To be proactive in the prevention of the eutrophication of Minnesota's water resources through the reduction of point source phosphorus loading.
- To protect the water quality of waterbodies that have water quality better than standards.
- To help restore waterbodies that are impaired due to excess nutrients.
- To help achieve TMDL driven or watershed-specific nutrient reduction goals.
- To help protect downstream water resources including those beyond Minnesota's borders.

The proposal will codify in rule the Agency's Phosphorus Strategy. It will assure a continuation of the impressive gains made in phosphorus removal from point sources that has taken place since March 2000 under the Strategy. It will continue to encourage biological phosphorus removal treatment technologies. It will have a significant secondary benefit of reducing effluent concentrations of other solids-associated pollutants such as mercury.

The proposed TP limit will only impact municipalities and industries as they expand or build new treatment facilities, and only if they discharge more than 1,800 pounds of TP per year. This will automatically exempt more than half of all permitted POTWs. Excluding the smaller facilities will have very little negative environmental effect. Implementation of the Agency's proposal is straightforward and simple; it will avoid the uncertainties and potential controversy of determining the meaning of "affects," which can be a stumbling block under the current rule. This could reduce the number of contested case hearings and legal challenges generated by proposed TP limits.

Other states including Wisconsin have rules similar to what the Agency is proposing already in place. The proposal is consistent with statewide efforts to improve Minnesota's water quality through major initiatives at the executive and legislative levels of state government.

The treatment costs attributed to this proposal described in Section XI are substantial, but a significant portion of these costs will be incurred independent of the proposed rule. The combination of TP limits in existing rules (Lake Superior basin), major nutrient-related TMDLs (Lake Pepin and Minnesota River), significant basin-wide nutrient reduction goals (St. Croix), means point source TP removal is already, or soon will be, required in much of the state. Also under the Strategy, TP limits for new and expanding facilities were becoming commonplace. The proposal includes three potential exemptions, plus the option of a variance, to a TP limit that a discharger may qualify for upon request.

X. CONSIDERATION OF ECONOMIC FACTORS, PROPOSED EUTROPHICATION STANDARDS

A. INTRODUCTION [X. EU standards, economics]

As mentioned in Section II, Minnesota's lakes have a huge economic value. About 500,000 visitors come to Minnesota each year to fish – mostly on lakes. To not vigorously protect this valuable resource risks costing the state money in the long run.

Studies of the economic value of water cover a broad range of uses and values attached to water resources, and estimates have been made in all parts of the world. Study methods range from those that are tightly connected with real market data to others that estimate the value of rather abstract human values and preferences. The number of studies has reached the point that analysts find it useful to spend time compiling databases that catalogue relevant studies.[58] A small selection of studies that are most relevant to Minnesota's lakes will be highlighted in this section of the SONAR.

The possibility of added costs to either point and nonpoint sources due to the adoption of the eutrophication standards is discussed in Sections X.C and X.D.

B. ECONOMIC BENEFIT OF ADOPTING EUTROPHICATION STANDARDS [X. EU standards, economics]

The old adage, an ounce of prevention is worth a pound of cure, is true when it comes to lakes. In general, it is far cheaper to take steps to protect lakes from becoming eutrophic than it is to try to restore lakes to an earlier condition after they have suffered from cultural eutrophication. The Agency has had considerable experience in this area through the administration of the Clean Lakes Program and Clean Water Partnerships, which provide funding and technical help to restore degraded lakes. There are examples of dramatic improvements in lake quality following restoration actions (usually following diversion of point sources of TP away from the lake); but not all lakes respond well to remedial efforts, and few ever return to their pre-impacted condition. Work at the University of Wisconsin has shown that restrictions which protect lakes from degradation improves the value of lakeshore property.

The Agency believes that proposed eutrophication standards and the extension of the TP effluent limit will improve the water quality in Minnesota. It is reasonable to expect that these improvements will sustain and possibly increase the economic value of lakes and rivers. The Agency does not have the resources to carry out the types of studies that would be required to quantify the specific economic values associated with the proposed rules. Such studies would be very expensive and time consuming. However, published or reported studies of the economic

[58] A Beneficial Use Values Database (BUVD) was compiled in 2001 at the University of California Davis campus. The BUVD reports on over 2,000 water-related values estimated in 128 documents. Copies of the BUVD and directions for its use can be found at http://buvd.ucdavis.edu.

value of water resources in other locations and in Minnesota indicate that water quality improvements in Minnesota lakes are likely to have a positive economic value. Likely improvements include:

- Enhanced outdoor recreation opportunities for local residents and for tourists from other states,
- Market value increases for properties located on waterbodies and
- Increased non-use values (e.g., bequests, "option" value) that some residents associate with knowing that water quality is improving.

Fishing leads the list of water-related recreation activities. A national survey in 2001 found that 1.6 million people (over age 15) fished in Minnesota. They accumulated 27.5 million days fishing and spent $1.3 billion for supplies and services in Minnesota ($407 million on equipment).[59] About 330,000 people came from other states and countries to fish in Minnesota. Along with fishing, other valued recreation activities include boating and swimming. Tourism generally in Minnesota is now estimated to contribute nearly $10 billion annually to the state's economy.[60] Considering the estimate of spending related to fishing, it seems likely that water-related tourism accounts for a significant share of tourism's total economic impact. Recreation and tourism studies show that people are willing to spend time and money to use water resources, but these studies do not indicate how water resources affect value.

Property-based studies in several states have shown that people are willing to pay for water resources of higher quality. Research done in Maine, Vermont and New Hampshire have shown a direct correlation between water clarity and the market value of shoreland property. The Maine study examined the relationship between Secchi disk transparency and the selling price of over 900 properties on 34 lakes in Maine in from 1990 to 1994. They found that a decrease in Secchi disk transparency of one meter in 10 years was associated with significant declines in property values, from $3,000-$9,000 per lot (Exhibit EU-43, page 24. This exhibit, a special issue of *LakeLine*, is devoted to the economic value of lakes).

Closer to home, a study conducted in the late-1980s estimated the contribution of water clarity to lake-front property values on 53 lakes in northern Minnesota (Exhibit EU-47). In this study significant correlation was demonstrated among water transparency and measures of lake lot price. The author found that a one foot increase in Secchi disk transparency raised lakeshore prices by an average of $206 to $240 per lakeshore lot (average lake frontage of lots was 121 feet). Other variables tested, including lake size, lake depth and accessibility, did not prove to have a significant effect on lakeshore value. This study compiled estimates from land value assessments that, although they were influenced by market factors, were less direct than actual market sales data. The author suggests, however, that factors such as acid rain (making water

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[59] U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Census Bureau. 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. www.census.gov/prod/2003pubs/01fhw/fhw01-mn.pdf).

[60] Estimated by the Minnesota Department of Employment and Economic Development. This estimate takes into account more than direct expenditures by tourists. It includes the value of input suppliers' purchases (e.g., petroleum purchased by refiners) and demand from households that benefit from income changes induced by demand increases. Find the estimate at http://www.deed.state.mn.us/tourism/economy/EconomicImpact.htm.

appear more clear) or dark, bog-stained water (making the water appear less clear) can alter people's perceptions of water quality and their perceptions of the value of the adjacent land.

An important recent Minnesota study, already mentioned in Section VI.L.4, that used actual property sales data, found that lakeshore property values increase when water clarity increases and decrease when water clarity decreases (Table 3 in Exhibit EU-39). This study was patterned after the Maine study mentioned above. The authors report that a one meter improvement in Secchi transparency increased the value of lakeshore property by an average of $45.64 for each frontage foot on the lake (median increase, $13.59; range $1.08 to $423.58). A one meter decrease in Secchi transparency decreased lakeshore property values by an average of $69.36 per frontage foot (median decrease, $22.92; range $1.43 to $594.16).[61]

Informal research by the Minnesota Department of Revenue confirms the expected influence of lake frontage on property values. Acting on a recent request from the Agency, Department of Revenue staff members asked some county assessors about the difference in estimated market value between lakeshore properties and properties that have no lakeshore.[62] The results are striking, as shown in Table II-19. The median estimated market value of the lakeshore lots is $100,550 compared to $15,500 for the off-lake locations (mean values are $142,520 vs. $17,360, respectively).

[61] The lake with both the largest increase ($423.58) and largest decrease ($594.16) in dollar value with a one meter change in water clarity is Leech Lake. The lake with both the smallest increase ($1.08) and smallest decrease ($1.43) in dollar value with a one meter change in water clarity is Balsam Lake in Itasca County.
[62] Phone and e-mail communications with John Hagen, Minnesota Department of Revenue.

Table II-19. Difference in Value Between a Residential Lakeshore Lot and a Similar Lot Located Off the Water.

County	Size	Off Lake Location	EMV*		Size	On Lake Location	EMV
Becker	Min. 1 acre	Audubon Twp.	8,000		150 Width	Lake Cormorant	62,000
Becker	Min. 1 acre	Callaway Twp.	4,500		200 Width	Birch Lake	19,000
Becker	Min. 1 acre	Eagle View	4,500		150 Width	Tulaby Lake	64,500
Becker	Min. 1 acre	Lake Eunice	11,600		150 Width	Maud Lake	69,900
Cass	100X300	Birch Lake	15,000		100X300	Birch Lake	140,000
Cass	2.5 acres	Leech Lake-Walker	25,000		2.5 acres	Leech Lake-Walker	300,000
Crow Wing	85X135	Gull Lake-back lot	14,300		85X135	On Gull Lake	396,700
Crow Wing	80 X ?	Crow Wing Lake	14,300		80 X ?	On Crow Wing Lake	71,700
Crow Wing	Similar Size	Off Blue Lake	15,000		Similar	On Blue Lake	102,500
Douglas	100X200	Le Homme Dieu Lake	25,000		100X200	Lettomme Dieu Lake	315,000
Douglas	200X300	Mina Lake	12,500		200X300	Mina Lake	115,000
Hubbard	2.50 acres	Yes	13,800		2.48 acres	Yes	69,900
Hubbard	3.00 acres	Yes	23,000		2.69 acres	Yes	113,600
Hubbard	3.00 acres	Yes	33,000		2.93 acres	Yes	98,600
Itasca	8.1 acres	Island Lake	26,000		4.2 acres	Island Lake	69,500
Itasca	9.1 acres	Bluewater Lake	17,400		2.4 acres	Bluewater Lake	332,900
Lake	2.36 acres	Off Lake Ojibway	22,100		2.24 acres	On Lake Ojibway	78,100
Lake	2.50 acres	Near Two Harbors	30,200		2.20 acres	Lake Superior	194,500
Otter Tail	2.02 acres	Aurdal Township	16,000		150X345	Swan Lake	94,900
Otter Tail	2.02 acres	Aurdal Township	16,000		280X400	Long Lake	142,100

* EMV = Estimated market value, in dollars.
Notes: Becker County - Only frontage given and off lake lots are a minimum of one acre. Crow Wing - all rural neighborhoods. Lake County - Lake Ojibway lots are both in Town of Fall Lake.

The economic value of several individual Minnesota lakes or lakes in a small watershed have been estimated using methods first used by Todd (1990) in a study on the economic value of Minnesota's lakes (Exhibit EU-41). An example of these economic analyses was published in the Minnesota Lakes Association *Reporter* (November 2005). The study quantified the economic potential of the Turtle Lake watershed, a watershed that includes 10 lakes near Bigfork, Minnesota. The study estimated the value of direct consumer purchases associated with lake activities; and estimates of people's willingness to pay to protect the resource over and above necessary expenditures, and willingness to pay to protect the resource for the future (Exhibit EU-40). The combined annual consumer purchases and willingness to pay value was just under $5 million for the 10-lake watershed. The "income" from these lakes was about 15 times greater that the annual property tax for properties in the watershed (which was $333,348 in 1999). The Turtle Lake study also estimated that 54 water-related jobs are created based on the combined acreage for the 10 lakes in the watershed (16.5 jobs for each 1000 acres of fishable lake)[63].

Stream trout lakes are also important to Minnesota's economy. The overall annual economic impact of anglers fishing inland trout lakes is $52 million, with another $33 millions in direct income. These expenditures support over 1,000 full and part time jobs.[64]

Studies that focus more broadly on water-related values reinforce the specific findings that relate to tourism and property. In the region around the Minnesota River, researchers found general public opinion in favor of programs that reduce phosphorus in the river by 40 percent.[65] Acceptable levels of annual household payments ranged from $14 to $40. This result compares well with recent national research. A national panel surveyed in 2004 indicated a willingness to pay $23 per year for a one percent improvement in lake and river water quality.[66]

Without the benefit of direct value studies, the Agency must rely on indirect evidence of the economic benefit of the proposed rules. Review of national and local studies shows that:

- When analysts look for economic value in water-related resources, they find it. People are willing to pay to use and protect water resources.
- Water resources comprise an important factor in the operation of Minnesota's economy.
- Property values respond positively to improvements in the clarity of water in lakes and negatively to declines in water clarity.

The weight of the indirect evidence indicates to the Agency that the proposed rules will add to the economic value of Minnesota's water resources.

C. GENERAL ASSESSMENT OF POTENTIAL COSTS ATTRIBUTED TO ADOPTION OF EUTROPHCIATION STANDARDS [X. EU standards, economics]

The Agency considered the possibility that the proposed eutrophication standards might result in added costs to the following programs.

1. NPDES permits for POTWs and industries
2. Individual sewage treatment systems
3. Storm water permits, MS-4 and construction activities
4. Feedlot permits

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[63] This study is also published in a special issue of *Lake Line*, vol. 23, page 21 devoted to the economic value of lakes, Exhibit EU-43, page 21.

[64] Gartner, W., L. Love, Erkilla and Fulton. 2002 Economic impact and social benefits study of coldwater angling in Minnesota. Univ. of Minn. Dept. of Fisheries and Wildlife. Prepared for MDNR. 126 pages.

[65] Mathews, Leah Greden, Frances R. Homans and K. William Easter, "Reducing Phosphorus in the Minnesota River: How Much is it Worth?" Staff Paper P99-4, Department of Applied Economics, College of Agricultural, Food and Environmental Sciences, University of Minnesota, April 1999.

[66] Viscusi, W. Kip, Joel Huber and Jason Bell, "The Value of Regional Water Quality Improvements," Discussion paper no. 477, Harvard Law School, June 2004.

The Agency concluded that potential future costs, attributable specifically to the proposed eutrophication standards, were likely for just the first of the categories listed above; i.e., potentially a very small subset of NPDES permittees. It is the opinion of the Agency that the other programs listed above will not be significantly impacted, or that the possibility of added costs are so hypothetical that it defies estimation. Implementation of the existing or developing programs listed as 2 - 5 above will proceed independent of the proposed standards and should not be significantly affected. Also, if the proposed eutrophication standards are not adopted, the Agency will continue to vigorously implement the narrative standard in Minn. R. 7050.0150, subp. 5.

5. Nonpoint sources activities

While the Agency has not identified added costs for nonpoint sources (including those regulated under a permit which are considered point sources), it does not mean that the reduction of nutrient loading to surface waters from septic systems, stormwater runoff, feedlots, or nonpoint sources in general is not a major goal for these programs. The contributions of nutrients from all these sources can be a major concern locally as well as state-wide (Exhibit EU-6).[67] It is the Agency's intent that the proposed standards be a factor considered when these programs are being implemented; and that adopted standards might influence a decision by the regulating authority to require more effective (and possibly more costly) best management practices, to influence the setting of priorities for regulatory actions, or to spur a more proactive response to reduce nutrient loading. However, the Agency believes that the possibility that these actions will result in added costs, due just to the eutrophication standards, is very hypothetical and speculative, and that any attempt to guess at costs would have little meaning. These programs are discussed individually in the next paragraphs.

It is conceivable that the eutrophication standards might re-invigorate or spur counties to advance their programs to inspect and require upgrading of failing onsite sewage treatment systems around a lake. Or they might focus attention on those lakes in jeopardy of exceeding standards. However, many lake-rich counties have had aggressive septic system inspection and replacement programs in place for many years. The Agency feels the proposed standards might play a roll in reinforcing these programs, but the county's programs will proceed regardless.

The Agency's stormwater permit program has undergone significant expansion since March 2003 when the program broadened to include many more cities and smaller construction sites. NPDES or state disposal system permits are required for construction sites, industrial sites and municipalities. The tremendous expansion of the program (e.g., from 900 to 3000 construction site permits) has led to the development of general permits that apply to most construction sites collectively. Permittees are required to develop pollution prevention plans and to implement

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[67] Statewide contributions of TP, from Exhibit EU-6:

Human waste products, 10.9 %
Individual sewage treatment systems, 3.7 %
Urban and non-agricultural rural runoff, 10.5 %
Feedlots, 1.0 %
Total nonpoint sources, 69 % (this changes to 75 % now that the Metro plant is meeting a 1 mg/L limit).

appropriate best management practices (BMP) to reduce pollutants in stormwater. The general permits do not contain numeric limits for TP, or numeric limits for any pollutant.

As discussed in other contexts, the possibility exists that the eutrophication standards might result in added costs; if, for example, a construction site was adjacent to a lake and the standards were the impetus to require more rigorous BMPs to control runoff. The Agency has not attempted to estimate the costs of this possibility because separating the costs that would be incurred without the standards to those attributable to the standards is too hypothetical. The proximity of a lake to the construction zone may prompt the application of the best available BMPs independent of the standards.

Phosphorus limits are a possibility in the future for municipal stormwater permits, but this will not be due to the eutrophication standards.

The Agency and delegated counties permit approximately 990 feedlots in Minnesota. All but 40 of these feedlots are covered under a general permit. The general and individual permits do not allow any discharge of manure wastes to surface waters, except under conditions of extreme rain events.[68] These permits also include special conditions and management practices to prevent the flow of phosphorus containing runoff from entering surface waters following land application of manure. The proposed eutrophication standards will have no impact on feedlot permits.

In general, pollutants from non-point sources are controlled through the voluntary implementation of BMPs. A variety of educational and incentive programs are in place at several levels of government to encourage the application of BMPs. The eutrophication standards will not change the basic voluntary/incentive approach to controlling nonpoint source pollution. As has been repeatedly stated, however, the Agency's intent with the promulgation of numeric standards is that they may be an additional consideration and possible incentive to implement BMPs to protect valuable lake resources. The Agency believes that this possible response to the eutrophication standards is too speculative to be the basis for a meaningful prediction of costs for implementing BMPs.

The possibility of costs to any small business or city exceeded $25,000 in the first year the proposed eutrophication standards are adopted is discussed in Section V.L.

D. POTENTIAL COSTS TO POINT SOURCE DISCHARGERS ATTRIBUTED TO ADOPTION OF EUTROPHCIATION STANDARDS [X. EU standards, economics]

1. Introduction [X.D. EU standards, economics]

The Agency is assuming that the proposed addition of the eutrophication standards will result in additional treatment costs to some municipal dischargers (POTWs). It is impossible to know with certainty what those future costs to point sources might be because we do not know the number or size of POTWs that might be impacted. A series of factors must fall into place for

[68] http://www.pca.state.mn.us/publications/feedlot-gp-permit-06.pdf.

any discharger to incur costs. Also, a portion of the estimated costs for point sources might be incurred regardless, if the proposed standards are not adopted, due to a range of factors, such as:

- Continued application of the Phosphorus Strategy;
- Use of the nutrient criteria as a basis for TP effluent limits;
- New or renewed watershed TP reduction goals; and
- Continued emphasis on phosphorus as a major pollutant by all branches and levels of governments.

The Agency is making a good faith effort to estimate costs using our experience of setting TP effluent limits over the last five years. We believe that our cost estimates are conservative and likely to over estimate true costs.

The Agency has not attempted to estimate potential added costs specifically for industries attributable to the eutrophication standards. The possible costs to industries due to the proposed extension of the TP limit to new and expanded discharges can be used as an indication of possible treatment costs (Section XI.E), but the Agency believes very few industries will fall into the categories of potentially impacted discharges listed below.

To estimate potential costs to municipalities, the Agency will use hypothetical situations and make several assumptions. In all situations described for this purpose the discharger is already required to meet a 1 mg/L TP effluent limit based on the current rules. It is assumed that when the TP limit is due to the proposed eutrophication standards, the limit will be more stringent than 1 mg/L.

The situations the Agency believes could result in costs to a municipal discharger are:

1. Discharge **directly** to a lake with water quality that meets, or is better than, the proposed standards; nondegradation and loading minimization will be the basis for the effluent limit.
2. Discharge affects a **downstream** lake with water quality that meets, or is better than, the proposed standards; nondegradation will be the basis for the effluent limit.
3. Discharge to **downstream** lake for which the increased TP loading is likely to cause an exceedance of eutrophication standards; maintenance of standards will be the basis for the effluent limit.
4. Discharge to **downstream** lake on the impaired waters list due to excess nutrients; federal requirements and load minimization will be the basis for the effluent limit until the TMDL is completed.

Also, in order for any discharger to be impacted, one of the following situations would need to be true.

- The permit has expired and is being reissued;
- The facility is new or expanding (a *de minimis* loading is not applicable in these situations);

- The public or an outside party has brought to the Agency's attention that the facility is negatively impacting a lake; or
- The facility is impacting a lake for which a TMDL has been completed.

To estimate future costs the Agency is making assumptions about the number and size of dischargers impacted based largely on our experience setting TP limits, and in light of recent improvements in TP removal treatment technologies. The number of POTWs assumed to be impacted in the next five years and the treatment technologies that may be required to meet TP limits more stringent than 1 mg/L are shown in Table II-24.

2. Basis for Cost Estimates [X.D. EU standards, economics]

The information the Agency used to compile cost estimates comes from: 1) previous work and cost estimates for phosphorus removal completed by Agency staff (Section XI.D); 2) a search of some of the available literature on estimating costs for phosphorus removal by POTWs; and 3) information collected from Minnesota wastewater treatment facilities that have completed construction of phosphorus removal projects or have prepared estimates contemplating future phosphorus removal related construction projects.

The costs to achieve effluent TP concentrations in the range of 1.0 to 0.04 mg/L are estimated for three facility design flows, and for different removal techniques. The removal techniques evaluated, which are designated as "good, better and best" Tiers are:

1. Tier 1, chemical removal,
2. Tier 2, chemical removal with sand filters, and
3. Tier 3, chemical removal with microfiltration or membrane biological reactor (MBR) processes.

The focus of this analysis is the additional costs incurred to treat effluent TP to levels lower than 1 mg/L. It is assumed that the plants, at a minimum, will require new chemical addition facilities (capital costs) and subsequent operation and maintenance (O&M) costs, including additional biosolids (sludge) storage and treatment.

For advanced treatment of effluent phosphorus to the range of 0.1 to 0.04 mg/L, it is assumed that additional settling, sand filters, or microfiltration processes, are required (Exhibit PL-12). For the purposes of this evaluation, it was assumed that all treatment plants will use chemical precipitation to remove phosphorus. This does not imply a recommendation of chemical phosphorus removal over biological phosphorus removal on the part of the Agency. On the contrary, biological phosphorus removal with chemical backup followed by additional treatment or microfiltration will generally result in less O&M cost than treatment to the same level with chemicals alone due to the need for less chemical and less sludge production.

3. <u>Methods and</u> <u>Capital and O&M Costs to Meet 1.0 mg/L TP Effluent Limit Using Chemical Addition</u> [X.D. EU standards, economics]

While the focus of this analysis is costs to meet a limit more stringent than 1 mg/L, it is useful to start with estimates of the costs to meet a 1 mg/L effluent limit in situations where the facility has not previously had a TP limit. The common use of chemical addition in the form of alum or ferric chloride to remove TP in wastewater treatment facilities, and the associated capital costs to meet a 1 mg/L limit for a range of POTW sizes, is discussed in Section XI.D (estimated costs for industries are discussed in Section XI.E). The analysis discussed in this Section, to meet 1 mg/L TP in the context of the proposed eutrophication standards, is analogous to the estimates shown in Tables II-25 and II-26.

Many of the same references were reviewed by Agency staff for both analyses to arrive at the best cost estimates for chemical removal of phosphorus to 1 mg/L.[69] In addition, the following two references were used in this analysis.

- Minnesota Environmental Science and Economic Review Board, Wastewater Phosphorus Control and Reduction Initiative, April 29, 2005.
- Small Flows Quarterly. "Cost and Affordability of Phosphorus Removal at Small Wastewater Treatment Plants," Fall 2004, Volume 5, Number 4.

In this analysis an **average** cost for a given size of facility is estimated. It is important to point out that treatment costs are generally very site specific, and it is quite possible that different wastewater treatment facilities that have similar design flows will not have the same cost estimate for chemical phosphorus removal processes and sludge handling.

The cost estimates assume construction to treat to the design flow of the facility and the use of alum as the TP removal chemical. The estimates include costs for a chemical feed system with a 15 day storage supply of alum, incremental costs of clarifier improvements, and biosolids treatment and handling to accommodate the increased biosolids volume above the amount normally generated by using non-chemical removal processes or with chemical removal as a backup to achieve 1.0 mg/L TP. The costs provided in the EPA and Chesapeake Bay references are in 1984 and 2002 dollars, but they have been updated based on the June 2006 Engineering News Record (ENR) (construction cost index value of 7700).

The estimated average capital and O&M costs for three sizes of POTWs are shown in Table II-20. The estimated range of costs could be from one half to twice that of the average costs. The range in potential costs is large due to variations in the level of phosphorus coming into the treatment facility, and the amount of biosolids treatment and storage needed at the specific facility. In particular, the large range in costs depends on the need, or the lack of need, for the latter. For example, many facilities currently have the capacity to store one year's production of biosolids when only six months of storage capacity is needed. Therefore they would be able to store more biosolids each year without significant increased cost by just increasing their frequency of land application. The costs for additional treatment processes, such as sand filters, are not included in the Table 20 figures but are discussed in the next sections. The costs in Table 20 are comparable to the costs shown in Tables II-25 and 26 for the same facility sizes (see Section XI.D.3).

[69] 1. Priebe. Preliminary Cost Estimates For Phosphorus Removal, MPCA, November 18, 1992.

2. Henningsgaard. Rough Cost Estimates For Phosphorus Removal, MPCA, January 17, 2002.

3. Nutrient Reduction Technology Cost Estimations for Point Sources in the Chesapeake Bay Watershed (also see Exhibit PL-12).

4. MPCA staff document, Research Document for the Clean Water Legacy Act. September 2, 2004, updated on February 17, 2005.

5. Information from state of Wisconsin.

6. EPA 1984. Reference texts, The Cost Digest: Cost Summaries of Selected Environmental Control Technologies. EPA 600/8-84-010.

Table II-20. POTWs, Summary of Estimated Costs for Phosphorus Removal to1.0 mg/L Using Alum.

Cost in Dollars For:	Average Monthly Wet Weather Plant Design Flow		
	0.2 mgd	1.5 mgd	5 mgd
Total Capital	$400,000	$1,500,000	$2,000,000
Annual O&M	$50,000	$100,000	$300,000

4. <u>Capital and O&M Costs to Meet a TP Limit More Stringent Than 1.0 mg/L Using Chemical Addition</u> [X.D. EU standards, economics]

The additional costs to treat to levels of effluent TP below 1 mg/L are determined for three "Tiers" of available treatment technologies capable of achieving effluent TP in the range of 0.5 to 0.04 mg/L. Tier 1 is TP removal with chemical addition only (without filters or other processes). Tier 1 is assumed to be capable of meeting a TP limit of 0.5 mg/L. Tier 2 assumes chemical addition plus sand filtration. Tier 2 is assumed to be capable of meeting a TP limit of 0.1 mg/L. Tier 3 is chemical addition plus the addition of polymers and ultra filtration. Tier 3 is assumed to be capable of meeting a TP limit as low as 0.04 mg/L.

Table II-21 is a summary of the costs to achieve a Tier 1 level of TP removal. These costs assume the addition of a limited amount of phosphorus removal capability, and that the facility is already able to achieve a 1.0 mg/L limit. Thus, chemical addition TP removal systems would already be in place. The capital cost for implementing a "Tier 1" upgrade would only include the capital costs for additional storage and treatment and the O&M costs for the additional chemical needed to achieve the lower TP level. Such systems, however, may also require a more sophisticated chemical addition process to introduce chemical at more points at the facility, or additional settling capability, which could add to the costs shown.

Table II-21. POTWs, Summary of Additional Costs for Tier 1 Phosphorus Removal Using Alum. TP Removal to as Low as 0.5 mg/L.

Cost in Dollars For:	Average Monthly Wet Weather Plant Design Flow		
	0.2 mgd	1.5 mgd	5 mgd
Total Capital	$100,000	$200,000	$300,000
Annual O&M	$20,000	$50,000	$100,000

Table II-22 is a summary of the costs to achieve a Tier 2 level of TP removal. These costs assume a significant amount of phosphorus removal capability, which requires additional treatment units beyond what the facility needs to achieve a 1.0 mg/L limit. Again, it is assumed that the facility is already achieving a 1.0 mg/L limit through chemical addition. The capital cost for a Tier 2 upgrade would include costs for the addition of sand filters or additional settling mechanisms, and additional biosolids storage and treatment. Additional use of chemicals, the sand filtration and any additional settling processes are included in the estimated annual O&M costs.

Table II-22. POTWs, Summary of Additional Costs for Tier 2 Phosphorus Removal Using Alum and Sand Filtration. TP Removal to as Low as 0.1 mg/L.

Cost in Dollars For:	Average Monthly Wet Weather Plant Design Flow		
	0.2 mgd	1.5 mgd	5 mgd
Total Capital	$300,000	$1,300,000	$2,400,000
Annual O&M	$50,000	$200,000	$600,000

Table II-23 is a summary of the costs to achieve a Tier 3 level of TP removal. These costs assume a phosphorus removal capability that will achieve very low effluent TP concentrations – concentrations within the range of the proposed TP standards for lakes. As before, it is assumed that the facility is meeting a 1.0 mg/L TP limit through chemical addition. The cost for implementing the Tier 3 upgrades would include the capital costs for one of the following options.

- The addition of dual stage sand filtration, or
- Ion exchange technology, or
- Micro filtration, or
- Membrane reactor filtration.

A description of these treatment technologies is beyond the scope of this SONAR, but it should be noted that they all are proven and currently being used to treat TP to levels as low as 0.04 mg/L.[70] (also see Exhibit PL-12.) Since just one of the treatment technologies listed above would be added to the chemical addition system already be in place, the capital costs may not be dramatically more than the costs for the Tier 2 systems. For example, a facility would not need dual stage sand filtration and a microfiltration system at the same time. Also, chemical costs and additional biosolids storage costs may not be significantly more than the costs for Tier 2 since the additional amount of phosphorus removed is a smaller percentage over the amount that would be actually removed to achieve the Tier 2 limit. However, the costs for energy, operation and maintenance would be significantly higher than for most systems meeting a Tier 2 limit.

The estimated O&M costs for Tier 3 level removal are higher because, in addition to the cost of additional chemical and additional biosolids storage and treatment, the advanced treatment systems are very likely to require a more sophisticated computer operating system and a more highly trained or experienced operator. The operation of these facilities will be more complex and older computer operating system probably will need to be replaced. Therefore, the added O&M costs for Tier 3 may be significant.

[70] Technical Memorandum "Evaluation of Exemplary WWTPs Practicing High Removal of Phosphorus." CH2MHILL, November 21, 2005.

Table II-23. POTWs, Summary of Additional Costs for Phosphorus Removal Using Alum and a Tier 3 Level of Treatment. TP Removal to as Low as 0.04 mg/L.

Cost in Dollars For:	Average Monthly Wet Weather Plant Design Flow		
	0.2 mgd	1.5 mgd	5 mgd
Total Capital	$400,000	$1,500,000	$3,500,000
Annual O&M	$80,000	$400,000	$800,000

5. <u>Summary and Total Estimated Costs Due to Eutrophication Standards</u> [X.D. EU standards, economics]

To estimate potential costs to municipalities over the next five years the Agency is projecting, based on our experience over the previous five years, that relatively few POTWs will need to remove TP beyond 1 mg/L due to the proposed eutrophication standards. Also, as outlined in Section X.D.1, a portion of the estimated costs could occur even if the standards are not adopted.

As stated, the Agency is very reluctant now to permit a discharge directly to a lake, and few such permits have been granted over the last several years. Nevertheless, there is always the possibility that a small POTW may have no option but to discharge to a lake. The receiving lakes in these situations are usually large and the discharge is small to very small. It is likely that a POTW that must discharge directly to a lake in the future will have AWWDF less than 0.2 mgd, but the estimated costs are based on a POTW of that size. The Agency is projecting three such dischargers in the next five years.

Table II-24 summarizes the estimated costs for the number of facilities projected to be impacted in the four categories outlined in the *introduction* Section above. A total of 15 facilities in two size categories are projected to be impacted. It is assumed that any new discharge directly to a lake will be required to provide the best treatment achievable with current proven technologies; i.e., a Tier 3 level of treatment. If the additional loading of TP from the POTW is projected to cause an exceedance of the standards in a downstream lake, it is assumed that these dischargers would need to provide a Tier 2 level of treatment. If the POTW is in a situation where nondegradation or the implementation of a TMDL determines the TP effluent limit, it is assumed a Tier 1 level of treatment will be adequate. We need to emphasize, however, that a POTW in any of the four categories could get a TP limit requiring treatment at any of the three Tier levels, depending on the situation.

Table II-24. Summary of Estimated Average Costs to Municipal Dischargers Over the Next Five Years Due to the Eutrophication Standards.

Scenario	Size mgd	No. in 5 years	Treat-ment Tech-nology	Potential TP Limit mg/L	Projected Total Costs over 5 Years		
					Capital cost $ millions	Annual O&M $ millions	Total costs* $ millions
Direct discharge to lake							
	0.2	3	Tier 3	0.05	1.2	0.24	1.44
	5.0	None					
Discharge impacts lake downstream							
- Nondegradation Predicted measurable increase	0.2	2	Tier 1	0.5	0.2	0.04	0.24
	5.0	2	Tier 1	0.5	0.6	0.2	0.8
- Expected exceedance of standard	0.2	2	Tier 2	0.1	0.6	0.1	0.7
	5.0	2	Tier 2	0.1	4.8	1.2	6.0
- Impacts impaired water (TMDL complete)	0.2	2	Tier 1	0.5	0.2	0.04	0.24
	5.0	2	Tier 1	0.5	0.6	0.2	0.8

* Total capital plus one year of O&M costs

Treatment technologies (any may be combined with biological phosphorus removal):

Tier 1. chemical addition

Tier 2. chemical addition and sand filtration

Tier 3. dual stage sand filtration, or ion exchange, or micro filtration or membrane reactor filtration.

In summary the Agency predicts that roughly 15 POTWs may be required to remove TP to a level below 1 mg/L due to the proposed eutrophication standards at an estimated total capital cost of $8.2 million and a total O&M cost for one year of $2.02 million.

XI. CONSIDERATION OF ECONOMIC FACTORS, EXTENSION OF PHOPHORUS EFFLUENT LIMIT

A. INTRODUCTION [XI. TP limit, economics]

The Agency has made a concerted effort to estimate as accurately as possible the costs some municipalities and industries may incur as a result of the proposed extension of the 1 mg/L phosphorus (TP) limit to new and expanded discharges. At the same time the Agency believes that the full costs of removing TP from point sources cannot be attributed to the extension of the TP effluent limit alone. In other words, the costs due to this proposal will be substantially mitigated for the reasons discussed in Section XI.F.

The possibility of costs to any small business or city exceeded $25,000 in the first year the proposed extension of the TP limit is discussed in Section VIII.L.

Isolating the treatment costs that can be attributed to just one phase of a complex treatment facility is difficult. Wastewater treatment costs are not usually broken out in such a way that the costs for removing just CBOD or TSS or, in this case TP, are readily available. This is probably even more true for facilities designed for biological phosphorus removal (Bio-P). Bio-P seems to be the treatment technology of choice today for many cities because of the advantages it offers, in addition to the removal of TP. A full discussion of this technology is outside the scope of the SONAR, but the following brief description is warranted.

B. BIOLOGICAL PHOSPHORUS TREATMENT TECHNOLGIES [XI. TP limit, economics]

In general, Bio-P technology is a variation of the standard activated sludge secondary treatment process. The Bio-P variation creates conditions that promotes the growth of phosphorus accumulating bacteria. This is accomplished by exposing the microorganisms in the wastewater to a sequence of anaerobic then aerobic zones in the biological treatment process. The bacteria first release the small amounts of phosphorus that are naturally stored in their cell mass into the wastewater, but in the aerobic step the organisms take up the readily bio-available phosphorus from the wastewater. The organisms become heavy and settle out in the final clarifiers. The phosphorus containing organisms are removed with the waste sludge. Bio-P can be accomplished through design (new or expansion); or, in some cases, it can be achieved by altering operation modes or making other alterations to existing facilities to provide an anaerobic step to enhance the phosphorus removing bacteria (retrofits). In some cases the motivation to operate an existing facility in a “Bio-P” mode is the savings in energy cost the technology offers, and TP removal is a secondary benefit.

As with most biological treatment process there are advantages and disadvantages associated with Bio-P that need to be considered before a decision is made whether or not to convert to, or build an enhanced Bio-P facility. From the results achieved so far by the increasing number of Bio-P facilities in the metro area and throughout Minnesota (conservatively 30 to 35 facilities statewide), the advantages seem to outweigh the disadvantages. The advantages and disadvantages are listed below:

Advantages:

- Effluent phosphorus concentrations average 1 to 2 mg/L or less over the long-term (recent information indicates that Bio-P should be able to meet 1 mg/L);
- Chemical addition for phosphorus removal can be eliminated or at least substantially reduced. This can also reduce or eliminate alkalinity addition required to restore what is consumed by chemical phosphorus precipitation;
- Better settling of solids resulting in improved clarification, dewatering, and sludge handling;
- Produces less sludge compared to the chemical addition process;
- Can reduce aeration requirements, equipment and energy costs;
- Can accommodate simple and low-cost retrofits to existing wastewater treatment facilities; and
- Potential exists for total nitrogen removal providing additional improvement in effluent quality.
- Overall environmental benefits typically include reductions in energy consumption, chemical use, sludge production and reduced truck traffic.

Disadvantages:

- Can be more complicated to operate;
- Needs a more consistent influent, waste loads that vary in strength or quality can be problematic;
- Requires more careful design considerations; and
- May only be reliable for an effluent concentration of 1.0 to 2.0 mg/L total phosphorus on any given month.

Over the last 10 to 15 years the Bio-P treatment technology has become a popular choice for municipalities that need to build new or expand. Results of the joint League of Minnesota Cities and Agency survey of cities that have a 1 mg/L TP limit and use Bio-P technology (Exhibit PL-5, see Sections XI.D.4 - 7) indicate that Bio-P facilities outside the metro area generally add some chemical to assure compliance with the limit. The Agency believes that as wastewater treatment plant operators gain experience and confidence in the technology (combined with an annual average limit), chemical use may be reduced in the future. Recent experience has shown that the technology can consistently achieve a 1 mg/L limit without chemicals. For example, several large Metropolitan Council Environmental Services (MCES) facilities, including the very large Twin Cities Metro Plant, meet a 1 mg/L limit with Bio-P alone.

C. ECONOMIC BENEFITS OF EXTENDING THE TP LIMIT [XI. TP limit, economics]

The Agency believes that the extension of the TP limit to new and expanding dischargers (above 1,800 pounds of TP per year) will have economic benefits for the state by preventing declines in the biology and water quality of rivers and steams. The Agency has not attempted to quantify assumed benefits; to do so would be extremely difficult and time consuming, if not impossible in our opinion. The expected nutrient reductions will more directly benefit rivers and streams. Essentially all the discharges affected by this proposal are to rivers and streams, but downstream lakes and reservoirs will benefit as well. Discharges directly to lakes or discharges that measurably affect a downstream lake will be covered by the existing P Rule (Minn. R. 7053.0255, subp. 3, item A, subitem 1) and by the proposed eutrophication standards for lakes.

The study of the negative impacts anthropogenic sources of excess nutrients have on riverine systems is relatively new, compared to the long history and extensive literature on the eutrophication of lakes. One such study is: "Economic value of aesthetic amenities of rivers" (Exhibit PL-6, also see Exhibit EU-48, page 21). Important work by Agency staff in this area have been reported in Exhibits PL-7 and PL-8. Other states in EPA Region 5 (e.g. Michigan, Ohio and Indiana), and elsewhere around the country, are beginning to document the impact nutrients have on rivers and streams as they assemble data for the promulgation of numeric nutrient standards. These data show that, in general, as nutrients increase in streams and rivers the quality of the aquatic community declines. Negative impacts have been demonstrated in fish, invertebrate, and plant communities. Some of these states plan to adopt numeric standards for rivers and streams at the same time or before they adopt standards for lakes. The Agency plans to adopt nutrient standards for rivers and streams in a future triennial review.

D. POTENTIAL COSTS TO MUNICIPALITIES ATTRIBUTED TO EXTENDING THE TP LIMIT [XI. TP limit, economics]

1. <u>TP Limits Under the Phosphorus Strategy as Model for Future</u> [XI.D. TP limit, economics]

The Agency is using the five-year record of establishing TP limits under the Phosphorus Strategy (Strategy) to estimate future costs to facilities expected to be impacted by the proposed extension of the TP limit. The role the Strategy has played in establishing TP limits in POTW and industrial NPDES permits is described in Section IX.C. The Agency believes that this record, spanning from March 2000 to September 2005, provides a reasonably accurate model to estimate the number of discharges expected to be impacted over the next five years. The Agency has not explicitly tried to project costs beyond the first five years. It is probably reasonable to assume that costs to municipalities that build new or expand (and discharge more than 1,800 pounds of TP per year) in the second five-year time frame will incur treatment costs comparable to costs projected for the first five years (with adjustments for inflation). It seems likely, however, that overall costs should decline over the long term, because of the declining number of facilities that do not already have a TP limit based on this or some other requirement.

The municipal (POTW) and industrial permittees that have gotten limits from 2000 - 2005 are shown in Exhibits PL-10 and PL-11, respectively. The Agency determined that 34 POTWs with average wet weather design flows (AWWDF) of 0.2 mgd or larger got TP limits based on implementation of the Strategy. An additional nine POTWs with AWWDF smaller than 0.2 mgd, shown in the shaded part of Exhibit PL-10, also got limits during this five-year period. Not listed in Exhibit PL-10 are about 10 POTWs that got TP limits over the last five years based on the current requirements in Minn. R. 7050.0211, subp.1a, because they discharge to or affect a downstream lake.

2. Methods Used to Estimate Costs [XI.D. TP limit, economics]

Listed below are the assumptions and approaches used by the Agency to estimate future costs to POTWs due to the extension of the TP limit.

1. The history of giving TP limits during the five year period the Strategy has been in place is a reasonable time frame from which to projects future costs. Also, five years is the life of NPDES permits.
2. Facilities that got limits for the reasons listed in Exhibit PL-10 as “P strategy”, “Volunteered for limit”, or “Negotiated” are attributed to the Strategy. It is assumed that these facilities would have gotten a limit also if the proposed extension of the TP limit to new and expanding facilities had been in place since March 2000.
3. Facilities with AWWDF of 0.2 mgd or larger are assumed to be large enough to exceed the *de minimis* TP loading of 1,800 pounds per year. This assumes an effluent TP concentration of about 3 mg/L (3 mg/L X 0.2 mgd X 8.337 [conversion to pounds] X 365 days = 1826 pounds per year).
4. Essentially the same number of POTWs (34) will get TP limits in the next five years that got limits from March 2000 to September 2005. The Agency does not have any solid basis to project that either more or fewer facilities will be impacted in the next five years.
5. TP treatment costs are estimated for seven size categories of POTWs based on AWWDFs (see Table II-25). Estimates were not made for the > 100 mgd category because no new or expanded plants this large are expected in the next five years.
6. No POTW in the 5-10 mgd size category got a limit in the previous five years. The Agency is assuming that one facility in this relatively large size group will be impacted by the proposal in the next five years. This brings the total number of POTWs projected to be impacted to 35.
7. Estimated capital costs are the costs attributed to the portion of the treatment facility directly related to the removal of phosphorus; they are total costs, **not** amortized costs.
8. Estimated costs have been updated to February 2005 dollars where appropriate.
9. The Agency is aware that the cost of some materials and construction costs in general have increased in 2006, which might make the estimated “high” costs more plausible. However, the Agency still believes the “average” costs are the best estimates of expected costs over the next five years.

Agency wastewater treatment plant design and NPDES permit review engineers estimated the costs attributable to phosphorus removal for POTWs. The Agency’s analysis of potential costs to municipalities is described in Exhibit PL-3. The discussion in the next six sections is taken from this Exhibit. Total capital construction costs and annual operational and maintenance (O&M) costs **attributed to TP removal** have been estimated. Any extra costs associated with the handling and disposal of sludge due to use of chemical is included in the cost estimates.

Costs are estimated for three different removal technologies: 1) chemical addition (including stabilization ponds), 2) Bio-P with chemical addition for polishing, and 3) Bio-P alone. Projected costs for the three treatment options are the complete costs of phosphorus removal for each option alone. For example, the costs for chemical addition alone are not added to the costs for Bio-P with chemical back-up to arrive at the total costs for the latter option. All cost estimates are based on meeting a monthly average effluent limit of 1 mg/L total phosphorus (TP).

Cost estimates are based on:

1. Previous work and cost estimates for TP removal completed by Agency staff;
2. Research in the published literature on the subject of estimating costs for wastewater treatment projects, particularly for TP removal;
3. TP removal project cost estimates provided by consulting engineers based on their experience in Minnesota;
4. A report prepared by Hydroqual, Inc. for MESERB on wastewater phosphorus control (Exhibit PL-4); and
5. Information from a survey, conducted by the League of Minnesota Cities and the Agency, of Minnesota wastewater treatment facilities that have completed construction of phosphorus removal projects, or have prepared estimates contemplating future phosphorus removal related construction projects at their facilities, (Exhibit PL-5).

3. <u>Chemical Addition</u> [XI.D. TP limit, economics]

The most common phosphorus removal technique currently practiced by mechanical wastewater treatment facilities in Minnesota is chemical addition; i.e., coagulation and precipitation with salts of aluminum or iron. Alum (aluminum sulfate), or ferric chloride (including possible addition of a polymer) is typically fed into the wastewater flow path prior to or at entry points into primary or secondary clarifiers to provide for mixing, coagulation, and then settling of the phosphorus into the sludge blanket in the clarifiers. The phosphorus is then removed from the clarifiers with the waste sludge (solids), which is usually applied to tillable farmland.

Several internal and external references were reviewed to determine the best method to arrive at the cost estimates for chemical removal of phosphorus.[71] Chemical treatment cost estimates using alum include costs for a chemical feed system with a 15 day storage supply, incremental costs of clarifier improvements, and sludge treatment and handling to accommodate the increased sludge volume above the amount normally generated when using chemical phosphorus removal.

[71] 1. Memo from Bill Priebe. Preliminary cost estimates for phosphorus removal. November 18, 1992.
2. Spreadsheet from Bruce Henningsgaard . Rough cost estimates for phosphorus removal. January 17, 2002.
3. MPCA Staff document. Research document for the Clean Water Legacy Act. September 2, 2004, updated on February 17, 2005.
4. EPA. The cost digest: cost summaries of selected environmental control technologies.
5. Information from Water Environment Federation.
6. Information from state of Wisconsin.

The Agency was able to make high and low cost estimates for the seven size categories, as shown in Tables II-25 and II-26 (Table A in Exhibit PL-3). The Agency believes making high, low and average cost estimates is a reasonable way to bracket the range in possible costs. Costs are often very site-specific. Even facilities that have similar design flows may not have the same costs associated with chemical phosphorus removal processes and sludge handling. The average cost estimate is the average of the high and low estimates for each category. The Agency believes that overall, the **average** costs represent the most likely or reasonable estimates of future costs. The low costs may under estimate and the high costs may over estimate true costs.

A summary of total capital costs and annual O&M costs for chemical addition (using alum) are shown in Tables II-25 and II-26, respectively. The low capital cost estimates are for alum dosages based on influent TP concentrations of approximately 5 to 9 mg/L, which is a typical range for Minnesota POTWs.[72] The high capital cost estimates are for alum dosages based on high influent TP concentrations of 13 to 17 mg/L.

Table B in Exhibit PL-3 shows estimated costs for TP removal for a number of specific facilities in Minnesota using ferric chloride, based on February 2005 dollars. The ferric chloride costs were compared to cost estimates completed by the state of Wisconsin to support revisions to their water quality rules (Table C in Exhibit PL-3). A comparison of capital cost estimates in Table A to those in Table B (Exhibit PL-3) indicates that the total capital cost estimates for ferric chloride generally fall into the lower part of the total capital cost ranges for alum. Annual O&M costs for ferric chloride also appear to fall in the lower range of the O&M cost estimates for alum.

Table II-25. Total Capital Costs for TP Removal – Estimated High, Low, and Average Capital Costs for Alum Addition for Seven Size Categories of Municipal Wastewater Treatment Plants, Projected Over the Next Five Years.

Plant Size AWWDF Mgd	No. of N/E Projected Over Next 5 Years	Estimated Total Capital Costs for Alum Addition					
		Cost Per Plant $ in millions			Total Cost Over 5 Years $ in millions		
		Low	Avg.	High	Low	Avg.	High
0.2-0.5	6	0.20	0.46	0.71	1.2	2.76	4.26
0.5-1.0	13	0.30	0.65	1.0	3.9	8.45	13.0
1.0-5.0	11	0.40	0.93	1.45	4.4	10.23	15.95
5-10	1	1.05	4.53	8.0	1.05	4.53	8.0
10-20	1	1.2	6.10	11.0	1.2	6.1	11.0
20-40	2	5.0	8.0	12.0	10.0	17.0	24
40-100	1	10.0	12.5	15.0	10.0	12.5	15
> 100	0	na	na	na	Na	na	na
Total	35				$31.75	$61.57	$91.21

N/E = New or expanded; na means not applicable or not available.

[72] A recent Agency analysis of permittee discharge monitoring report data showed a mean influent TP of 6.4 mg/L for 166 POTWs.

Table II-26. Operation and Maintenance Costs for TP Removal – Summary of Estimated High, Average, and Low O&M Costs for Alum Addition for Seven Size Categories of Municipal Wastewater Treatment Plants, Projected Over the Next Five Years.

Plant Size AWWDF Mgd	No. of N/E Projected Over Next 5 Years	Estimated Total Annual O&M Costs for Alum Addition					
		Cost Per Plant $ in millions			Total Annual Cost $ in millions		
		Low	Avg.	High	Low	Avg.	High
0.2-0.5	6	0.04	0.08	0.12	0.24	0.48	0.72
0.5-1.0	13	0.05	0.13	0.20	0.65	1.69	2.60
1.0-5.0	11	0.08	0.49	0.90	0.88	5.39	9.90
5-10	1	0.35	0.72	1.08	0.35	0.72	1.08
10-20	1	0.7	2.1	3.50	0.7	2.1	3.50
20-40	2	1.08	4.0	7.0	2.16	8.1	14.0
40-100	1	2.60	6.8	11.0	2.60	6.8	11.0
> 100	0	na	na	na	Na	na	na
Total	35				$7.58	$25.28	$42.8

N/E = New or expanded; na means not applicable or not available.

4. <u>Verification of Estimated Costs for Chemical Addition</u> [XI.D. TP limit, economics]

The Agency sought to verify or "crosscheck" the cost estimates shown in Tables II-25 and II-26 by comparing them to estimates from references other than those identified in footnote 71, and information from a small number of actual costs for phosphorus removal projects completed in Minnesota. Agency cost figures were also crosschecked with cost information from:

- A study of 17 facilities in Minnesota by Hydroqual (Exhibit PL-4). This work provides useful cost estimates for possible chemical and biological phosphorus removal enhancements for these facilities, but it does not include costs for sludge handling. Thus, its value as a "crosscheck" is limited.
- Information from a consulting engineering firm in the Twin Cities (Bonestroo), and
- A joint League of Minnesota Cities/Agency (LMC/Agency) Bio-P cost survey (Exhibit PL-5).

Details about how the capital cost information from the Bonestroo and the LMC/Agency survey are provided in Exhibit PL-3 under "Chemical Capital Cost Analysis". The crosschecks in general are very helpful in determining if the Agency's estimated ranges are reasonable, and to narrow the range of the cost estimates. Also, it helps the Agency characterize the cost ranges as high, low or average.

5. Cost Information for Stabilization Ponds [XI.D. TP limit, economics]

Stabilization pond treatment systems represent a subset of chemical phosphorus treatment, but limited information on costs to pond systems is available. Pond treatment systems typically store and passively treat the wastewater in a series of connected primary and secondary ponds or cells. If TP removal is required, it is usually accomplished by adding chemical to one of the secondary cells to precipitate the TP from the water. Pond treatment systems normally discharge twice a year, once in the spring and once in the fall.

Most pond systems have a design capacity of less than 0.2 mgd, and therefore most will not trigger the *de minimis* annual load of 1,800 pounds of TP. Facilities below the *de minimis* loading will not get a TP limit under the proposal. Of the 295 pond treatment systems in Minnesota, 52 have an AWWDF greater than 0.2 mgd. Nine of these 52 larger pond systems already have a TP limit of 1 mg/L under the existing rule, Minn. R. 7050.0211.[73]

Information, albeit limited, was obtained from Bonestroo and the LMC/Agency survey on estimated capital and O&M costs for stabilization pond systems. The first facilities listed in Tables D and E in Exhibit PL-3 under the treatment type heading "chemical" show estimated capital costs for TP removal in stabilization ponds. Based on the design flow of 0.07 mgd for the facility listed in Table E of Exhibit PL-3, it is unlikely it would trigger a limit (i.e., annual TP loading less than 1,800 pounds per year), but it is included in this discussion because of the small amount of data available for ponds. TP treatment costs for a third pond system are available from Agency files. The costs for these three facilities, and the projected costs over the next five years, are shown in Table II-27. The small number of municipalities with pond systems projected to be impacted, a total of six, is based on the Agency's experience over the last five years. The ability to crosscheck estimated costs for stabilization pond systems is very limited. An indirect approach that can provide a reasonable estimate of total capital and annualized O&M costs for ponds is to use the average costs for mechanical systems in the appropriate size category (Tables II-25 and II-26).

Table II-27. Pond Systems – Total Capital and Annual O&M Costs for Alum Addition for Three Pond Wastewater Treatment Facilities, and Projected Costs Over the Next Five Years.

Plant Size AWWDF Mgd	No. of N/E Projected Over Next 5 Years	Estimated Total Costs for Alum Addition in Pond Systems			
		Average Cost Per Pond Facility, $ in millions		Total Average Cost Over 5 Years, $ in millions	
		Total Capital	Annual O&M	Total Capital	Annual O&M
0.07	na	0.050	na	na	na
0.236	4	0.093	0.021	0.37	0.084
0.5	2	0.1717	0.1522	0.34	0.30
Total	6			$0.71	$0.384

N/E = New or expanded; na means not applicable or not available.

[73] Numbers based on information from October 2005. Thirty four of all 295 ponds currently have TP limits. There are an additional 74 pond systems covered under a general permit, and two of these have TP limits.

6. Costs for Biological Phosphorus with Chemical Back-up [XI.D. TP limit, economics]

The biological phosphorus removal (Bio-P) process is described in Section XI.B. Almost all facilities that have built new or expanded in the last five years have incorporated Bio-P into the design. This treatment technology is gaining popularity because of its TP removal capabilities as well as other advantages.

Very little information seems to be available in the published literature that discusses costs for just the TP removing components of a Bio-P plant or for Bio-P with chemical back-up. This may be because the design of Bio-P facilities is still fairly new in the United States, although it has been successfully applied in Minnesota starting in the late-1990s. Due to the lack of published literature on costs, we used the cost information provided by Bonestroo, the LMC/Agency survey, and the MESERB study (Tables D, E and F, respectively, in Exhibit PL-3). The Bonestroo information provides the only estimates for annual O&M costs. The cost figures shown for Bio-P plus chemical back-up in Table II-28 are the average of the "high" and "low" values from Table F in Exhibit PL-3, so that these costs might be more comparable to the "average" Bio-P alone costs (Table D in Exhibit PL-3), and the chemical addition costs in Table II-25. Costs are not available for facilities larger than 40 mgd.

There is a fairly wide range in reported Bio-P plus chemical back-up costs when costs for TP removal are expressed as a **percentage** of the total project capital costs. Percentages range from 1 to 29 percent, but mean percentages center around 8 to 15 (percent values are in *italics* in Table II-28). The 8 to 15 percent range may be a reasonable rule of thumb estimate of the increase in total capital costs attributable to removing TP for the Bio-P plus chemical backup option.

Table II-28. Bio-P with Chemical Back-up – Estimates of Average Total Capital Costs for TP Removal Using Bio-P with Chemical Back-up from Three Sources. Annual O&M Costs from One Source for Just Two Size Categories.

Plant Size AWWDF Mgd	TP Capital Costs $ in millions	*% Costs for TP of Total Project Capital Costs*	TP Capital Costs $ in millions	*% Costs for TP of Total Project Capital Costs*	TP Capital Costs $ in millions	Annual O&M $ in millions
Source:	Bonestroo		LMC/Agency		MESERB	Bonestroo
0.2-0.5			0.390 (2)	*8.2 (1.4-15)*	0.39	
0.5-1.0	0.545 (1)*	*8*	0.929 (4)	*12 (1.2-29)*	0.65	0.0033 (1)
1.0-5.0	0.563 (6)	*10 (1-21)***	1.63 (2)	*15 (6-23)*	1.0	0.0049 (6)
5-10					1.65	
10-20					2.75	
20-40					5.0	

Blank cells means there is no information.
* Number in parenthesis is number of facilities for which costs are averaged.
** Number in parenthesis is range of percent values.

7. Costs for Biological Phosphorus Removal [XI.D. TP limit, economics]

Cost estimates for Bio-P processes alone are limited to the information shown in Table E in Exhibit PL-3. Most of the designs for existing Bio-P facilities in Minnesota incorporate chemical back-up, as a guarantee that the facility can consistently meet the 1 mg/L TP effluent limit. Operating experience, as reported in the Hydroqual/MESERB study (Exhibit PL-4) indicates that Bio-P processes, in general, are capable of removing about 80 to 90 percent of the influent phosphorus. Therefore, if influent TP concentrations are in the normal 5 to 9 mg/L range, one could expect effluent concentrations in the 0.5 to 1.8 mg/L range. With the current state of the Bio-P technology in Minnesota, Bio-P facilities with a 1 mg/L TP limit generally need to polish with chemical to consistently meet the limit. Major exceptions to the need for chemical polishing are some of the metro area wastewater treatment facilities operated by the Metropolitan Council Environmental Services (MCES), including the very large Metro Plant (AWWDF of 251 mgd). The Metro Plant and several other MCES facilities are meeting a 1 mg/L limit with Bio-P alone.[74]

Verification of the cost figures for Bio-P removal only is not possible, due to a lack of information. Agency staff (reference 2 in Exhibit PL-3) offers a possible range of capital costs for Bio-P removal for newly designed treatment facilities, and for retrofitted facilities. Through contacts with consultants and the MCES, the Agency has estimated Bio-P capital construction costs of $0.30 to $0.50 per gallon for new designs, and $0.10 to $1.00 per gallon for retrofitted facilities. The Bio-P capital cost figures for the projects shown in Table E in Exhibit PL-3, expressed as cost per gallon treated, range from $0.03 to $0.21 per gallon, which is considerably less than the figures from Agency staff. The latter are based on estimates reported by the municipalities themselves; they should reflect real-world Bio-P costs in Minnesota. These costs are shown in Table II-29 (the $36 million figure for the > 100 mgd category is the MCES Metro Plant).

Table II-29. Bio-P Alone – Estimates of Total Capital Costs for TP Removal Using Bio-P Alone from LMC/Agency Survey (Table E in Exhibit PL-3).

Plant Size AWWDF Mgd	TP Capital Costs $ in millions	*% Costs for TP Removal of Total Project Capital Costs*
1.0-5.0	0.1 (1)*	*0.2*
10-20	0.9 (1)	*1.8*
20-40	5.0 (2)	*27 (1.3-53)***
40-100	8.0 (1)	*6.4*
> 100	36 (1)	*45*

* Number in parenthesis is number of facilities for which costs are averaged.
** Number in parenthesis is range in percents.

[74] Including Seneca, Blue Lake and Eagles Point as well as the Metro Plant.

Capital costs for Bio-P with chemical back-up and Bio-P alone, projected to be incurred over the next five years, are summarized in Table II-30. Total cost figures are not provided because data is missing for some size categories.

Table II-30. Summary of Estimated Average Capital Costs for Bio-P with Chemical Back-up and for Bio-P Alone, Projected Over the Next Five Years.

Plant Size AWWDF Mgd	No. of N/E Projected Over Next 5 Years	Estimated Average Capital Costs for TP Removal Using Bio-P with Chemical Back-up In $ millions		Estimated Average Capital Costs for TP Removal Using Bio-P Alone In $ millions	
		Per Plant	Total Cost Over 5 Years	Per Plant	Total Cost Over 5 Years
0.2-0.5	6	0.39	2.34	na	na
0.5-1.0	13	0.65	8.45	0.1	1.3
1.0-5.0	11	1.0	11.0	na	na
5-10	1*	1.65	1.65	0.9	0.9
10-20	1	2.75	2.75	5.0	5.0
20-40	2	5.0	10.0	16	16.0
40-100	1	na	na	na	na
> 100 (251)	0	na	na	36	36

N/E = New or expanded; na means not available or not applicable

*No plant in the 5-10 mgd size range got a TP limit in the last five years; we are assuming that one will get a limit over the next five years for purposes of this cost estimate.

8. <u>Conclusions on Costs to POTWs</u> [XI.D. TP limit, economics]

The Agency has made a good faith effort to estimate TP treatment costs that might be incurred by new or expanding municipal wastewater treatment plants (> 1,800 pounds of TP discharged per year) over the next five years. The Agency believes it is important to estimate the total costs for phosphorus removal over the next five years for this rulemaking, **but most of these costs should not be attributed to the proposed extension of the TP limit** to new and expanding facilities, as discussed in Section XI.F.

The Agency believes that where high, low and average cost estimates can be made, that the average costs represent our best estimate of likely true costs. Estimated capital costs for TP removal are total, not amortized costs. Most estimates of annual O&M costs are for facilities that rely only on chemical addition to remove TP. Our own experience and information on Bio-P facilities from the LMC/Agency survey suggest strongly that chemical costs are reduced when bio-P technology is used.

The total estimated average capital costs for TP removal using chemical addition for the estimated 35 municipalities likely to be impacted over the next five years is over 61 million dollars (Table II-31). The total O&M costs for chemical addition for 35 municipalities over the next five years is over 25 million dollars (Table II-26). Comparable **totals** cannot be determined for the other two treatment options (Bio-P with chem. back-up and Bio-P alone) because cost values are missing for some POTW size categories. Gaps in the data are indicated by "na" in Table II-31. With possibly one exception (the 1-5 mgd size) the capital costs for chemical addition tend to be larger than the costs for Bio-P with or without chemical back-up (Table II-31).

Table II-31. Estimated Average Total Capital Costs for TP Removal for Municipal Wastewater Treatment Plants Projected Over the Next Five Years for the Three Treatment Options.

Plant Size AWWDF Mgd	No. of N/E Projected Over Next 5 Years	Chemical Treatment In $ Millions	Bio-P with Chemical Back-up In $ Millions	Bio-P Alone In $ Millions	Stabilization Ponds* Chem. Treat. In $ Millions
0.2-0.5	6	2.76	2.34	na	0.37
0.5-1.0	13	8.45	8.45	0.1	0.34
1.0-5.0	11	10.23	11.0	na	na
5-10	1	4.53	1.65	0.9	na
10-20	1	6.1	2.75	5.0	na
20-40	2	17.0	10.0	16	na
40-100	1	12.5	na	na	na
> 100	0	na	na	36**	na
Total	35	$61.57	na	na	na

N/E = New or expanded; na means not applicable or not available.
*The Agency is projecting four and two new or expanding pond facilities in the 0.2-0.5 and 0.5-1.0 mgd categories over the next five years, respectively.
** Costs attributed to the 251 mgd MCES Metro Plant

E. POTENTIAL COSTS TO INDUSTRIES ATTRIBUTED TO EXTENDING THE TP LIMIT [XI. TP limit, economics]

1. <u>Introduction and Industry Categories</u> [XI.E. TP limit, economics]

The treatment technologies used for total phosphorus (TP) removal at municipal wastewater treatment plants are also applicable to industrial facilities. Typically, facilities to remove TP from an industrial waste stream means adding wastewater treatment capacity at the end of the existing treatment process. In most cases industrial wastewater treatment plants use chemical addition of alum and/or ferric chloride for precipitation and removal of TP in their discharge effluents. However, some industrial facilities may also use biological wastewater treatment processes or Bio-P processes to removal TP. Biological treatment processes for TP removal at industries is generally more applicable to industrial categories that generate higher organic loadings in their wastewater and discharge directly to receiving waters in Minnesota (as opposed to discharging to a sanitary sewer). In some cases Bio-P processes are not applicable to certain industries because biological treatment is not needed to remove other pollutants generated in the industrial process wastewater.

For the estimation of costs, industrial plants are described according to industrial categories rather than by size or flow as in the case of municipalities. This is primarily because dry versus wet weather flow is typically not applicable to industrial plants. Although a range of process wastewater flows and pollutant loadings may occur, a specific industry typically generates a certain pollutant concentration level and loading, which is related primarily to the industrial category and the specific industry's production rate. For example an industry category may generate a specific mass loading (e.g., pounds per day) of a pollutant per production rate. In addition, pollutant characteristics vary from one industrial category to another. Some industries generate minimal amounts of phosphorus in their wastewater, such as mining and power generating facilities. In some cases industrial wastewater with biological treatment processes are phosphorus deficient with respect to nutrient requirements, and therefore may need to add phosphorus for efficient biological treatment to occur. For other industry categories, for example food processing, dairy related production, rendering, meat processing, etc., high concentrations of TP are often generated in the process.

Therefore, the applicability of the proposed extension of the TP limit is very industry specific. Some industries within an industrial category may not discharge wastewater but treat wastewater via land application systems. In those instances treatment technologies to remove TP are usually not applicable or required and there will be no costs. To analyze the cost for removal of TP at industries, an evaluation of industries which may discharge significant loadings of TP was completed. Examples of these industries include, but are not limited to, wet mill corn processing, food processing, beet sugar processing, dairy processing, rendering and pulp and paper. As a starting point, calculations were completed to determine the existing TP discharge mass loadings from industries discharging to a receiving water in Minnesota. Total capital and annual operation and maintenance (O&M) costs are estimated.

It is difficult to predict over what time frame the estimated costs will be incurred by Minnesota industries. The Agency can't be sure which types of industries may expand or be newly constructed over the next five years. Industrial development is dependent on many factors, most prominently market conditions. Therefore, determining which industries may potentially expand or construct new facilities, and subsequently generate TP to levels of concern (>1,800 pounds TP per year), is an estimate at best. The following assumptions were used to determine the number of new or expanded facilities expected to generate at least 1,800 lbs of phosphorus per year in process wastewater:

1. The Agency assumes the costs estimated in this analysis will be incurred over a five-year period, which correlates with the term of NPDES permits. Only three of the TP limits given to roughly 14 industries over the last five years are attributed to the Phosphorus Strategy (Exhibit PL-11), which is an indication of the number that may get limits over the next five years due to this proposal. For the purpose of estimating costs, the Agency is projecting that about six facilities in the seven categories described below may get TP limits (Table II-32).
2. Only industries that may generate TP in wastewater at appreciable levels that may trigger a TP treatment or removal requirement were evaluated.

3. A flow and TP concentration level in the effluent was used for a specific industry category based on TP and flow information from the Agency's discharge monitoring reports (DMR) for specific existing industrial permittees.
4. If flow and TP concentration information are not available from DMRs, information from EPA categorical development documents and literature were used.

The following industries that generate TP at levels that may trigger a TP discharge limit and would also potentially discharge to a receiving water were used in this analysis:

Ethanol Industry. The ethanol industry in Minnesota is expanding rapidly with several new plants anticipated. Costs are considered for one new ethanol production plant and one expanding plant. New ethanol plants recycle and internally treat all process wastewaters which contain high organic loadings. Therefore, no process wastewater is discharged. However, ethanol plants must pre-treat water used in the production process, typically using reverse osmosis systems, and they also discharge cooling tower blowdown. In most cases TP is kept at relatively low levels in the discharge. However, in some cases greater amounts of TP may be generated and potentially discharged. This may be due to the higher levels of TP in the source water. Phosphorus may also be used as an additive for cooling tower treatment purposes, and in addition the "concentration effects" of reverse osmosis and closed cycle cooling tower systems serve to increase TP concentrations. Therefore, one new ethanol plant was evaluated which may trigger a TP discharge limit. In general, however, ethanol plants do not comprise a significant source of TP to receiving waters.

The second example is an ethanol plant in Minnesota planning an expansion, and assumed to have TP levels in the discharge that will exceed 1,800 pounds per year.

Dairy Processing Industry. Dairy processing generates TP, sometimes at significant levels, due to TP in raw materials and cleaning processes. Most of these plants use land application as a wastewater treatment technology and do not discharge to receiving water. However, for purposes of estimating costs we assume one dairy processing facility with a discharge to receiving water is expanding, and will discharge above the *de minimis* amount.

Rendering Industry. Animal rendering is a potential industry which may undergo expansion in the current market. We assume one facility will expand over the next five years.

Poultry Processing Industry. An expanding chicken processing plant was selected to represent a food or meat processing industry expansion. Minnesota has a relatively high number of food processing facilities, although many of these plants do not directly discharge to receiving waters but use land application as a wastewater treatment technology.

Corn Processing Industry. The corn processing industry employing wet milling may potentially undergo expansion due to market conditions.

Pulp and Paper Milling Industry. Pulp and paper mills have completed a number of expansions in the past 10 to 15 years in Minnesota, and while future expansions may be possible they are likely to be limited within the next five years.

Refining Industry. Expansion of existing petroleum refining may occur in the next five years due to market conditions.

In addition to the seven categories listed above, there are a number of other industrial categories that could potentially undergo an expansion or be proposed for new construction within Minnesota in the next five years. However, most industrial expansions and/or new industry construction are related to industries that do not generate TP or generate TP at minimal levels. Therefore, these industries, for example power cogeneration, mining, power plants, etc., are not included in this analysis.

2. Estimated Costs by Industry Category [XI.E TP limit, economics]

The Agency anticipates that the economic impact of the proposed extension of the TP limit on industries that do not already have an existing TP discharge limit and discharge directly to a receiving water, is likely to be relatively minimal. If anything, we believe the estimated costs shown in Table II-32 are likely to overstate the true costs.

Estimates for capital and O&M costs to meet a 1.0 mg/L TP effluent concentration are shown in Table II-32. Annualized capital cost is based on 20 year useful life (equivalent uniform annual cost) and an eight percent interest rate. The costs for the industry examples listed in Table II-32 represent our estimates for the industries likely to be impacted over approximately a five-year period. The $1.115 million total figure in Table II-32 represents the estimated **annual amortized** capital costs plus the **annual** O&M costs for all eight examples.

Table II-32. Estimated Total Average Capital and Annual O&M Costs for TP Removal for Seven Categories of Industries (see text below).

Industry	Flow MGD	Influent TP mg/L (range)	Capital Cost $ millions	Annualized Capital Cost $ millions	Annual O and M $ millions	Total Annual Cost $ millions
New Ethanol Plant	0.25	2.4 (low)	0.92	0.094	0.08	0.174
Expansion Ethanol Plant	0.278	2.38	0.92	0.094	0.08	0.174
Dairy Processing	seasonal pond discharge	3.53	0.08	0.008	0.035	0.043
Rendering Plant	Seasonal pond discharge	8.25	0.15	0.015	0.08	0.095
Poultry Processing Plant	1.10	6.98	0.90	0.092	0.125	0.217
Corn Wet Milling Plant	1.50	11.65	0.70 to 1.3	0.132	0.20 to 0.28	0.412
Pulp and Paper Plant	11.62	2.625	0	0	0	0
Petroleum Refining	4.25	0.73	0	0	0	0
Total (all plants)			**4.27**	**0.435**	**0.68**	**1.115**

Ethanol. Estimates for the new ethanol plant are based on a hypothetical plant with a production level of 50 million gallons ethanol per year or more, discharging reverse osmosis and cooling tower blowdown wastewaters at a continuous rate of about 0.25 mgd, with an anticipated TP generated per year at 1,800 lbs. The TP removal is anticipated to occur through a chemical addition treatment system added to the end of the treatment process already in place (chemical storage, chemical feeding equipment and pumps, rapid mixing, coagulation and flocculation, and clarification). The estimated total capital cost of this system is estimated to be $920,000 with annual O&M costs of $80,000.

Estimates for an expanding ethanol plant are based on a plant assumed to expand from a production rate of about 45 million gallons to about 57 million gallons of ethanol per year. Flow is continuous and is estimated to increase from an average of 0.2 mgd to an expanded flow rate of 0.3 mgd. TP generated annually and discharged would be projected to increase from a current level of about 1,460 lbs per year to 2,190 lbs per year, at an effluent concentration of 2.4 mg/L. As for the new ethanol plant, TP removal is anticipated to occur post process wastewater treatment through chemical addition (chemical storage, chemical feeding equipment and pumps, rapid mixing, coagulation and flocculation, and clarification). The estimated total capital cost of this system is estimated to be $920,000 with annual O&M costs of $80,000.

Dairy Processing. Estimates for the dairy processing plant are based on a 20 percent hypothetical expansion of a milk processing rate of about 1.25 million pounds per day into natural and aseptic cheese and whey products. Current TP discharged is about 3,100 lbs/year, average TP concentration of effluent discharged is 3.5 mg/L, with a discharge flow average of 2.2 mgd based on a total discharge of about 90 million gallons per year. Wastewater treatment at the plant consists of the screening, dissolved air flotation, holding tank, two trickling filter towers, a 2.5 million gallon oxidation ditch, final clarification, and a two-cell stabilization pond system consisting of a 19-acre primary cell and a 15-acre secondary cell. Treated effluent is stored in the stabilization ponds and is discharged seasonally (spring and fall, totaling 52 days in 2005).

Based on a 20 percent expansion of the dairy processing production rate, a proportional increase in flow and TP mass load was used to estimate costs. Effluent TP concentration (untreated) remains the same. Because of the seasonal discharge, TP removal would be anticipated to be achieved most cost effectively through chemical addition at the existing final stabilization pond (chemical addition to pond method), with chemical addition used seasonally. A capital cost of $80,000 is based on boat application and chemical feed equipment for seasonal treatment only. An annual O&M cost of about $30,000 is based on alum treatment cost of $8.00 per pound phosphorus.

Rendering Plant. The rendering plant example is based on a theoretical 20 percent expansion of a rendering plant. The principal activity at the rendering plant is the rendering, feather processing, hide curing, and pet food processing from animal meat by-products. The facility currently processes approximately 300,000 tons of raw materials (meat by-products) each year. Currently the TP mass discharged is about 8100 lbs., the total discharge flow was about 136 million gallons, and the average TP concentration in the discharge was 8 mg/L. Based on a 20 percent expansion of the plant production rate, a proportional increase of 20 percent flow and TP mass load generated was used to estimate costs. TP concentration (untreated) remains the same. Wastewater from the rendering plant is treated at a series of wastewater treatment ponds including an anaerobic pond, four aerobic ponds, two aerated holding ponds and a final polishing pond. The discharge occurred intermittently for 95 days via the final polishing pond throughout the year (intermittently for eight months in 2005).

It is possible that chemical precipitation for TP removal could be accomplished in this system by pond treatment application at the final polishing pond, discharging on an intermittent basis. It would be more efficient to adjust operations such that only periodic additions of chemical to the final polishing pond are made, by extending the periods of time for discharge. The capital cost for pond application method for chemical precipitation is estimated at about $150,000 with annual O&M at about $80,000 based on a cost of about $8.00 per pound phosphorus treated.

Poultry Processing. The poultry processing plant example is based on a theoretical 20 percent expansion of a poultry processing plant. The plant processes chickens at an average rate of 170,000 birds per day, five days per week. The plant packages whole, cut-up, chill pack, marinated, and de-boned chicken, and stores these products in coolers until shipped, either fresh or frozen. It is assumed that the plant currently discharges 19,375 lbs. of TP per year at a total annual flow of 332 million gallons, and an average TP concentration in the discharge of 7.0 mg/L. Based on a 20 percent expansion of the plant production rate, a proportional increase of 20 percent flow and TP mass load generated was used to estimate costs. TP concentration (untreated) remains the same. Wastewater treatment at the plant consists of screening, grit removal, final screening, dissolved air flotation, equalization, activated sludge, final clarification, tertiary filtration (for recycle of treated effluent for process waster makeup), and UV disinfection. The effluent is discharged continuously. The TP removal technology would likely occur by chemical addition treatment utilizing the existing final clarifiers with modifications (adding chemical storage and feeding systems, and rapid mixing for the alum and/or ferric chloride feed). Additional sludge handling capacity could be required. The estimated capital cost for the modifications required to the wastewater treatment system are $900,000 (includes additional sludge handling) with annual O&M at $125,000.

Corn Wet Milling. The corn wet milling plant example is based on a theoretical 20 percent expansion of a corn wet milling plant. The existing corn wet milling plant is assumed to have a production capacity of about 180,000 bushels of corn per day and processes corn into corn syrup, fructose, gluten, fiber feed, and ethanol. It is assumed that the plant currently discharges 42,000 lbs. of TP per year at a total annual flow of 420 million gallons (~ 1.15 mgd), and an average TP concentration in the discharge of 12 mg/L. Based on a 20 percent expansion of the plant production rate, a proportional increase of 20 percent flow and TP mass load generated was used to estimate costs. TP concentration (untreated) remains the same. Wastewater treatment at the plant consists of equalization, anaerobic fluidized bed reactor, sequential batch reactors (aerobic system), effluent equalization, polymer feed, sand filtration, and effluent aeration. The TP removal technology would likely occur by chemical addition treatment utilizing the existing treatment system with chemical addition prior to sand filtration. Modifications would be required including addition of chemical storage and handling systems, rapid mixing for the alum and/or ferric chloride feed). Additional sand filtration capacity could be required. The estimated capital cost for the modifications required to the wastewater treatment system are $700,000 with annual O&M at $200,000. If additional sand filtration capacity is needed due to TP treatment the additional capital cost to add a pressurized sand filter is estimated at about $600,000 with an additional annual O&M cost of about $80,000.

Pulp and Paper. The pulp and paper example is based on a theoretical 20 percent expansion of a pulp and paper mill. The hypothetical paper mill manufactures uncoated and coated publication grade (magazine) paper using groundwood pulp via thermo-mechanical process, purchased bleached kraft pulp, and other raw materials. The mill produces 240 tons/day of supercalendered printing paper, 480 tons/day of coated magazine grade paper, and 360 tons/day of thermo-mechanical pulp. It is assumed that the plant currently discharges 76,000 lbs. of TP per year at a total annual flow of 3,500 million gallons (~ 9.6 mgd), and an average TP concentration in the discharge of 2.6 mg/L. Based on a 20 percent expansion of the plant production rate, a proportional increase of 20 percent flow and TP mass load generated was used to estimate costs. The untreated TP concentration remains the same. Wastewater treatment at the mill consists of cyclone degritting, polymer feed, primary clarification, nutrient feed system, activated sludge, final clarification, activated sludge reaeration, and sludge processing equipment.

Under normal conditions pulp and paper mill influent wastewater is nutrient deficient and phosphorus and nitrogen must be added to provide for efficient biological wastewater treatment. In most cases the chemical addition is managed such that only the required mass of phosphorus and nitrogen are added, and the effluent TP is usually well below 1.0 mg/L. For example, a pulp and paper mill in Minnesota achieves an average effluent TP of 0.40 mg/L by managing the nutrient feed ratios properly. For this mill the expectation is that through proper management of nutrient feed rates of phosphoric acid and ammonia, in accordance with established BOD:nitrogen:phosphorus treatment ratios, the TP in the effluent will be reduced to well below a 1.0 mg/L concentration[75]. Therefore, there would be no capital and O&M costs to meet a 1.0 mg/L TP in the effluent.

Petroleum Refining. The petroleum refining example is based on a theoretical 18 percent expansion of a petroleum refinery. The refinery processes crude oil at a rate of about 280,000 barrels per day into petroleum products such as gasoline, diesel, propane, butane, heating fuels, asphalt, sulfur, petroleum coke, and jet fuel. It is assumed that the refinery currently discharges 7,600 lbs. of TP per year at a total annual flow of 1,300 million gallons (~ 3.56 mgd), and an average TP concentration in the discharge of 0.7 mg/L. Based on a possible 18 percent expansion of the plant production rate by 50,000 barrels per day, a proportional increase of 18 percent flow and TP mass load generated was used to estimate costs, although flow would not necessarily be expected to increase by 18 percent due to potential internal recycling. TP concentration (untreated) remains the same or less. Wastewater treatment at the refinery consists of oil/water separation, dissolved air flotation, activated sludge process, powdered activated carbon system, final clarification, and polishing ponds, in addition to in-plant process water recycling and reuse systems.

Phosphorus may be added to refinery cooling water systems for scaling control, and pose a limited TP contribution source in the wastewater from cooling tower blowdown. However, phosphorus concentrations in refinery process wastewaters are generally low. The refinery has maintained TP levels in the treated effluent through proper management of phosphorus additions and maintaining overall wastewater treatment efficiency. Powdered activated carbon addition may also serve to lower TP by removal of particulate attached phosphorus. Expansion of refinery production would not cause an increase in the effluent TP concentration beyond current levels. Accordingly there would be no costs expected for TP removal as a result of a refinery expansion. Also, current Agency policy is to not impose a TP limit on facilities that discharge at a concentration less than 1 mg/L, unless the discharge impacts or is expected to impact a downstream lake.

In summary the Agency has estimated potential costs to seven categories of industries that potentially may get TP limits due to the proposed extension of the TP limit to new and expanding facilities that discharge more than 1,800 pounds TP per year. Projected cost for two of the seven categories is zero. While it is very difficult to predict the number of industries likely to be impacted over the next five years, the Agency has estimated costs for eight examples (one new and one expanded ethanol plant plus the other six, Table II-32). Costs will be incurred

[75] As of June 2006 the pulp and paper mill on which our example is based indicated to the Agency that they would be making changes to substantially reduce the TP concentration in their effluent to below 1 mg/L, possibly significantly below 1 mg/L.

over time. The total estimated capital costs are $4.27 million and the annual operational and maintenance (O&M) costs are $0.68 million (Table II-32). The estimated total (annual) cost for five years (annualized capital cost times 5 plus 5 years of O&M) is about $5.6 million, and the total costs (total capital cost plus 5 years of O&M) is about $7.8 million.

Current Agency policy is to not impose a TP limit on facilities that discharge at a concentration less than 1 mg/L, unless the discharge impacts or is expected to impact a downstream lake or reservoir.

F. TRUE COSTS DUE TO PROPOSED EXTENSION WILL BE FAR LESS THAN FULL ESTIMATES [XI. TP limit, economics]

As noted in the introduction to this Section, there are several reasons why much of the costs for removing TP from municipal and industrial dischargers, as discussed in the previous two sections, **cannot** be attributed just to the proposed extension of the TP effluent limit in this rulemaking. The Agency believes it is better to start with full cost estimates, which can be determined with some degree of accuracy, and then discuss the reasons why a significant portion of these costs should not be attributed to the proposal. Determining exactly what fraction of the total future costs should be attributed to the proposed extension of the TP limit is very difficult. The reasons full costs should not be attributed to the proposal have been mentioned throughout the *reasonableness* sections and will be summarized in this Section.

1. There has been a clear trend over the last five years that as permits are reissued, especially when a facility expands (or builds new), that the permit will include a limit for phosphorus. There are a number of reasons for this. A general reason is the increased awareness that phosphorus is a conservative (not degraded over time) pollutant of major concern not only for lakes but for rivers and stream as well, and the growing number of waterbodies (mostly lakes) listed as impaired due to nutrients. Phosphorus removal generally provides a higher quality effluent, lower in suspended solids and possibly lower in $CBOD_5$. Reduced solids generally mean lower effluent concentrations of some other pollutants such as mercury.

2. TP effluent limits have been issued to new and expanding facilities under the Phosphorus Strategy. About 35 facilities have gotten limits that can be attributed to the strategy since the Strategy was approved in March of 2000. To a large extent the proposed extension of the TP limit to new or expanding facilities is already being implemented, and has been for five years, as Agency policy under the Strategy.

3. TP limits are being or will be required in several major watersheds in Minnesota, which includes a large portion of the state (see Section IX.D).

- Lake Superior basin: 1 mg/L TP limits under existing Minn. R. 7065.
- Minnesota River TMDL: seasonal TP limits for about 40 larger dischargers.
- Lake Pepin TMDL: the implementation plan for this TMDL has not been completed yet but it seems likely that any plan would include 1 mg/L TP limits for at least the larger facilities. The Lake Pepin watershed includes half of the area of Minnesota.

- St. Croix: newly signed interstate agreement reinforces a previous goal to reduce TP loading to Lake St. Croix by 20 percent. Most permits reissued for facilities in the basin include a TP limit.
- Rainy River basin: there is increased concern about the eutrophication of Lake of the Woods. The Rainy River watershed makes up 80 percent of the lake's drainage basin, which means the TP concentrations in the river most certainly have a major impact on the trophic status of this very large lake. The Rainy River basin plan calls for managing TP loading to surface waters to minimize impacts.
- Basin plans for the Red, Lower Mississippi and Cedar Rivers have established nutrient reduction goals.

4. The discharge of a pollutant(s) to a waterbody listed as impaired for that same pollutant(s) is controlled by federal requirements. A new discharge to any waterbody cannot cause or contribute to a violation of water quality standards (40 CFR 122.4(i)). Also the Agency cannot issue a permit to an existing facility that would cause, have reasonable potential to cause, or contribute to an exceedance of a water quality standard (40 CFR 122.44(d)(1)(i)). Since impaired waterbodies by definition exceed one or more water quality standards, additional loading of the pollutant(s) causing the impairment is severely limited.[76]

These federal regulations would require TP limits in situations involving impaired waters even if the proposed eutrophication standards and extension of the TP limit are not adopted. The nutrient criteria, based on the existing narrative standard in Minn. R. 7050.0150, subp. 5, would continue to be the basis for assessing lakes for impairment. The proposed eutrophication standards will provide a more precise assessment benchmark and a more direct vehicle to assess lakes. Also, expanded application of the nutrient criteria in the setting of effluent limits is a possibility in the future.

5. Permittees may request relief from the extension of the TP limit through one or more of the three proposed exemptions or through the variance process. The estimated costs for POTWs and industries discussed in the previous two Sections assume the Agency will receive no requests for relief.

6. The Clean Water Legacy Act passed by the 2006 legislature and signed by the Governor provides funding to help pay for phosphorus removal. In its first year the act provides grants totaling $3.2 million to cover 75 percent of the capital cost for TP removal infrastructure. The money can go to communities building new or to cover costs already incurred retroactively; however, new construction will be given priority. Requests for funding have already exceeded the first year's allocation of funds. The Agency is hopeful the legislature will continue funding TP removal and will increase the allotment.

7. TP limits will be implemented gradually over time. First the facility must expand or build new and exceed the *de minimis* loading of 1,800 pounds TP per year after May 1, 2008. The

[76] A test of the Agency's interpretation of the federal requirements was provided by a challenge to the issuance of the NPDES permit for a proposed new Annandale/Maple Lake treatment plant. On May 17, 2007 the State Supreme upheld the Agency's authority to interpret the Clean Water Act and issue the Annandale/Maple Lake permit as proposed, reversing the findings of the lower courts.

issued permit normally includes a compliance schedule which gives the community time to complete construction and bring the new treatment components on line before the limit becomes effective.

XII. IMPACTS ON AGRICULTURE

Minnesota Statute § 14.111 requires agencies to send a copy of any proposed rule that affect farming operations to the Commissioner of Agriculture no latter than 30 days prior to publication of the proposed rule in the *State Register*. The Agency maintains that the proposed amendments to Minn. R. ch. 7050 and Minn. R. ch. 7053 discussed in Book II of the SONAR will have no direct affect on farming operations. The proposed eutrophication standards might have an indirect impact on agriculture if they result in the implementation of best management practices to minimized nutrient loading to lakes. The Agency has not attempted to estimate these very hypothetical costs as discussed Section X.C.

On April 18, 2007, the Agency sent a letter, together with a draft copy of the proposed rule amendments, to the Commissioner of Agriculture well in advance of the targeted *State Register* publication date. The letter, which will be introduced as an exhibit at the beginning of the public hearings, highlighted the proposed water quality standards for two herbicides, acetochlor and metolachlor. Staff in the Department of Agriculture asked the Agency to develop and adopt standards for these two herbicides because they have been detected in Minnesota's surface waters. The Agency has received substantial help and support in preparing the information supporting the proposed standards from the Department of Agriculture. These proposed standards are discussed in SONAR Books III. Department of Agriculture staff and other representatives of the agricultural community are on the Agency's interested party contact list for this rulemaking.

XIII. NOTICE TO THE COMMISSIONER OF TRANSPORTATION

Minnesota Stat. § 174.05, subd. 1 requires the Agency to inform the Commissioner of Transportation of all activities which relate to the adoption, revision or repeal of any standard or rule concerning transportation. A representative of the Minnesota Department of Transportation (MDOT) is on the Agency's interested party contact list and received all the notifications discussed in Section III of SONAR Book I. The proposed revisions discussed in this Book will have no direct affect on transportation. As the case for agriculture, the proposed eutrophication standards might have an indirect impact on transportation if they result in the implementation of more extensive or more expensive best management practices at road construction and repair sites to minimized nutrient loading to lakes. The Agency has not attempted to estimate or quantify these hypothetical added costs because there are too many unknowns, as discussed Section X.D.1. On April 18, 2007, the MPCA sent a letter, together with a draft copy of the proposed rule amendments, to the Commissioner of MDOT. The letter will be introduced as an exhibit at the beginning of the public hearings.

In an earlier letter, the Agency informed MDOT that we would not be revising the Class 2 standard for chloride as they had requested (see Section III.F in Book I and Exhibits A-14j and A-22).

XIV. LIST OF WITNESSES AND EXHIBITS

A. WITNESSES

The Agency plans to have the following staff available to testify at the public hearings on issues covered in Book II. The principal areas on which they would testify are listed.

<u>David Maschwitz</u> – The proposed amendments in general, history of their development and author of SONAR Book II.
<u>Steve Heiskary</u> – Lake and river eutrophication sampling and assessment process, proposed Minnesota eutrophication standards and development of federal nutrient criteria.
<u>David Kortan</u> – Estimated costs to dischargers due to the proposed adoption of the eutrophication standards and treatment technologies for removing phosphorus.
<u>Mark Tomasek</u> – Supervisor of Water Standards Unit. Proposed extension of the phosphorus limit to new and expanding dischargers and the setting of TP limits in NPDES permits.
<u>Randy Thorson</u> – Estimated costs to municipalities due to the proposed extension of the phosphorus limit to new and expanding dischargers and treatment technologies for removing phosphorus.
<u>Don Kriens</u> – Estimated costs to industries due to the proposed extension of the phosphorus limit to new and expanding dischargers and industrial treatment technologies

B. EXHIBITS

The list of all exhibits is attached.

XV. CONCLUSION

Based on the foregoing, the proposed rule amendments discussed in SONAR Book II are both needed and reasonable.

Dated: 7/16/09

Brad Moore
Commissioner

Exhibit List: Statement of Need and Reasonableness, Books I-III

A-1 **Statement of Need and Reasonableness, Book I of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
July 2007 Book I of III

A-2 **Statement of Need and Reasonableness, Book II of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
July 2007 Book II of III

A-3 **Statement of Need and Reasonableness, Book III of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
Book III of III

A-4 **Statement of Need and Reasonableness (SONAR): In the Matter of Proposed Additions To Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; Proposed Additions Required By Minnesota Session Law 2003, Chapter 128, Article 1, Section 156 As Amended By Minnesota Session Law 2005, First Special Session, Chapter 1, Article 2, Section 156**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
May 2006 http://www.pca.state.mn.us

A-5 **Exhibit List for Statement of Need and Reasonableness, Books I-III**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
July 2007

A-6 **2006 303(d) List. (Final 2004 MPCA Clean Water Act Section 2004 303(d) Total Maximum Daily Load (TMDL) List of Impaired Waters)**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Publication MPCA St. Paul
June 1, 2006 http://www.pca.state.mn.us
The List identifies impaired streams and lakes in ten major River Basins.

A-7 **Guidance Manual For Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) Report and 303(d) List**

Author: Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Guidance MPCA St. Paul
October 2005 pp1-106 & Appendices http://www.pca.state.mn.us/water/tmdl/index

URL: See first document under "publications"

A-8a **Subject: Triennial Review -Revised**

From Larry C. Salmela, Department Manager - Environmental, United States Steel Corporation (USS)
Comment Letter Mount Iron
September 22, 2003
To Mr. Marvin Hora, Environmental Outcomes Division, MPCA

A-8b

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)
Comment Letter
October 31, 2003
To David Maschwitz and Greg Gross, Environmental Outcomes Division, MPCA
Follow-up to Meeting on October 24, 2003 in New Ulm, Minnesota

A-9 Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052
Author: Minnesota Pollution Control Agency (MPCA)
Public Notice State Register (SR) St. Paul
November 10, 2003 Vol 28 (19), pp.614-5

A-10

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Letter MPCA St. Paul
November 6, 2003 http://www.pca.state.mn.us
To Interested Parties for 7050, 7052 and 7055 Water Quality Rules
1st Notice to mailing list. MPCA Cover Letter with State Register Notice to Interested Parties for 7050, 7052 and 7055.

A-11a Subject: State Register of November 10, 2003 - Possible Amendments to Rules Governing State Water Quality Standards
From Larry C. Salmela, Department Manager - Environmental, United States Steel Corporation (USS)
Comment Letter Mount Iron
December 12, 2003
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Comment Letter from 1st Notice.

A-11b Subject: Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052
From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB), Christopher M. Hood, Flaherty & Hood, P.A.
Comment Letter
December 31, 2003
To David Maschwitz, Environmental Outcomes Division, MPCA
Comment Letter from 1st Notice.

A-11c Subject: Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052
From Rebecca J. Flood, Manager - Environmental Compliance Section, Environmental Services Division, Metropolitan Council
Comment Letter St. Paul
December 31, 2003
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Comment Letter from 1st Notice.

A-11d Subject: Proposed Water Quality Standards Rules Revision Invitation to Comment
From Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy (MCEA)
Comment Letter St. Paul
January 9, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Comment Letter from 1st Notice.

A-11e Subject: Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052
From Keith E. Hanson, Minnesota Chamber of Commerce Water Quality Subcommittee - Chair
Comment Letter St. Paul
December 31, 2003
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Comment Letter from 1st Notice.

A-11f Subject: Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Steven Colvin, Environmental Management Unit Supervisor, Division of Ecological Services, Minnesota Department of Natural Resources (MDNR)

Comment Letter St. Paul

December 31, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11g Subject: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process… (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

September 29, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-11h Subject: RE: MPCA WQ Standards Rule Revision…

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

September 29, 2003

To David Flakne, Syngenta

Comment Letter from 1st Notice.

A-11i Subject: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process… (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

December 19, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice. 3 Attachments:
EPA DWLOC Values iRED.ppt; EPA LOC CASM Screening Values…; US EPA Atrazine Aquatic Life Water Quality (see Exhibit H-59)

A-11j Subject: RE: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process…

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

December 22, 2003

To David Flakne, Syngenta

Comment Letter from 1st Notice. Attachment: Atrazine U.S. EPA.doc

A-11k Subject: Syngenta Comments/Questions on MPCA Proposed Revisions to WQ Standards 7050 and 7052… (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

May 25, 2004

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice. Comment Letter from 1st Notice. 3 Attachments:
EPA DWLOC Values iRED.ppt; EPA LOC CASM Screening Values…; US EPA Atrazine Aquatic Life Water Quality

A-11l Subject: RE: Syngenta Comments/Questions on MPCA Proposed Revisions to WQ Standards 7050 and 7052…

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

May 25, 2004

To David Flakne, State Government Relations Manager, Syngenta Crop Protection

Comment Letter from 1st Notice.

A-12 Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

Minnesota Pollution Control Agency (MPCA)

Public Notice State Register (SR) St. Paul

May 17, 2004 Vol 28(46); pp.1464-7

Notice to solicit in SR, May 17, 2004

A-13

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Letter
May 11, 2004
To Interested Party
Cover Letter & Mailing List - 2nd Notice

A-14a Subject: Water Quality Rule Revisions

From Paula West, Executive Director, Minnesota Lakes Association (MLA)
e-mail Brainerd
May 13, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14b Subject: Proposed Extension of 1 mg/L Phosphorous Effluent Limit to New or Expanding Discharges

From Steven Colvin, Environmental Management Unit Supervisor, Division of Ecological Services, Minnesota Department of Natural Resources (MDNR)
Letter St. Paul
May 14, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14c Subject: RE: Syngenta Comments/Questions on MPCA Proposed Revision to WQ Standards Chapter 7050 and 7052… (Importance: High)

From David Flakne, State Government Relations Manager, Syngenta Crop Protection
e-mail Madison
May 25, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14d

From Crosby-Ironton Presbyterian Church
Letter Crosby
June 11, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Re: Upholding Strict Standards to Protect Water Quality in Our State

A-14e Subject: Clean Water/Public Input

From Tine Thevenin, Author/Speaker
e-mail Lake City
June 18, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14f Subject: Request for Development of Water Quality Standards

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)
Letter St. Paul
June 23, 2004
To Greg Gross, Environmental Outcomes Division, MPCA

A-14g Subject: Mercury Comments

From Donald Barron
Comment Letter Thief River Falls
Received June 24, 2004
To Environmental Protection Agency Administrator, Ariel Rios Building (Washington, D.C.)
Copy Mailed To: David E. Maschwitz, Environmental Outcomes Division, MPCA, St. Paul, MN

A-14h Subject: Comments - Proposed Changes to MS Ch. 7050

From Terry Noonan, Project Manager - Water Resources, Ramsey County Public Works
e-mail Shoreview
June 25, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14i **Subject: Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052**

From Al Christopherson, President, Minnesota Farm Bureau Federation (MFBF)
Comment Letter
June 28, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
with Cover Letter (e-mail from Jackie Gauger sent on June 29, 2004)

A-14j **Subject: Mn/DOT Comments on Water Quality Standards Revision**

From Richard Elasky, Chief Environmental Officer, Minnesota Department of Transportation (MNDoT)
Comment Letter St.Paul
June 29, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
3 Attachments: Derivation of Acute and Chronic Toxicity Criteria for Chloride (January, 2000) prepared by: Jim Schmidt -WDNR; Chronic Data - Chlorides spread sheet provided by Jim Schmidt -WDNR; Ambient Aquatic Life Criteria For Chloride -Chloride Issue Paper (2003) provided by Connie Due - Iowa DNR, Environmental Services Division, Water Quality Bureau

A-14k **Subject: MESERB/CGMC Data Practices Act Request Relative to Proposed Amendments to the Phosphorus Rule, Minn. R. 7050.0211, subp. 1a**

From Chistopher M. Hood, Flaherty & Hood, P.A.
Letter St. Paul
June 30, 2004
To Commissioner Sheryl Corrigan
Included an Attached Memo (Exhibit A-14l)

A-14l **Subject: Supplemental Data Practices Act Request**

From Christopher M. Hood, Flaherty & Hood, P.A. for Coalition of Greater Minnesota Cities (CGMC)
Letter St. Paul
July 16, 2004
To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

A-14m **Subject: Proposed Water Quality Standards Rule Revision Invitation to Comment**

From Sol Simon, President - Mississippi River Revival (MRR)
Comment Letter Winona
June 30, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-15a **Proposed Amendments to Minnesota Rules Chapter 7050 [RULES AS PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)
Rule MPCA St. Paul
July 16, 2007 wq-rule1-02

A-15b **Proposed New Minnesota Rules Chapter 7053 [RULES AS PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)
Rule MPCA St. Paul
July 16, 2007 wq-rule1-03

A-16 **NEWS RELEASE: MPCA Seeks Input on Proposed Changes to State Water-Quality Standards**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Publication MPCA St. Paul
For Release: June 4, 2004 http://www.pca.state.mn.us
News Release for the public meetings

A-17 Subject: Plans for Additions and Revisions to Water Quality Standards in Minn. R. chs. 7050 and 7052

From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo St. Paul

September 23, 2003

To MPCA's Citizens' Board

with cover letter to interested parties from David Maschwitz dated September 12, 2003, and list of 59 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on September 23, 2003)

A-18 Triennial Review of Water Quality Standards, Minn. R. ch. 7050 & 7052

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation St. Paul

September 23, 2003

For MPCA's Citizens' Board

PowerPoint presentation

A-19 Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards

From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo St. Paul

August 13, 2004

To MPCA's Citizens' Board

with cover letter to interested parties dated August 16, 2004, and list of 72 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on August 24, 2004)

A-20 Update of Plans to Revise MN Water Quality Standards

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation St. Paul

August 24, 2004

To MPCA's Citizens' Board

PowerPoint presentation

A-21 Health Risk Limits for Groundwater Water Intake and Cancer Potency Adjustment Factors

Author: Helen Goeden, Ph.D., Minnesota Department of Health (MDH)

Presentation St. Paul

August 24, 2004

To MPCA's Citizens' Board

PowerPoint presentation - New MDH Slides

A-22 Subject: Request for Change to the Class 2 Standard for Chloride

From Marvin E. Hora, Manager, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

September 24, 2004

To Mr. Richard Elasky, Chief Environmental Officer, Minnesota Department of Transportation (MNDoT)

A-23 Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo St. Paul

September 21, 2004

To MPCA's Citizens' Board

Cover letter to interested parties; 2 Attachments; Agency Board Meeting was on September 28, 2004.

A-24 Update of Plans to Revise MN Water Quality Standards

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation St.Paul

September 28, 2004

To MPCA's Citizens' Board

PowerPoint presentation

A-25 2003 Administrative Rule Preliminary Proposal Form

Author: David E. Maschwitz, Environmental Outcomes Division, MPCA

Form MPCA St. Paul

October 27, 2003

with cover memorandum To: Scott Wiggins, Legislative Coordinator; From: Kevin Molloy, Water Quality Rule Coordinator; 1st of three forms to the Governor's Office

A-26 2007 Admistrative Rule Proposed Rule and SONAR form: Minnesota's Water Quality Standards, Proposed Revision of Minnesota Rules Chapter (Minn. R. Ch.) 7050, Proposed Addition of a New Rule, Minn. R. Ch. 7053, Proposed Repeal of Out-dated Rules, Minn. R. Ch. 7056 and 7065

Author: David E. Maschwitz (Rule/SONAR Content) and Kevin Molloy (Rulemaking Coordinator), Minnesota Pollution Control Agency (MPCA)

Form MPCA

April 9, 2007 Adm. Rule Tracking #: AR081(B)

Attached to Memo: Letters to Commissioner Tom Hanson, Department of Finance, Commissioner Gene Hugoson, Minnesota Department of Agriculture, and Commissioner Carol Molnau, Minnesota Department of Transportation

A-27 No Exhibit

A-28 Petition for Rulemaking to the Minnesota Pollution Control Agency -Pursuant to Minnesota Statutes § 14.09 et seq.

From Chistopher M. Hood, Flaherty & Hood, P.A.

Petition St. Paul

December 15, 2003

To Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Includes cover letter to Commissioner Sheryl Corrigan Re: Petition to amend Minn. R. 7050.0211, subp. 1a (the "phosphorus rule")

A-29 Subject: Response to Petition to Amend Minn. R. 7050.0211, subp. 1a (the "phosphorus rule")

From Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

January 13, 2004

To Christopher M. Hood, Flaherty & Hood, P.A.

A-30 Phosphorus Rulemaking Petition

From Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy

Petition Minnesota Center for Environmental Advocacy (MCEA) St. Paul

July 27, 2004

To Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Includes cover letter (Re: Petition to Amend Minn. R. 7050.0211)

A-31 Subject: Petition to Amend Minn. R. 7050.0211

From Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

August 18, 2004

To Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy

(Response to MCEA's July 27, 2004 Petition)

A-32a Subject: MPCA Proposed Phosphorous Rule and Phosphorous Strategy Amendments

From Christopher M. Hood, Flaherty & Hood, P.A.

Letter St. Paul

June 30, 2004

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Attached Technical Memo from MESERB (see Exhibit A-32b)

A-32b **Subject: MPCA Approach to Phosphorus Effluent Limits in NPDES Permitting**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Memo — Alexandria

June 30, 2004

To Commissioner Sheryl Corrigan

Attachment to Exhibit A-14k

A-33

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

August 5, 2004

To Christopher M. Hood, Flaherty & Hood, P.A.

Response to Christopher Hood on the Minnesota Data Practices Act Request of June 30, 2004, and the Follow-up Request of July 16, 2004.

A-34 **Subject: Amendments to Phosphorus Rule, Minn. R. 7050.0211, subp. 1a**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter — Alexandria

February 11, 2005

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Additional Contact: Steve Nyhus, Flaherty & Hood, P.A.

A-35 **Subject: MPCA Proposed Water Quality Assessment Rules Revisions and Ecoregion-Based Eutrophication Standards**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter — Alexandria

March 18, 2005

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Additional Contact: Steve Nyhus, Flaherty & Hood, P.A.

A-36 **Subject: Response to MESERB February 11, 2005 Letter, Comments on Amendments to Phosphorus Rule; and March 18, 2005 Letter, Comments on Proposed Eutrophication Standards**

From Greg Gross, Supervisor, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

May 12, 2005 — pp.1-13 and pp.1-6

To Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Attachment: Draft Amendments to Minnesota Rules Chapter 7050; Excerpt of Planned Revision of Water Quality Standards

A-37a **Minn. Session Law 2003, ch. 128, art. 1, § 156, subdivisions 1 and 2 Water Quality Assessment Process**

Law — Minnesota Office of Revisor of Statutes — St. Paul

2003 — http://www.revisor.leg.State.mn.us

(Original Law)

A-37b **Minn. Special Session Law 2005 ch. 1, art. 2, § 151, subdivisions 1, 2 and 3 Water Quality Assessment Process**

Law

2005 — http://www.revisor.leg.State.mn.us

(Amendment to: Minn. Session Law 2003, ch. 128, art. 1, § 156, subdivisions 1 and 2)

A-38 **No Exhibit**

A-39 **No Exhibit**

A-40a **Subject: Critical Concerns Regarding Draft Nutrient Standards and Phosphorous Rule**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter Alexandria

June 16, 2005 pp.1-4

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

A-40b **Water Quality Standards: A Review with an Emphasis on Numeric Nutrient Criteria**

Author: Walt Poole, Ph.D., America's Clean Water Foundation (ACWF)

Report ACWF

March 2005 pp.6-31

In Cooperation with the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA)

A-41 **Subject: MESERB's Concerns Regarding Nutrient Standards and Phosphorous Rule**

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

June 29, 2005 pp.1-3

To Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

A-42a **Changes to Proposed Amendments to Minn. Rules, ch. 7050**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

March 9, 1990 pp.1-6

A-42b **Revised Changes to Proposed Amendments to Minn. Rules pts. 7050.0218, subp. 2 and 7050.0220, subp. 4**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

March 16, 1990

A-43 **No Exhibit**

A-44a **Sensitivity of Mussels to Ammonia Toxicity, Implications for a Revised Minnesota Ammonia Standard Considering the Biology and Distribution of Mussels in Minnesota**

Author: Minnesota Pollution Control Agency (MPCA)

Agenda MPCA St. Paul

March 25, 2004

Contact List on back

A-44b **Subject: Meeting at MPCA, 1:00-4:30p.m., March 25, 2004**
Sensitivity of Mussels to Ammonia Toxicity, Implications for a Revised Minnesota Ammonia Standard Considering the Biology and Distributions of Mussels in Minnesota

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

March 15, 2004

To Ammonia Toxicity Experts (see exhibit A-44c for list)

A-44c

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document St. Paul

2004

List of Attendees (for March 25, 2004 Mtg.: exhibit A-44b)

A-45 **Notice of Intent To Re-Evaluate the Aquatic Life Ambient Water Quality Criteria for Ammonia**

Author: Geoffrey H. Grubbs, Director, Office of Science and Technology, Environmental Protection Agency (EPA)

Public Notice Federal Register - Online via GPO Access Washington, D.C.

July 8, 2004 Vol 69(130); pp.41262-4 http://www.gpoaccess.gov/fr/index.html

A-46a **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

December 3, 2004 http://www.pca.state.mn.us

Included excerpts from Minn. Rule ch 7050 revisions (See Exhibit A-46b).

A-46b **Excerpts of Planned Revision of Water Quality Standards: Preliminary Draft Amendments to Minn. R. 7050.0150 and 7050.0222 - Relevant Definitions and Eutrophication Standards for Lakes, Reservoirs and Shallow Lakes [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule Minnesota Office of Revisor of Statutes St. Paul

November 1, 2004 http://www.pca.state.mn.us

Attachment to December 3, 2004 website, "Proposed Water Quality Standards Rule Revisions".

A-47 **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: June 16, 2005 http://www.pca.state.mn.us

A-48a **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: August 9, 2005 http://www.pca.state.mn.us

Includes complete versions of Minn. Rules ch 7050 & 7055 [Drafts]. (See Exhibit A-48b & A-48c)

A-48b **Proposed Amendments to Minnesota Rules Chapter 7050 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

July 28, 2005 http://www.pca.state.mn.us

A-48c **Proposed Amendments to Minnesota Rules Chapter 7055 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule Office of Revisor of Statutes, State of Minnesota St. Paul

July 28, 2005

Attached to August 9, 2005 Rule Revision Website

A-49a **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: January 26, 2006 http://www.pca.state.mn.us

Includes complete versions of Minn. Rules ch 7050 & 7055 [Drafts] (Updated January 1, 2006; See Exhibit A-49b & A-49c) and Derivation of acetochlor and metolachlor standards (See Exhibit A-49d)

A-49b **Proposed Amendments to Minnesota Rules Chapter 7050 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

Revised January 1, 2006 http://www.pca.state.mn.us

A-49c **Proposed New Minnesota Rule Chapter 7055 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

Revised January 1, 2006 http://www.pca.state.mn.us

A-49d **Outline of Basis for Draft Proposed Acetochlor and Metolachlor Class 2 Water Quality Standards**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

January 17, 2006 http://www.pca.state.mn.us

A-50 **Water Quality Standards Handbook: 2nd Ed.**
Author: Office of Water, Environmental Protection Agency (EPA)
Guide EPA Washington
August 1994 EPA-823-B-94-005a; pp.5-11, 5-12 http://www.epa.gov
[5.3] Variances From Water Quality Standards

A-51 **National Recommended Water Quality Criteria: 2002**
Author: Office of Water and Office of Science and Technolgy, Environmental Protection Agency (EPA)
EPA Report Washington, D. C.
November 2002 http://www.epa.gov

A-52 **Announcement: Health Risk Limits Expert Advisory Panel**
From Patricia Bloomgren, Director, Division of Environmental Health, Minnesota Department of Health (MDH)
Letter St. Paul
2005 http://www.health.state.mn.us
(General Posting on MDH website)

A-53 **Subject: Exclusions/Inclusions for DWS in 7050**
From Richard D. Clark
e-mail St. Paul
May 20, 2005
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Includes Attachment: SONAR excerpt on Drinking Water Standards

A-54 **40 CFR parts 141 and 143**
Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access
Rule Code of Federal Regulations (CFR) Washington, D.C
Revised July 1, 2004 Vol 21 http://www.gpoaccess.gov/fr/index.html
Title 40 "Protection of Environment"; Part 141 "National Primary Drinking Water Regulations" and Part 143 "National Secondary Drinking Water Regulations"

A-55a **Statement of Need and Reasonableness [Excerpt]**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document St. Paul
1979; 1980 Rule Revision PCA-004-80-AK, pp.1, 37-8
Excerpt on Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55b **Report of the Hearing Examiner [Excerpt]**
Hearing Examiner
Report Stat e of Minnesota Office of Hearing Examiners St. Paul
1980 PCA-80-004-AK, pp.1, 78-81
Excerpt related to Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55c **Proposed Findings of Fact and Conclusions [Excerpt]**
Minnesota Pollution Control Agency (MPCA)
MPCA Document St. Paul
October 28, 1980 Cover sheet, pp.20
Cover Sheet: Agenda Item Control Sheet; Excerpt on Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55d **Order Adopting Rules**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document St. Paul
1980 PCA-80-004-AK, p. 3, no. 4
In the Matter of the Proposed Amendments to MPCA Rules WPC 14, 15, 24 and 25 and the Proposed Repeal of WPC 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17,18, 19, 20, 21, 23, 26, 29, 31 and 32.

A-56 **Minn. R. ch. 7056**

Author: Minnesota Pollution Control Agency (MPCA)

Rule — Minnesota Office of Revisor of Statutes — St. Paul

November 3, 1998 — http://www.revisor.leg.state.mn.us/

Mississippi River and Tributaries

A-57 **Minn. R. ch. 7065**

Author: Minnesota Pollution Control Agency (MPCA)

Rule — Minnesota Office of Revisor of Statutes — St. Paul

November 3, 1998 — http://www.revisor.leg.state.mn.us/
http://www.revisor.leg.state.mn.us/

Effluent Standards for Disposal Systems

A-58 **No Exhibit**

A-59 **No Exhibit**

A-60 **40 CFR 131.10 (a) Designation of Uses**

Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access

Rule — Code of Federal Regulations (CFR) — Washington, D.C.

Revised July 1, 2004 — pp.370-1 — http://www.gpoaccess.gov/fr/index.html

(Waste Assimilation Not a Beneficial Use).

A-61 **Water Quality Standards Handbook: 2nd Ed.**

Author: Office of Water, Environmental Protection Agency (EPA)

Guide — EPA — Washington, D.C.

August 1994 — EPA-823-B-94-005a; pp.2-1, 2-2 — http://www.epa.gov

[2.1] Use Classification - 40 CFR 131.10(a) in Chapter 2, "Designation of Uses"

A-62 **40 CFR 131.12 Antidegradation Policy**

Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access

Rule — Code of Federal Regulations (CFR) — Washington, D.C.

Revised July 1, 2005 — pp.390-1 — http://www.gpoaccess.gov/fr/index.html

Title 40 "Protection of Environment"; Part 131 "Water Quality Standards"

A-63 **Water Quality Standards Handbook: 2nd Ed.**

Author: Office of Water, Environmental Protection Agency (EPA)

Guide — EPA — Washington, D.C.

August 1994 — EPA-823-B-94-005a; pp.4-1 to 4-14 — http://www.epa.gov

Chapter 4 - Antidegradation

A-64a **Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards**

From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo — MPCA — St. Paul

January 13, 2006 — http://www.dnr.state.mn.us

To MPCA Citizens' Board

with cover letter to interested parties dated January 13, 2006, and list of 72 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on January 24, 2006)

A-64b **Triennial Review of Water Quality Standards: Update on Revisions of Minn. R. ch. 7050**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation — St. Paul

January 24, 2006

To MPCA's Citizens' Board

A-65a **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised July 28, 2006 http://www.pca.state.mn.us

Included Draft Minn. R. chs. 7050 and 7053 and Outline of Acetochlor and Metolachlor Standards

A-65b **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St, Paul

June 6, 2007 http://www.pca.state.mn.us

Includes Proposed Minn. R. chs. 7050 (Exhibit A-15a) and 7053 (Exhibit A-15b) and Outline of Acetochlor and Metolachlor Standards; Attached email to Interested Parties

A-66 **Subject:**

From Tom Poleck, Water Quality Branch, Environmental Protection Agency (EPA)

Letter Chicago

December 19, 2005

To Dave Maschwitz, Environmental Outcomes Division, MPCA

"…initial response to changes that the Minnesota Pollution Control Agency (MPCA) is considering making to certain aspects of Minn. R. ch. 7050, including proposed rule revisions that MPCA posted on its website on August 9, 2005."

A-67a **Subject: Water Quality Standards for Mercury**

From Char Brooker

e-mail Maplewood

February 3, 2006

To David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Example of emails received after January 24, 2006 presentation at the MPCA's Citizen Board Meeting

A-67b **Subject: FW: FW: Act to Reduce Mercury in Minnesota Fish!**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

March 2, 2006

To Interested Party

EC-1 **Ambient Water Quality Criteria for Bacteria-1986**

Author: Environmental Protection Agency's (EPA's) Office of Research and Development Microbiology and Toxicology Div., Cincinnati, OH and Office of Water Regulations and Standards, Criteria and Standards Div., Washington, D.C.

EPA Report EPA Washington, D.C

January 1986 EPA440/5-84-002; pp.i-iv, 1-18 http://www.epa.gov

Bacteriological Ambient Water Quality Criteria for Marine and Fresh Recreational Waters

EC-2 **Implementation Guidance for Ambient Water Quality Criteria for Bacteria**

Primary Authors: Jim Keating, Jennifer Wigal, and Lars Wilcut, Office of Water (4305T), Environmental Protection Agency (EPA)

Guidance EPA Washington, D.C.

March 2004 EPA-823-B-04-002; pp.i-x, 1-89 http://www.epa.gov

EC-3 **Fecal Contamination of Surface and Recreational Waters: Disease Transmission and Public Health Protection [DRAFT]**

Prepared by Tetra Tech EM Inc. for Minnesota Pollution Control Agency (MPCA);

Report MPCA St. Paul

September 30, 1997 pp. i- ii, 1-28 http://www.pca.state.mn.us

EC-4 **Microbial Indicators of Faecal Contamination In Water: A Current Perspective**

Author: Pam Tallon, Brenda Magajna, Cassandra Lofranco and Kam Tin Leung, Department of Biology, Lakehead University, and Ontario Ministry of the Environment, Standards Development Branch, Etobicoke

Journal Water, Air and Soil Pollution Ontario -Canada

2005 Vol 166; pp.139-166 http://springerlink.metapress.com/content/1573-2932/

EC-5 **Do U.S. Environmental Protection Agency Water Quality Guidelines for Recreational Waters Prevent Gastrointestinal Illness? A Systematic Review and Meta-Analysis**

Author: Timothy J. Wade, N. Pai, Joseph N.S. Eisenberg, and J. Colford, Jr., Epidemiology and Biomarkers Branch, Environmental Protection Agency (EPA), Research Triangle Park, NC; School of Public Health, Div. of Epidemiology, Univ. of California

Review | Environmental Health Perspectives (EHP) | Berkley

June 2003 | Vol 111; pp.1102-8 | http://www.ehponline.org

EC-6a **Method 1603: Escherichia coli (E. coli) in Water by Membrane Filtration Using Modified membrane-Thermotolerant Escherichia coli Agar (Modified mTEC)**

Author: Office of Water (4303T) Environmental Protection Agency (EPA)

EPA Report | EPA | Washington, E.C.

September 2002 | EPA-821-R-02-023 | http://www.epa.gov

EC-6b **40 CFR Part 136.**
Part III. Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Ambient Water [Final Rule]

Author: Environmental Protection Agency (EPA)

Rule | Federal Register (FR)

July 21, 2003 | Vol 68(139); pp.43271-83 | http://www.epa.gov/fedrgstr

EC-6c **Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Notice of Data Availability**

Author: Environmental Protection Agency (EPA) -from Online via GPO Access

Public Notice | Federal Register (FR)

April 11, 2006 | Vol 71(69); pp.18329-31 | http://www.epa.gov/fedrgstr/

EC-7 **Rapidly Measured Indicators of Recreational Water Quality are Predictive of Swimming Associated Gastrointestinal Illness**

Author: Timothy J. Wade, Rebecca L. Calderon, Elizabeth Sams, Michael Beach, Kristen P. Brenner, Ann H. Williams, and Alfred P. Dufour, The National Institute of Environmental Health Sciences, U.S. Department of Health and Human Services

Journal | Environmental Health Perspectives (EHP)

Online: September 1, 2005 | Vol 114 (1); pp.24-8 | http://www.ehponline.org

EC-8 **South Zumbro River in Rochester Fecal Coliform and E. coli Monitoring (2001) [DRAFT]**

Author: Norman Senjem and Lee Ganske, Minnesota Pollution Control Agency (MPCA)

MPCA Document | MPCA | St. Paul

April 2003 | http://www.pca.state.mn.us

EC-9 **Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota**

Submitted by: Norman Senjem, Lee Ganske, Gregory Johnson, David Morrison, and Bill Thompson, Regional Environmental Management Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document | MPCA | St. Paul

October 2002 | http://www.pca.state.mn.us

For Submission To: Region 5, U.S. Environmental Protection Agency (EPA), Chicago, Illinois

EC-10 **Water-Resources Investigations.**
Escherichia coli and Fecal-coliform Bacteria as Indicators of Recreational Water Quality

Author: Donna S. Francy, Donna N. Myers, and Kevin D. Metzker, U.S. Geological Survey

Report | U.S. Geological Survey | Columbus

1993 | Report# 93-4083 | http://www.usgs.gov

EC-11 **Surface Water Pathogen Study**

Prepared by Wenck Associates, Inc.

Study | Minnehaha Creek Watershed District

Study Completion: July 2003 | pp.i-vii, 2-1 to 6-3, Appendix A & B

Prepared for the Minnehaha Creek Watershed District

EC-12 **1984 Mississippi River Bacteria Study**

Author: Gary L. Fandrei, Minnesota Pollution Control Agency (MPCA)

Study | MPCA | Roseville

April 1985 | pp.i-vii, 1-29 | http://www.pca.state.mn.us

EC-13 **Health Effects Criteria for Fresh Recreational Waters**

Author: Alfred P. Dufour, Toxicology and Microbiology Division, Environmental Protection Agency (EPA)

EPA Report EPA Cincinnati

August 1984 EPA-600/1-84-004 http://www.epa.gov

EC-14 **Fecal Coliform vs. E. coli Water Quality Standards**

Author: Dave Christopherson, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

May 2003

EC-15 **Water Pollution Control Act of 1972 Amendment to Section 303(i) Beaches Environmental Assessment and Coastal Health Act of 2000 .**

106th Congress

Law U.S. Code Washington, D.C.

October 10, 2000 Public Law 106-284; 114 STAT.870 http://www.gpoaccess.gov/uscode/index.html

BEACH Act Amendment to the Clean Water Act

EC-16a **Subject: Reminder of Deadline and Advisement of EPA's Plans to Comply with Requirements of Section 303(i) of the Clean Water Act, Also Known As the BEACH Act**

From Benjamin H. Grumbles, Office of Water, Environmental Protection Agency (EPA)

Letter EPA Washington, D.C.

April 19, 2004

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

with Attachment - Outline/Requirements: "General Background of the BEACH Act"

EC-16b **Subject: Federal Promulgation of Water Quality Criteria for Bacteria**

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter MPCA St. Paul

May 7, 2004

To Benjamin H. Grumbles, Office of Water Environmental Protection Agency (EPA)

Response to EPA

EC-17 **40 CFR Part 131**
Part II. Water Quality Standards for Coastal and Great Lakes Recreation Waters; Final Rule

Author: Environmental Protection Agency (EPA)

Public Notice Federal Register (FR) Washington, D.C.

November 16, 2004 Vol 69(220); pp.67218-67243 http://www.epa.gov/fedrgstr

Rules and Regulations. (EPA Promulgation of Standards for States Not Meeting Deadline)

EC-18 **Minnesota Lake Superior Beach Program**

Author: Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

June 24, 2004; Accessed: March 3, 2005 http://www.pca.state.mn.us/water/beaches/index.html

EC-19 **Draft Matrix of Protocols and Criteria Used in Beach Closing Decisions [DRAFT]**

Prepared by the Metro Area Beach Monitoring Group, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

September 2005

Headings: Sampling and Analysis Methods; ods; Thresholds; Actions; Other Items

EC-20 **Subject: Comments on the May 2002 Draft "Implementation Guidance for Ambient Water Quality Criteria for Bacteria"**

From Marvin E. Hora, Manager, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter MPCA St. Paul

August 2002

To Mr. William Morrow, Assistant Branch Chief, Water Quality Standards Branch, U.S. Environmental Protection Agency (EPA)

EC-21 **Microbiological Quality of Puget Sound Basin Streams and Identification of Contaminant Sources**

Author: Sandra S. Embrey, Hydrologist, U.S. Geological Survey

Journal J. of the American Water Resources Assoc. (JAWRA) Tacoma

April 2001 Vol 37(2); pp.407-21 http://www.awra.org/publicationindex.html

EC-22 **Accommodating Change of Bacterial Indicators In Long Term Water Quality Datasets**

Author: Curtis G. Cude, Natural Resource Specialist, Oregon Department of Environmental Quality, MSD/BSD

Journal J. of the American Water Resources Assoc. (JAWRA) Portland

February 2005 Vol 41(1); pp.47-54 http://www.awra.org/publicationindex.html

EC-23 **Bacterial Water Quality Standards for Recreational Waters (Freshwater and Marine Waters)**

Author: Office of Water (4305T), Environmental Protection Agency (EPA)

Report EPA Washington, D.C.

June 2003 EPA-823-R-03-008; pp.i-iii, 1-9+ http://www.epa.gov/waterscience/beaches

Status Report

EC-24 **Environmental Sampling and Analytical Contract Valid from July 1, 2004 Through June 30, 2006**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

June 30, 2006

Showing Costs for Bacteriological Sample Analysis at Eight Labs

EU-1 **Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria, Third Edition**

Prepared by Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and C. Bruce Wilson Watershed Section, Regional Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

September 2005 http://www.pca.state.mn.us/water

EU-2 **The Changing Lake Regions of Minnesota**

Author: Minnesota Lakes (MLA) Reporter

Newspaper Minnesota Lakes Association Reporter

July 2003 Vol 7 (2); pp.1 & 6 http://www.mnlakes.org

David E. Maschwitz, Environmental Outcomes Division, MPCA

EU-3a **Ecological Disaster. The State We're In. One of a Series of Articles About Conservation, Chapter 3: Clearing the Shorelines**

Author: Dennis Anderson, Star Tribune Staff Writer

Newspaper Minneapolis Star Tribune -Metro Edition Minneapolis

December 18, 2001 pp.A-1, A-10 & A-11 #http://www.startribune.com#

EU-3b **State of the Lakes. Minnesota is Known as the State of 10,000 Lakes and the Land of Sky Blue Waters. But Who's Looking After Our Trademark Waters?**

Author: Greg Breining, Minnesota Department of Natural Resources (MDNR)

Journal Minnesota Conservation Volunteer St. Paul

July-August, 2003 http://www.dnr.state.mn.us/volunteer

EU-3c **'Dog Days' of Summer Bring the Greening of Minnesota's Lakes. The Solution to Lake Water Degradation May Be in Our Own Backyards**

Author: Forrest Peterson, Minnesota Pollution Control Agency (MPCA)

MPCA Publication Minnesota Environment St. Paul

Fall 2001 Vol 2 (1); pp.1-6 www.pca.state.mn.us

EU-4 **Minnesota Sea Grant: Why Love Lakes? and Summary Report: Public Perceptions, Use, and Future of Minnesota Lakes. Results of the 1998 Minnesota Lakes Survey (1999)**

Author: Keith A. Anderson, University of Minnesota Sea Grant Program

Newsletter The Seiche Newsletter

December 1998; Accessed: February 23, 2006 pp.1-4 http://www.seagrant.umn.edu/seiche

EU-5 **Limnology. Ontogeny and Evolution of Lake Ecosystems**

Author: Robert G. Wetzel, Professor of Botany, Kellogg Biological Station, Michigan State University

Book Section W. B. Saunders Company Philadelphia

1975 p.640 of 743

EU-6 **Detailed Assessment of Phosphorus Sources to MN Watershed: Under TMDL Master Contract [Executive Summary]**

Prepared by Barr Engineering

Report MPCA St. Paul

February 2004 pp.1, 2, ii-xxxiv http://www.pca.state.mn.us

EU-7 **Rules and Standards Development for Nonpoint Source Controls**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Publication MPCA St. Paul

January 7, 1986 http://www.pca.state.mn.us

EU-8 **Subject: Lake Eutrophication Standards Development**

From Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, Minnesota Pollution Control Agency (MPCA)

Memo MPCA

January 26, 1995

To Duane L. Anderson, Manager, Monitoring & Assessment Section, Water Quality Division, MPCA

EU-9 **Phosphorus Strategy Task Force**

Author: Water Quality Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

June 1996 http://www.pca.state.mn.us

EU-10 **National Strategy for the Development of Regional Nutrient Criteria**

Author: Office of Water, Environmental Protection Agency (EPA)

EPA Report EPA Washington,

June 1998 EPA 822-R-98-002 http://www.epa.gov

EU-11 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VI**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA 822-B-00-008; pp.i-x, 1-27, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northern Glaciated Plains and Western Corn-belt Plains Ecoregions

EU-12 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VII**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA-822-B-00-009; pp.i-xii, 1-28, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northcentral Hardwood Forests Ecoregion

EU-13 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VIII**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA-822-B-00-010; pp.i-x, 1-26, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northern Lakes and Forests Ecoregions

EU-14 **Ecoregional Nutrient Criteria**

Author: Office of Water, Environmental Protection Agency (EPA)

Fact Sheet EPA

October 2002 EPA-822-F-02-008 http://www.epa.gov/OST/standards/nutrient.html

EU-15 **Nutrient Criteria Development; Notice of Ecological Nutrient Criteria (66 FR 1671)**

Author: Environmental Protection Agency (EPA)

Public Notice Federal Register (FR)

January 9, 2001 Vol 66(6); pp.1671-4 http://www.epa.gov/fedrgstr/

EU-16 **Nutrient Criteria Technical Guidance Manual. Lakes and Reservoirs - First Edition**

Author: George Gibson, et al., Office of Water, Office of Science and TechnologyEnvironmental Protection Agency (EPA)

Guidance EPA Washington,

April 2000 EPA-822-B00-001 http://www.epa.gov

EU-17 **Subject: Development and Adoption of Nutrient Criteria into Water Quality Standards**

From/Signed by Geoffrey Grubbs, Director, Office of Science & Technology, Environmental Protection Agency (EPA)

Memo EPA

November 14, 2001 http://www.epa.gov/OST/standards/nutrient.html

To Water Directors, Regions I - X; Directors, State Water Programs; Directors, Great Water Body Programs; Directors, Authorized Tribal Water Quality Standards Programs; State & Interstate Water Pollution Control Administrators

EU-18 **Subject: EPA Policy as it Relates to the Phosphorus Objectives for the Nation's Receiving Waters**

From Francis T. Mayo, Regional Administrator, Environmental Protection Agency (EPA)

Letter EPA Region V Chicago

April 20, 1973

To Clarence A. Johannes, Director, Division of Water Quality, MPCA

EU-19a **Minnesota's Plan for Development of Nutrient Criteria**

Author: Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Plan MPCA

April 2003

To U. S. Environmental Protection Agency (EPA), Region V, Chicago, IL

(Including: Schematic, Summary, Timeline & Narrative)

EU-19b **Minnesota's Plan for Development of Nutrient Criteria**

From Environmental Outcomes and Analysis Division, Minnesota Pollution Control Agency (MPCA)

Plan MPCA St. Paul

September 2006

To U. S. Environmental Protection Agency (EPA), Region V, Chicago, IL

(Including: Schematic, Summary, Timeline & Narrative)

EU-20 **Subject: Minnesota's Nutrient Criteria Development Plan**

From Michael J. Sandusky, Division Director, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

April 2003

To Mr. David Pfeifer, U.S. Environmental Protection Agency (EPA), Region V

Cover Letter to April 2003 Nutrient Plan (Exhibit EU-19a)

EU-21

From Jo Lynn Traub, Director Water Division, Environmental Protection Agency (EPA), Region V

Letter EPA Region V Chicago

May 5, 2003

To Michael Sandusky, Director, Environmental Outcomes Division, MPCA

EPA Approval of 2003 Nutrient Plan (Exhibit EU-19a)

EU-22a **Subject: Minnesota Nutrient Criteria Plan Update: 2004**

From Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, MPCA

Memo MPCA St. Paul

April 7, 2004

To Dave Pfeifer, U. S. Environmental Protection Agency (EPA), Region V

EU-22b **Subject: Cover Letter - Response to a Request for Progress on Minnesota's Nutrient Criteria Development Plan**

From Leo Raudys, Division Director, Regional Division, Minnesota Pollution Control Agency (MPCA)

Letter MPCA St. Paul

December 1, 2004 http://www.pca.state.mn.us

To Jodi Lynn Traub, U. S. Environmental Protection Agency (EPA), Region V

Response to Exhibit EU-21

EU-23 **Minnesota Ecoregions**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

1993

MPCA Map & Ecoregion Descriptions

EU-24 **Analysis of Regional Patterns in Lake Water Quality: Using Ecoregions for Lake Management in Minnesota**

Author: Steven A. Heiskary, C. Bruce Wilson, Division of Water Quality, Minnesota Pollution Control Agency (MPCA) and David P. Larsen, Environmental Research Lab, Environmental Protection Agency (EPA), Corvallis, Oregon

Journal Lake & Reservoir Management (LRM) -Intnt'l

1987 Vol III; pp.337-44 http://www.nalms.org/journal/lrm.htm

EU-25 **Developing Eutrophication Standards for Lakes and Reservoirs**

Prepared by the Lake Standards Subcommittee, North American Lake Management Society (NALMS)

Report NALMS Alachua

May 1992 http://www.nalms.org

Chair: Steve Heiskary, MPCA

EU-26 **No Exhibit**

EU-27 **The Regional Nature of Lake Water Quality Across Minnesota: An Analysis for Improving Resource Management**

Author: Steven Heiskary and Bruce Wilson, Research Scientists, Program Development Section, Water Quality Division, Minnesota Pollution Control Agency (MPCA)

Journal Journal of the Minnesota Academy of Science (JMAS) St. Paul

1989 Vol 55(1); pp.71-7

EU-28 **Minnesota Lake Water Quality Assessment Report, Second Edition**
A Practical Guide for Lake Managers

Author: Steven A. Heiskary and C. Bruce Wilson, Program Development Section Division of Water Quality, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

May 1990 http://www.pca.state.mn.us

EU-29 **Lake Assessment Program: A Cooperative Lake Study Program**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Journal Lake and Reservoir Management (LRM)

1989 Vol 5(1); pp.85-94 http://www.nalms.org/journal/lrm.htm

EU-30 **Developing Phosphorus Criteria for Minnesota Lakes**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA), and W. W. Walker, Jr., Environmental Engineer, Concord, Massachusetts

Journal Lake and Reservoir Management (LRM)

1988 Vol 4(1); pp.1-9 http://www.nalms.org/journal/lrm.htm

EU-31 No Exhibit

EU-32 **A Chlorophyll a Trophic Status Classification System for South African Impoundments**

Author: R. D. Walmsley

Journal Journal of Environmental Quality

1984 Vol 13(1); pp.97-104 http://jeq.scijournals.org

EU-33 **Analysis and Application of Lake User Survey Data**

Author: Eric Smeltzer, Vermont Department of Environmental Conservation and S. A. Heiskary, Environmental Outcomes & Analysis, Minnesota Pollution Control Agency (MPCA)

Journal Lake and Reservoir Management (LRM)

1990 Vol 6(1); pp. 109-18 http://www.nalms.org/journal/lrm.htm

EU-34 **Citizen Lake-Monitoring Program - 2001 Secchi Data Sheet**

From Minnesota Pollution Control Agency (MPCA)

Form MPCA

November 17, 2001 http://www.pca.state.mn.us

Includes choices for perceptions of physical condition and suitability for recreation.

EU-35 **Reconstructing Historical Water Quality in Minnesota Lakes from Fossil Diatoms**

Author: Steven A. Heiskary, Edward B. Swain, Minnesota Pollution Control Agency (MPCA), and Mark B. Edlund, Science Museum of Minnesota, St. Croix Watershed Research Station

MPCA Publication Environmental Bulletin St. Paul

September 2004 No. 4 http://www.pca.state.mn.us

EU-36 **Water Quality Reconstruction from Fossil Diatoms: Applications for Trend Assessment, Model Verification, and Development of Nutrient Criteria for Lakes in Minnesota, USA**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information and Edward B. Swain, Ph.D., Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

September 2002 http://www.pca.state.mn.us/water/lakequality.html reports

Part of a Series on Minnesota Lake Water Quality Assessment

EU-37 **Shallow Lakes of Southeastern Minnesota: Status and Trend Summary for Selected Lakes**

Author: Steven A. Heiskary, Howard Markus, and Matt Lindon, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

July 2003 http://www.pca.state.mn.us

Part of a Series on Minnesota Lake Water Quality Assessment
www.pca.state.mn.us/publications/reports/lakes-shallowlake-swmn.pdf

EU-38 **Interrelationships Among Water Quality, Lake Morphometry, Rooted Plants and Related Factors for Selected Shallow Lakes of West-Central Minnesota**

Author: Steven A. Heiskary and Matt Lindon, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

March 2005 http://www.pca.state.mn.us

Part of a Series on Minnesota Lake Water Quality Assessment

EU-39 **Lakeshore Property Values and Water Quality: Evidence from Property Sales in the Mississippi Headwaters Region**

Author/Submitted by: Charles Krysel, Elizabeth Marsh Boyer, Charles Parson, Ph.D., and Patrick Welle, Ph.D., Mississippi Headwaters Board & Bemidji State University

Report Mississippi Headwaters Board Bemidji

June 2003 http://www.mississippiheadwaters.org

Submitted To the Legislative Commission on Minnesota Resources

EU-40 **Economic Value of Protecting Minnesota's Lakes**

Author: Harold E. Dziuk, Ph.D., Board Member for the Itasca Coalition of Lake Associations (CLA)

Newspaper Minnesota Lakes Association Reporter

November 2005 Vol 9(4); pp.1, 6-7 http://www.mnlakes.org

EU-41 **Importance of Lakes to Minnesota's Economy**

Author: Hank Todd, Minnesota Office of Tourism

Report Minnesota Lake Management Conference

October 1989 http://www.mnlakes.org

EU-42 **No Exhibit**

EU-43 **Economic Values of Lakes**

A publication of the North American Lake Management Society (NALMS)

Journal LakeLine Bloomington

Fall 2003 Vol 23(3); pp.1-48 http://www.nalms.org/lakeline/lakeline.htm

EU-44 **Shallow Lakes**

A publication of the North American Lake Management Society (NALMS)

Journal LakeLine Bloomington

Spring 2003 Vol 23(1); pp.11-36 http://www.nalms.org/lakeline/lakeline.htm

Special Issue of Lake Line

EU-45 **Developing Environmental Indicators for Minnesota. Lakes. The Environmental Indicators Initiative**

Author: State of Minnesota, Funded by the Minnesota Legislature on Recommendation of the Legislative Commission on Minnesota Resources (LCMR), Sponsored by The Environmental Quality Board (EQB)

Report Legislative Commission on Minnesota Resources (LCMR)

1998 http://www.commissions.leg.state.mn.us/lcmr/lcmr.htm

EU-46a **Statement of Need and Reasonableness: In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

April 2002

Assessment Factors Rule Revision

EU-46b **Staff Post-hearing Response to Public Comments**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

July 8, 2002

Assessment Factor Rule Revision *[Attachments not part of the exhibit]*

EU-46c **Staff Final Response to Public Comments**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

July 15, 2002

Assessment Factor Rule Revision

EU-47 **Measuring the Economic Value of Water Quality: The Case of Lakeshore Land**

Author Donald N. Steinnes, Department of Economics, University of Minnesota Duluth

Journal The Annals of Regional Science

1992 Vol 26; pp.171-6

EU-48 **Protecting Aesthetics and the Visual Resource Quality of Lakes**

Author: Eric J. Macbeth, Minnesota-Wisconsin Boundary Area Commission

Journal — Proceedings of a National Conference on Enhancing the States' Lake Management Program — Chicago

April 1992 — 1991; pp.17-23

EU-49 **Subject: Nutrient Pollution and Numeric Water Quality Standards**

From Benjamin H. Grumbles, Assistant Administrator, Office of Water Environmental Protection Agency (EPA)

Memo — EPA — Washington, D.C.

May 25, 2007

To Director, State Water Programs

H-1 **Subject: Request for Development of Water Quality Standards**

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)

Letter — St. Paul

February 27, 2002

To Greg Gross, Environmental Outcomes Division, MPCA

H-2a **Subject: Water Quality Criterion for the Wrogge Spill**

Author: Dann D. White, Monitoring and Assessment, Water Quality Division, Min esota Pollution Control Agency (MPCA)

Letter — St. Paul

June 10, 1996

To Ms. Michelle Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture (MDA)

H-2b **Aquatic Life Criteria (Summary Sheet): Acetochlor**

Author: Minnesota Pollution Control Agency (MPCA)

Summary — MPCA — St. Paul

January 29, 1998

Includes Cover Letter

To Ms. Michele Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture. From Dann D. White

H-3 **Subject: Interim Water Quality Guideline Value for Metolachlor**

From Dann D. White, Monitoring and Assessment, Water Quality Division, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

February 23, 1998

To Ms. Michelle Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture (MDA)

H-4 **Acetochlor Supplement: Supplementary Information on Acetochlor and Metolachlor**

Author: Angela L. H. Preimesberger and David E. Maschwitz, Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

November 7, 2005

Developed by the Water Quality Standards Unit, MPCA, in Cooperation with the Minnesota Department of Agriculture, Agronomy and Plant Protection Division

H-5 **Metolachlor Supplement: Supplementary Information on Acetochlor and Metolachlor**

Author: Angela L. H. Preimesberger and David E. Maschwitz, Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

November 8, 2005

Developed by the Water Quality Standards Unit, MPCA, in Cooperation with the Minnesota Department of Agriculture, Agronomy and Plant Protection Division

H-6 **Subject: Request for Development of Water Quality Standards**

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)

Letter — St. Paul

April 11, 2003

To Greg Gross, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

H-7 **Subject: Request for Development of Water Quality Standards**

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)
Letter — St. Paul
June 23, 2004
To Greg Gross, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

H-8 **Water Quality Best Management Practices for Agricultural Herbicides**

Author: Minnesota Department of Agriculture (MDA)
Guide — St. Paul
February 2004 — http://www.mda.sate.mn.us

H-9 **Aquatic Life Criteria: Acetochlor [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)
Summary — MPCA — St. Paul
March 14, 2006
Summary Sheet (5pgs) & Tables 1-5

H-10a **Aquatic Life Criteria: Metolachlor (50:50 Formula) [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)
Summary — MPCA — St. Paul
March 15, 2006
Summary Sheets (4pgs) & Tables 1-5

H-10b **Aquatic Life Criteria: Metolachlor (88:12) formula [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)
Summary — MPCA — St. Paul
February 7, 2006
Summary Sheets (4pgs) & Tables 1-5

H-11 **Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses**

Author: Charles E. Stephan, Donald I. Mount, David J. Hansen, John H. Gentile, Gary A. Chapman, and William A. Brungs, Office of Research and Development, U.S. EPA, Environmental Research Laboratories -Duluth, MN, Narragansett, RI, Corvallis, OR
Guide — EPA — Duluth
July 30, 1985 — pp.i-vi, 1-98 — http://www.epa.gov

H-12a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Acute Toxicity to Rainbow Trout (Salmo gairdneri). Prepared by ICI Group Environmental Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.
Evaluation — EPA
Reviewed: November 18, 1991 — OPP# (MRID No.) 419633-06; Registrant Report# BL3960/B — http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-12b **Acetochlor: Acute Toxicity to Rainbow Trout (Salmo gairdneri). Prepared by ICI Group Environmental Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, P. A. Johnson and D. S. Adams
Study — Monsanto
1991 — Registrant Report# BL3960/B; OPP# (MRID No.) 419633-06
Attachment: MPCA Reference Review Form by D. White (Exhibit H-12a)

H-13a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acute Toxicity of MON-097 (AB-81-181) to Bluegill Sunfish (Lepomis macrochirus). Unpublished Study prepared by Analytical Bio-Chemistry Laboratories, Inc. on 23 Sept. 1981 for Monsanto Company Submitted 10-27-81 Under Accession (SIC) No. 246128**

Reviewed by J. Tice, Fish & Wildlife Biologist; HED/EEB
Evaluation — EPA
Reviewed: November 5, 1981 — OPP# 85993 and OPP# ACC246128 — http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-13b **Acute Toxicity of MON-097 (AB-81-181) to Bluegill Sunfish (Lepomis macrochirus). Unpublished Study prepared by Analytical Bio-Chemistry Laboratories, Inc. on 23 Sept. 1981 for Monsanto Company Submitted 10-27-81 Under Accession (SIC) No. 246128**

Author: J. Griffin and C. M. Thompson

Study Monsanto

1981 OPP# 85993 and OPP# ACC246128

For Monsanto Company

Attachment: MPCA Reference Review Form by D. White (Exhibit 13a)

H-14a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Determination of Acute Toxicity to Bluegill Sunfish (Lepomis macrochirus). Brixham Study No. R1072/B. Study performed by Imperial Chemical PLC, Brixham Laboratory, Freshwater Quarry, Brixham, Devon, U.K. Submitted by ICI Americas, Inc.**

Reviewed by Rosemary Graham Mora, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: September 20, 1991 OPP# (MRID No.) 41565133 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-14b **Acetochlor: Determination of Acute Toxicity to Bluegill Sunfish (Lepomis macrochirus). Brixham Study No. R1072/B. Study performed by Imperial Chemical PLC, Brixham Laboratory, Freshwater Quarry, Brixham, Devon, U.K. Submitted by ICI Americas, Inc. EPA**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, and B. J. Harland

Study Monsanto

1989 OPP# (MRID No.) 415651-33

Attachment: MPCA Reference Review Form by D. White (Exhibit H-14a)

H-15 **Acetochlor Fish Studies - Acetochlor: Determination of Acute Toxicity to Mirror Carp (Cyprinus carpio), Submitted by ICI Brixham Environmental Laboratory**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, and H. M. Miller

Study Monsanto

1989 Report# BL/B/3554,

Attachment: MPCA Reference Review Form by D. White

H-16a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: An Investigation of the Toxicity of Technical Material and Formulation WF2061 to First Instar Daphnia magna. Laboratory Report No. RJ 0744B. Study performed by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, U.K. Submitted by ICI Americas, Inc.**

Reviewed by Rosemary Graham Mora, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 3, 1991 OPP# (MRID No.) 415651-34 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-16b **Acetochlor: An Investigation of the Toxicity of Technical Material and Formulation WF2061 to First Instar Daphnia magna. Study performed by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, U.K. Submitted by ICI Americas, Inc.**

Author: E. Farrelly, M. J. Hamer

Study Monsanto

1989 Registrant Report# RJ 0744B, OPP# (MRID No.) 415651-34

Attachment: MPCA Reference Review Form by D. White (Exhibit H-16a)

H-17 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acute Toxicity to Daphnids (Daphnia magna) Under Static Conditions, Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC**

Reviewed by Rosemary Graham Mora, M.S., Environmental Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 14, 1996 OPP# (MRID No.) 439289-12 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-18a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102 - Acute Toxicity to Rainbow Trout (Oncorhynchus mykiss) Under Static Conditions. Springborn Laboratories, Inc, Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation EPA

Reviewed: May 20, 1996 OPP# (MRID No.) 439289-11 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-18b **Final Report:**
CGA 77102 - Acute Toxicity to Rainbow Trout (Oncorhynchus mykiss) Under Static Conditions. Springborn Laboratories, Inc, Wareham, MA

Author: Maura K. Collins, Study Director, Springborn Laboratories Inc.

Study Syngenta (Ciba-Geigy Corporation)

December 12, 1995 Registrant Report# CGA-77102; OPP# (MRID No.) 439289-11

Submitted To: Ciba-Geigy Corporation (Greensboro, NC)

Attachment: MPCA Reference Review Form by D. White

H-19a **Data Evaluation Record (Validation Sheet) - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acute Toxicity of CGA-24705 to Rainbow Trout (Salmo gairdneri) Report# BW-78-6-186

Author: R. Balcomb

Evaluation EPA

Reviewed: July 20, 1978 OPP# (MRID No.) 18722 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-19b **Acute Toxicity of CGA-24705 to Rainbow Trout (Salmo gairdneri)**

Prepared by Robert J. Buccafusco, EG & G, Bionomics, Aquatic Toxicology Laboratory

Study Syngenta (Ciba-Geigy Corporation)

June 1978 Report# CGA-24705; OPP# (MRID No.) 18722

Attachment: MPCA Reference Review Form by D. White

H-20 **Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals**

Author: Foster L. Mayer and Mark R. Ellersieck

Manual United States Department of the Interior -Fish & Wildlife Service Washington, D.C.

1986 Resource Publication 160; cover,pp.3,4 & 313 http://www.fws.gov

H-21a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
(Acetochlor: Daphnia magna Life-Cycle Study. Prepared by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, UK. Submitted by ICI Americas, Inc. Wilmington, DE)

Reviewed by Louis M. Rifici, M.S., Associate Scientist, KPN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 4, 1991 OPP# (MRID No.) 415651-38 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-21b **Acetochlor Aquatic Invertebrate Studies - Acetochlor: Daphnia magna Life-Cycle Study**

Prepared by ICI Agrochemicals

Study Monsanto

1990 Report# RJ0785B; OPP# (MRID No.) 415651-38

Attachment: MPCA Reference Review Forms by D. White

H-22a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acetochlor: Determination of Chronic Toxicity to Fathead Minnow (Pimphales promelas) Embryos and Larvae. Prepared by ICI PLC, Brixham Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.

Reviewed by Louis M. Rifici, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 4, 1991 OPP# (MRID No.) 415920-11 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-22b **Acetochlor: Determination of Chronic Toxicity to Fathead Minnow (Pimphales promelas) Embryos and Larvae. Prepared by ICI PLC, Brixham Laboratory, Brixham, Devon, UK.; Submitted by ICI Americas, Inc.**

Author: J. F. Tapp, J. E. Caunter and R. D. Stanley

Study — Monsanto

1989 — Report# BL/B/3669; OPP# (MRID No.) 415920-11

Attachment: MPCA Reference Review Form by D. White (Exhibit H-22a)

H-23 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Chronic Toxicity of Acetochlor to Daphnia magna Under Flow-Through Test Conditions. Study conducted by Analytical Bio-Chemistry Laboratories, Inc., Columbia, MO. Submitted by Acetochlor Registration Partnership, c/o Monsanto Agricultural Company, St. Louis, MO**

Reviewed by William S. Rabert, Biologist, Ecological Effects Branch, Environmental Fate and Effects Division (7507C), Environmental Protection Agency (EPA)

Evaluation — EPA

Reviewed: November 2, 1993 — OPP# (MRID No.) 427131-05 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-24a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: S-Metolachlor (CGA-77102): Early Life-Stage Toxicity Test with Fathead Minnow (Pimephales promelas). Springborn Laboratories, Inc, Wareham, MA. Novartis Crop Protection Inc., Greensboro, NC**

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation — EPA

Reviewed: May 2, 2000 — OPP# (MRID No.) 449959-03 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-24b **s-Metolachlor (CGA-77102): Final Report s-Metolachlor (CGA-77102) - Early Life-Stage Toxicity Test with Fathead Minnow (Pimephales promelas)**

Author: J. V. Sousa, Study Director, Springborn Laboratories Inc.

Study — Syngenta (Novartis Crop Protection, Inc.)

Study Completion: November 30, 1999 — Registrant Report# CGA-77102; OPP# (MRID No.) 449959-03

Attachment: MPCA Reference Review Form by D. White

H-25a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Determination of Toxicity to the Green Alga Selenastrum capricornutum. Laboratory ID No. R1072/I. Conducted by Imperial Chemical Industries PLC, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation — EPA

Reviewed: January 17, 1992 — OPP# (MRID No.) 415651-41 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-25b **Acetochlor: Determination of Toxicity to the Green Alga Selenastrum Capricornutum. Laboratory ID No. R1072/I. Conducted by Imperial Chemical Industries PLC, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Author: D. V. Smyth, J. F. Tapp, S. A. Sankey and R. D. Stanley

Study — Monsanto

1989 — OPP# (MRID No.) 415651-41

H-26a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor Toxicity to the Duckweed (Lemna gibba). Laboratory ID No. W556/D (FT21/92). Conducted by ZENECA Agrochemicals, Surrey, UK**

Reviewed by William S. Rabert, Biologist, Ecological Effects Branch, Environmental Fate and Effects Division (7507C)

Evaluation — EPA

Reviewed: November 4, 1993 — OPP# (MRID No.) 427131-07 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-26b **Acetochlor Toxicity to the Duckweed (Lemna gibba). Laboratory ID No. W556/D (FT21/92). Conducted by ZENECA Agrochemicals, Surrey, UK**

Author: D. V. Smyth, S. A. Sankey, and A. J. Penwell

Study — Monsanto

1993 — OPP# (MRID No.) 427131-07

Attachment: MPCA Reference Review Form by D. White (Exhibit H-26a)

H-27 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Acetochlor: Toxicity to the Freshwater Diatom Navicula pelliculosa. Laboratory ID No. W566/C (FT20/92). Conducted by Imperial Chemical Industries PLC, Devon, UK. Submitted by ICI Agrochemicals, Surrey, UK

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 24, 1993 OPP# (MRID No.) 427131-08 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-28 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:
Acetochlor: Toxicity to Blue-green Alga Anabaena flos-aqua. Laboratory ID. No. W566/A (FT18/92). Conducted by Imperial Chemical Industries PLC, Devon, UK. Submitted by ICI Agrochemicals, Surrey, UK

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: June 1, 1993 OPP# (MRID No.) 427131-09 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-29 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of One Day Exposure to Technical Acetochlor on Elodea canadensis Acquired from an Outdoor Pond

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2003-149

Attachment: MPCA Reference Review Form by D. White

H-30 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of a Single Application of Technical Acetochlor in a Static Test on Elodea canadensis Acquired from an Outdoor Pond

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2004-009

Attachment: MPCA Reference Review Form by D. White

H-31 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of a Single Application of Technical Acetochlor in a Static Test on Elodea canadensis Acquired from a Commercial Supplier

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2004-010

Attachment: MPCA Reference Review Form by D. White

H-32 Acetochlor Outdoor Microcosm/Mesocosm Studies - The Determination of the Biological Effects of a Single Pulse of Technical Acetochlor in Outdoor Ponds

Author: E. M. Foekema

Study Monsanto

2005 Registrant Report# TN-2005-076

Attachment: MPCA Reference Review Form by D. White

H-33 Acetochlor Algae Studies - Acetochlor Technical-Toxicity Test and Recovery Period with Freshwater Green Alga, Psudokchneriella subcapitata

Author: J. R. Hoberg

Study Monsanto

2003 Registrant Report# SE-2003-097

Attachment: MPCA Reference Review Form by D. White

H-34 Acetochlor Algae Studies - Acetochlor Technical-Toxicity Test and Recovery Period with Marine diatom, Skeletonema costatum

Author: J. R. Hoberg

Study Monsanto

2003 Registrant Report# SE-2003-098

Attachment: MPCA Reference Review Form by D. White

H-35 **Acetochlor Outdoor Microcosm/Mesocosm Studies - An Assessment of Toxicity of Technical Acetochlor to the Aquatic Macrophytes Glyceria maxima, Myriophyllum spicatum, and Lagarosiphon major.**

Author: P. Kaur, B. Caswell, J. Newman, and S. J. Powers

Study — Monsanto (Dow Agrosciences)

2003 — Registrant Report# DAS 011246

Attachment: MPCA Reference Review Form by D. White

H-36 **Acetochlor Laboratory Aquatic Macrophyte Tests - Acetochlor Technical-Toxicity Test and Period with Duckweed, Lemna gibba**

Author: A. E. Putt

Study — Monsanto

2003 — Registrant Report# SE-2003-095

Attachment: MPCA Reference Review Form by D. White

H-37 **Factors Determining the Bioaccumulation Potential of Pesticides in the Individual Compartments of Aquatic Food Chains**

Author: H. Ellgehausen, J. A. Guth, and H. O. Esser, Agricultural Division, CIBA-GEIGY Ltd., Basel, Switzerland

Journal — Ecotoxicology and Environmental Safety

1980 — Vol 4 (2); pp.134-157; ECOTOX# 6458 — http://www.elsevier.com/wps/find/journaldescription.cws_home/622819/description#description#

Attachment: MPCA Reference Review Form by D. White

H-38 **Short-Term Effects of Herbicides on Primary Productivity of Periphyton in Lotic Environments**

Author: K. E. Day

Journal — Ecotoxicology

1993 — Vol 2 (2); pp.123138; ECOTOX# 13325 — http://www.springerlink.com/content/1573-3017

Attachment: MPCA Reference Review Form by D. White

H-39 **Metolachlor and 2,4-Dichlorophenoxyacetic Acid Sensitivity of Salvinia natans**

Author: A. M. Goncz, and L. Sencic

Journal — Bulletin of Environmental Contamination and Toxicology

1994 — Vol 53 (6); pp.852-5; ECOTOX# 13738

Attachment: MPCA Reference Review Form by D. White

H-40 **Aquatic Phyto-Toxicity of 23 Pesticides Applied at Expected Environmental Concentrations**

Author: H. G. Peterson, C. Boutin, P. A. Martin, K. E. Freemark, N. J. Ruecker, and M. J. Moody

Journal — Aquatic Toxicology

1994 — Vol 28 (3/4); pp.275-92; ECOTOX# 13800 — http://www.elsevier.com/wps/find/journaldescription.cws_home/505509/description#description#

Attachment: MPCA Reference Review Form by D. White

H-41 **Comparative Sensitivity of Selenastrum capricornutum and Lemna minor to Sixteen Herbicides**

Author: J. F. Fairchild, D. S. Ruessler, P. S. Haverland, and A. R. Carlson

Journal — Archives of Environmental Contamination and Toxicology

1997 — Vol 32; pp.353-57; ECOTOX# 18093

Attachment: MPCA Reference Review Form by D. White

H-42 **Comparative Sensitivity of Five Species of Macrophytes and Six Species of Algae to Atrazine, Metribuzin, Alachlor, and Metolachlor**

Author: J. F. Fairchild, D. S. Ruessler, and A. R. Carlson

Journal — Environmental Toxicology and Chemistry

1998 — Vol 17 (9); pp.1830-4; ECOTOX# 19461 — http://etc.allenpress.com/entconline/?request=index-html

Attachment: MPCA Reference Review Form by D. White

H-43 **Comparative Assessment of Herbicide Phytotoxicity to Selenastrum capricornutum Using Microplate and Flask Bioassay Procedures**

Author: D. St. Laurant, and C. Blaise

Journal — Environmental Toxicology and Water Quality: An International Journal

1992 — Vol 7; pp.35-48 (OECDG Data File); ECOTOX# 56387 — http://www3.interscience.wiley.com/cgi-bin/jhome/10008541

Attachment: MPCA Reference Review Form by D. White

H-44 **An Aquatic Risk Assessment of Four Herbicides Using Six Species of Algae and Five Species of Aquatic Macrophytes**

Author: J. F. Fairchild, S. D. Ruessler, M. K. Nelson, and A. R. Carlson

Journal — Society of Environmental Toxicology and Chemistry (SETAC)

1994 — Conference Proceeding; ECOTOX# 61707 — http://www.setac.org

Presented at the 1994 SETAC Meeting, Oct. 30-Nov. 3, 1994, Denver, CO
Attachment: MPCA Reference Review Form by D. White

H-45 **The Toxicity of the Herbicide Metolachlor, Some Transformation Products and a Commercial Safener to an Alga (Selenastrum capricornutum), a Cyanophyte (Anabaena cylindrica) and a Macrophyte (Lemna gibba)**

Author: K. E. Day, and V. Hodge

Journal — Water Quality Research Journal -Canada

1996 — Vol 31 (1); pp.197-214 — http://www.cciw.ca/wqrjc/wqrjce.htm

Attachment: MPCA Reference Review Form by D. White

H-46 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor-technical-5 Day Toxicity to Freshwater Green Alga, Anabaena flos-aqua. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-04 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-47a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical -Toxicity to Duckweed (Lemna gibba). Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-05 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-47b **Metolachlor technical - Toxicity to Duckweed (Lemna gibba)**

Author: James R. Hoberg

Study — Syngenta (Ciba-Geigy Corporation)

January 9, 1995 — SLI Registrant Report# 94-8-5404; OPP# (MRID No.) 43487105

Attachment: MPCA Reference Review Form by D. White

H-48 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical-Toxicity to the Marine diatom, Skeletonema costatum. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-06 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-49 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical-5-Day Toxicity to the Freshwater Green Alga, Selenastrum capricornutum, Using Acetone as a Carrier Solvent. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: March 1, 1995 — OPP# (MRID No.) 435413-01 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-50 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Metolachlor technical-5-Day Toxicity to the Freshwater diatom, Navicula pelliculosa, Using Acetone as a Carrier Solvent. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation EPA

Reviewed: March 1, 1995 OPP# (MRID No.) 435413-01 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-51 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acute Toxicity of CGA-51202 to the Duckweed, Lemna gibba G3

Reviewed by Karl Bullock, M.S. Environmental Scientist, Golder Associates, Inc.

Evaluation EPA Marblehead

Reviewed:November 10, 1999 OPP# (MRID No.) 449295-14 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-52 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Report on the Growth Inhibition Test of CGA-51202 to Green Algae (Scenedesmus subspicatus). Ciba-Geigy Ltd, Crop Protection Division, Basle, Switzerland. Novartis Crop Protection, Inc., Greensboro, NC

Reviewed by Karl Bullock, M.S. Environmental Scientist, Golder Associates, Inc.

Evaluation EPA

Reviewed: November 10, 1999 OPP# (MRID No.) 449295-15 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-53 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Toxicity of CGA-354743 to Duckweed, Lemna gibba G3. T.R. Wibury Laboratories, Inc., Marblehead, MA. Novartis Crop Protection, Inc., Greensboro, NC

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation EPA

Reviewed: April 13, 2000 OPP# (MRID No.) 449317-20 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-54 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102: 5-Day Toxicity to the Marine Diatom Skeletonema costatum. Springborn Laboratories, Inc, Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 16, 1996 OPP# (MRID No.) 439289-30 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-55a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102: 5-Day Toxicity to the Fresh Water Green Alga Selenastrum capricornutum. Springborn Laboratories, Inc, Wareham, MA

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 16, 1996 OPP# (MRID No.) 439289-29 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-55b **Final Report:**
CGA 77102: 5-Day Toxicity to the Fresh Water Green Alga Selenastrum capricornutum. Springborn Laboratories, Inc Wareham, MA

Author: James R. Hoberg

Study Syngenta (Cib-Geigy Corporation)

September 20, 1995 Registrant Report# 95-8-6031;
OPP# (MRID No.) 439289-29

Submitted To: Ciba-Geigy Corporation, Crop Protection Division (Greensboro, NC)

Attachment: MPCA Reference Review Form by D. White

H-56a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: CGA 77102: Toxicity to Duckweed Lemna gibba. Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC**

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 16, 1996 OPP# (MRID No.) 439289-31 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-56b **Final Report: CGA 77102: Toxicity to Duckweed Lemna gibba. Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC**

Author: James R. Hoberg

Study Syngenta (Ciba-Geigy Corporation)

Study Completion: September 28, 1995 Registrant Report# 95-8-6068; OPP# (MRID No.) 439289-31

Attachment: MPCA Reference Review Form by D. White

H-57 **Acetochlor Plant Toxicity Data from Table 4a, Proposed Water Quality Standard**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

January 19, 2006

Spreadsheets: Species Chronic Value (SCV), and Ranked Toxicity Values (January 20, 2006)

H-58 **Metolachlor Plant Toxicity Data from Table 4a, Proposed Water Quality Standard**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

January 19, 2006

Spreadsheets: Species Chronic Value (SCV), and Ranked Toxicity Values (January 20, 2006)

H-59 **Ambient Aquatic Life Water Quality Criteria for Atrazine [REVISED DRAFT]**

Author: Office of Water, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

October 2003 EPA-822-R-03-23 http://www.epa.gov

H-60 **New York State-Aquatic Fact Sheet: Ambient Water Quality Value for Protection of Aquatic Life [DRAFT]**

From New York State

Fact Sheet

August 10, 2005

H-61 **Health Risk Limits for Groundwater Chemical: Acetochlor, CAS# 34256-82-1 [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

December 28, 2006 http://www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

H-62 **Subject: Health Based Values for Acetochlor ESA & Acetochlor OXA**

From Helen Goeden, Health Risk Assessment Unit, Environmental Health Division, Minnesota Department of Health (MDH)

Memo St. Paul

February 13, 2006

To Dan Stoddard, Joseph Zachmann, Minnesota Department of Agriculture (MDA)

Includes Attachment: Data for Derivation of Ground Water Health Based Value (HBV)

H-63 **Acetochlor Fish Studies - Acetochlor: An Investigation of Accumulation and Elimination in Bluegill Sunfish in a Flow-Through System (ICI Americas Report# RJ0846B) and Calculation of Bioconcentration Factors in Bluegill Sunfish (Addendum to RJ0846B)**

Author: M. J. Hamer, E. Farrelly, J. Litzen, and I. R. Hill; M. J. Hamer, S. J. Crook, and I. R. Hill; K. H. Carr

Study Monsanto

1990; Addendum Dates: 1991, 2003 Registrant Report# MSL-18896

Attachment: MPCA Reference Review Form by D. White (BCF Studies)

H-64 **Health Risk Limits for Groundwater Chemical: Metolachlor, CAS# 51218-45-2 (and s-Metolachlor) [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

July 26, 2004 http://www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

H-65 **Subject: Health Based Value for Metolachlor OA and Metolachlor ESA**

From Anne Kukowski, Health Risk Assessment Unit, Minnesota Department of Health (MDH)

Memo St. Paul

July 7, 2004

To Joseph Zachmann, Dan Stoddard, Minnesota Department of Agriculture (MDA)

H-66 **Metabolism of [14C] Metolachlor in Bluegill Sunfish**

Author: Sean M. Cruz, Margaret N. Scott, and Andrew K. Merrit, Metabolism Department, Agricultural Division, Ciba-Geigy Corporation

Journal Journal of Agricultural Food Chemistry

1993 Vol 41; pp.662-8 http://www.health.state.mn.us

Attachment: MPCA Reference Review Form by D. White

H-67 **CORN - Minnesota Agriculture in the Classroom Program**

Author: Minnesota Department of Agriculture (MDA)

Fact Sheet MDA St. Paul

2004 http:/www.mda.state.mn.us/maitc

Commodity Card: Corn (Field)

H-68a **S-Metolachlor; Pesticide Tolerance**

Author: Environmental Protection Agency (EPA)- From the Federal Register Online via GPO Access

Public Notice Federal Register (FR) Washington, D.C

August 30, 2006 Vol 71(168); pp.51505-10 http://www.epa.gov/fedrgstr/

H-68b **Subject: Transmittal Memo for the Ecological Risk Assessment for the Use of S-Metolachlor on Pumpkins and Winter Squash (IR-4, DP 324973) and on Pumpkins in New York State (S18, DP 327861)**

From Paige Doelling Brown, Ph.D., Fisheries Biologist, James Hetrick, Ph.D., Senior Chemist, and Nancy Andrews, Ph.D. Branch Chief Environmental Risk Branch 1, Environmental Fate and Effects Division

Memo EPA Washington, D.C,

May 31, 2006

To Joanne Miller, Product Manager, Herbicide Branch, Barbara Madden, Risk Integration, Minor Use, Emergency Response Branch, and Daniel Rosenblatt, Team Leader, Emergency Response Team, Registration Division

H-68c **Ecological Risk Assessment for Use of S-Metolachlor (PC 108800) on Pumpkins and Winter Squash (DP324973, DP327861)**

Author Environmental Fate and Effects, Environmental Protection Agency (EPA)

EPA Document EPA Washington, D.C.

May 2006 http://www.epa.gov

Referenced in Memo (Exhibit H-68b)

H-68d **Subject: S-metolachlor Human Health Risk Assessment for Proposed Section 18 Uses on Cilantro, Collards, Kale, and Mustard Greens; Section 3 Use on Pumpkins; and Tolerance on Winter Squash without a US Registration. PC Code: 108800 S-metolachlor & 108801 Metolachlor, ID#: 06OH05 & PP#5E7015, DP Numbers: 329117 & 326011. [Executive Summary]**

From W. Cutchin, Chemist, ARIA Team, Technical Review Branch, Registration Division

Memo EPA Washington, D.C.

July 13, 2006 pp.1-11

To Barbara Madden and A. Ertman PM-5, Risk Integration Minor Use and Emergency Response Branch, Registration Division; Through Christina Swartz, Chief Registration Action Branch, Health Effects Division

H-69 **Toxicity to Daphni magna, Hyalella azteca, Oncorhynchus kisutch, Oncorhynchus mykiss, Oncorhynchus tshawytscha, and Rana catesbeiana of Atrazine, Metolachlor, Simazine, and Their Formulated Products**

Author: M. T. Wan, C. Buday, G. Schroeder, J. Kuo, and J. Pasternak

Journal Environmental Contamination and Toxicology

2006 Vol 76; pp.52-58

Attachments: Journal article and report providing details on test methods (Environmental Toxicology and Chemistry, Vol 24(5);pp.1146-54, 2005; Environmental Protection, Conservation and Protection, Environment Canada, Report EPS 1/RM/11, 1990)

HH-1 **Current Drinking Water Standards: List of Drinking Water Contaminants and MCLs**

Author: Ground Water and Drinking Water, Environmental Protection Agency (EPA)

Website EPA Washington, D.C.

July 2002, Accessed: July 14, 2005 EPA 816-F-02-013 http:/www.epa.gov/safewater/mcl.html

HH-2 **2006 Edition of the Drinking Water Standards and Health Advisories**

Author: Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

August 2006 EPA 822-R-06-013 http:/www.epa.gov/waterscience

HH-3 **Guidelines for the Development of Surface Water Quality Standards. For Protection of Aquatic Life, Including Human Health and Wildlife [DRAFT]**

Author: David E. Maschwitz, Environmental Outcomes Division, Environmental Standards and Analysis Section, Minnesota Pollution Control Agency (MPCA)

Guide MPCA St. Paul

August 28, 2000 pp.1-40, and Appendix A - G1. http:/www.pca.state.mn.us

1st Version: January 1990

HH-4 **Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health**

Author: Office of Water, Office of Science and Technology, Environmental Protection Agency (EPA)

Guide EPA Washington, D.C.

October 2000 EPA-822-B-00-004; pp.i-xvii, 1-1 through 5-67 http:/www.epa.gov

FINAL

HH-5 **Health Risk Limits for Groundwater Chemical Summary: Benzene, CAS# 71-43-2 [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

November 24, 2004 http:/www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

HH-6 **Health Risk Limits for Groundwater Chemical Summary: Naphthalene, CAS# 91-20-3 [DRAFT]**

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

February 17, 2004 http:/www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

HH-7 **Aquatic Life Criteria: Benzene, CAS# 71432**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

January 1990, Revised February 1993

Summary Sheets (3pgs) and Tables 1-5a

HH-8 **Aquatic Life Criteria: Benzene, CAS# 71-43-2 [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

February 1993, Revised January 2006

Summary Sheets (5pgs) and Tables 1-5a

HH-9 **Aquatic Life Criteria: Naphthalene, CAS# 91203**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

April 1991

Summary Sheets (4pgs) and Tables 1-5b

HH-10 **Aquatic Life Criteria: Naphthalene, CAS# 91-20-3 [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

April 1991, Revised January 2006

Summary Sheets

HH-11 **Fact Sheet for the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit Program General Permit No. MN G790000 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

April 20, 2006 http://www.pca.state.mn.us

with Attachments (pp.1-21)

M-1 **Water Quality Criterion for the Protection of Human Health: Methylmercury**

Author: Office of Science and Technology, Office of Water, Environmental Protection Agency (EPA)

Report EPA Washington, D.C.

January 2001 EPA-823-R-01-001; pp.i-xvii, 1-1 through 7-2, R-1-29, A, A1-33; http://www.epa.gov

M-2 **Minnesota's Total Maximum Daily Load Study of Mercury [DRAFT]***

Prepared by Minnesota Pollution Control Agency (MPCA)

Study MPCA St. Paul

June 1, 2006 Study# wq-iw4-01b; pp.i-xiii, 1-57, Appd.A and B www.pca.state.mn.us

**Draft Report Until Approved by U.S. EPA*

M-3 **Sources of Mercury Pollution and the Methylmercury Contamination of Fish in Minnesota**

Author: Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

August 2005 #4-06 http://www.pca.state.mn.us

Pollution Prevention & Sustainability Fact Sheet

M-4 **Eat Fish Often?**

Author: Minnesota Department of Health (MDH)

Pamphlet MDH St. Paul

May 2004 IC# 141-0378 http://www.health.state.mn.us

A Minnesota Guide to Eating Fish

M-5 **Water Quality Criteria: Notice of Availability of Water Quality Protection of Human Health: Methylmercury**

Author: Environmental Protection Agency (EPA) -From the Federal Register Online via GPO Access

Public Notice Federal Register (FR)

January 8, 2001 Vol 66(5); pp.1344-59; [DOCID:fr08ja01-55] http://www.epa.gov/fedrgstr/

M-6 **Subject: Bioaccumulation Factors (BAF) for Mercury in Northern Pike and Walleye: Rivers**

Author: Dennis Wasley (update by Bruce Monson), Minnesota Pollution Control Agency (MPCA)

Memo MPCA St. Paul

September 30, 2005 (Updated: August 5, 2003)

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Includes Tables

M-7 **Subject: Bioaccumulation Factors (BAF) for Mercury in Northern Pike and Walleye: Lakes [DRAFT]**

From Bruce Monson, Minnesota Pollution Control Agency, (MPCA)

Memo MPCA St. Paul

July 30, 2003

To David E. Maschwitz, Environmental Outcomes Division, Dennis Wasley, Gary Kimball, MPCA

M-8 **Notice of Draft Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion**

Author: Environmental Protection Agency

Public Notice Federal Register (FR) Washington, DC

August 9, 2006 Vol 71(153); pp.45560-4 http://www.epa.gov/fedrgstr/

PL-1a **MPCA Phosphorus Strategy Web Page**

Author: Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

July 14, 2006 http://www.pca.state.mn.us/water/phosphorus.html

PL-1b **Phosphorus Strategy: NPDES Permits (000306) - Strategy for Addressing Phosphorus in National Pollutant Discharge Elimination System (NPDES) Permitting**

Author: Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

March 2000 (000306) http://www.pca.state.mn.us

PL-1c **MPCA Phosphorus (P) Strategy: NPDES Permits [Information Packet]**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

March 2000 (000306) http://www.pca.state.mn.us

Referenced in fact sheet (Exhibit PL-1b)

PL-2a **St. Croix Basin Phosphorus-Based Water-Quality Goals - Report on the Recommended Water-Quality Goals of the St. Croix Basin Water Resources Planning Team and the 5th Annual Conference "Protecting the St. Croix: Reducing and Managing Nutrients and Sediments"**

Prepared by Pamela J. Davis, Coordinator, St. Croix Basin Water Resources Planning Team

Report St. Croix Basin Water Resources Planning Team

August 2004 Report# wq-b6-01 http://www.pca.state.mn.us

PL-2b **Wisconsin Department of Natural Resources and Minnesota Pollution Control Agency: Agreement on Nutrient and Sediment Reduction in the St. Croix River Basin**

Signed: Sheryl Corrigan, Commissioner Minnesota Pollution Control Agency and Scott Hassett, Secretary Wisconsin Department of Natural Resources

Agreement

Signed: April 6, 2006

Includes Strategy-Based Subcommittee Structure [Draft] June 15, 2006

PL-3 **Subject: Cost Estimates for Phosphorus Removal**

From Randy Thorson, Municipal Division, Minnesota Pollution Control Agency (MPCA)

Memo

August 17, 2005 http://www.pca.state.mn.us

To David E. Maschwitz, Environmental Analysis and Outcomes Division, MPCA

PL-4 **Wastewater Phosphorus Control and Reduction Initiative**

Author: Hydroqual, Inc. in Association with H. David Stensel, Ph.D., P.E., University of Washington

Study Minnesota Environmental Science and Economic Review Board (MESERB) Seattle

Study Completion Date: April 2005 Project #MESE0001; ppES1-14

Bio-P Study (Executive Summary)

PL-5 **Joint LMC/MPCA Survey of Bio-P Costs**

Survey

PL-6 **Economic Evaluation of Aesthetic Amenities: A Case Study of River View**
S. N. Kulshreshtha and J. A. Gillies, University of Saskatchewan
Journal Water Resources Bulletin
April 1993 Vol 29(2); pp.257-66

PL-7 **Establishing Relationships Among Nutrient Concentrations, Phytoplankton Abundance, and Biochemical Oxygen Demand in Minnesota, USA, Rivers**
Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and Howard Markus, Monitoring & Assessment, Minnesota Pollution Control Agency (MPCA)
Journal Lake and Reservoir Management (LRM) St. Paul
2001 Vol 17(4); pp.251-62 http://www.nalms.org/journal/lrm.htm

PL-8 **Establishing Relationships Among In-Stream Nutrient Concentrations, Phytoplankton and Periphyton Abundance and Composition, Fish and Macroinvertebrate Indices, and Biochemical Oxygen Demand in Minnesota USA Rivers - Final Report**
Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and Howard Markus, Monitoring & Assessment, Minnesota Pollution Control Agency (MPCA)
Report MPCA St. Paul
July 2003 pp.i-iv, 1-100
To USEPA Region V

PL-9 **Subject: Proposed Extension of 1mg/L Phosphorus Effluent Limit to New or Expanding Discharges**
From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Memo St. Paul
March 18, 2004
To Michael Sandusky, Director, Environmental Outcomes Division, MPCA
(without attachments)

PL-10 **Municipalities Given 1 mg/L Total Phosphorus Effluent Limits Since Phosphorus Strategy Was Approved, March 2000**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document
September 2005

PL-11 **Industries Given 1 mg/L Total Phosphorus Effluent Limits Since Phosphorus Strategy Was Approved, March 2000 [Working DRAFT]**
Author: David E. Maschwitz, Environmental Outcomes Division, MPCA
MPCA Document St. Paul
September 2005

PL-12 **Evaluation of Membrane Bioreactor Process Capabilities to Meet Stringent Effluent Nutrient Discharge Requirements**
Author: Edwin J. Fleischer, Thomas A. Broderick, Glen T. Daigger, Anabela D. Fonseca, R. David Holbrook, Sudhir N. Murthy
Journal Water Environment Research (WER)
2005 Vol 77(2); pp.162-78 http://www.wef.org/ScienceTechnologyResources/Publications/WER/

PL-13 **Chapter NR 217-Effluent Standards and Limitations**
Wisconsin Department of Natural Resources
Rule
November 1992 http://www.legis.state.wi.us/rsb/index.html

PL-14 **Implementation Guidance for Chapter NR 217: Phosphorus Effluent Standards and Limitations [Final Document]**
Author: Wisconsin Department of Natural Resources and Bureau of Watershed Management
Guidance WI DNR
June 1999 http://www.dnr.state.wi.us/

PL-15 **Notice of Adopted Amendment**
Illinois Pollution Control Board
Public Notice Illinois Register
February 17, 2006 Vol 30(7); pp.2365-72

UC-1 **Subject: Stream Reclassification Request of Renville County Ditch No. 45, (Branch Lateral 3)**
From Craig R.Olson (Yaggy Colby Associates) on behalf of Midwest Investors of Renville, Inc., dba Golden Oval Eggs Cooperative
Letter
June 13, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-2 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45 (Branch Lateral 3)**
Golden Oval Eggs Cooperative
Form Renville
November 8, 2004

UC-3 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45 (Branch Lateral 3)**
Southern Minnesota Beet Sugar Cooperative
Form Renville
November 8, 2004

UC-4 **Subject: Requesting Discharge Variance and Reclassification of Judicial Ditch No. 29, Evan, Minnesota**
From Sylvia Schwarz, Arden Environmental Engineering, Inc. on behalf of the City of Evan, Minnesota
Letter Evan
August 14, 2001
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-5 **Stream Assessment Worksheet Use Attainability Analysis, Lateral Judicial Ditch No. 29 and Judicial Ditch No. 29**
City of Evan, Minnesota
Form Evan
October 24, 2002

UC-6 **MPCA Board Item and Attachments Re: Evan NPDES/SDS Permit Issuance and Variance Request, Brown County – Request for Variance from the Dissolved Oxygen, Un-ionized Ammonia Nitrogen and Fecal Coliform Bacteria Water Quality Standards for Judicial Ditch No. 29**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA Evan
April 22, 2003 http://www.pca.state.mn.us

UC-7 **Subject: Requesting Reclassification of Judicial Ditch No. 4**
From Scott A. Johnson, Terracon on behalf of Lac Qui Parle Oil Cooperative
Letter Dawson
April 28, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-8 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 4**
Lac Qui Parle Oil Cooperative
Form Dawson
November 4, 2004

UC-9 **Subject: Dawson Ditch**
From Chris Domeier, Minnesota Department of Natural Resources (MDNR) Fisheries, Ortonville, MN
e-mail Ortonville
January 26, 2006
To Gerald Blaha, Environmental Outcomes Division, MPCA
Referencing April 1982 sodium hydroxide spill to Jud. Dt. No. 4 at Dawson, MN Spill File No. 10403

UC-10 **Subject: Requesting a Total Chloride Variance Request for Discharge to an Unnamed Ditch to Sater's Creek**
From Rick Serie, Agri-Energy, LLC
Letter Luverne
February 27, 2002
To Becky Olson, MPCA

UC-11 **Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditch and Sater's Creek**
Agri-Energy, LLC
Form — Luverne
November 4, 2004

UC-12 **Subject: Requesting Stream Reclassifications for Unnamed Ditches and Freeborn County Ditch No. 71 and Discharge Variances, Myrtle, Minnesota**
From Dan Bigalke (Arden Environmental Engineering, Inc.), on behalf of the City of Myrtle
Letter — Myrtle
December 23, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-13 **Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditches and County Ditch No. 71**
City of Myrtle, MN
Form — Myrtle
November 3, 2004

UC-14 **Subject: Requesting Stream Reclassification for Freeborn County Ditch No. 11 and Discharge Variances, Manchester, Minnesota**
From Dan Bigalke (Arden Environmental Engineering, Inc.) on behalf of the City of Manchester
Letter — Manchester
December 23, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-15 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 11**
City of Manchester, MN
Form — Manchester
November 3, 2004

UC-16 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45: Class 7 Reclassification back to a Class 2B Water Use Classification**
Form
November 8, 2004

UC-17 **Biological Monitoring Report for CD45 and Sacred Heart Creek**
Author: Barr Engineering
Report — Renville
March 2006

UC-18 **2003 Aerial Photograph of the Wright Lake, Hoot Lake Area at Fergus Falls, Minnesota Showing the Locations of Waters Proposed for Class 1C Classification**
U. S. Department of Agriculture, Farm Service Agency
Map(s)
2003

UC-19 **Overview of Minnesota's NPDES/SDS Construction Stormwater Permit**
Author: Minnesota Pollution Control Agency (MPCA)
Fact Sheet — MPCA
November 2005 — Water Quality/Stormwater #2-05 — http://www.pca.state.mn.us

UC-20 **Summary Comparison of Chloride Water Quality Standards for EPA Region V States, North Dakota, South Dakota, and Iowa**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document — MPCA
Not Given

UC-21 **Minnesota Subregional Hydrologic Unit Code Chloride Data Summary retrieved from the EPA STORET National Environmental Data System**

Author: Environmental Protection Agency (EPA)

Summary EPA

Accessed: May 2006 http://www.epa.gov/storet/

STORET (short for STOrage and RETrieval)

UC-22 **Figure 5. – Mean Hardness of Calcium Carbonate at NASQAN (National Stream Quality Accounting Network) Stations During 1975 Water Year from Quality of Rivers in the United States**

J.C. Briggs and J. F. Fricke

Report U.S Geological Survey

1977 Open-file Report 78-200

UC-23 **Total Hardness of Minnesota's Ground Water 1992 - 1996 from Minnesota Pollution Control Agency's Baseline Water Quality of Minnesota's Principal Aquifers, 1992 - 1996.**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

Not Given

UC-24 **Minnesota Subregional Hydrologic Unit Code Total Hardness Data Summary retrieved from the EPA STORET National Environmental Data System**

Author: Environmental Protection Agency (EPA)

Summary EPA

Accessed: May 2006

STORET (short for STOrage and RETrieval)

UC-25 **Water Quality Criteria, Second Edition**

Editors: Jack E. McKee and Harold W. Wolf

Report California State Water Resources Board

Revised 1963 Publication No. 3 – A

UC-26 **Manual on Industrial Water and Industrial Waste Water, Second Edition [Excerpt pp. 24 and 25, Table III: Water Quality Tolerances for Industrial Applications]**

Author: American Society for Testing and Materials

Manual ASTM Philadelphia

1959 ASTM Special Technical Publication No. 148-D

UC-27 **Guidelines for Establishing Water Quality Standards for Interstate Waters, (Under the Water Quality Act of 1965, Public Law 89-234)**

Author: U.S. Department of Interior, Federal Water Pollution Control Administration.

Guidance

May 1966

UC-28 **Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior [Excerpt]**

Author: U.S. Department of the Interior, Federal Water Pollution Control Administration

Report

April 1, 1968 pp.185-215

[a.k.a Green Book]

UC-29 **Categorization of Surface Waters for Industrial Consumption for WPC-15**

Author: George R. Koonce, Chief - Section of Industrial and Other Wastes, Division of Water Quality, Minnesota Pollution Control Agency

MPCA Document MPCA

1973

Rulemaking exhibit from the 1973 revisions to WPC-15 (PCA Exhibit 41, 5-31-73)

UC-30 **Water Quality Criteria 1972 [Excerpt]**

A Report of the Committee on Water Quality Criteria, Environmental Studies Board, National Academy of Sciences, National Academy of Engineering,

EPA Report EPA

March 1973 EPA.R3.73.033; pp.368-96 http://www.epa.gov

[a.k.a. Blue Book]

UC-31 **Quality Criteria for Water 1986 [Excerpt page entries regarding Hardness]**

Author: Office of Water Regulations and Standards, Environmental Protection Agency (EPA)

EPA Report EPA

May 1, 1986 EPA 440/5-86-001; Unnumbered http://www.epa.gov

[a.k.a. Gold Book]

UC-32 **Non-irrigation Surface Water Permit Locations Retrieved from Minnesota Department of Natural Resources Water Appropriation Permits Database**

Author: Minnesota Department of Natural Resources (MDNR)

Summary DNR

Accessed: May 2006

UC-33 **Closed-cycle Cooling Systems for Steam-electric Power Plants: A State-of-the-art Manual, Interagency Energy/Environment R&D Program Report [Excerpt]**

Author: Industrial Environmental Research Laboratory, Environmental Protection Agency (EPA)

Manual EPA

Not Given EPA-600/7-79-001; pp.237-61

UC-34 **Subject: Soliciting Comments on the MPCA Proposed Class 3B to Class 3C Changes as Outlined in a May 26, 2004 Email Message from David Maschwitz (MPCA) to Keith Hanson**

From Keith Hanson, Minnesota Power

e-mail

May 27, 2004

To Minnesota Chamber of Commerce Environment and Water Quality Committee

UC-35 **Subject: Response to Comments on the Proposed Class 3B to Class 3C Changes**

From David E. Maschwitz, Environmental Outcomes Division, MPCA

e-mail

March 4, 2005

To Kevin Kangas, Sappi Paper Cloquet, LLC,

UC-36 **Cluster Rule Impact on Recovery Boiler Operations: Chloride and potassium Concentrations in the Kraft Liquor Cycle**

Author: J. M. Jordan and P.S. Bryant

Journal TAPPI

December 12,1996 Vol 79(12); pp.108-16

UC-37 **Dynamic Modeling of Potassium and Chloride in the Recovery Area**

Author: B. Malmberg, L. Edwards, et al.

Journal TAPPI

June 2002 Vol 1(4); pp.3-6

UC-38 **Selective Removal of Chloride and Potassium in Kraft Mills.**

Author: L. Manuel, G.A. Ferreira, et al.

Journal TAPPI

April 2003 Vol 2(4); pp.21-5

UC-39 **Mineral Scale Management, Part I. Case Studies**

Author: P.W. Hart and A.W. Rudie

Journal TAPPI

June 2006 Vol 5(6); pp.22-7

UC-40 Mineral Scale Management. Part II. Fundamental Chemistry

Author: A.W. Rudie and P.W. Hart

Journal TAPPI

July 2006 Vol 5(7); pp.17-23

UC-41 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditch to County Ditch No. 42

Form Winthrop

November 4, 2004

UC-42 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Creek to Cedar Creek

Author: Isanti Estates Mobile Home Park

Form Isanti

November 9, 2004

Minnesota Pollution Control Agency

STATEMENT OF NEED AND REASONABLENESS

BOOK III of III

**In the Matter of Proposed Revisions
Of Minnesota Rules Chapter 7050,
Relating to the Classification and
Standards for Waters of the State;**

**The Proposed Addition of a New Rule,
Minnesota Rules Chapter 7053,
Relating to Point and Nonpoint Source Treatment Requirements; and**

The Repeal of Minn. R. Chapters 7056 and 7065

BOOK III

1. Addition of fish tissue water quality standard for mercury.
2. Adoption of standards for two herbicides, acetochlor and metolachlor.
3. Update the human health-based water quality standards for benzene and naphthalene.
4. Adopt an *E. coli* standard to replace the current fecal coliform standard for protection of swimming and other forms of water recreation.
5. Change the default industrial use classification from 3B to 3C, which will relax Class 3 standards for chlorides and hardness for most waters.
6. Changes related to use classifications, including update listings for Class 2A and Class1 waters and correct and clarify the use class listings.
7. Addition of new Class 1 surface waters and update list of trout waters (Class 2A).
8. Propose 12 use classification changes for 12 waterbodies, including new limited resource value water segments (Class 7 waters).

July 2007

BOOK III
Contents

TABLES

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[1] The 10% MS values in the 1986 criteria document and in 69 FR 67221 (Exhibit EC-17) differ slightly, the Agency is using the latter.

FIGURES

ACRONYMS AND ABBREVIATIONS USED IN THE SONAR

ACR	Acute to chronic ratio
Agency	Minnesota Pollution Control Agency
ASTM	American Society for Testing and Materials
AWWDF	Average [monthly] wet weather design flow
BAF	Bioaccumulation factor
BAP	Bioavailable phosphorus
BCF	Bioconcentration factor
BEACH	Beach Environmental Assessment and Coastal Health (BEACH) Act
Bio-P	Biological phosphorus removal treatment technologies
BMP	Best management practice
BOD_5	Biochemical oxygen demand; BOD_5 is BOD measured over a 5-day period
BWCAW	Boundary Waters Canoe Area Wilderness
CAS	Chemical abstract services registry number
$CBOD_5$	Carbonaceous biochemical oxygen demand; $CBOD_5$ is CBOD measured over a 5-day period
CESARS	Chemical Evaluation Search and Retrieval System database
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfu	colony-forming units
CGMC	Coalition of Greater Minnesota Cities
ch.	Chapter
Chl-a	Chlorophyll-a
CLMP	Citizens Lake Monitoring Program
CS	Chronic standard
CSF	Cancer slope factor
CSMP	Citizens Stream Monitoring Program
CWA	Clean Water Act
CWP	Clean Water Partnership
DMR	Discharge monitoring report
DO	Dissolved oxygen
DOC	Dissolved organic carbon
DWS	Drinking Water Standards
EC20, EC50	Effect concentration; concentration of chemical that has a significant effect on 20 percent and 50 percent of the test organisms in a specified time period, respectively
ECOTOX	Ecotoxicology database
EPA	U.S. Environmental Protection Agency
Ex.	Exhibit
EU	Eutrophication
FAV	Final Acute Value
FPE	Fullest practicable extent
FTE	Full time equivalent – measurement of staff resources
g/d	grams per day
GLI	Great Lakes Water Quality Initiative
IBI	Index of Biotic Integrity
IEPA	Illinois Environmental Protection Agency
HBV	Health based value
HH	Human health-based standard
HRL	Health risk limit
IRIS	Integrated Risk Information System
L	Liter
LAP	Lake Assessment Program
LC50	Lethal concentration; concentration of chemical that results in death of 50 percent of the test organisms in a specified time period
LOEC	Lowest observable effect concentration
m	meter or meters
MATC	Maximum acceptable toxicant concentration
MCEA	Minnesota Center for Environmental Advocacy
MCES	Metropolitan Council, Environmental Services
MCL	Maximum contaminant levels (EPA drinking water standards)
MDA	Minnesota Department of Agriculture
MDEP	Massachusetts Department of Environmental Protection
MDH	Minnesota Department of Health

MDNR	Minnesota Department of Natural Resources
MeHg	Methylmercury
MESERB	Minnesota Environmental Science and Economic Review Board
MFCA	Minnesota Fish Consumption Advice or Advisory
µg/L	microgram per liter or parts per billion
mg/kg	milligram per kilogram or parts per million
mg/L	milligram per liter or parts per million
mgd	million gallons per day
µm	micron, one millionth of a meter
MPCA	Minnesota Pollution Control Agency
Minn. R. ch.	Minnesota Rules chapter
Minn. Stat. ch.	Minnesota Statutes chapter
MS	Maximum standard
NA or na	Not applicable or not available
NALMS	North American Lake Management Society
NCHF	North Central Hardwood Forest Ecoregion
NE	No effect concentration
ng/L	nanogram per liter or parts per trillion
NGP	Northern Glaciated Plains Ecoregion
NLF	Northern Lakes and Forest Ecoregion
NHD	National Hydrography Data
NOEC	No observable effect concentration
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
OPP	Office of Pesticide and Planning, EPA
ORVW	Outstanding Resource Value Water
P Rule	Existing Minn. R. 7050.0211, subp. 1a; proposed Minn. R. 7053.0255
PAH	Polynuclear aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PMP	Phosphorus management plan
POTW	Publicly owned treatment works
ppm	Parts per million
RfD	Reference dose
RSC	Relative Source Contribution Factor
SCV	Species chronic value
SD	Secchi depth or Secchi transparency
SDS	Minnesota State Disposal System permits
SONAR	Statement of Need and Reasonableness
SR	Minnesota *State Register*
SSS	Site-specific standard
STORET	EPA water quality data storage and retrieval system
su	standard units, units for pH measurements
TBEL	Technology-based effluent limit (limit = limitation)
TMDL	Total Maximum Daily Load
TSI	Carlson Trophic State Index
Tox	Toxicity-based standard
TP	Total phosphorus or phosphorus
TSS	Total suspended solids
UAA	Use attainability analysis
USDA	United States Department of Agriculture
USGS	United States Geological Survey
VOC	Volatile organic carbon
WCBP	Western Corn Belt Plains Ecoregion
WDNR	Wisconsin Department of Natural Resources
WQBEL	Water quality- [standard] based effluent limit
WQS	Water quality standard
WWTP	Wastewater treatment plant

Table III-A. Reader's Guide to Location of Major Topics in SONAR Book III.

ITEMS	**SECTIONS AND PAGE NUMBERS**			
Section in SONAR:	Introduction, Background	Need	Reasonable-ness	Economics, etc.
Major Topics				
What's proposed in this rulemaking*	Na			
What's in SONAR Books I, II and III*	1			
Mercury fish tissue standard	7	10	12, 17	
- human health			18	
- wildlife			24	
- implementation and economic impact				27, 29
Acetochlor and Metolachlor standards	31	31	34, 39	
- basis for acetochlor standard			40, 44, 54	
- basis for metolachlor standard			42, 44, 54	
- implementation and economic impact				35, 57, 63
Benzene and Naphthalene standards	70	70	71	
- human health			74	
- implementation and economic impact				71, 79
E. coli standard	83	90	92, 96	
- protection of waters for swimming	83		96	
- basis for E. coli standard			97, 100, 106	
- transition from fecal coliform, implementation and economic impact			114	92, 125
- no change to fecal coliform effluent limit			118	
Change to Class 3, industrial use	128	140	142, 146	
- chloride and total hardness standards	133			
- implementation and economic impact				142, 148
Updates, additions and corrections to use classifications	159	160	160, 166	166, 168
Addition of Class 1 waters and Update of trout waters list	169	170, 172	170, 172, 173	174, 176
Limited resource values waters (Class 7)	179	180	181, 184	
- list of proposed classification changes	180			
- economic impact				181, 194
Impacts on agriculture and transportation				197, 198

*See SONAR Book I, pages 1 and 3.

I. INTRODUCTION

A. SCOPE [I. INTRODUCTION]

The Minnesota Pollution Control Agency (Agency) is proposing to amend Minn. R. ch. 7050, establish a new rule, Minn. R. ch. 7053, and repeal two rules, Minn. R. ch. 7056 and 7065. This book of the Statement of Need and Reasonableness (SONAR) covers the eight proposed changes and additions to Minn. R. ch. 7050 listed below.

1. Addition of fish tissue water quality standard for mercury.
2. Adoption of standards for two herbicides, acetochlor and metolachlor.
3. Update the human health-based water quality standards for benzene and naphthalene
4. Adopt an *E. coli* standard to replace the current fecal coliform standard for protection of swimming and other forms of water recreation.
5. Change the default industrial use classification from 3B to 3C, which will relax Class 3 standards for chlorides and hardness for most waters.
6. Changes related to use classifications to update, correct and improve the use class listings.
7. Addition of new Class 1 surface waters and update list of trout waters (Class 2A), and
8. Propose 12 use classification changes for 12 waterbodies, including new limited resource value water segments (Class 7 waters).

B. STATEMENT OF NEED AND REASONABLENESS [I. INTRODUCTION]

The Administrative Procedures Act (Minn. Stat. ch. 14) requires the Agency to address certain questions and issues in rulemaking that are discussed in the SONAR. The SONAR contains the Agency's affirmative presentation of facts on the need for and reasonableness of the proposed rule amendments. It also addresses all the statutory requirements associated with proposed administrative rules. As stated, Book III of the SONAR covers the proposed changes and additions listed in the previous Section. The *need, reasonableness* and *economic impacts* for each of the eight proposed standards or amendments are discussed together in eight major sections of Book III.

All the proposed amendments to Minn. R. ch. 7050 are shown in Exhibit A-15a. The proposed new Minn. R. ch. 7053 is shown in Exhibit A-15b. If there are any discrepancies between the versions in Exhibits A15a and A-15b and the certified versions from the Revisor's Office, the latter should be assumed to be the correct version.

Book I of the Agency's SONAR covers background information on topics relevant to these proposed revisions, which is not repeated in SONAR Books II or III (see list below).

- Beneficial uses and use classification system;
- Water quality standards;
- Triennial review of water quality rules;

- Assessment of impaired waters;
- Total maximum daily loads (TMDL);
- Items originally considered, but postponed for this rulemaking;
- Response to comments outside scope of proposed amendments; and
- Public participation.

References to Minn. R. ch. 7050 or 7053 in this SONAR are to the proposed **revised or new rule**[2], unless specifically stated otherwise.

Numerous exhibits pertinent to the proposed amendments are cited throughout SONAR Book III. Exhibits have been catalogued in an Access file for ease of tracking, sorting and numbering. The list of exhibits pertinent to the subjects covered in Book III is attached. Due to the large number of exhibits (and large size of some), the exhibits will not be made available on the Agency's Web pages. Any exhibit can be made available upon request for the cost of reproduction. The prefixes used to identify categories of all exhibits are shown in Table III-1

Table III-1. Prefixes for Categories of Numbered Exhibits.

Prefix to Exhibit Number	Category of Exhibits
A	Administrative, legal authority, Board appearances, rule language changes, public comments, etc.
EU	Eutrophication standards for lakes and reservoirs
PL	Phosphorus effluent limit
M	Mercury standard
HH	Human health-based and drinking water standards
H	Standards for herbicides acetochlor and Metolachlor
EC	*E. coli* standard
UC	Use classification changes: Class 1-Domestic Consumption, Class 2-Aquatic Life and Recreation, Class 3-Industrial Consumption, and Class 7-Limited Resource Value Waters.

The SONAR has been assigned the following exhibit numbers:

- SONAR Book I is Exhibit A-1
- SONAR Book II is Exhibit A-2
- SONAR Book III is Exhibit A-3
- A complete list of all exhibits is Exhibit A-5

Throughout the text the reader is referred to relevant sections elsewhere in the SONAR. The references are to sections rather than page numbers. To help locate the cited sections, section and subsection headings are followed [in brackets] by the Roman numeral and capital letter, if needed, that identifies the location of that section or subsection. Also in the same brackets is an

[2] Throughout the SONAR, some words or phrases are in **bold** for emphasis.

abbreviated name of the major section. For example, a heading in the *mercury standard* section is: “Current Mercury Standards [IV.A. mercury standard].”

This SONAR can be made available in other formats, including Braille, large print and audio tape. TTY users may call the Agency teletypewriter at 651-282-5332 or 800-657-3864. The Agency will make the *State Register* notice, the SONAR and the proposed rule available during the public comment period on the Agency’s Public Notices Web site: http://www.pca.state.mn.us/news/data/index.cfm?PN=1

II. AGENCY'S STATUTORY AUTHORITY

The Agency's authority to adopt water quality standards and to classify waters of the state is found in Minn. Stat. § 115.03 (2005), particularly subdivisions 1(b) and 1(c). Subdivision 1(b) authorizes the Agency to classify waters, while subdivision 1(c) authorizes the Agency:

> To establish and alter such reasonable pollution standards for any waters of the state in relation to the public use to which they are or may be put as it shall deem necessary for the purposes of this chapter and, with respect to the pollution of waters of the state, chapter 116;

Additional authority for adopting standards is established under Minn. Stat. § 115.44, subd. 2 and 4. Subdivision 2 authorizes the Agency to:

> group the designated waters of the state into classes, and adopt classifications and standards of purity and quality therefor. …

Subdivision 4 authorizes the Agency to:

> adopt and design standards of quality and purity for each classification necessary for the public use or benefit contemplated by the classification. The standards shall prescribe what qualities and properties of water indicate a polluted condition of the waters of the state which is actually or potentially deleterious, harmful, detrimental, or injurious to the public health, safety, or welfare; to terrestrial or aquatic life or to its growth and propagation; or to the use of the waters for domestic, commercial and industrial, agricultural, recreational, or other reasonable purposes, with respect to the various classes established…

Finally, the Agency is authorized under Minn. Stat. § 115.03, subd. 5 to perform any and all acts minimally necessary, including the establishment and application of standards and rules, for the Agency's ongoing participation in the NPDES[3] permitting program.

Under these statutory provisions, the Agency has the necessary authority to adopt the proposed rules.

The adoption of administrative rules is regulated under Minn. Stat. ch. 14. This statute and Minn. R. ch. 1400 lay out the rulemaking process, and obligations of the Agency to, for example, involve the public, consider the impact of the rules amendments on certain subsets of Minnesotans, and assess the economic impact of the proposed amendments. They also serve to assure fairness and openness in the process.

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[3] NPDES means National Pollutant Discharge Elimination System.

The proposed rule will be enforced in accordance with the authority provided to the Agency by Minn. Stat. ch. 116 and 115. The Agency has general authority to enforce its rules under these statutes. If approved, the changes to the existing rule will be enforceable by the Agency.

III. OVERALL NEED

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the need for and the reasonableness of the rules as proposed. In general terms, "need" means that the Agency must present the reasons for making the proposed changes to Minn. R. ch. 7050. Also, need has come to mean that a problem exists which requires administrative attention.

The Agency has the authority to develop and promulgate water quality standards under the Clean Water Act (CWA)[4] and Minnesota Statutes.

The need for the six proposed changes included in Book III of the SONAR will discussed separately in Sections IV.B, V.B, VI.B, VII.B, VIII.D, IX.B, X.B, X.C and XI.B.

[4] Clean Water Act, section (§) 303 (c)(2)(B) codified in 33 United States Code (U. S. C.) § 1313 (c)(2)(B)-January 19, 2004.

IV. FISH TISSUE STANDARD FOR MERCURY

A. INTRODUCTION [IV. mercury standard]

1. Current Mercury Standards [IV.A. mercury standard]

Minnesota currently has numeric water quality standards for mercury in both Minn. R. ch. 7050 and 7052 that apply to total mercury concentrations in water (Table III-2).

Table III-2. Existing Class 1 and Class 2 Numeric Chronic Water Quality Standards for Mercury. Minn. R. ch. 7050 and 7052.

Rule	Chronic Standard		Mercury Form	Basis	Medium
	Class 1 Drinking water	Class 2 Aquatic life			
Ch. 7050 Statewide	2.0 µg/L (2000 ng/L)	0.0069 µg/L (6.9 ng/L)	Total mercury*	Human Health	Water column
Ch. 7052** Lake Superior basin	na	0.0013 µg/L (1.3 ng/L)	Total mercury*	Wildlife that eat Fish	Water column

* Chemical Abstract Service (CAS) number for total mercury: 7439-97-6.
** Ch. 7052 also lists a human health-based criterion of 1.8 ng/L.

Minnesota also has a narrative standard in Minn. R. 7050.0150, subp. 7 that limits fish tissue contaminants to levels that allow safe consumption of fish as often as one meal per week. The original narrative standard ("*…nor shall there be any significant increase in harmful pesticide or other residues in the waters, sediments, and aquatic flora and fauna…*") dates to the first statewide water quality rule in 1967. In a 2003 rulemaking, the Agency linked the level of contaminants that are acceptable and unacceptable in fish to Minnesota Department of Health (MDH) fish consumption advice by expanding on the original narrative standard in Minn. R. 7050.0150, subp. 7 (quoted below).

> [Minn. R. 7050.0150] *Subp. 7.* ***Impairments of waters relating to fish for human consumption***. *In evaluating whether the narrative standards in subpart 3, which prevent harmful pesticide or other residues in aquatic flora and fauna, are being met, the commissioner will use the residue levels in fish muscle tissue established by the Minnesota Department of Health to identify surface waters supporting fish for which the Minnesota Department of Health recommends a reduced frequency of fish consumption for the protection of public health. A water body will be considered impaired when the recommended consumption frequency is less than one meal per week, such as one meal per month, for any member of the population. That is, a*

water body will not be considered impaired if the recommended consumption frequency is one meal per week or any less restrictive recommendation such as two meals per week, for all members of the population. The impaired condition must be supported with measured data on the contaminant levels in the indigenous fish.

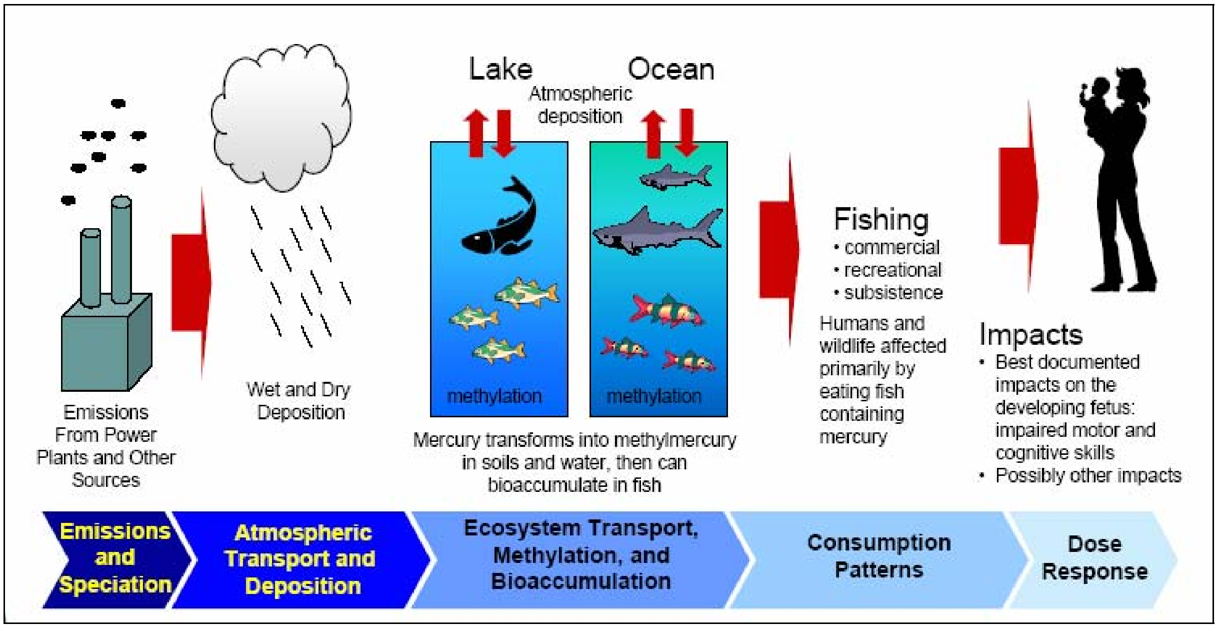
The Agency is now proposing to add a numeric fish tissue water quality standard to Minn. R. ch. 7050 that is a quantification of the narrative standard. The proposed standard is based on the U.S. Environmental Protection Agency (EPA) *Water Quality Criterion for Protections of Human Health: Methylmercury* (2001; Exhibit M-1). The proposed mercury standard is 0.2 milligram of total mercury per kilogram of fish (or parts per million, ppm). It will apply to total mercury concentrations in edible fish tissue of any species of fish from Minnesota's waters. The promulgation of a 0.2 ppm mercury standard will augment the current numeric chronic standards by providing a more precise level of protection to fish consumers. The proposed standard applies directly to the fish medium rather than the water medium. The fish tissue standard will not affect or change the application of the current mercury acute or chronic water column standards.

2. <u>Mercury in the Environment</u> [IV.A. mercury standard]

Mercury is unique among most pollutants that the Agency deals with and a word about its sources, movement and fate in the global environment is warranted. Mercury has a complex environmental cycle that results in significant bioaccumulation in fish and consequent significant route of exposure to fish consumers (human and wildlife). As depicted in Figure III-1, the primary source of mercury in the environment is air emissions from both anthropogenic and natural sources. In Minnesota, sources of mercury deposition are attributed 70 percent to anthropogenic (burning coal, mining operations, etc.) and 30 percent to natural sources (volcano eruptions, rock weathering, etc.) (Exhibit M-2). Mercury emitted to the atmosphere can travel short and extremely long distances before being deposited on land and water by wet and dry processes. Ninety percent of mercury deposited in Minnesota comes from outside the state (Exhibit M-3).

Once introduced into surface water, certain bacteria can transform mercury to methylmercury by adding a carbon group. This organic form of mercury is efficiently taken up by aquatic organisms, but is only slowly eliminated. Thus, with each step up the aquatic food chain, methylmercury accumulates in tissues at ever greater concentrations. This process, called biomagnification, can result in methylmercury concentrations in top predator fish like walleye and northern pike reaching concentrations more than 2.5 million times the **methylmercury** concentrations in water (Exhibit M-1).

Figure III-1. Sources, Transport and Fate of Mercury in the Environment.



(Figure from US EPA presentation (2004) for press about new fish consumption advisories)

Mercury is a water quality problem that stems from excessive atmospheric releases from human activities, therefore a multimedia strategy is needed to address the problems caused by too much mercury in the environment. The Agency's proposed fish tissue standard will help limit mercury exposure to fish consumers, while mercury regulations and reduction strategies at the Federal and State level strive to reduce the sources. Minnesota enacted legislation in 1999 leading to programs at the Agency that have removed mercury from products, manufacturing, incinerator emissions, and schools.[5] Voluntary reduction agreements have also resulted in mercury reductions from coal burning power plants and taconite processors. Prompted by stakeholder concern and considerable feedback on mercury regulations Governor Pawlenty in early 2006 called for legislative mandates to reduce mercury emissions; the *Minnesota Mercury Emissions Reduction Act of 2006* passed in May 2006, requiring more stringent mercury controls on the state's three largest coal-fired power plants.[6]

[5] MPCA. 2005. 2005 Mercury Reduction Progress Report to the Minnesota Legislature. Minnesota Pollution Control Agency, St. Paul, MN. Pub. No. Lrp-p2s-1sy06, October 2005.

[6] MPCA. 2006. Fact Sheet: Reducing Mercury Emissions from Power Plants in Minnesota, Minnesota Pollution Control Agency and Minnesota Department of Commerce, St. Paul, MN, September 2006.

B. NEED FOR FISH TISSUE MERCURY STANDARD [IV. mercury standard]

1. Adoption of EPA 304(a) Mercury Criterion [IV.B. need, mercury standard]

The Clean Water Act (CWA) mandates that the EPA develop water quality criteria for toxic pollutants listed in the CWA. The criteria are designed to protect aquatic life and the human use of aquatic life (e.g., fish consumption). The EPA criteria have only guidance status. States and tribes use the EPA criteria as the basis for the adoption of legally enforceable water quality standards into rules. States are required to adopt standards equal to, or "as protective as," the criteria to protect the beneficial uses of state surface waters.[4,7] The CWA and EPA authorize states to make scientifically defensible changes to EPA criteria, including proposing a standard more stringent than the EPA criterion if the more stringent value is supported by local information. This is what the Agency has done in the case of mercury. In 2001, EPA's Office of Water and Office of Science and Technology released a final fish tissue residue criterion of 0.3 ppm or mg/kg (Exhibit M-1). This criterion is meant to ensure that the methylmercury levels in freshwater fish are below levels considered harmful to people that eat fish.

2. Fish Tissue Is the Medium of Concern [IV. B. need, mercury standard]

Traditionally, water quality criteria (from EPA) and Agency standards are water concentrations, and the current numeric standards for mercury are no exception (Table III-1). The ultimate goal of the water-medium standards is to keep mercury concentrations below health benchmarks in fish tissue. Determining protective water concentrations requires estimating how much the concentration of mercury in fish exceeds concentrations in the water the fish live in. This ratio, mercury in fish to mercury in water, is called the bioaccumulation factor (BAF). BAFs for mercury are influenced by numerous factors that can differ from waterbody to waterbody, leading to difficulty in assigning a single BAF. Use of a fish tissue standard eliminates the need to apply a BAF because it applies directly to the medium of exposure, offering a more reliable approach for protecting fish consumers.

Another important aspect to having a fish tissue standard for mercury involves the available monitoring data. Mercury is present in the surface water column at very low or trace concentrations. Specialized sampling and analysis techniques are required to accurately measure mercury at these levels. The cost of sampling and analysis substantially exceeds that of conventional pollutants. In contrast, techniques used to analyze mercury in fish tissue are less specialized and more cost effective. The Agency partners with the Minnesota Departments of Health, Natural Resources, and Agriculture to annually obtain edible fish tissue data on mercury and PCBs (polychlorinated biphenyl ethers) in Minnesota's lakes and streams (Section IV.D.8).[8] This more comprehensive monitoring data provides the primary foundation for determining if surface waters meet water quality standards and beneficial uses.

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7 Clean Water Act Section 303(c)(2)(B).

8 MPCA. 2004. Minnesota's Fish Contaminant Monitoring Program. MPCA, Pollution Prevention/Sustainability fact sheet #4.05, St. Paul, MN, September 2004.

3. 0.2 ppm Is Being Implemented Currently, Promulgation is Appropriate [IV.B. need, mercury standard]

The Agency has been using 0.2 ppm of mercury in fish, the same as the proposed standard, to assess surface waters for impairment beginning in 2002 (section 303(d) of the CWA). As noted, the 0.2 ppm value used to date is a numeric interpretation of the existing narrative standard. Average fish tissue concentrations in each waterbody tested are compared to the 0.2 ppm threshold. Exceedances of 0.2 ppm in fish was responsible for 67 and 58 percent of all impaired water listings on the 2004 and 2006 303(d) lists, respectively (Exhibit A-6).[9] The listing of surface waters on the 303(d) list is mandated by the CWA and has regulatory and legal implications. Adopting this numeric value in rule provides more visibility and clarity for the 303(d) listing process for mercury.

4. Conclusions [IV.B. need, mercury standard]

The need to augment the current chronic standards for mercury with the proposed 0.2 mg/kg or ppm fish tissue standard include:

- The CWA requires that states adopt EPA criteria–in this case the 2001 EPA fish tissue residue criterion (or modification thereof)–when applicable for protecting designated beneficial uses.
- Fish consumption is the primary source of mercury exposure to humans; the standard applies in fish tissue.
- Fish tissue is the medium of interest and concern; therefore having a fish tissue standard more reliably protects fish consumers by eliminating the need to extrapolate safe mercury levels in fish from water column standards by removing the uncertainty in bioaccumulation factors (BAFs).
- The Agency has far more fish tissue data than water column data for mercury.
- The proposed standard is the same as the Agency's numeric interpretation of the narrative standard and MDH fish consumption advise,
- The proposed standard serves as the primary basis to assess mercury contamination in surface waters. Promulgation is the appropriate step, and adding this numeric standard in the rule enhances visibility of the 303(d) listing process. It was used to list mercury impairments for the 2002, 2004, and 2006 303(d) lists of impaired waters. Mercury listings account for 58 percent (1309/2274)[9] of all surface water impairment listings in 2006, with 97 percent listed because of mercury in excess of 0.2 mg/kg in fish and only 3 percent for water column violations.

[9] MPCA. 2006. Clean Water Act Section 303(d) TMDL List [Draft], MPCA, St. Paul, MN, April 2006

C. REASONABLENESS OF PROPOSED MERCURY FISH TISSUE STANDARD, REQUIRED INFORMATION [IV. mercury standard]

1. <u>Introduction</u> [IV.C. reasonableness, mercury standard]

Minnesota Stat. ch. 14 requires the Agency to explain the facts establishing the reasonableness of the proposed rules. "Reasonableness" means: 1) that there is a rational basis for the Agency's proposed actions, 2) that the Agency's proposed amendments are appropriate and consistent with its mandate to protect Minnesota's water resources, and 3) due consideration has been given to the potential economic impacts of the proposals. The reasonableness of the proposed mercury standard is explained in this and the next Section, but this introduction to "reasonableness" applies to all the proposed amendments.

The Agency is obligated to review and revise as necessary Minnesota's water quality standards every three years (Clean Water Act § 303(c)(1)). The Agency is about three years behind the three-year schedule. Typically there are more standards or provisions in Minnesota's water quality rules that the Agency feels need to be revised or updated than the Agency has staff resources to pursue. Thus, the items that are included in the scope of this revision represent items considered to have a relatively high priority. It is reasonable and appropriate for the Agency to make these priority decisions, to balance the number of water quality rule provisions that can be addressed against statutory requirements, water quality programmatic considerations, available staff resources, and other factors that together define overall priorities for rulemaking. This introductory statement on reasonableness will not be repeated for each of the proposed changes covered in this Book of the SONAR.

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed mercury standard.

2. <u>Classes of Persons Affected by the Proposed Rule Amendments, Including those Classes that Will Bear the Costs and Those that Will Benefit</u> [IV.C. reasonableness, mercury standard]

Because the Agency already has a narrative fish tissue standard for protecting human health and a fish tissue assessment process in place, the adoption of the numeric fish tissue standard essentially does not affect any parties (see discussion in Section IV.E). The Agency sees benefits, however in adopting the standard, because the numeric standard offers transparency to outside parties on the value used to assess fish tissue data for 303(d) impairment listing, corresponds to the fish tissue concentration used by MDH for limiting fish consumption in sensitive subpopulations, and meets the CWA requirements of promulgating EPA ambient water quality criteria, enhancing consistency in the state and federal approaches to mercury contamination in fish tissue.

3. Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues [IV.C. reasonableness, mercury standard]

The Agency does not expect there to be any additional costs to any party initially as a result of promulgation of the mercury fish tissue standard. The Agency in cooperation with the Minnesota Departments of Health, Natural Resources, and Agriculture already have a fish tissue monitoring program in place to assess human health impacts. The addition of this standard does not affect the monitoring program. The Agency programs utilizing mercury standards will also not have costs at the outset of this rule promulgation; as fully discussed in Section IV.D.9. the fish tissue standard augments the water column standards and effluent limits and narrative fish consumption standard and does not change impairment assessments or National Pollutant Discharge Elimination System (NPDES) or State Disposal System (SDS) permit activities at the Agency. However, the Agency cannot rule out the possibility that in the future the EPA will require states to apply an alternative approach to setting effluent limits and mercury control that could result in costs to NPDES/SDS permitted facilities.

The addition of water quality standard for mercury in fish tissue will not affect State revenues.

4. Determination of Whether There Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose [IV.C. reasonableness, mercury standard]

Addition of the fish tissue mercury standards does not have any costs associated with it, and because the 0.2 ppm value is being used now, adoption will be no more intrusive.

5. Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments [IV.C. reasonableness, mercury standard]

The Agency has not seriously considered alternatives to the proposed fish tissue standard for mercury. Because the Agency already has a narrative fish tissue standard that addresses human health using the same numeric value of 0.2 ppm for impaired water assessments, the Agency initially considered not adding the numeric standard in rule, however, as described in Section IV.B., *Need*, the standard has unique advantages and meets CWA requirements not specifically satisfied by the narrative standard.

6. Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [IV.C. reasonableness, mercury standard]

The Agency does not expect any costs to affected parties that are not already being incurred under the existing fish-contaminant narrative standard or the mercury numeric standards. Economic impacts are described in Section IV. E.

7. Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [IV.C. reasonableness, mercury standard]

No party will incur costs if the Agency does not adopt the fish tissue standard, because, as stated we are already using 0.2 ppm.

8. Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference [IV.C. reasonableness, mercury standard]

Federal regulations in the CWA and laid out in EPA guidance and water quality criteria documents provide the requirements and guidelines to develop water quality standards; the proposed mercury fish tissue standard developed by the Agency is consistent with relevant federal regulations. There is no Federal mercury fish tissue standard. The CWA gives states the authority to promulgate water quality standards based on EPA criteria. EPA has published Ambient Water Quality Criteria for a mercury fish tissue residue criterion of 0.3 ppm. The CWA and EPA guidance encourage states to modify criteria based on local data. The Agency modified the standard based on the higher fish consumption rate used in Minnesota over the default general population rate used by EPA, resulting in a proposed standard of 0.2 ppm (Section IV.C.4).

9. Consideration and Implementation of the Legislative Policy Under Minn. Stat. §§ 14.002 and 14.131 [IV.C. reasonableness, mercury standard]

Minnesota statutes require state agencies, whenever feasible, to develop rules that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals. The proposed fish tissue standard for mercury is "prescriptive" as are all numeric standards as described in more detail in Section III.C.9, *Implementation*. Numeric water quality standards are important benchmarks for the protection of Minnesota's water resources and the Agency believes their prescriptiveness is not inconsistent with the intent of this statute.

The general concepts of how prescriptive or flexible a rule should be are discussed more in SONAR Book I, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [IV.C. reasonableness, mercury standard]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

The Agency described its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I. The Agency has gone well beyond the statutory requirements in its efforts to involve the public in this rulemaking. The Agency has made significant changes to the scope and content of the proposed amendments in response to public comments.

The Agency intends to send a copy of the Notice of Hearing to the following people and organizations.

- All parties who have registered with the Agency for the purpose of receiving notice of rule proceedings, as required by Minn. Stat. § 14.14, subd. 1a;
- All individuals and representatives of associations the Agency has on file as interested and affected parties; and
- The chairs and ranking minority party members of the legislative policy and budget committees, with jurisdiction over the subject matter of the proposed rule amendments, will receive a copy of the proposed rule amendments, SONAR and notice, as required by Minn. Stat. § 14.116.

Minnesota Stat. § 115.44, subd. 7 states that notices required under sections 14.14, subd. 1a, and 14.22 must also be mailed to the governing body of each municipality bordering or through which the waters for which standards are sought to be adopted flow. The Agency intends to hold public hearings, therefore, section 14.22 does not apply. To comply with Minn. Stat. § 115.44, subd. 7, the Agency shall provide a copy of the notice to the following:

- Mayors of cities in Minnesota
- Minnesota County Commissioners Chairs
- Minnesota Township Chairs
- Soil and Water Conservation Districts
- County Water Planners
- Watershed Districts
- Water Management Organizations
- NPDES/SDS industrial permittees
- POTW permittees

Additionally, the Agency will provide notice to:

- Environmental Justice Advocates of Minnesota
- Council of Asian-Pacific Minnesotans
- Chicano-Latino Affairs Council
- Council of Black Minnesotans
- Minnesota Indian Affairs Council
- EPA Tribal Liaison, and the Indian Tribes in Minnesota:
    - Boise Fort Band of Chippewa
    - Fond du Lac Reservation
    - Grand Portage Reservation
    - Leech Lake Reservation
    - Lower Sioux Indian Community
    - Mille Lacs Band of Chippewa

- Prairie Island Community
- Red Lake Nation – Red Lake Band of Chippewa
- Shakopee Mdewakanton Sioux (Dakota) Community
- Upper Sioux Community
- White Earth Reservation

The Agency will issue a press release at the time the notice of proposed rule adoption is published in the *State Register*. The press release will include the dates, times and locations of the public hearings, and information on how the public can submit comments. In addition, a copy of the notice, proposed rule amendments and SONAR will be posted on the Agency's public notice Web site at: http://www.pca.state.mn.us/news/index.html. Due to the large number (and large size of some), the exhibits will not be made available via the Agency's Web pages. Any exhibit can be made available upon request.

Pursuant to Minn. Stat. § 14.14, subd. 1a, the Agency believes its regular means of notice, including publication in the *State Register* and on the Agency's public notice Web page will adequately provide notice of this rulemaking to persons interested in or potentially affected by these rules.

This section of the *reasonableness, required information* will not be repeated for the other eight proposed amendments in this SONAR but it applies equally to all.

11. <u>Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local Governments</u> [IV.C. reasonableness, mercury standard]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency will provide the Department of Finance with a copy of the proposed rule and SONAR Form at the same time as these items are sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

12. <u>Agency Determination Regarding Whether Cost of Complying with Proposed Rule in the First Year After the Rule Takes Effect Will Exceed $25,000</u> [IV.C. reasonableness, mercury standard]

The Administrative Procedures Act was amended in 2005 to include a section on potential first-year costs attributable to the proposed amendments (Minn. Stat. § 14.127, subd. 1 and 2). This amendment requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees.

The Agency has determined that the cost of complying with the proposed mercury standard in the first year after it takes effect will not exceed $25,000 for the two categories listed above. This is because the proposed mercury standard is already being implemented and adoption will not change the way the Agency assesses waterbodies for potential impairment.

D. REASONABLENESS OF PROPOSED MERCURY FISH TISSUE STANDARD [IV. mercury standard]

1. Introduction [IV.D. reasonableness, mercury standard]

As stated, mercury is one of the most prevalent and troublesome pollutants the Agency deals with, and the consumption of fish is the primary source of mercury to people. The Agency is proposing to augment the current mercury standards that define safe levels in water with a standard that defines a safe level in fish tissue. “Safe” in this context means safe for sensitive populations that eat freshwater fish up to, but not exceeding, a frequency of one meal per week for a lifetime (Table III-4). The Agency plans to retain both chronic standards currently in Minn. R. ch. 7050 and 7052: the statewide 6.9 ng/L and the Lake Superior Basin 1.3 ng/L standards (Table III-2).

Addition of a fish tissue standard for mercury in Minn. R. ch. 7050 is reasonable, because it provides consistency in the goals and approaches used by Agency, MDH, and EPA for protecting humans from mercury’s health effects.

- Follows the comprehensive and thoroughly reviewed risk assessment by EPA for the sole purpose of having states promulgate a fish tissue standard—the EPA concluded a fish tissue standard is the most scientifically defensible and practical approach for addressing mercury contamination in surface waters (the 2001 EPA criterion; Exhibit M-1);
- Addresses protection for sensitive populations, in this case, life-stages: developing fetuses, infants, and children.
- Reflects the threshold used by Minnesota Department of Health (MDH) to recommend fish consumption of less than one meal per week for some women and children and the Agency for determining impairment based on the narrative fish consumption standard adopted into Minn. R. 7050.0150, subp. 7 in 2003.
- Supports the multi-agency fish tissue mercury monitoring program.[8] The fish tissue data supports multiple programs and provides the most comprehensive data on mercury contamination in surface waters for use in 303(d) impaired waters assessments.

2. EPA Fish Tissue Residue Criterion (2001) [IV.D. reasonableness, mercury standard]

The EPA criterion for mercury (Exhibit M-1) is unique among all the aquatic life criteria that EPA has published over the years in that it is the only one that sets a safe concentration in **fish tissue** rather than water. EPA felt that a fish tissue criterion was the most scientifically sound and rationale approach to address mercury contamination in surface waters and fish. Having a criterion apply in fish tissue instead of water best fits the environmental characteristics and human health-exposure and -toxicological data for mercury. An important factor, according to EPA, is that fish consumption is the primary route of exposure of mercury to humans.

The EPA, in consideration of the National Research Council's 2000 extensive report on the health effects of methylmercury[10] and the 1997 EPA Eight-Volume Mercury Report to Congress on mercury emissions, impacts, and controls[11], conducted a comprehensive and thorough risk assessment of mercury and all its common forms to propose the fish tissue criterion (Exhibit M-1). The guidance document was also bolstered by critical and extensive comments from peer reviewers, including experts from the Agency and MDH. The assessment covered exposure, health effects, sensitive life-stages, and bioaccumulation in fish.

The EPA's exposure assessment focused on characterizing sources of exposure to all the common forms of mercury. Again, exposure to methylmercury from fish consumption stands out as the principal form and route of exposure. The amount of fish consumed and whether the fish are freshwater or marine, factors into the criterion. In 2000, EPA established 17.5 grams of fish per day (g/d) as the default freshwater fish consumption rate for the general population (Exhibit HH-4). This rate is based on routine, comprehensive surveys on food and water consumption by the U. S. Department of Agriculture (USDA). EPA used data from the USDA 1994-1996 Continuing Survey of Food Intake by Individuals on fish consumption by the both fish consumers and non-consumers to set the 17.5 g/day consumption rate, which is the 90^{th} percentile rate (represents daily freshwater fish consumption rate for the upper 10 percent of the surveyed population). EPA also concluded that 17.5 g/day is an adequate estimate of the average fish consumption rate for sport fishers. EPA subtracts out methylmercury exposure from marine fish, because the criterion applies only to exposure from freshwater sources (fish). The estimated exposure to methylmercury from marine fish consumption for the general population is accounted for in the determination of the mercury standard by the Relative Source Contribution Factor (RSC).

3. <u>EPA Criterion and Proposed Standard Reflect Latest Analysis of Health Effects</u> [IV.D. reasonableness, mercury standard]

The most well studied and understood health effect from excess mercury exposure is toxicity to the nervous system (Exhibit M-1). Mercury in a variety of forms can affect neurological functioning of infants, children, and adults. But the subpopulations with the greatest sensitivity to neurological effects are developing fetuses and infants. Extensive studies are available that have followed neurodevelopment in babies and children in populations that rely heavily on fish and seafood as a source of food. These epidemiological studies have shown that prenatal methylmercury exposure through fish and seafood consumption by pregnant women correlates with deficits in neurological tests in their babies and children. Exposure to methylmercury during these early life-stages is shown to affect the "processes involved with a child's ability to learn and process information" (Exhibit M-1).

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[10] National Research Council. 2000. Toxicological Effects of Methylmercury. National Academy Press, Washington, D. C. pp. 344.
[11] EPA. 1997. Mercury Study Report to Congress (Eight Volumes): Volume VII. Characterization of Human Health and Wildlife Risks from Mercury Exposure in the United States. EPA, Washington, D. C., EPA-452R-97-009.

The EPA develops a health toxicity value for noncarcinogens, termed a reference dose (RfD), to establish a limit of daily exposure for a lifetime below which adverse health effects are unlikely. The EPA uses the most sensitive and well understood health endpoint to set this value and for methylmercury determined that was neurodevelopmental deficits arising from prenatal exposure. The final EPA RfD of 0.0001 mg/kg-d (milligram of methylmercury per kilogram of adult body weigh-day) sets a sound health protective value by being based on strong human evidence, additional uncertainty factors, and comprehensive peer review by numerous experts at EPA and other organizations (Exhibit M-1). Recent studies have also linked methylmercury exposure to impaired cardiovascular function. Given the current health data, EPA concluded the RfD to also be protective of other health effects to other populations, so applies the RfD to the general population. Both the MDH in their fish consumption advice and the Agency, by basing the proposed standard on the EPA criterion, are using the same RfD.

The EPA also reviewed the bioaccumulation of methylmercury in fish to propose a nationwide BAF (Exhibit M-1). The review encompassed data on the concentrations of mercury in different forms in surface waters and accompanying fish data from across the U.S. The EPA compilation of the data confirmed what experts already knew: BAFs for mercury are influenced by many physical and biological factors in a surface water system and that the ranges of BAFs found across the country were not suitable to developing single values that would be reliable in all waterbodies. The highly variable BAFs for methylmercury contributed to the decision to develop a fish tissue criterion.

4. Basis for Modification of EPA Criterion - 30 Grams Per Day Fish Consumption [IV.D. reasonableness, mercury standard]

The Agency is proposing to adopt a fish tissue mercury standard that is more stringent than the EPA criterion, 0.2 ppm rather than 0.3 ppm. The adjustment is based on the assumption in Minnesota that people eat 30 grams of fish per day (g/d), compared to EPA’s assumption that people nation-wide eat 17.5 g/d (Exhibit HH-4).

The Agency has used a fish consumption rate of 30 g/d since first promulgating human health-based numeric water quality standards for toxic pollutants in 1990. The higher Minnesota rate is based on regional fish consumption data, and recognizes the importance and popularity of fishing to Minnesotans. The CWA authorizes and encourages states to modify EPA criterion based on statewide data that differs from national default values. In this case, the Agency is modifying the fish consumption rate used in EPA fish tissue criterion. In addition, if reliable data are available to show that localized populations in Minnesota consistently eat more (or less) fish than 30 g/d, existing Minn. R. 7050.0220, subp. 7 allows the Agency to recalculate an existing standard using the local fish consumption data for a site-specific application.

The fish consumption value of 30 g/d is based on a recommendation of a technical advisory committee to the Agency that met for almost a year in 1988-1989. This committee reviewed data from two surveys of the fish eating habits of the fishing population in Wisconsin and

Ontario.[12,13] These data are shown in Table III-3, along with data from a nation-wide survey for comparison.[14] It is apparent from these data that the general population eats relatively little freshwater fish even in states that have large fishing populations. In contrast, a survey of people that regularly fish Lake Michigan showed a high fish consumption rate (mean of 45.5 g/d). The Agency felt in 1989 that the Wisconsin and Ontario data were more representative of consumption patterns in Minnesota where the majority of fish caught are from inland lakes rather than from the Great Lakes. The technical advisory committee, which made a number of significant recommendations to the Agency on water quality standard issues, recommended using the 80th percentile fish consumption rate for the **angling population**. The mean of the 80th percentile values from the Wisconsin and Ontario surveys was 29 g/d, which was rounded to 30 g/d. This value was accepted by the Agency and it became the basis for the successful promulgation of about 30 human health-based chronic water quality standards in 1990 (existing Minn. R. 7050.0222).

Table III-3. Summary of Fish Consumption Data from Several Sources; Basis for 30 g/day Fish Consumption Rate.

Surveyed Population	**N**	**median**	**Mean**	**75%**	**80%**	**95%**	**99%**	**source**
		Fish Consumption – Grams per Day						
Lake Michigan anglers	182	27.4	45.5	50.1	56.6	103	--	1
General, NW Central[a]	1503	0.0	2.3	--	--	--	25.3	1
General, NE Central[b]	2924	0.0	2.0	--	--	--	25.8	1
Wisconsin anglers (sport-caught fish)	790	6.2	11.3	15.5	21.0	37.3	--	2
Wisconsin anglers (all fish)	797	21.1	25.4	33.6	--	63.4	--	2
Ontario anglers (sport-caught fish)[c]	3020	12.5	20.8	30.7	37.5	105	--	2

Footnotes:
a NW central, includes Minnesota, Iowa, Missouri, N & S Dakota, Nebraska, Kansas
b NE central, includes Ohio, Indiana, Illinois, Michigan, Wisconsin.
c Consumption values equal meals/day times median meal size of 227 grams.
Sources: 1. Rupp et al. 1980; 2. Wisconsin Division of Health 1987; 3. Cox et al. 1985 and Cox et al. 1987 (these publications are not exhibits).

Soon after the adoption of 30 g/d fish consumption rate several additional fish consumption surveys became available. In particular, two studies in Michigan were used to support the selection of a fish consumption amount for the Great Lakes Initiative (GLI) rule, promulgated by

[12] Wisconsin Division of Health and State Laboratory of Hygiene. 1987. Study of sport fishing and fish consumption habits and body burden levels of PCBs, DDE, and mercury of Wisconsin anglers. Final report to study participants.14 pp.

[13] Cox, C., A. Vaillancourt, C. DeBarros, and A. F. Johnson. 1985. Guide to eating Ontario sport fish, questionnaire results. Ontario Ministry of the Environment, Aquatic Contaminants Section, Water Resources Board.35 pp.; Cox, C., A. Vaillancourt, and A. F. Johnson. 1987. A comparison of the results from the "Guide to eating Ontario sport fish" questionnaires. Ontario Ministry of the Environment Aquatic Biology Section, Water Resources Branch. 85 pp.

[14] Rupp, E. M., F. L. Miller, and C. F. Baes III. 1980. Some results of recent surveys of fish and shellfish consumption by age and region of U.S. Residents. Health Physics Vol.39:165-175.

EPA in 1995 and adopted by the Agency in 1998 (Minn. R. ch. 7052). EPA and the Great Lakes States selected a consumption rate of 15 g/d for the calculation of GLI criteria, which is the mean consumption rate for anglers in the Michigan studies.[15] The 80th percentile consumption rate from the same Michigan studies was 30 g/d. Thus, the Michigan survey results agree very well with the two earlier studies used by the Agency.

To further put 30 g/d fish consumption rate in perspective it is useful to note the following points:

- The amount of fish people eat in one meal varies with the size of the person. MDH assumed that a person weighing 154 pounds (70 kilograms) would eat a half pound of fish in one meal. Thirty g/d equals 210 grams per week or just under one half pound (0.463 pounds). Thus, 30 g/d is essentially equal to one, ½ pound meal per week for the "standard" 70 kg person.

- Use of the 80th percentile consumption rate for anglers may protect many anglers in the upper 20th percentile consumption bracket as well, because these people, while eating a lot of fish, may not eat all their fish from the same source over an entire lifetime.

- A recent survey of fish consumption habits of people with fishing licenses living in Minnesota and North Dakota suggests that a value of about 30 g/d of sport-caught fish was closer to the 95th percentile consumption rate, rather than the 80th percentile. The Agency is reluctant to draw too many conclusions from this one survey because the authors were not able to characterize non-response bias and the response rate for survey recipients was only 20 percent. Nevertheless, it may indicate that the 30 g/d rate is more protective than previously thought.

- An 80th percentile consumption value for the angling population should protect better than 95 percent of the general population (Table III-3, values for General NW and NE Central).

- Prior to 2000 and for many years, EPA used a fish consumption rate of 6.5 g/d to calculate criteria. They increased that amount in 2000 to 17.5 grams per day for the calculation of their human health-based criteria (Exhibit HH-4).

In conclusion the Agency has used 30 g/d to calculate human health criteria since 1990, and feels that it is appropriate and reasonable to continue to use that consumption amount to adjust the EPA mercury fish tissue criterion. The result is a proposed standard somewhat more stringent than the EPA national criterion, but this is reasonable because of the importance of sport fishing and the high percentage of Minnesotans (about half) that have fishing licenses.

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[15] The Agency recalculated the EPA Great Lakes Initiative human health-based standards using 30 g/d rather than 15 g/d so Minn. R. ch. 7052 standards would agree with Minn. R. ch. 7050 standards.

5. Consistent with Existing Narrative Standard and Fish Consumption Advice [IV.D. reasonableness, mercury standard]

The proposed numeric fish tissue mercury standard offers consistency in the goals and approaches for protecting fish consumers from mercury contamination among the Agency, MDH and EPA. The shared goal of all three agencies is to limit mercury exposure to fish consumers, so they can enjoy the numerous health benefits of eating fish.

In the "assessment factor" rulemaking completed in 2003 the Agency added details about how waterbodies are assessed for impairment due to mercury in fish (existing Minn. R. 7050.0150, subp. 7, quoted in Section III.A.1). The addition linked the narrative standard to fish consumption thresholds established by MDH, and to a fresh water fish consumption level of one meal per week. The proposed mercury standard of 0.2 ppm is also linked to a consumption level of one meal per week. The proposed standard is completely compatible with the rule changes made in 2003.

To encourage good health for the people that eat fish in Minnesota, the MDH issues guidelines for how often certain fish can be eaten safely. This is called the Minnesota Fish Consumption Advisory (MFCA). Beginning in 2001 the MFCA has provided general advice applicable to all fishing lakes and rivers in Minnesota, regardless of whether the fish from a given waterbody have been tested, with the exception of a subset of lakes and rivers listed individually that have more restrictive consumption advice (Exhibit M-4).

The MDH establishes the concentrations of mercury in fish that trigger the various levels of advice – from "unlimited consumption" to "do not eat". These concentrations are derived using health-based estimates of exposure to mercury through fish consumption that are likely to be without appreciable risk of harmful effects on humans. The advice is derived using the best peer-reviewed science available. The fish tissue mercury concentrations and corresponding MDH advice categories are shown in Table III-4. Mercury concentrations in Table III-4 are for consumption by the more sensitive sub-populations.

Mercury concentrations in edible fish tissue of 0.2 ppm is the upper end of the range of mercury in fish that corresponds to MDH advice for limiting fish consumption to one meal per week for sensitive members of the population (pregnant women, women who may become pregnant, and children under age 15). At mercury levels between 0.2 and 1.0 ppm, the advice changes to no more than one meal per month for the sensitive groups (Table III-4). Because methylmercury affects neurodevelopment, developing fetuses, infants, and children are more sensitive to health effects than older children and adults. The 0.2 ppm value is based on keeping exposure below the health toxicity value or reference dose (RfD) designed to protect humans (including susceptible subgroups or life-stages) from an appreciable risk of adverse health effects over a lifetime.[16] The 0.2 ppm threshold is lower than the threshold applicable to the less sensitive members of the population, women not planning on getting pregnant and men.

[16] EPA. 2006. Integrated Risk Information System (IRIS), glossary. Accessed at http://www.epa.gov/iris/gloss8.htm on April 10, 2006.

Table III-4. Mercury Fish Tissue Concentrations (in ppm) that Correspond to MDH Fish Consumption Advice, and Levels that Indicate an Impaired Condition (shaded cells).

Mercury	*Minnesota Department of Health* **Fish consumption advice for pregnant women, women who may become pregnant, and children under age 15**			
Consumption Advice	Unlimited	1 meal/week	1 meal/month	Do not eat
Fish Concentration in mg/kg (ppm)	<= 0.05	>0.05 – 0.2	>0.2 - 1.0	> 1.0
Mercury	**Fish consumption advice for women not planning to be pregnant and men**			
Consumption Advice	Unlimited	1 meal/week	1 meal/month	Do not eat
Fish Concentration in mg/kg (ppm)	<=0.16	>0.16-0.65 (>0.2-0.65)	>0.65-2.8	>2.8
Shaded cells indicate consumption advice that corresponds to an impaired condition or non-support for the human health narrative fish consumption standard.				

The MDH consumption advice is, as the name implies, a guide to help people make good choices about the fish they eat; there is nothing mandatory or regulatory about the MFCA. In contrast, waters determined to be impaired due to mercury (the 303(d) list) are deemed to be in violation of a legally enforceable water quality standard. While mindful of the differences between "advice" and the regulatory implications of impaired waters listings, the Agency also feels it is very important to maintain as much consistency as possible between the thresholds MDH uses to assess data for the MFCA and the thresholds the Agency uses to assess data for determination of impairment. Consistency is important to facilitate public understanding and acceptance of both assessment processes as well as for scientific reasons.

6. <u>Standard in Form of Total Mercury</u> [IV.D. reasonableness, mercury standard]

The proposed mercury fish tissue standard is specified as **total** mercury, rather than as methylmercury (MeHg) or an inorganic form. There are several reasons why the Agency believes a total mercury fish tissue standard is appropriate and reasonable, even though MeHg is the form that is harmful to people and the human health risk analyses (EPA's RfD) are based on MeHg.

Probably the primary reason "total" mercury makes the most sense is that the analysis of mercury in fish tissue are reported as total mercury. Also, the vast majority of all mercury concentrations measured in water are, historically as well as currently, total mercury. In the last 10 years or so the analysis of water samples for MeHg has increased, but MeHg is measured usually as part of a more specialized monitoring program or as part of a research project. In water the concentration of total mercury is normally much greater than the concentration of MeHg, and therefore total mercury is easier to detect and measure analytically.

Second, a total mercury standard is reasonable because while the concentration of MeHg is relatively low in water, it is very high in fish tissue. The Agency must be concerned about all forms of mercury in water (i.e., total mercury); because we don't know how much of the total will end up in fish as MeHg. The amount of MeHg relative to total in most surface waters is low. The EPA reviewed the percentages of dissolved MeHg to total mercury in a variety of surface waters at the time the new fish tissue criterion was being prepared. The data EPA assembled for nine lakes in the northern hemisphere had an average percent of dissolved MeHg of about three percent (range: 0.2 to 14 percent). The data for 13 rivers in the U.S. (including separate averages reported for 39 and 7 rivers in Wisconsin) showed an average percent of dissolved MeHg of 1.4 percent (range: 0.2 to 5.1 percent).

In fish tissue the situation is reversed. That is, almost all the mercury in fish is in the methyl form. Aquatic organisms are exposed to different forms of mercury from the surrounding water and food uptake, but because of the efficient absorption of MeHg in the gastrointestinal tract and its very low elimination rate, mercury in fish tissue is almost 100 percent MeHg (Exhibit M-1). The standard analytical method does not distinguish the form of mercury actually measured in fish tissue (EPA Method 7473)[17]. Analytical results are reported as total mercury, but it can be safely assumed that essentially all the mercury in fish is MeHg.

Third, the current water standards are expressed as total mercury, therefore there is consistency in having a total mercury fish tissue standard.

Finally, the laboratory method for analysis of mercury in fish tissue measures total mercury concentrations.[17] Again, it is well established that the total mercury measured in fish is equal to the MeHg concentration. The analytical technique does not have to specifically measure MeHg, which lowers the cost and increases reliability of results. It is reasonable for the Agency to promulgate the fish tissue standard as a total mercury concentration.

7. Protection of Wildlife [IV.D. reasonableness, mercury standard]

Fish consumption is also the principal source of mercury-exposure for fish-eating wildlife. EPA has extensively reviewed wildlife data on exposure and health effects for the water quality standard proposed in the Great Lakes Initiative (GLI) in 1995,[18] promulgated into Minn. R. ch. 7052 in 1998. The Great Lakes basin standard of 1.3 ng/L is based on protecting fish-consuming avian and mammalian wildlife in the Great Lakes area. EPA also conducted a thorough review of fish-eating wildlife and impacts of mercury exposure in the Mercury Report to Congress in 1997.[11] This review encompassed a broader national view of fish-eating wildlife. To date EPA has not developed a national fish tissue mercury criterion for protecting fish-eating wildlife, nor have they developed national guidance or protocols for proposing a fish tissue standard for the protection of wildlife. The Agency is not currently proposing a fish tissue standard exclusively based on protecting fish-eating wildlife, but is retaining the GLI standard in Minn. R. ch. 7052

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[17] EPA. 1998. EPA Method 7473: Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry. EPA. January 1998.

[18] EPA. 1995. Great Lakes Water Quality Initiative Technical Support Document for Wildlife Criteria and Great Lakes Water Quality Initiative Criteria Documents for the Protection of Wildlife: DDT, Mercury, 2,3,7,8-TCDD, PCBs. EPA, Office of Water (EPA-820-B-95-009; EPA-820-B-95-008), Washington, D.C.

and feels the current and proposed standards in Minn. R. ch. 7050 also provide benefits for wildlife.

However, ongoing work by EPA and collaborators has potential for providing a sound foundation for future criteria.[19,20] Common loons are considered a sentinel species for setting limits on mercury exposure for northern waters.[20,21] Extensive laboratory and field research on common loons and mercury exposure and health effects in Wisconsin and northeastern United States is providing important data for protecting this and other fish-eating species of wildlife.[22,23] The Agency has collaborated with one of the nation's top experts on common loons, Dr. David Evers, to examine mercury exposure in Minnesota's common loons.[24] Because recent work by Dr. Evers and colleagues linked adverse effects in loons with fish tissue concentration in prey fish greater than 0.15 ppm (mg/kg),[23] the Agency will continue examining new data and guidance by EPA for future fish tissue standards for wildlife.

The current lack of a statewide wildlife-based mercury criterion or standard is offset by the fact that numerous lakes and river segments are already listed as impaired for mercury. These waterbodies will be addressed by the proposed mercury TMDL (Exhibit M-2). Because mercury is an air problem, identification of impaired waters serves as a route to achieve reductions in mercury emissions that will benefit both human and wildlife fish consumers in all waterbodies, not just those actually listed as impaired. The TMDL impairment threshold is also based on 0.2 ppm in large predator fish (walleyes and northern pike); therefore, achieving the human health standard in these fish results in even lower concentrations in smaller fish, lower on the food chain – fish typically consumed by many wildlife species, including common loons.

8. Monitoring Mercury Contamination in Surface Waters and Fish [IV.D. reasonableness, mercury standard]

The Agency has programs to monitor mercury in surface waters and edible fish tissue and receives data from outside sources. Beginning in 1996, the Agency began monitoring river basins across the state for mercury and other metals using improved methods. Other agencies have also provided mercury monitoring data from surface waters, including the Metropolitan Council Environmental Services and the U. S. Geological Survey. These programs employ ultra-clean sampling and analytical methods to ensure the highest quality of data. But the longest standing and most comprehensive mercury monitoring data comes from the multi-state agency Fish Contaminant Monitoring Program, which started testing fish for contaminants in 1967.[8]

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[19] Lazorchak et al. 2003. Contamination of fish in streams of the mid-Atlantic region: An approach to regional indicator selection and wildlife assessment. *Environmental Toxicology and Chemistry,* Vol. 22(3): 545-553.
[20] Nacci et al. 2005. An approach to predict risks to wildlife populations from mercury and other stressors. *Ecotoxicololgy*, Vol. 14: 283-293.
[21] Evers. 2004. Status Assessment and Conservation Plan for the Common Loon (*Gavia Immer)* in North America for U. S. Fish and Wildlife Service. Biodiversity Research Institute, Gorham, Maine.
[22] Meyer. 2005. The Wisconsin Loon Project: Insuring Loons will be Here for the Grand Kids. Wisconsin Department of Natural Resources, Rhinelander, Wisconsin.
[23] Evers. 2003. Assessing the Impacts of Methylmercury on Piscivorous wildlife Using a Wildlife Criterion Value based on the Common Loon, 1998-2002. Biodiversity Research Institute (BRI2003-07). Falmouth, Maine.
[24] Evers. 2006. Determining Biotic Exposure and Risk of Methylmercury in Voyageurs National Park: As Indicated by the Common Loon [Draft]. Biodiversity Research Institute (BRI2006-03). Gorham, Maine.

The Fish Contaminant Monitoring Program involves the Minnesota Departments of Health, Natural Resources and Agriculture as well as the Agency. The program collects fish from lakes and rivers throughout Minnesota, primarily for assessment of human exposure to mercury (and fish tissue contaminants). A variety of fish species and sizes that represent the resident community are collected annually from an average of 95 locations (lakes and streams). The complete fish tissue data base has over 23,000 records. MDNR fisheries staff captures the fish, the fish are processed in the Agency's water lab, and the analyses are done at the MDA analytical lab. The MDH issues an annual fish consumption advisory, updated with the fish tissue results from the previous year for waters with more restrictive advice than the general advice.

The identification of waters impaired due to the indigenous fish being a potential health hazard is an important part of protecting surface waters for full aquatic life uses. The direct analysis of fish tissue for contaminants is the best means to do this. The shared fish contaminants database ensures the most cost-effective, complete, and consistent data for fish consumption advice and comparison to standards for impairment listing.

9. <u>Mercury Total Maximum Daily Load Study</u> [IV.D. reasonableness, mercury standard]

In June 2006, the Agency published the final draft of a regional TMDL for mercury impaired waters. (*Minnesota's Total Maximum Daily Load Study of Mercury* [Draft], Exhibit M-2). The mercury TMDL was submitted to EPA Region 5 for review in August 2006 and EPA approved the TMDL on March 27, 2007.

The TMDL study stems from over 1,300 listings of waterbodies impaired due to too much mercury as measured in fish tissue or in the water. The CWA requires the state to examine pollutant sources and allocate reductions in all sources needed to meet water quality standards (the TMDL). The principal source of the mercury in Minnesota, as elsewhere, is fallout from the atmosphere. Because the primary source is consistent state-wide, it is very appropriate for the TMDL to address the problem regionally.

The TMDL determined that point sources (water discharges from wastewater treatment plants) contribute less than one percent of total mercury loading state-wide. Nevertheless, the TMDL study may affect the requirements of NPDES/SDS permitted facilities in the future. The Agency plans to form a stakeholder advisory committee in 2007 to discuss implementation options for point sources under the approved TMDL. The committee should be able to make recommendations to the Agency in about a year. Meanwhile the Agency will continue to rely on requiring mercury minimization plans in NPDES permits and the current 6.9 ng/L standard to set effluent limits for mercury where needed. Minimization plans identify and seek to reduce the direct sources of mercury to the municipal wastewater treatment system. The less mercury coming into the plant the less that goes out in the effluent. The TMDL also proposes to include fish tissue monitoring along with water monitoring for some facilities, which will enhance data on BAF calculations if need for site-specific TMDLs.

The adoption of the 0.2 ppm mercury standard will not impact the TMDL itself at all because the impairments leading to the TMDL were based on the same threshold, 0.2 ppm in fish.

10. Implementation and Water-Medium Standards [IV.D. reasonableness, mercury standard]

As previously discussed, the mercury fish tissue criterion is the first ambient water quality criterion published by EPA that applies in fish tissue and not water. A "fish-tissue" standard is implemented very much like any other water quality standard (SONAR Book I, Section II.A.6), including the assessment of waterbodies for potential impairment and as the foundation for setting effluent limits in NPDES and State Disposal System (SDS) permits. The Agency has used fish tissue mercury data for impaired waters assessments since 2002. However, it poses unique challenges in practical application in programs built on standards applied as water concentrations, such as the NPDES/SDS program.

The EPA fish tissue criterion does not address the application of the criterion or provide guidance on using fish monitoring data to determine compliance to the criterion for impaired waters assessments (the *Federal Register* notice provides some guidance, see below). The Agency already has established protocols, updated with each 303(d) impaired waters list that describes the use of fish tissue data in relationship to the narrative standard. In Minn. R. ch. 7050, there will be no restrictions set on the application of the fish tissue criterion based on fish species or fish characteristics, however in response to extensive comments received from stakeholders on the mercury TMDL and recent legal interpretations of the CWA, the Agency is reviewing protocol for 303(d) listing and TMDL applications. At the January 24, 2006 update of the Agency Citizen Board, staff mentioned that several refinements on the interpretation of a fish tissues standard were under discussion (Exhibits A-64a and A-64b). Considered were the possibility of, 1) not applying the standard to top predator fish that exceed a certain size, 2) requiring more than one fish in a sample to list a waterbody, and 3) using regression analysis to infer mercury concentrations for fish of a size not represented in the sample. The Agency received over 500 e-mails in response to this presentation; the concern was that these actions would weaken the mercury standard (example of the most common e-mail is Exhibit A-67a). An e-mail response was sent to all those that e-mailed comments (Exhibit A-67b). The Agency will be obtaining additional stakeholder input and making final decisions on these changes through the 303(d) listing, assessment guidance, and TMDL process. The Agency is not considering changes in how water column data is used in impairment listings.

Currently, effluent limits for mercury in NPDES/SDS permits are based on either the statewide water column chronic standard of 6.9 ng/L, adopted in 1990 (Minn. R. ch. 7050), or in the Lake Superior Basin, 1.3 ng/L adopted in 1998 (Minn. R. ch. 7052). With the promulgation of the mercury fish tissue standard, the Agency is retaining these water column standards and plans to continue their use in setting effluent limits until alternative approaches are deemed practicable and feasible based on the recommendation of the mercury TMDL implementation stakeholder committee and any final guidance from EPA on the implementation of the 2001 EPA fish tissue residue criterion.

The EPA *Federal Register* notice on the publication of the fish tissue criterion in 2001 provides a short discussion on possible alternatives for implementing the fish tissue standard as a basis for

NPDES effluent limits, including conversion to water concentrations (Exhibit M-5). The exception would be for waters covered by the Great Lakes Initiative (GLI) where the EPA supports retention of the mercury water column standards and their use in setting effluent limits (1.3 ng/L in Minn. R. ch. 7052). In the notice, EPA presents problems inherent with applying any of the approaches for setting effluent limits and announces by the end of 2001 EPA would publish detailed guidance for States and Tribes on implementation. On August 9, 2006 a draft guidance was finally published by EPA (Exhibit M-8). The Agency has reviewed the *Draft Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion*, but is not planning at this time to alter our approach to implementation for these reasons:

- Any new approach for implementing mercury controls at water point sources needs to be consistent with the recommendations of the mercury TMDL stakeholder advisory committee, EPA final guidance, and other NPDES/SDS and CWA rules;
- Simple use of bioaccumulation factor (BAF) for mercury to translate the fish tissue standard to a water concentration for effluent limits is problematic as described below.

The "BAF" approach to translating a fish tissue to a water concentration is simple:

C_w in ng/L (ppt) = (0.2 ppm / BAF) (1,000,000)

Where:
C_w = concentration of mercury in water in ng/L
0.2 mg/kg or ppm = fish tissue standard
BAF in l/kg
1,000,000 = adjustment of units from parts per million to parts per trillion

There is a substantial amount of information on mercury bioaccumulation rates. But one fact that always emerges from any analysis of mercury bioaccumulation is how variable it is, and how site-specific it can be. This was the conclusion of EPA in their review of bioaccumulation for the revised mercury criterion (Exhibit M-1). The EPA avoided having to settle on one BAF, or a range of BAFs, by proposing a fish tissue mercury criterion – one of its major advantages.

The Agency has examined monitoring data from Minnesota's lakes and streams from which mercury BAFs can be derived. Using total mercury concentrations measured in water and fish in the same watersheds, the Agency evaluated BAFs for river basins and lakes (Exhibits M-6 and M-7). The best set of BAF data for lakes is from 14 lakes covering the three distinct geographical and land-use zones across the state: agriculture, Twin Cities metropolitan area, and forest (Exhibit M-2 and M-7). BAFs for total mercury in lakes using standard size walleye and northern pike ranged from 32,587 L/kg to 1,426,490 L/kg., with a geometric mean of 388,424 L/kg.

Similarly the Agency reviewed bioaccumulation data for major river systems in Minnesota (Exhibit M-6). Basin-wide average BAFs ranged from a low of 28,000 L/kg for the lower Mississippi River to a high of 148,000 L/kg for the upper Mississippi River basin. The variability of mercury BAFs within Minnesota means that one needs to be cautious about using a particular BAF in the translation process, and final guidance on how to translate a fish tissue number to a water column concentration is pending.

At this time the Agency plans to retain the current water quality standards for mercury that apply to water column concentrations (Table III-2), primarily to maintain consistency in how the Agency addresses mercury from water point sources. The Agency always planned to retain the 1.3 ng/L standard in Minn. R. ch. 7052 because it is wildlife-based, and until the Agency (or EPA) develops a wildlife-based fish tissue standard (criterion), the Agency will retain this standard. The Agency changed its position regarding retaining the human health-based 6.9 ng/L standard over the course of preparing for this rulemaking. The Agency originally planned to replace it with the proposed fish tissue standard of 0.2 ppm. The decision was made to retain it because EPA had not issued a final implementation guidance (Exhibit M-5), and because, at the time, the Agency's mercury TMDL was still in draft from (Exhibit M-2). In addition, the lack of EPA final guidance means the Agency does not have the benefit of EPA's expertise on the issues, or their strategies and policies on how to make the transition from fish to water concentrations. EPA also has easy access to nation-wide monitoring data and modeling tools that the Agency may not. The Agency decided to retain the 6.9 ng/L standard for the purpose of setting mercury effluent limits, at least as an interim measure.

In conclusion, the Agency will continue to urge point sources to reduce mercury emissions wherever they can through development and implementation of mercury reduction plans. And the Agency will continue to set effluent limits for the larger facilities. The Agency plans to delay using the 0.2 ppm fish tissue standard as the basis for setting point source effluent limits until the mercury stakeholder committee issues recommendations. Final implementation guidance from EPA would be helpful as well. Meanwhile, the Agency plans to retain the 6.9 ng/L standard and continue to use it as the basis for setting effluent limits. The addition of the fish tissue standard will not affect NPDES or SDS effluent limits for some time and the outcome of the stakeholder committee process is uncertain.

E. ECONOMIC IMPACT [IV. mercury standard]

The addition of new water quality standards can have the potential for economic impact primarily to programs involved with surface water monitoring, 303(d) impairment listings, TMDL studies and NPDES/SDS permits. Initially, the addition of the fish tissue mercury standard will have no economic impacts on any of these programs, because:

- The numeric fish tissue standard is already applied under the narrative fish consumption standard in existing Minn. R. 7050.0150, subp. 7;
- Monitoring and 303(d) listing programs are already based on assessing mercury contamination in fish tissue;
- Water quality standards and effluent limits for mercury underlying NPDES/SDS permits will not change until stakeholders have an opportunity to weigh in on the process.

The Agency has been using 0.2 ppm of mercury in fish, the same as the proposed standard, to assess surface waters for 303 (d) impairment beginning in 2002 (section 303(d) of the CWA).

As noted previously, the 0.2 ppm value used to date is the numeric interpretation of the existing narrative standard for protecting human consumers of fish. The promulgation of this value in rule as the fish tissue mercury standard does not change the Agency's assessment of mercury in fish tissue.

The principle monitoring program for mercury in surface waters has been based on fish tissue measurements. The Agency already has cooperated with the Minnesota Departments of Health, Natural Resources, and Agriculture to set up a cost-effective and comprehensive fish tissue monitoring program focused primarily on mercury contamination. The promulgation of the mercury fish tissue standard does not affect the monitoring design or scope of the already ongoing FCMP.

As noted, dischargers covered under NPDES/SDS permits will not have any changes in their permits due to the addition of the mercury fish tissue standard, at least for the foreseeable future. The Agency is retaining the two water column mercury standards, which are unaffected by the mercury fish tissue standard. However, the Agency recognizes that the retention of the current chronic water column standard may prove to be an interim solution for setting effluent limits and the mercury TMDL stakeholder process or a final implementation guidance from the EPA may ultimately lead to an alternative approach for setting effluent limits or controlling mercury from water point sources.

Because of the high uncertainty in identifying the timeframe for when changes to effluent limits could occur and what those changes would mean, if any, the Agency cannot provide a definitive answer on if costs would be incurred by NPDES/SDS permitted facilities in the future.

F. CONCLUSIONS [IV. mercury standard]

Mercury is an air pollutant that because of its complex environmental cycle ends up being a significant problem in aquatic systems. Bioaccumulation in fish and other aquatic organisms mean that humans receive most of their mercury exposure from fish consumption. The Agency is proposing to add a numeric fish tissue water quality standard to Minn. R. ch. 7050. The proposed standard is based on the EPA *Water Quality Criterion for Protections of Human Health: Methylmercury* (2001; Exhibit M-1). The proposed mercury standard is 0.2 milligram of total mercury per kilogram of fish (or parts per million, ppm) will apply to total mercury concentrations in edible fish tissue of any species of fish from Minnesota's waters. The promulgation of a 0.2 ppm mercury standard is important for augmenting the current numeric chronic standards for water column concentrations by providing a more precise level of protection to fish consumers, where mercury exposure is a concern. The fish tissue standard would not, however, affect or change the application of the current mercury chronic standards.

V. PROPOSED STANDARDS FOR ACETOCHLOR AND METOLACHLOR

A. INTRODUCTION [V. acetochlor and metolachlor]

In February 2002, the Minnesota Department of Agriculture (MDA) asked the Agency to develop surface water standards for several pesticides (Exhibit H-1). In subsequent meetings, the Agency indicated it had resources to develop and promulgate water quality standards for two herbicides. MDA responded by saying that standards for acetochlor and metolachlor would be their first priority.

B. NEED FOR ACETOCHLOR AND METOLACHLOR STANDARDS [V. acetochlor and metolachlor]

1. <u>Introduction</u> [V.B. need, acetochlor and metolachlor]

The Agency develops and revises water quality standards to protect aquatic life, and human and ecological health under mandates in the Clean Water Act[25], Minnesota Statutes[26], and Minnesota Rules chapters 7050 and 7052. Most numeric standards promulgated and adopted by the Agency are based on aquatic life criteria published by EPA under Section 304(a) of the Clean Water Act. It is EPA's responsibility to research the literature, conduct toxicity tests as needed, solicit public input, develop and publish nation-wide aquatic life criteria. EPA criteria are guidance, and they must be adopted as standards by states to become legal entities. EPA's role as developer of national criteria is extremely important to state (and Tribal) water quality standard programs. It facilitates the adoption of consistent and well researched numeric standards by states and Tribes. Unfortunately, EPA criteria are not available for many modern-day pesticides, including acetochlor and metolachlor. Therefore, the Agency undertook the development of the proposed standards "from scratch" using methods that follow EPA and Agency guidance (described fully in *Reasonableness*, with reference to Exhibits H-11 and HH-3). The Agency has done this before; in the absence of EPA criteria; for example, we developed and successfully promulgated standards for two herbicides, atrazine and alachlor, in 1994.

Before committing to develop standards, the Agency had developed "advisory values" for both acetochlor and metolachlor in 1996 and 1998, respectively. Advisory values are based on a limited search of relevant toxicity data, and they have not, nor would they, be promulgated into Minnesota Rules. The Agency advisory values for both herbicides are based on aquatic life toxicity. Advisory values are often developed in response to spill incidents and for use as clean-up thresholds at pesticide remediation sites (Exhibits H-2a, H-2b and H-3, Table III-5). The Class 2A (trout waters) advisory value for acetochlor was lowered slightly in 1998.

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[25] Clean Water Act, section (§) 303 (c)(2)(B) codified in 33 United States Code (U. S. C.) § 1313 (c)(2)(B)-January 19, 2004.
[26] Minnesota Statutes § 115.03, subd. 1(b) and 1(c).

In 1986 EPA developed advisory values for metolachlor based on both human health and aquatic life toxicity.[27] The EPA aquatic life "advisory program" seemed to be an effort by EPA in the mid-1980s to satisfy the strong demand for toxicity-based values, in lieu of the more rigorous and time consuming process of developing 304(a) criteria. EPA advisory values, like the Agency's counterpart, are based on a limited investigation of toxicity data. EPA urges caution in the application of advisory values. It appears that by about 1990, EPA abandoned the advisory value program. These values are shown in Table III-5 compared to the proposed chronic standards (in shaded rows).

Table III-5. Agency and EPA Chronic Advisory Values for Acetochlor and Metolachlor, Compared to Proposed Chronic Standards, in µg/L.

Herbicide	Source	Basis	Class 2A	Class 2Bd	Class 2B,2C,2D
Acetochlor				µg/L	
1996 advisory	MPCA	Toxicity	0.79	1.4	1.4
1998, revised advisory	MPCA	Toxicity	0.63	1.4	1.4
Proposed chronic standard	MPCA	Toxicity	1.7	1.7	1.7
Metolachlor				µg/L	
1998 advisory	MPCA	Toxicity	10	10	10
1986 advisory	EPA	Human health	44	44	44
1986 advisory	EPA	Toxicity	100	100	100
Proposed chronic standard	MPCA	Toxicity	23	23	23

MPCA means Minnesota Pollution Control Agency

2. Request for Standards from Minnesota Department of Agriculture [V.B. need, acetochlor and metolachlor]

The Minnesota Department of Agriculture (MDA) is Minnesota's lead agency for pesticide regulations and management.[28] And the Pollution Control Agency has a broad mandate to protect Minnesota's waters from toxic pollutants.[29] Both agencies have an excellent record of coordination in carrying out these roles. In conjunction with records of pesticide sales and monitoring data that shows potential exceedances, and sales of pesticides, MDA asked the Agency to develop water quality standards, or at a minimum, advisory values, to evaluate the significance of pesticides detected in surface waters, or to anticipate the aquatic toxicity of new

[27] EPA 1986. Water quality advisory, metolachlor. Criteria and Standards Division, Office of Water Regulations and Standards. U.S. EPA. 20 pp.
[28] Minnesota Statutes §§ 18B, 18C, 18D and 103H (2004).
[29] Minnesota Department of Agriculture (MDA) and Minnesota Pollution Control Agency (MPCA). 2004. Cooperative Surface Water Quality Monitoring System, Agreement signed July 2004 by G. Hugoson, Commissioner MDA and S. Corrigan, Commissioner MPCA. Available at www.mda.state.mn.us/appd/ace/maace.htm.

products[30]. The MDA in turn uses standards and advisory values to make pesticide management decisions (Acetochlor and Metolachlor Supplements, Exhibit H-4 and H-5).

In February 2002, MDA's Agricultural Chemical Environmental Section sent a formal request to Agency Water Standards Unit explaining the need for additional pesticide standards (Exhibit H-1). The MDA updated their request in April 2003 to encompass new information on pesticide-use and detections. Their request also recommended an extensive review for promulgation of water quality standards for eight pesticides and/or their environmental breakdown products (degradates), as preferred to a less comprehensive aquatic toxicity review used to set advisory values (Exhibit H-6). Further discussion between the Agency and MDA in May 2004 (as recorded in a letter on June 23, 2004; Exhibit H-7) led to the Agency's commitment to develop standards for acetochlor and metolachlor, and to review degradate information when available. The Agency also agreed to follow up on the development of additional advisory values on the other priority pesticides and degradates in the future, as staff availability permits.

3. Acetochlor and Metolachlor Used Extensively in Minnesota [V.B. need, acetochlor and metolachlor]

Acetochlor and metolachlor (including s-metolachlor) are both preemergence herbicides used to control grasses and some broadleaf weeds. About three to five million pounds of acetochlor and about one to two million pounds of metolachlor were sold in Minnesota each year from 2002 to 2004, mainly for use on corn (see Exhibits H-4 and H-5).[31]

4. Herbicides Detected in Ground and Surface Waters [V.B. need, acetochlor and metolachlor]

Requests from MDA for acetochlor and metolachlor water quality standards were prompted by detection of these herbicides in Minnesota's surface waters, and contamination at remediation sites. As explained fully in the Acetochlor and Metolachlor Supplements (Exhibits H-4 and H-5), under the guidance of MDA's Pesticide Management Plan, MDA identified acetochlor as a surface water pesticide of concern, and both acetochlor and metolachlor as frequently detected in ground water in 2003.[32] Previously, a multi-stakeholder committee representing state agencies, farmers, agricultural industries, environmental groups, and academia recommended MDA take additional actions in response to the frequency of detection and measured concentrations of acetochlor in surface water, and for acetochlor and metolachlor in ground water.[33] MDA surface water monitoring data has shown concentrations of acetochlor at or above the Agency advisory value developed in 1998 (Exhibit H-2b). These "exceedances" met MDA's Pesticide Management Plan criteria for a "surface water pesticide of concern", which calls for pesticide-

[30] Pesticide is a general term that encompasses a range of agents used to control and kill pests and commonly refers to herbicides (controls plants), fungicides (controls fungi), and insecticides (controls insects).

[31] MDA Web site on pesticide use at http://www.mda.state.mn.us/appd/pesticides/pesticideuse.htm

[32] MDA. 2003. Notice of proposed determinations regarding the occurrence of pesticides in waters of Minnesota. *Minnesota State Register*. March 24, 2003.Vol. 27(39): 1484-1486.

[33] Recommendations from the Common Detection Advisory Committee to the Commissioner of Agriculture on the Status of Pesticides in Minnesota's Water Resources. June 2002. MDA. St. Paul. Available at www.mda.state.mn.us/appd/ace/maace.htm.

specific voluntary best management practices (Exhibit H-8). Pesticide-specific voluntary BMPs were also developed for acetochlor and metolachlor for ground water protection.

Frequent occurrence of acetochlor and metolachlor in surface runoff flows, prompted MDA to request the development of standards for these two pesticides, in part as a prevention strategy to keep various watersheds in Minnesota from being put on a total maximum daily load (TMDL) impaired waters list. Metolachlor detections in surface water samples have been found in as much as 100 percent of samples taken during storm-events, and in 92 percent of samples taken during base flow periods.[34] Concentrations have been below the Agency's advisory value at most sampling locations. The properties of metolachlor result in a high potential for movement into surface waters following land application. Acetochlor's registration in 1994 for use on crops by EPA was contingent on a reduction in use of other corn herbicides, such as alachlor. As early as 1995, MDA monitoring showed detections in surface water; acetochlor is now detected at all automated river stations during the growing season and in almost half of the statewide survey sites.[34] Monitoring has shown single samples with acetochlor concentrations above the advisory value (Acetochlor Supplement, Exhibit H-4).

The Agency believes it is important to respond positively to MDA's request and monitoring results, and to promulgate water quality standards for acetochlor and metolachlor in Minn. R. ch. 7050. The development and promulgation of standards assures that there will be a complete, current and comprehensive scientific review of aquatic life and human health toxicity information, and an opportunity for a full public review. Adopted pesticide standards will help provided the basis for appropriate responses by MDA, Agency, and the agricultural community to surface water detections. The significance to human and ecological health from pesticides in surface waters cannot be determined without water quality criteria.

In summary, standards for acetochlor and metolachlor are needed to honor MDA's request for additional pesticide standards, because of the extensive use of these herbicides on corn, and because they are being detected in both ground and surface waters in Minnesota. Detected concentrations of these chemicals in waters of the state, particularly acetochlor, pose a potential threat to aquatic communities. Water quality standards will help assesses the magnitude of these potential problems in the future.

C. REASONABLENESS OF PROPOSED ACETOCHLOR AND METOLACHLOR STANDARDS, REQUIRED INFORMATION [V. acetochlor and metolachlor]

1. Introduction [V.C. reasonableness, acetochlor and metolachlor]

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed acetochlor and metolachlor standards.

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[34] MDA. 2002-2005. Pesticide Monitoring in Water Resources: Annual Data Reports and Sampling Data. MDA, St. Paul. Available at www.mda.state.mn.us/appd/ace/maace.htm .

2. Classes of Persons Affected by the Proposed Rule Amendments, Including those Classes that Will Bear the Costs and Those that Will Benefit [V.C. reasonableness, acetochlor and metolachlor]

As with all statewide water quality standards, essentially all the citizens of Minnesota could be affected by, and benefit from, the proposed water quality standards for the corn herbicides, acetochlor and metolachlor. Some of the benefits to people in general are intangible, such as the assurance that Minnesota's Agencies are taking steps to protect aquatic communities and human health by continuing to address detections of pesticides in surface waters. Concerns about another corn herbicide, atrazine, have made pesticides a popular news item. The MDA has taken critical steps with the development and promotion of pesticide-specific voluntary best management practices (BMPs) to manage and reduce the occurrence of corn herbicides in surface and ground waters. Water quality standards provide benchmarks to show that Minnesota's waters are healthy and support their designated beneficial uses or are in need of additional intervention. Agency promulgation of water quality standards for the most frequently used and detected corn herbicides is a necessary step to ensure protection of Minnesota's valuable water resources and fulfill the protection level goals under the Clean Water Act.

In the corn-growing areas of the state where acetochlor and metolachlor are used, water quality standards provide local and state agencies the tools for ensuring aquatic communities and human health are not being impacted by pesticides in surface waters. Surface waters with measurable concentrations of acetochlor and metolachlor include rivers protected for trout fishing, swimming, drinking water, and fish consumption. The standards for acetochlor and metolachlor are designed to protect all these designated beneficial uses. Direct users (human and aquatic organisms) of surface waters will benefit by having the protection provided by the standards.

Promulgated water quality standards for pesticides benefit the Agency and MDA when setting priorities for monitoring and management activities. Numerous pesticides are registered for agricultural use, all with different toxicity and properties; information on their relative toxicities and potential for leaching and runoff assists in setting monitoring priorities by MDA. Analytical costs and available resources dictate which pesticides should be included in their monitoring program. Monitoring can target the most toxic, highly used, and mobile pesticides in the environment. The MDA uses advisory values and standards from the Agency to trigger voluntary statewide and chemical-specific BMP development and outreach activities to reduce impacts before impairment may occur. Comprehensive reviews of pesticides for standards ensure that the best data is being used by state agencies to direct activities by the agricultural community.

Section IV.L., *Economic Impact*, provides a complete discussion of the affected parties and costs. Stakeholders possibly affected are summarized below.

The Agency and MDA have shared responsibilities for ensuring waters meet their designated beneficial uses relative to pesticides. Water quality standards give the Agency a basis for assessing waters for impairment by acetochlor and metolachlor for 303(d) listing. The Agency already assesses MDA pesticide monitoring data for possible impairment of other herbicides with standards: alachlor and atrazine. The Agency has staff with expertise on pesticide assessments put time into the Impaired Waters assessment process; the time commitment is expected to increase with the new acetochlor and metolachlor standards, but the extent is uncertain. The MDA will be affected primarily in their technical support role to the Agency in pesticide assessments.

More parties will be affected if waters are listed as impaired on the 303(d) list. The Agency would need to direct resources into developing a TMDL and implementation plan for listed watersheds. The MDA would also likely assist in TMDL development and implementation. Corn growers in the listed watershed would be affected by a herbicide impairment by responding to BMPs. Registrants may participate in monitoring or management activities.

3. Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues [V.C. reasonableness, acetochlor and metolachlor]

The Agency and MDA are the principal state agencies that deal with pesticides in surface waters. The Agency doesn't expect any substantial new costs to either agency as an immediate result of the promulgation of acetochlor and metolachlor standards. Where agency costs are anticipated would be as a result of a 303(d) listing; current monitoring data points to at least one future listing for acetochlor. A complete discussion of probable costs to the Agency is found in Section IV.L.

The Agency anticipates no impact to minimal impacts to State revenues from the addition of water quality standard for acetochlor and metolachlor.

4. Determination of Whether There Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose [V.C. reasonableness, acetochlor and metolachlor]

Promulgation of water quality standards for acetochlor and metolachlor offers options to the Agency not available without the standards. Assessment of herbicide concentrations in surface waters could be enacted under the current narrative standard in Minn. R. 7050.0150, subp. 3, but numeric standards provide clear, sound, and legally defensible protective water concentrations for determining if waters are meeting their designated beneficial uses. No other option exists for offering the same level of confidence and visibility of important health benchmarks for assessing the potential impacts of herbicides in surface waters.

As popular corn herbicides, acetochlor and metolachlor are widely applied annually to corn crops in Minnesota. Sales of acetochlor and metolachlor in 2004 were 3.8 and 2.7 million pounds, respectively, and ranked number two and four in pounds of active ingredients sold for all corn herbicides.[31] Both herbicides are detected in surface waters draining corn growing sections of the state.[34] The MDA has requested the Agency develop water quality standards for over 15 pesticides and some degradates, but identified these two herbicides as their top priority (Exhibits H-1, H-6, and H-7). The Agency feels it is important to act on MDA's requests, so not developing any water quality standards for pesticides (includes herbicides) is not a defensible option.

Previous advisory values developed by the Agency do not receive the level of scrutiny and exposure as promulgated water quality standards. The MDA can use the advisory values and have for developing and promoting voluntary BMPs (Exhibit H-8), but water quality standards provide greater reliability for such resource-intensive efforts. Promulgation of water quality standards requires and provides a forum for extensive review and opportunities for comments from any interested party; development of advisory values don't go through the same rigorous review process. The Agency also has not used advisory values for 303(d) listing, an important assessment of surface waters required by the Clean Water Act.

5. Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments [V.C. reasonableness, acetochlor and metolachlor]

The Agency has not seriously considered alternatives to the proposed water quality standards for acetochlor and metolachlor. The Agency would like to have developed additional water quality standards for pesticides as requested by MDA, but because of the significant amount of staff time and need to adhere to the rules timeline, the Agency could only feasibly commit to the two top pesticides, acetochlor and metolachlor. The publication of final ambient water quality criteria for modern pesticides by EPA in the future would greatly reduce the time and staff commitment to develop these standards and would facilitate addressing more pesticides.

6. Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [V.C. reasonableness, acetochlor and metolachlor]

Potential costs to any party attributed to the herbicide standards would primarily be contingent on impairment listings on the 303(d) list and subsequent TMDLs; estimates of possible costs are discussed in Section IV.L, *Economic Impacts*.

7. Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [V.C. reasonableness, acetochlor and metolachlor]

The Agency believes there could be "costs" to Minnesotans if the herbicide standards are not adopted. Minnesotans place a high value on our water resources for drinking water and fish consumption, recreation, and healthy ecosystems (see example discussion for benefits of eutrophication standards in Book II, Section V.B). The Agency has a mandate to protect these designated beneficial uses and when chemicals are detected in surface waters the Agency has a responsibility to take a closer look at possible impacts to humans and aquatic systems. At certain levels of exposure, acetochlor and metolachlor can affect human health; acetochlor is classified as a likely human carcinogen (see Section V.I). Both show toxicity to aquatic plants at concentrations that have been measured in surface waters (see Section V.G). Development of acute and chronic water quality standards aim to protect humans and aquatic systems from detrimental effects. If water quality standards are exceeded there can be a direct and indirect "cost" to human health and quality of life, resulting in monetary losses.[35]

8. Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference [V.C. reasonableness, acetochlor and metolachlor]

Federal regulations in the CWA, EPA guidance and water quality criteria documents provide the requirements and guidelines to develop water quality standards. The EPA has not published ambient water quality criteria or Maximum Contaminant Levels (federal drinking water standards) for acetochlor or metolachlor. The proposed herbicide standards developed by the Agency followed, and are consistent with, relevant federal regulations and guidance.

9. Consideration and Implementation of the Legislative Policy Under Minn. Stat. §§ 14.002 and 14.131 [V.C. reasonableness, acetochlor and metolachlor]

Minnesota Stat. § 14.002 requires state agencies, whenever feasible, to develop rules that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

The proposed numeric water quality standards for acetochlor and metolachlor are "prescriptive" as are all numeric standards as described in more detail in Section V. J. on *Implementation*.

The general concepts of how prescriptive or flexible a rule should be are discussed more in SONAR Book I, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [V.C. reasonableness, acetochlor and metolachlor]

Minnesota Stat. § 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made. These specific notification requirements are discussed in Section IV.C.10 and will not be repeated here. The Agency outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I.

11. Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local governments [V.C. reasonableness, acetochlor and metolachlor]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency

[35] U.S. Office of Management and Budget. 2003. Draft 2003 Report to Congress on the Costs and Benefits of Federal Regulations; Notice. *Federal Register*, Vol.68(22): 5492-5527, February 3, 2003.

provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

D. REASONABLENESS OF PROPOSED ACETOCHLOR AND METOLACHLOR STANDARDS, GENERAL [V. acetochlor and metolachlor]

1. Introduction [V.D. reasonableness, acetochlor and metolachlor]

The Agency is responsible for protecting surface and ground waters from degradation and effects of pollutants. Due to the wide use of acetochlor and metolachlor in Minnesota and their detection in waters of the state it is reasonable to develop and promulgate standards for these two herbicides.

In developing the proposed water quality standards for acetochlor and metolachlor, Agency staff determined criteria that protect, 1) aquatic life (toxicity-based criteria), and 2) human health (human health-based criteria). For some, usually highly bioaccumulative, chemicals the Agency will also determine a criterion to protect wildlife (wildlife-based criteria). There is not enough information available to develop a wildlife-based criterion for either acetochlor or metolachlor. As such, the research for these two pesticides was limited to aquatic toxicity and potential impacts on human-health. The Agency is proposing to adopt as standards the lower or more stringent of the toxicity- or human health-based criteria; which in this case for both herbicides, are the toxicity-based criteria. Promulgation of the lower of the two criteria as the proposed standard is standard Agency practice and ensures protection of all Class 2 uses. The Agency is not aware of any information that would suggest that the proposed standards will not be protective of wildlife also.

The methodologies to develop toxicity-based, human health-based and wildlife-based standards, and bioaccumulation factors and are described in Minn. R. ch. 7050.0218, subparts 4-9 and in Exhibit HH-3, MPCA's *Guidelines for the Development of Surface Water Quality Standards* (2000).

2. Acquisition of Data [V.D. reasonableness, acetochlor and metolachlor]

The Agency has worked closely and cooperatively with MDA's Agronomy and Plant Protection Division (now the Pesticide and Fertilizer Management Division) to assemble background information on acetochlor and metolachlor (Acetochlor and Metolachlor Supplements, Exhibits H-4 and H-5).[36] In addition, the Agency consulted with MDA to ensure comprehensive retrieval of all data relevant to standards development, including acquisition of aquatic toxicity and fish tissue measurements from the EPA Office of Pesticide Programs and from the pesticide registrants. MDA's knowledge of data sources has supported the Agency's data needs, including the data Minnesota Department of Health needs for the human health toxicological review.

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[36] J. Zachmann, Ph.D., Pesticide Management Plan Coordinator and D. Stoddard, Assistant Division Director.

Most of the ‘raw’ toxicity data (EC50s and LC50s) the Agency needs to develop standards is obtained from the ECOTOXicology database (ECOTOX) and the Chemical Evaluation Search and Retrieval System (CESARS) database. ECOTOX was built and is maintained by EPA’s Office of Research and Development and the National Health and Environmental Effects Research Laboratory’s Mid-Continent Ecology Division (Duluth, MN). CESARS was developed by the Ontario Ministry of the Environment and the Michigan Department of Natural Resources. Agency staff utilized EPA’s Office of Pesticide and Planning’s (OPP) pesticide database and pesticide registration documents. For instance, staff reviewed the final EPA document, *Ecological Risk Assessment for the use of S-Metolachlor (PC 108800) on Pumpkins and Winter Squash* (DP324973, DP327861), May 2006 (Exhibit H-68C). The principal registrants for acetochlor, Monsanto, and s-metolachlor, Syngenta, also provided the Agency with aquatic toxicity study results. Agency staff also does a literature search through the State’s library system for additional relevant research in scientific journals, in International Joint Commission reports, as well as publications by EPA and the U.S. Fish and Wildlife Service. Acute and chronic toxicity data for the particular chemical of interests is assembled from these searches. This same process and databases are used to search for bioaccumulation factor (BAF) and bioconcentration factor (BCF) data to develop human health-based standards and wildlife-based standards (if needed) for the chemical of interest. The toxicity data assembled by the Agency in summary sheets and tables for acetochlor and metolachlor are in (Exhibits H-9, H-10a and H-10b).

3. <u>Standards for Parent Chemical Only</u> [V.D. reasonableness, acetochlor and metolachlor]

The Agency is currently proposing water quality standards only for the parent chemicals, acetochlor and metolachlor, and not the environmental degradates or metabolic break-down products. The MDA’s monitoring program measures only the parent chemicals in surface waters, but measures both parent chemicals and degradates in ground water. Because of the large amount of staff time it takes to develop standards, and the general lack of data on degradates, the Agency is focusing on standards for the acetochlor and metolachlor parent chemicals. Limited information suggests that the degradate chemicals are no more toxic than the parent chemicals. Information on degradate toxicity is available in EPA Office of Pesticide Program risk assessments published August 30, 2006 (Exhibits H-68a-d).

E. ACETOCHLOR, PROPOSED ACUTE TOXICITY-BASED STANDARDS, REASONABLENESS [V. reasonableness, acetochlor]

Aquatic life (Class 2) numeric standards have three parts:

1. Final Acute Value (FAV) – protects for acute toxicity (most often used as an “end-of-pipe” effluent limit)
2. Maximum (MS) – protects for acute toxicity, applied to surface waters
3. Chronic (CS) – protects for chronic toxicity, applied to surface waters

The three proposed standards for acetochlor are toxicity-based, for all class 2 waters. The proposed acute toxicity standards (FAV and MS) are based on toxicity data for **aquatic animals**; and the proposed chronic standard is based on chronic data for aquatic plants. This Section discusses the former.

There is not enough acceptable acute toxicity data for aquatic animals to use the preferred EPA criteria development method (called the Tier I method). This method requires toxicity test results for a minimum of eight species distributed in several taxonomic groups of aquatic organisms (e.g., fish, aquatic insects, crustaceans, zooplankton, mussels, etc.; Exhibit HH-3). The Agency has acceptable toxicity data for acetochlor for just four species of aquatic animals. In this situation the Agency uses a "Tier II" method to calculate the standard (Minn. R. 7050.0218, subp. 5, item G). The Tier II method requires data for at least one fish species and one zooplankton (a water flea or daphnid). In brief, the Tier II method selects the lowest acute value in the limited data set and divides it by an "adjustment factor" to arrive at the final acute value. The less data available, the larger the adjustment factor; factors range from a maximum of 13 (2 toxicity values) to a minimum of 4.3 (7 toxicity values). The lowest acute value in the data set divided by the appropriate adjustment factor is the Tier II final acute value. The FAV is then divided by an acute to chronic ratio (ACR) to arrive at the Tier II chronic criterion (based on aquatic animals). Since there are no data from which a chemical-specific ACR can be developed, the default ACR of 18 is used (Minn. R. 7050.0218, subp. 5, item G, subitem (10).

The acceptable acute aquatic organism studies used to develop the acetochlor FAV are listed in Table 3a of Exhibit H-9. The lowest of the four acute values is 1,210 µg/L for rainbow trout (for complete EPA Data Evaluation Records and registrant (Monsanto) studies, see Exhibits H-12a and H-12b). Complete EPA reviews and registrant studies for the other acceptable aquatic organism (animal) studies pertinent to the FAV are in Exhibits H-13a through H-16b.

The proposed acute-based standards (FAV and MS) and the values used to calculate them are shown below in Table III-6. The plant-based chronic standard is shown as well (see Section V.G). Table III-6 also shows human health-based criteria for acetochlor, calculated from both a reference dose and a cancer potency factor (see Section V.I).

Table III-6. Summary of Proposed Acetochlor Water Quality Standards, Showing Calculation Steps for FAV and MS.

Information for Acetochlor	Value or Proposed Standard	
Toxicity-based (Tox)		
Number of species with acceptable test results	4	
Lowest acute value, µg/L	1,210	
Tier II Adjustment Factor	7.0	
Final Acute Value, µg/L	173	
Acute to chronic ratio	18	
Chronic, based on animal data, µg/L	9.6	
Human Health-Based (HH)		
Reference dose, mg/kg-day*	0.02	Na
Cancer Potency Slope Factor, mg/kg-d^{-1*}	na	0.0327
BAF, L/kg (all Class 2 waters)	43.4	43.4
Chronic, µg/L (Class 2A,/2Bd)	85	6.5
Chronic, µg/L (Class 2B,2C,2D)	213	16
Proposed Standards		
Final Acute Value, µg/L	173	
Maximum (FAV divided by 2), µg/L	86	
Chronic (plant toxicity), µg/L	1.7	

* In a recent memo, EPA indicates that the RfD is protective of potential cancer effects on humans. The Cancer Assessment Review Committee (CARC) classified acetochlor as, “Suggestive Evidence of Carcinogenic Potential," and they concluded that: "Quantification of cancer risk is not required since the chronic RfD (cRfD) of 0.02 mg/kg/day will be protective of both non-cancer and cancer effects, including rat nasal tumors, thyroid tumors, and mouse tumors." This suggests that the Agency's RfD-based values of 85 and 213 µg/L would be the applicable human health-based criteria. (Memo from the U.S. EPA Office of Prevention, Pesticides, and Toxic Substances' Cancer Assessment Review Committee (CARC; Acetochlor: Fifth Report), January 3, 2007.)

F. METOLACHLOR, PROPOSED ACUTE TOXICITY-BASED STANDARDS, REASONABLENESS [V. reasonableness, metolachlor]

Background information on the Tier II method and development of the three-part water quality standard (FAV, MS and CS) are provided in the previous Section.

Currently there are two forms of metolachlor being used by the agricultural community (Exhibit H-5). One form, racemic metolachlor, is a 50:50 mixture of r- and s- isomers of 2-Chloro-N-(2-ethyl-6-methylphenyl)-N-(2-methoxy-1-methylethyl) acetamide. It has a chemical abstract services (CAS) registry number of 51218-45-2. This form is simply called metolachlor and referred to as 50:50 metolachlor in discussions of aquatic toxicity data. The second form, a newer product, contains mostly the s- isomer of metolachlor; it contains 88 percent s- and 12 percent r-metolachlor, and is called s-metolachlor and referred to as 88:12 metolachlor for the aquatic toxicity data discussions. The chemical name for s-metolachlor is (S)-2-Chloro-N-(2-ethyl-6-metylphenyl)-N-(2-methoxy-1-methylethyl)-acetamide, with a CAS registry number of 87392-12-9.

The Agency developed acute toxicity-based criteria (FAV and MS) for both the 50:50 and 88:12 forms of metolachlor using the Tier II method. The Agency is proposing the more stringent of the two as the metolachlor standard, because the two forms cannot be differentiated analytically in water samples (Exhibit H-5). Based on acute tests with both forms on the same species (rainbow trout), 50:50 metolachlor seems to be the more toxic of the two (Exhibits H-10a, H-19a, H-19b and H-20). The toxicity data for the apparently less toxic 88:12 form is shown in Exhibits H-10b, H-17, H-18a and H-18b. Thus, the proposed metolachlor acute toxicity-based standards are based on the 50:50 metolachlor data but apply to both forms as total metolachlor concentrations.

As for acetochlor, the Tier II method must be used to determine the FAV and MS for metolachlor because of the small amount of adequate animal toxicity data. The proposed metolachlor FAV is based on four acute values; the lowest is 3,800 μg/L for a species of aquatic fly (midge, *Chironomus*, Exhibit H-20). The other acute study pertinent to the FAV, including EPA Validation Sheets and registrant (Syngenta) studies, are found in Exhibits H-19a, H-19b, and H-69. The proposed FAV and MS, and the values used to calculate them are shown in Table III-7; the plant-based chronic standard is shown also. Table III-7 includes the metolachlor human health-based criteria for comparison, calculated from a reference dose (see Section V.I).

In summary, as for acetochlor, the proposed metolachlor standards are toxicity-based for all class 2 waters; and the:

- Tier II method is used to determine the proposed acute toxicity-based FAV and MS standards (Exhibit H-10a),
- FAV and MS are based on toxicity data for aquatic animals, and
- Chronic standard is based on aquatic plant data (next Section).

Table III-7. Summary of Proposed Metolachlor Water Quality Standards, Showing Calculation Steps for FAV and MS.

Information for Metolachlor	Value or Proposed Standard
Toxicity-based (Tox)	
Number of species with acceptable test results	4
Lowest acute value, µg/L	3,800
Tier II Adjustment Factor	7.0
Final Acute Value, µg/L	543
Acute to chronic ratio	18
Chronic, based on animal data, µg/L	30
Human Health-Based (HH)	
Reference dose, mg/kg-day	0.1
BAF, L/kg (all Class 2 waters)	16.5
Chronic, µg/L (Class 2A,/2Bd)	561
Chronic, µg/L (Class 2B,2C,2D)	2,777
Proposed Standards	
Final Acute Value, µg/L	543
Maximum (FAV divided by 2), µg/L	271
Chronic (plant toxicity), µg/L	23

G. ANALYSIS OF AQUATIC PLANT TOXICITY DATA AND PROPOSED CHRONIC STANDARDS FOR ACETOCHLOR AND METOLACHLOR, REASONABLENESS [V. reasonableness, acetochlor and metolachlor]

1. Analysis of Aquatic Plant Toxicity Data[37] [V.G. reasonableness, acetochlor and metolachlor]

Not surprisingly, toxicity data for the two herbicides acetochlor and metolachlor show that aquatic plants tend to be more sensitive to harmful effects than fish and aquatic invertebrates (Exhibits H-68b and H68c).[38,39] Acute toxicity tests with aquatic animals use mortality as the endpoint. Effect endpoints used in plant toxicity tests measure non-lethal impacts such as growth, loss of biomass or population changes. Thus, essentially all plant toxicity data is chronic, rather than acute. The proposed chronic standards are based on plant data. Plant data are generally not amenable for developing the acute-toxicity-based FAVs and MSs because of the difficulty in determining a lethal endpoint with plant data.

[37] Since January 17, 2006, the Agency has included a detailed description on the methods used to develop the aquatic plant-based chronic standards on the Minn. R. ch. 7050 revision webpage (Exhibit A-49d).
[38] Exhibits H-21a through H-23b cover the acceptable chronic aquatic animal data for acetochlor.
[39] Exhibits H-24a and H-24b cover the acceptable chronic aquatic animal data for metolachlor (only 88:12 form or s-metolachlor).

Plant toxicity data is more difficult to interpret than animal data. The EPA 1985 guidance says that procedures for conducting and interpreting the results of plant toxicity tests are not well established (Exhibit H-11). The 1985 guidance, which is still EPA's current guidance[40], provides only the following suggestions on how to interpret plant data when developing standards.

- Compare relative sensitivities of plants and animals.
- Select lowest result from a test with an important aquatic species.

In fact, however, the EPA has gone well beyond this very simplistic approach to interpreting plant data in their draft atrazine criterion (Exhibit H-59). The EPA's assessment of plant data in this criterion document offers a good deal of guidance, by example, which will be discussed below. Of note, Agency staff reviewed the final EPA document, *Ecological Risk Assessment for the use of S-Metolachlor (PC 108800) on Pumpkins and Winter Squash* (DP324973, DP327861), May 2006, which became available August 30, 2006 (Exhibit H-68C). The recent ecological risk assessment on s-metolachlor published by the EPA Office of Pesticide Programs also identifies potential concerns for ecological effects to aquatic plant communities, including shifts in algal species composition, and indirect effects to the larger aquatic community from non-target exposures from s-metolachlor field application, providing more support for the protection-level goals described below (Exhibits H-68b and H-68c). The information in this document does not provide any information which would change the proposed metolachlor water quality standards.

Due to the lack of more definitive "official" guidance, but using the atrazine criterion as a guide, the Agency felt it was important to spell out our protection-level goals for chronic standards based on aquatic plant data. These goals reflect a policy to provide a community level of protection to aquatic plants, and they are consistent with ecological risk assessment guidance to help determine relative sensitivities of individually tested species to implement protection at the community or population level.[41]

- Protect the overall integrity of the plant community from significant impacts. For example, avoid discernable or projected negative shifts in species composition, such as green algae species replaced by blue-green algae, or a sensitive "desirable" macrophyte replaced by a "less desirable" macrophyte.
- Protect the most sensitive species tested if it is clear that the species is (are) ecologically important in Minnesota; otherwise it is not necessary to totally protect the most sensitive species from any impact to provide a community level of protection.
- Target approximately a 20th percentile level of protection based on the body of chronic toxicity data for plants. We feel this can be achieved by selecting a 5th percentile median effect concentration (EC50), or 20th percentile maximum acceptable toxicant concentration (MATC) from the distributions (EC50, EC20 and MATC are defined below).

[40] EPA is working on an update of the aquatic life criteria guidance.
[41] EPA. 1998. Guidelines for Ecological Risk Assessment. U. S. EPA Risk Assessment Forum.

The Agency reviewed the draft EPA atrazine criterion to obtain ideas for deriving standards for acetochlor and metolachlor. The atrazine criterion is helpful in framing an overall approach to assessing plant data, and in framing the protection level goals stated above, but the exact criteria determination methods used by EPA for atrazine cannot be used for acetochlor and metolachlor, because:

- There is far more plant data for atrazine, including an extensive set of laboratory and field aquatic plant community data (termed microcosm and mesocosm studies), which
- Allowed EPA to predict 5th percentile plant community effect levels versus time from the micro- and mesocosm data set, using a mathematical model (Figure III-2). Consistent with the community level protection goal, EPA's use of the 5th percentile effect level from the mesocosm studies does not provide complete protection at all times to the most sensitive organisms.

Figure III- 2. Results of Micro- and Mesocosm Studies with Atrazine Plotted Against the Study-specific Test Duration. Black Line Is the Five Percent Effect Level Over Time Interpolated By the CASM Model. From the EPA Atrazine Criterion (Exhibit H-59).

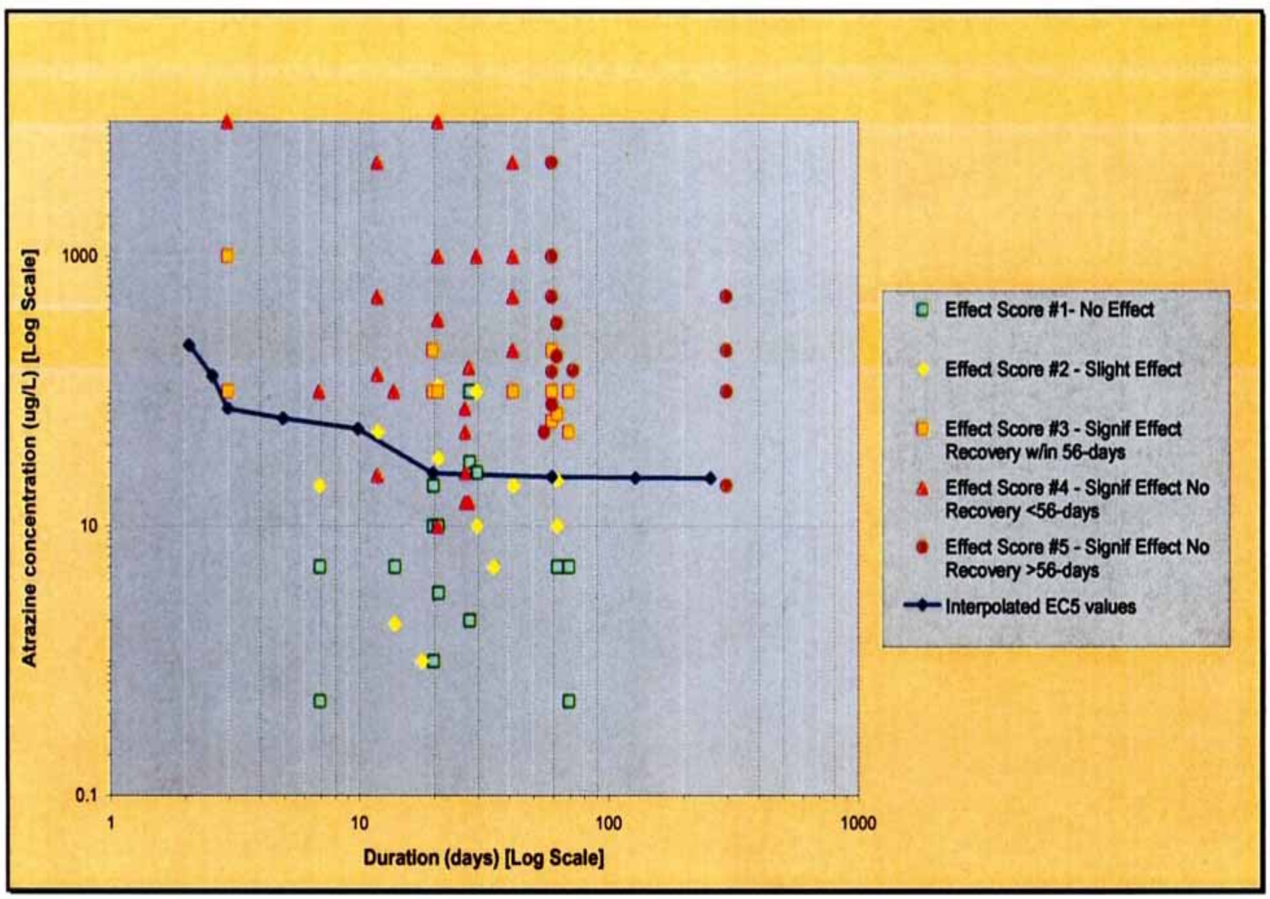


Figure E. Micro- and mesocosm study effect concentrations scored according to Brock et al 2000 and plotted against the study specific exposure duration. Interpolated 5% CASM Similarity Index points plotted.

Faced with less plant data to work with, the Agency decided to use the EPA method for calculating final acute values, described in Stephan et al. (1985, Exhibit H-11), as the basic approach to calculating the chronic standards. The FAV calculation is associated with the Tier I criterion calculation methods mentioned in Section V.E. The FAV method has been used by EPA since the late-1970s to calculate aquatic life criteria, and it was adopted into Minn. R. ch. 7050.0218, subp. 4, item B, subitem (4) in 1990. The FAV is a probability calculation of the 5th percentile value (or other percentile of choice) from the distribution of acceptable toxicity data. It is typically used with acute data to calculate the final acute value, hence the name. The FAV calculation uses the four values from the distribution of all values that most closely bracket the 5th percentile. These are almost always the lowest four values (i.e., the acute toxicity results for the four most sensitive organisms tested) because of the limited amount of data.

The FAV method can be used with chronic as well as acute data, which is what we are doing with the herbicide plant data. The resulting value is then called a “species chronic value” (SCV). As noted, percentile values other than the 5th percentile can be calculated as well, which is what we do with the MATC data, as explained below. The aquatic plant toxicity data are shown in Exhibits H-25a through H-36 for acetochlor, H-37 through H-53 for metolachlor 50:50 and H-54 through H-56b for metolachlor 88:12 and summarized in Table 4 of Exhibits H-9 and H-10a and b. Plant data are also shown with the FAV calculations in Exhibits H-57 and H-58).

For our analysis, aquatic plant data were divided into:

- EC50 values – median effect concentration; the concentration that demonstrates nonlethal effects or impacts on half the test population.
- MATC values – maximum acceptable toxicant concentration; the mean of the lowest concentration showing a measurable effect (LOEC) and the highest test concentration showing no significant effect (NOEC). The MATC is roughly comparable to an EC20.
- NE (No effect) values – highest concentration tested had no significant effect.
- In a few cases, where no EC50 was available for a species, EC50s were estimated from LOEC or NOEC concentrations based on the average of the species-specific EC50 to MATC ratios.

In general, the plant data for acetochlor and metolachlor show:

- The lowest to highest test results span a very large range, about five orders of magnitude (e.g. toxicity values for acetochlor range from 0.088 to 35,000 µg/L).
- The relative results of toxicity tests (EC50s, MATCs and NEs) across species often did not fall in the expected order of high to low; i.e., EC50 > MATC > NE.
- The ratio between associated EC50s and MATCs is generally small, in the range of 1-4.
- The lowest values for both chemicals are dominated by two species commonly used in plant toxicity tests, *Selenastrum capricornutum* (green algae) and *Lemna gibba* (inflated duckweed).

Aquatic plant data were assessed and combined as follows for both acetochlor and metolachlor:

1. Acceptable species-specific EC50 and MATC values were assembled. If two or more EC50s or MATCs are available for the same species, species geometric means are determined.
2. We could not discern any consistent relationship between test results and the toxic endpoint used in the test (i.e., growth, growth rate, change in biomass, frond development, etc.).
3. We could not discern any consistent relationship between test results and the duration of the test, which ranged from less than one day to 90 days (most tests last 3 to 14 days).
4. Therefore, results for the same species were averaged together regardless of the chronic endpoint, or duration of the test.
5. 5th percentile SCVs from the EC50 data sets were determined.
6. 20th percentile SCVs from the MATC data sets were determined.

Calculated SCVs, based on EC50 and MATC data, are shown in Table III-8, along with the number of values (N) in the data base.

Table III-8. Species Chronic Values for Acetochlor and Metolachlor from the Species-mean EC50s and MATCs.

Parameter	Acetochlor		Metolachlor	
	N	Value µg/L	N	Value µg/L
EC50				
5th %tile	8	0.093	18	35.6
20th %tile	8	3.58	18	98.5
MATC				
20th %tile	8	1.74	9	11.1
5th %tile	8	0.004	9	0.56

The 5th percentile EC50 for metolachlor and the 20th percentile MATC value for acetochlor in the shaded cells in Table III-8 are the primary basis or “starting points” for the proposed standards. Other information is used to confirm or adjust the proposed chronic standards, as discussed in the next two sections.

As noted, two aquatic plant species commonly used in herbicide toxicity tests, *Selenastrum capricornutum*, and *Lemna gibba*, are very sensitive to both acetochlor and metolachlor. The Agency is **not** excluding the data for these two species, but it is important, to ascertain the ecological importance of these two species in Minnesota, consistent with the protection level goals. Neither is considered ecologically important.

Selenastrum is a very minor component of the algae community in lake samples in Minnesota and is easily replaced by another genus of green algae, *Scenedesmus*. *Lemna gibba* does not occur in Minnesota; however, a related species of duckweed, *L. minor*, is very common. Data for metolachlor and other herbicides suggest that *L. minor* is not as sensitive as *L. gibba*. Therefore, neither of the two very sensitive species is considered to be "ecologically important" in Minnesota. The Agency believes the proposed standards will protect the overall integrity of Minnesota aquatic plant (and animal) communities.

The Agency asked a scientist at the EPA Mid-Continent Ecology Division, Office of Research and Development to review the Agency's approach to analyzing the plant data. In general, he felt that the Agency's approach was sound (i.e., the essence of which is the use of the FAV calculations with chronic data).[42] He made several suggestions concerning details of the Agency approach that could improve it, such as establishing consistent criteria for evaluating the plant data.   The Agency adopted the suggestions, and we believe that it improved the overall analysis of the plant data and the proposed standards. The person providing the comments has had many years of experience working with toxicity data and developing aquatic life criteria.

[42] Dr. Russ Erickson, EPA Mid-Continent Ecology Division, Office of Research and Development, Environmental Protection Agency, Duluth.

2. <u>Proposed Chronic Standard for Acetochlor</u> [V.G. reasonableness, acetochlor]

The Agency believes the 20^{th} percentile MATC value of 1.7 μg/L from the plant data does not need to be adjusted based on analysis of the other plant toxicity data. This value will be protective of Minnesota aquatic plant communities, and 1.7 μg/L is the proposed chronic standard. Figure III-3 shows the proposed acetochlor chronic standard in the context of all the plant data.

There are eight species-mean EC50s and five species-mean MATCs for acetochlor. The SCV calculations are very sensitive to the number of toxicity values (N) used in the calculations, particularly when N is small. The Agency is using an N of eight for both the MATC and EC50 calculations (Table III-8, and Exhibit H-57). With the small N, calculated SCV values at the "tails" of the distribution, such as the 5^{th} percentile, are more vulnerable to statistical distortion than values calculated more toward the center of the distribution, such as the 20^{th} percentile. The large range in magnitude of the lowest four values, which are used to make the SCV calculations, can exacerbate the distortion (for example, 0.22 to 819 μg/L is the range of the lowest four MATCs for acetochlor). For these reasons the Agency places more confidence in the 20^{th} percentile MATC SCV than in the 5^{th} percentile EC50 SCV for acetochlor. The Agency feels justified in elevating N from five to eight for the SCV calculation with the MATC data for these reasons:

- There are NEs, NOECs or LOECs for three species, *Elodea*, *Myriophyllum* and *Lemna gibba*, with a range of 0.85 to 200 μg/L, which is higher than the lowest MATC of 0.22 μg/L.
- These three (species mean) values plus the five MATCs totals eight.
- There are eight EC50s.
- An N of five stretches the boundaries of the FAV calculation method.
- 1.7 μg/L, based on an N of eight, is reasonable in view of the body of the chronic data and will be protective of plant communities (Figure III-3).

Results from aquatic plant community or mesocosm studies (values identified with an "m" in Figure III-3) are not very helpful in developing the proposed standard because more than half of the tests were unable to show effects at the highest concentration tested. Although, the relatively high range of these data (19 – 200 μg/L) supports the protectiveness of the proposed 1.7 μg/L chronic standard.

In conclusion, the proposed standard of 1.7 μg/L is reasonable (Exhibit H-9). It is:

1. The 20^{th} percentile of the available MATCs using an N of eight, including MATCs for the two most sensitive species, *Selenastrum capricornutum* and *Lemna gibba*.
2. Higher than the MATCs and EC50s for *S. capricornutum* and the MATC for *L. gibba*; the standard may not protect these two species from all harmful effects.
3. Below the EC-50s for *L. gibba*, and well below MATCs and EC50s for the other species tested.

4. Well below the EC50 of 47 µg/L for the nonnative African *Elodea*. This is the lowest EC50 (or MATC) for the next most sensitive species after *L. gibba* and *S. capricornutum*.
5. Below the calculated aquatic animal-based chronic value of 9.6 µg/L (Table III-6).
6. Below the lower of the two human health-based criteria, 6.5 µg/L (Table III-6).

3. <u>Proposed Chronic Standard for Metolachlor</u> [V.G. reasonableness, metolachlor]

The proposed chronic standard for metolachlor applies to both the 50:50 and 88:12 (s-metolachlor) formulations of the herbicide. This approach is consistent with the ecological risk assessment for s-metolachlor (88:12) published by EPA, which considered aquatic toxicity tests done on the two different formulas to be comparable (Exhibits H-68b and H-68c). The 5th percentile SCV from the aquatic plant EC50 data of 36 µg/L is a reasonable "starting point" for the proposed chronic standard, but must be lowered based on the body of available toxicity data (Table III-8 and Exhibit H-58). The Agency believes the proposed standard of 23 µg/L will be protective of Minnesota aquatic plant communities. Figure III-4 shows the proposed chronic standard in the context of all the plant data.

The plant toxicity data set for metolachlor is far more robust than for acetochlor, in terms of number of species tested and available EC50s (18 for metolachlor, 8 for acetochlor). There are six MATCs for metolachlor. Because of the relatively large number of EC50s, the Agency places more confidence in the 5th percentile SCV calculation from the EC50 data than in the 20th percentile MATC SCV. The lower MATC-based SCV of 11.1 µg/L is calculated using an N of nine. We feel it is reasonable to supplement the number of MATCs with the three LOECs to arrive at an N of nine. The three LOECs range from 274 to 750 µg/L, well above the lowest MATC of 4.8 µg/L. The MATC-based SCV of 11.1 µg/L provides useful information on an appropriate standard in the context of all the data (Exhibit H-58).

The Agency believes that the 5th percentile EC50 value of 36 µg/L should be lowered to 23 µg/L for the proposed chronic standard based on the following:

- A chronic test result of 41 µg/L is available for fathead minnow (Metolachlor 88:12). This chronic value divided by a "safety factor" of 2 is 21 µg/L.
- A relatively low EC50 of 70 µg/L is available for coon tail (*Ceratophyllum demersum*), an important resident aquatic plant species. This EC50 is the third lowest after *S. capricornutum* and *L. gibba*. An estimated MATC of 23 µg/L for coon tail can be determined by dividing the EC50 of 70 µg/L by the mean of the five species-mean EC50/MATC ratios (3.027).
- The midway point (average) between the 5th percentile EC50 (36 µg/L) and the 20th percentile MATC (11 µg/L, N = 9) is 23.

A single low metolachlor MATC for a species of algae (diatom, *Navicula pelliculosa*) prompted further investigation into this value and the role this diatom species plays in Minnesota. The MATC for this species is 6.9 µg/L; only two MATCs for the very sensitive green algal species, *Selenastrum capricornutum* are lower (Exhibit H-49). The Agency suspects this MATC may be an outlier, but we have no firm proof. The suggestive evidence is that it is 55 times lower than the EC50 of 380 µg/L for this species. An EC50/MATC ratio of 55 is many times larger than typical EC50/MATC ratios, which average about three. The *N. pelliculosa* EC50 agrees reasonably well with the EC50s for another genus of diatom, *Najas* sp. EC50s for *Najas* sp. range from 100 to 750 µg/L (geometric mean of 311 µg/L, Exhibit H-49). Regardless of the concerns about the MATC for *N. pelliculosa*, it is included in the SCV calculation of the 20th percentile MATC because we cannot confirm that it is an outlier. No explanation is provided in the original study as to why these data are atypical.

Navicula pelliculosa is widely distributed in the United States; however it is seldom seen in samples from Minnesota lakes. Scientists at the St. Croix Watershed Research Station were consulted about this species.[43] These scientists are the same diatom specialists that do the diatom reconstruction work to estimate pre-European trophic conditions in Minnesota lakes discussed in SONAR Book II, Section VI.C.3. They indicated that *N. pelliculosa* has been found in their samples but in small numbers and very uncommonly. It is reasonable, based on this information, to conclude that this diatom is not an ecologically significant species in Minnesota.

In conclusion, the proposed standard of 23 µg/L is reasonable (Exhibit H-10a). It is:

1. Higher than the MATCs for *Selenastrum capricornutum* and *Lemna gibba*, but below the geometric mean EC50s for these two sensitive species.
2. Higher than an MATC of 6.9 µg/L for the diatom, *Navicula pelliculosa*. The Agency believes this is reasonable because this species does not appear to be ecologically important in Minnesota, as discussed above.
3. Well below the MATC of 265 µg/L for the resident species *Lemna minor*, and all EC50s for the other species tested.
4. Below the lower of the two human health-based criteria of 561 µg/L (Table III-7).
5. Lower than the calculated animal-based chronic value of 30 µg/L (Table III-7).

[43] Dr. Mark Edlund, Associate Scientist (diatom ecology and evolution), St. Croix Watershed Research Station, part of the Science Museum of Minnesota.

Figure III-3. Plant Toxicity Data for Acetochlor Plotted Against Duration of Test, Showing the Proposed Chronic Standard.

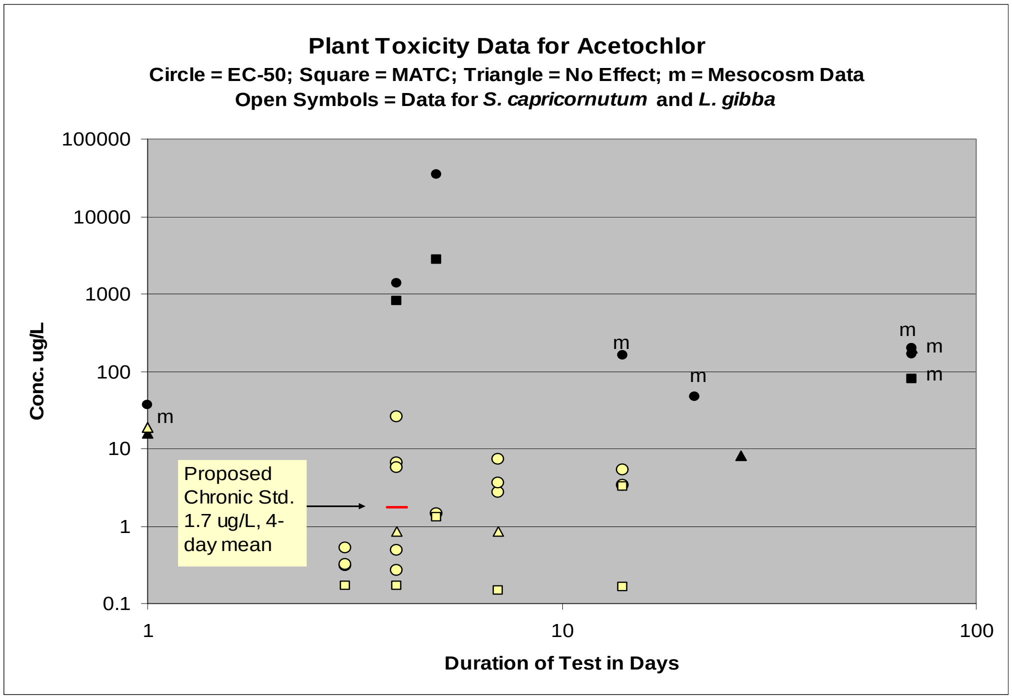
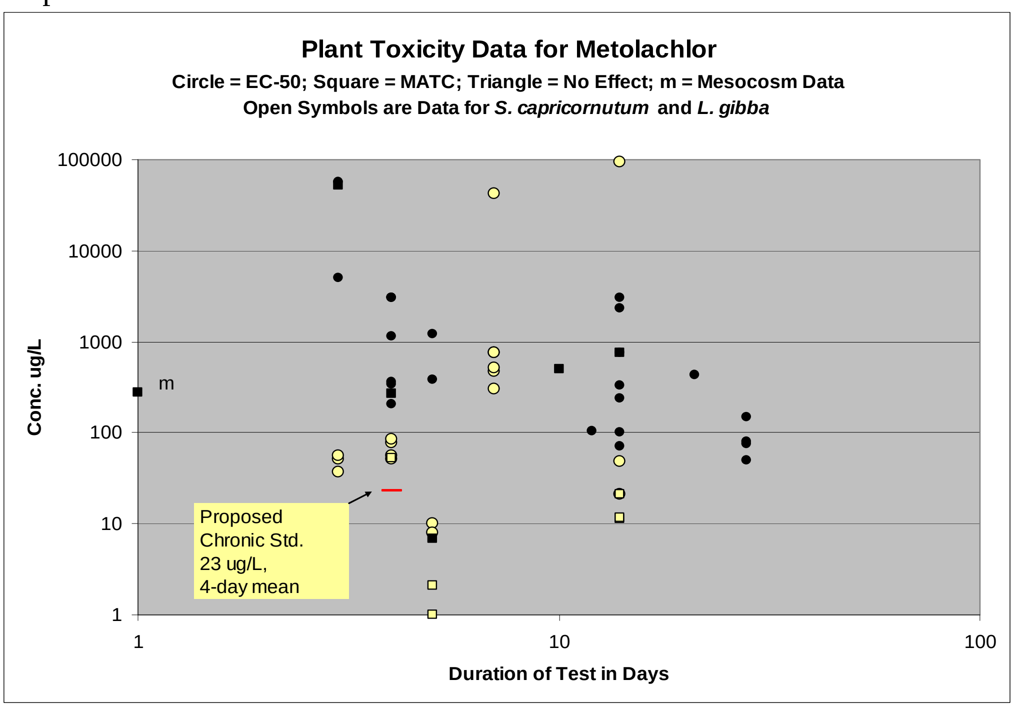


Figure III-4. Plant Toxicity Data for Metolachlor Plotted Against Duration of Test, Showing the Proposed Chronic Standard.



H. STANDARDS OF OTHER STATES [V. reasonableness, acetochlor and metolachlor]

The Agency solicited information from other states through the Association of State and Interstate Water Pollution Control Administrators to find out if other states had adopted water quality standards for either acetochlor or metolachlor. Out of the 12 states that responded, none had a standard for acetochlor; the following indicated they had a standard for metolachlor.

Illinois: 130 µg/L, chronic standard based on aquatic toxicity
Montana: 100 µg/L, based on human health.
Nebraska: 100 µg/L, chronic standard based on aquatic toxicity
New York: 35 µg/L, draft criterion based on aquatic toxicity

The Agency is not aware of the data or methods used by Illinois, Montana or Nebraska in the development of their standards. The draft criterion for New York was developed by an EPA scientist on loan from EPA Region 5 (Chicago) to the New York Department of the Environment. The data and methods used by New York parallel closely those used by the Agency in that they used the Tier II method with the aquatic animal data (Exhibit H-60). The major difference is that New York used the Tier II method to arrive at their chronic criterion as well as the FAV and MS, whereas the Agency used aquatic plant data to develop the chronic standard.

I. HUMAN HEALTH-BASED CRITERIA, ACETOCHLOR AND METOLACHLOR [V. reasonableness, acetochlor and metolachlor]

1. <u>Introduction</u> [V.I. reasonableness, acetochlor and metolachlor]

Human health-based chronic water quality standards ensure long term protection for designated surface water uses: drinking water and fish consumption and recreation. Standards are based on inputs that are consistent across toxic pollutants (e.g., drinking water consumption rates: 2 liters/day, fish consumption intake rates: 30 grams/day, and adult body weight: 70 kilograms), and inputs that are chemical-specific (e.g., bioaccumulation factors-BAF and human health toxicity values: reference dose- RfD or cancer potency slopes-q1*). The details of setting human health based criteria are available in Minn. R. 7050.0218, subp. 6, 7, and 8 and Agency Guidance Manual (Exhibit HH-3). The chemical-specific values and final human health-based criteria for acetochlor and metolachlor are presented in Tables III-6 and III-7.

2. <u>Acetochlor</u> [V.I. reasonableness, acetochlor and metolachlor]

The Agency determines human health-based chronic standards based on the human health toxicity values recommended by the Minnesota Department of Health (MDH) for setting Health Risk Limits (HRLs) or Health Based Values (HBVs, values not promulgated into Minnesota Rule[44]). MDH recently reviewed acetochlor and its two common environmental degradates,

[44] MDH develops HBVs when data are limited or prior to promulgation into Minn. Rules 4717.1700-4717.7800.

acetochlor-ESA and -OXA, because of detection in ground water and need for health protective values for drinking water use (Exhibit H-61). The MDH review provides comprehensive data for noncancer (systemic) effects, cancer evaluation, and more recently, considerations for infants and children (SONAR Book I, Section II.D.2).

The EPA classifies acetochlor as a "likely human carcinogen".[45] EPA recently published a cancer potency value (cancer slope factor, CFS) for lung and uterine tumors. MDH concurred with the CSF of 0.0327 mg/kg-d^{-1} for these tumors and recommended use of the CSF to calculate the human health criterion. MDH is proposing to use the CSF to develop a cancer HRL (Exhibit H-61). Protection from other cancers associated with acetochlor exposure, nasal turbinate and thyroid follicular cells, is expected based on the CSF and noncancer reference dose (RfD). Acetochlor has also shown adverse noncancer effects to the liver, kidney, and male reproductive system. At higher doses, termed "secondary endpoints" by MDH, acetochlor can affect the thyroid, pituitary, nervous system, and female reproduction. The EPA published a RfD of 0.02 mg/kg-d in the Integrated Risk Information System (IRIS)[46] and TRED.[45] EPA is also finalizing review of the common mechanism of action of acetochlor and another chloroacetanilide herbicides, alachlor, relative to nasal tumors.[47] The results of this review will not change the acetochlor criteria. The human health-based criterion calculated with the CSF is lower than the criterion calculated with the RfD (Table III-6).

The MDH is currently conducting a comprehensive review of how HRLs (and HBVs) are determined, with a focus on ensuring that these limits for drinking water use of contaminated ground water are health protective for infants and children. As discussed in SONAR Book I (Section II.D.2), the final recommendations and promulgation into Minnesota Rules was delayed to take into account substantial comments from an expert science advisory panel. The draft HRL for acetochlor includes an adjustment factor for a higher infant and children's drinking water intake rate (Exhibit H-61). The Agency did not apply the draft MDH adjustment factors in its calculation of human-health criteria because the final adoption of MDH's proposal into Minnesota Rules is still pending. In consultation with MDH, the Agency may consider site-specific adjustments to the human health-based criteria in the future.

As mentioned, MDH has reviewed human health toxicity data on two common degradates of acetochlor, acetochlor-OSA and-ESA (Exhibit H-62). The reviews were initiated because of detections in Minnesota ground water and resultant need to determine health protective values (HRL or HBV) for drinking water use. At this time, MDH developed provisional HBVs for use on a site-specific basis by MDA. Preliminary review suggests that these degradates are less toxic to humans than acetochlor, but because of limited data leading to higher uncertainty factors the RfD for protection of non-cancer health effects is almost equal to the parent, acetochlor.

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[45] EPA. 2006. Acetochlor Tolerance Reregistration Eligibility Decision (TRED). EPA, Office of Pesticide Programs. November 2005; finalized March 29, 2006.
[46] IRIS values have undergone extensive review and represent a consensus finding for EPA on human health toxicity. IRIS: Acetochlor (CASRN 34256-82-1). Available at: www.epa.gov/iris.
[47] EPA. 2006. Chloroacetanilide Cumulative Risk Assessment; Notice of Availability. *Federal Register*, Vol. 71(60): 15726-15728, March 29, 2006.

The other chemical-specific input that goes into setting human health-based criteria is the bioaccumulation factor (BAF). Unlike the RfD and CSF for which the Agency relies completely on EPA and MDH to provide, the BAF is determined by Agency staff from available data. Chemicals that are persistent in surface waters and have an affinity for fat or proteins can reach increasingly higher concentrations in the aquatic food chain. The BAF that is used in calculating standards is the amount of a chemical that accumulates in fish tissue after exposure through both the water they live in and the food they eat.

The data available for determining BAFs for acetochlor is limited, but is adequate to provide a sound BAF value for setting a human health-based criterion. Monsanto, the principal registrant for acetochlor, provided data on a laboratory measured bioconcentration factor (BCF) for bluegill sunfish (*Lepomis macrochirus*) (Exhibit H-63). Using radiolabeled acetochlor, bluegill sunfish were exposed for 28 days in a flow-through system. The resulting BCF for muscle (equivalent to edible tissue) based on total radioactivity was 40. Total radioactivity measures acetochlor and metabolites in the tissue. An additional study characterized 16.9 percent for the total radioactivity to the parent compound, acetochlor. The Agency utilized the total radioactivity BCF to account for metabolites that may also have toxic effects.[47, 48] Details for the final BAFs are found in the acetochlor summary sheet and Table 5 of Exhibit H-9.

3. Metolachlor [V.I. reasonableness, acetochlor and metolachlor]

The MDH has completed a toxicological review of metolachlor and its primary environmental degradates, metolachlor-ESA and -OSA (Exhibits H-64 and H-65). The review for the metolachlor HRL encompassed data relevant for human health assessments from studies using both metolachlor and s-metolachlor, with the final human health values applicable to both products as measured analytically as metolachlor. The basis for the noncancer toxicity values (RfD) and the most sensitive effect observed for metolachlor is decreased body weight. The Office of Pesticide Programs at EPA developed an RfD of 0.1 mg/kg-d in their 2002 Tolerance Registration Eligibility Decision. At higher doses, metolachlor can affect thyroid and liver weights and development in reduced body weight in rodents (secondary effects). EPA classifies metolachlor as a “possible human carcinogen” or Class C carcinogen, but determined that the RfD for noncancer protection would be also be protective of cancer (Exhibit H-68d).

In 1988, EPA developed a Lifetime Health Advisory value of 100 µg/L for metolachlor to use as a human health toxicity benchmarks in finished drinking water from community water supplies.[49] The EPA states that an updated value is needed, because of the newer RfD set by the Office of Pesticide Programs is lower than the one used in 1988 of 0.15 mg/kg-d. The drinking water value is based on an extra 10 fold uncertainty factor applied to Class C carcinogens.

As stated with regard to acetochlor, the draft HRL for metolachlor includes an adjustment factor for a higher infant and children’s drinking water intake rate (Exhibit H-64); the Agency is not proposing to apply the draft adjustment factors at this time as final adoption of MDH HRL

[48] Coleman, S., R. Linderman, E. Hodgson, et al. 2000. Comparative metabolism of chloroacetamide herbicides and selected metabolites in human and rat liver microsomes. *Environmental Health Perspectives*, Vol. 108(12): 1151-1157.
[49] EPA. 2004.2004 Edition of the Drinking Water Standards and Health Advisories. Office of Water. U.S. EPA.

revisions into Minnesota Rules is still pending. In consultation with MDH, the Agency may consider site-specific adjustments to the human health-based criteria in the future.

The MDH has developed provisional HBVs for metolachlor-ESA and –OSA (OA in MDH memo) in response to requests from MDA after detection in ground water (Exhibit H-65). MDH reviewed limited data on human health toxicity data and has concluded there is evidence that the degradates are less toxic than metolachlor, however, the data is not complete and remains provisional.

The best available BAF information came from a laboratory BCF study. In a 34 day flow-through study using bluegill sunfish (*Lepomis macrochirus*), a total BCF of 13.9 was found in edible tissue (Exhibit H-66). The study further examined the contribution of the parent compound and various metabolites represented in the total radioactivity value and attributed 18 percent to metolachlor. The total radioactivity BCF is used to account for possible toxic intermediates.[47] The metolachlor summary sheet (Table 5) provides more detail about the determination of the final BAF of 16.5 (Exhibit H-10a, Table III-7).

J. IMPLEMENTATION OF ACETOCHLOR AND METOLACHLOR STANDARDS [V. reasonableness, acetochlor and metolachlor]

1. Introduction [V.J. reasonableness, acetochlor and metolachlor]

The water quality standards for acetochlor and metolachlor will be implemented like other Class 2 standards. Minnesota R. 7050.0222, subp. 7, items B, C and D lay out the application of the acute and chronic water quality standards. The details on determining if surface waters are in compliance with the standards are established in the *MPCA Guidance Manual for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment: 305(b) Report and 303(d) List* (latest version 2006) (Exhibit A-7).[50] Professional judgment has a role in the final decision on compliance with standards and impairment determination, however, for numeric standards, such as pesticides and other chemicals under the heading of "toxics", there are clear criteria given, such as minimum number of samples and number of violations of the standard. The guidance is meant to provide a transparent and scientifically-defensible framework to assist other parties undertaking monitoring programs in the state for which data may be used for impairment assessments and for stakeholders interested in the impaired waters assessment process itself.

2 Pesticide Registration and Surface water monitoring Data [V.J. reasonableness, acetochlor and metolachlor]

a) Acetochlor [V.J. reasonableness, acetochlor and metolachlor]

Referencing the Agency and Minnesota Department of Agriculture (MDA) Acetochlor Supplement (Exhibit H-4), acetochlor is an herbicide for control of unwanted plants or weeds

[50] The guidance is updated with each new 303(d) list and is available from the Agency in paper copy or electronically on the Agency website.

that is applied prior to emergence of crop plants. Acetochlor has a similar structure and mode of action in plants as other chloracetamide (chloroacetanilide) herbicides, including metolachlor and alachlor. Acetochlor is primarily used on corn crops in Minnesota.[51] Other crops grown here that are suitable for acetochlor application are potatoes, soybeans, and other edible beans, but survey results suggest limited use on these crops. The EPA registered acetochlor for use in 1994 under conditions that use of other corn herbicides would decrease. Refer to the *Introduction* in the Acetochlor Supplement (Exhibit H-4) for important details on acetochlor and its registration, including:

- Full product uses,
- Trade names,
- Label requirements,
- And use-restrictions.

Registration of acetochlor for corn crops means environmental application in large areas of Minnesota, but primarily in the western, central, and southern counties (Exhibits H-5 and H-67). Minnesota Agricultural Statistics Service provides annual data on estimated use of pesticides in pounds of active ingredients and in 2004 3.8 million pounds of acetochlor were sold, ranking it number two in pounds of active ingredients sold for all corn herbicides.[31] In 2004, MDA in cooperation with other state and national agencies completed the most comprehensive survey to date on herbicide, insecticide, and fungicide use on corn, soybean, wheat, and hay in Minnesota[51]. This survey provides a sound framework for recording acetochlor use and distribution in Minnesota–see the Acetochlor Supplement for detailed results of the survey. The survey demonstrates common usage of acetochlor on corn crops surveyed.

The properties of a chemical affect the movement, accumulation, and breakdown in the environment. Understanding the fate of herbicides in the environment is especially important for protecting water resources. The Acetochlor Supplement (Exhibit H-4) provides a review of the fate and transport of acetochlor and describes common degradates, acetochlor-ethane sulfonic acid (acetochlor-ESA) and acetochlor oxanilic acid (acetochlor-OXA).

Surface water monitoring in Minnesota by the MDA and the United States Geological Survey (USGS) has shown acetochlor and two common degradates, acetochlor-ESA and -OSA are frequently detected (Exhibit H-4). The highest concentrations of acetochlor generally occur in May and June. Pre-emergent application in spring or fall for some products means the herbicide is available to run-off into surface waters with precipitation. The magnitude and duration of higher concentrations is influenced by the intensity and timing of the rainfall and stream characteristics. Another route of surface water detections is leaching into ground water that contacts streams. Details of detections and concentrations for acetochlor and other herbicides in Minnesota surface waters are available in the Tables of the Acetochlor Supplement from MDA annual monitoring reports (Exhibit H-4). An overview of MDA acetochlor monitoring data for the four surface water monitoring stations (network) operating from 2002 through 2004 is provided in the table below.

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[51] MDA. 2005. 2003 Pesticide Usage on Four Major Minnesota Crops. Minnesota Agricultural Statistics Services, MDA. St. Paul, MN. January 2005.

Table III-9. Examples of MDA Acetochlor Monitoring Data 2002-2004.

Station-Rivers	Sample Type	2002			2003			2004 (Partial Year)		
		% Det.	Max. Conc. µg/L	Medians µg/L	% Det.	Max. Conc. µg/L	Medians µg/L	% Det.	Max. Conc. µg/L	Medians µg/L
Blue Earth	Storm-event	94%	1.5	0.1	85%	0.860	0.095	92%	1.760	0.355
	Base Flow	14%	0.025 (P)	nd	0	Nd	nd	50%	0.330	0.055
Le Sueur	Storm-event	89%	7.1	0.56	88%	2.380	0.175	100%	1.520	0.420
	Base Flow	25%	0.06	nd	25%	0.180	nd	67%	1.050	0.098
Minnesota – Judson	Storm-event	80%	1.09	0.1	45%	0.430	nd	100%	0.850	0.370
	Base Flow	0	nd	nd	0	Nd	nd	50%	0.060	0.025 (P)
Middle Branch Whitewater	Storm-event	65%	9.6	0.46	50%	1.190	0.135	59%	2.170	0.095
	Base Flow	33%	7.5	nd	35%	0.400	nd	52%	1.580	0.025 (P)
Conc.: Herbicide Concentrations; Det.: Sample Detections; nd: Not Detected below Reporting Limit (RL=0.05 µg/L); P: Detected below Reporting Limit (½ RL= 0.025 µg/L)										

b) Metolachlor [V.J. reasonableness, acetochlor and metolachlor]

Metolachlor, like acetochlor and alachlor, is a chloracetamide (chloroacetanilide) herbicide used to control unwanted plants in association with field corn and other crops (Exhibit H-5). A recent survey by MDA points to application on field corn crops as the primary use of metolachlor in Minnesota.[51] Metolachlor is applied prior to emergence of crop plants either in the spring or fall. The general mode of action for metolachlor and other choracetamide herbicides is toxic action on seedling development. EPA registered metolachlor in 1976 and s-metolachlor in 1997. As described fully in the Metolachlor Supplement (Exhibit H-5), the composition change of s-metolachlor has lead to a higher effectiveness in weed control and resultant decrease in the application rate. The Metolachlor Supplement also covers:

- Full product uses,
- Trade names,
- And label requirements.

Use of metolachlor for corn crops means environmental application in large areas of Minnesota, but primarily in the western, central, and southern counties (Exhibits H-5 and H-67). Minnesota Agricultural Statistics Service provides annual data on estimated use of pesticides in pounds of active ingredients; metolachlor use declined from 1996 until 2001 (Exhibit H-5), with estimates at approximately 2.7 million pounds s-metolachlor sold in 2004.[31] The 2004 MDA survey on herbicide, insecticide, and fungicide use on corn, soybean, wheat, and hay in Minnesota found s-metolachlor was applied on 12 percent of the surveyed corn acres.[51] This survey provides a sound framework for recording metolachlor product use and distribution in Minnesota–see the Metolachlor Supplement (Exhibit H-5) for detailed results of the survey.

Characterizing the fate of herbicides in the environment is important for improving management for crop application and protecting water resources. Chemical properties such as persistence, water solubility, and degradation affect the distribution in the environment. The Metolachlor Supplement details the environmental fate of metolachlor and its degradates (Exhibit H-5). Like acetochlor, the oxanilic acid (OXA) and ethane sulfonic acid (ESA) degradates are commonly detected in surface and ground waters.

Monitoring in Minnesota by the MDA and the USGS frequently find metolachlor in surface waters (Exhibit H-5). As discussed in the Metolachlor Supplement, analytical methods for metolachlor do not distinguish between the two products, metolachlor and s-metolachlor. The highest concentrations of metolachlor have occurred in March, May, and June. Pre-emergent application in spring or fall for some products means the herbicide is available to run-off into surface waters with precipitation. The magnitude and duration of higher concentrations is influenced by the intensity and timing of the rainfall and stream characteristics. Another route of surface water detections is leaching into ground water that contacts streams. Details of detections and concentrations for metolachlor and other herbicides in Minnesota surface waters are available in the Tables of the Metolachlor Supplement (Exhibit H-5) from MDA annual monitoring reports. An overview of metolachlor monitoring data for the four surface water monitoring stations (network) operating from 2002 through 2004 is provided in the table below.

Table III-10. Examples of MDA Metolachlor Monitoring Data 2002-2004.

Station-Rivers	Sample Type	2002			2003			2004 (Partial Year)		
		% Det.	Max. Conc. (µg/L)	Medians (µg/L)	% Det.	Max. Conc. (µg/L)	Medians (µg/L)	% Det.	Max. Conc. (µg/L)	Medians (µg/L)
Blue Earth	Storm-event	100	0.52	0.13	95	0.460	0.125	100	0.71	0.285
	Base Flow	57	0.035 (P)	0.035 (P)	50	0.090	0.035 (P)	75	0.670	0.068
Le Sueur	Storm-event	100	0.65	0.17	88	0.680	0.140	100	1.300	0.230
	Base Flow	75	0.28	0.035 (P)	50	0.270	0.035 (P)	83	1.150	0.110
Minnesota – Judson	Storm-event	100	0.65	0.17	73	0.370	0.090	100	2.460	0.320
	Base Flow	0	nd	nd	11	0.290	nd	83	0.490	0.035 (P)
Middle Branch Whitewater	Storm-event	70	4.3	1.13	50	3.900	1.035	94	1.250	0.175
	Base Flow	33	3.84	nd	50	1.120	0.035 (P)	72	1.620	0.035 (P)
Conc.: Herbicide Concentrations; Det.: Sample Detections; nd: Not Detected below Reporting Limit (RL=0.05 µg/L); P: Detected below Reporting Limit (½ RL= 0.025 µg/L)										

3. Water Quality Assessments for Acetochlor and Metolachlor [V.J. reasonableness, acetochlor and metolachlor]

The maximum standard (MS) based on aquatic animals is compared to one-day average water column concentration of the chemical. Chronic standards (CS) based on aquatic toxicity, aquatic plants in the case of acetochlor and metolachlor, is compared to a four-day average water concentration.

The Agency has guidance for determining if monitoring data shows that pesticide concentrations in a surface waterbody (lake or river segment) violate water quality standards (Exhibit A-7). The requirements are based on a minimum data set and a frequency of violations of a standard to list a waterbody as impaired on the 303(d) list. For pesticides that are seasonally applied and reach higher concentrations in the spring and summer during storm-events, the Agency has framed specific requirements for assessing pesticides with technical assistance from MDA. The Agency has used this approach for assessing atrazine for the 2004 and 2006 303(d) lists, and plans to use the same assessment methods with acetochlor and metolachlor.[52]

The Agency relies on the pesticide monitoring program at MDA for use in assessing pesticide concentrations in surface waters.[29] Currently, MDA's program focuses on comprehensive stream or river monitoring in the southern third of the state and supplements these sites with statewide survey data.[34] Monitoring in surface waters has acetochlor and metolachlor results since 1993. MDA and their cooperators also supply the Agency with stream-flow data, termed hydrographs. The hydrographs are an important aspect to assessing pesticide concentrations as they are influenced by changes in the amount and source of water entering and moving through a stream monitoring station. MDA sampling includes continuous flow-based sampling during storm-events at selected stations and grab samples at all stations and survey sites.

4. Assessing Herbicide Mixtures [V.J. reasonableness, acetochlor and metolachlor]

Assuming the proposed standards are adopted, the Agency will have standards for three chloracetamide herbicides: alachlor, acetochlor, and metolachlor. Their general mode of toxicity in vascular plants is similar and is suspected to act on molecular targets important in all plant species (i.e. fatty acid and protein synthesis). Limited evidence in algal species has shown additive effects with mixtures of chloracetamides, suggesting same mode of action in these plant groups as well.[53] Studies on effects to aquatic plants have also shown similarity in the most sensitive species. Situations may arise where comparing individual herbicides to their respective standards may not account for cumulative negative effects arising from exposure to multiple chemicals targeted at plants.

EPA and MDH are developing guidance and rules for addressing chemical mixtures, including mixtures of chemicals with similar modes of toxicity or toxicities of parent compounds

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52 MPCA. 2003 and 2005. Assessment of Atrazine Concentrations in the Middle Fork (Branch) of the Whitewater River for the 2004 and 2006 305b/303d Integrated Assessment and Root River for the 2006 305b/303d Integrated Assessment.

53 Junghans, M., T. Backhaus, M. Faust, et. al. 2003. Predictability of combined effects of eight chloroacetanilide herbicides on algal reproduction. *Pesticide Management Science.* Vol 59: 1101-1110.

compared to their environmental degradates and biological metabolites.[47,54] EPA published detailed toxicity assessments of atrazine and its common environmental degradates[55]; the Agency has used their finding for assessing atrazine and degradate concentrations in surface waters. The Agency is following this ongoing work and may consider application in future impairment assessments. For example, use of an additive approach for mixtures of herbicides from the same chemical class by using a hazard quotients (sum of the average four-day concentration in surface waters/chronic standard for each herbicide) to assessing compliance to water quality standards. Minn. R. 7050.0222, subp. 7, item D already requires this approach for assessing samples with more than one carcinogenic substance.

5. Projected Exceedances of Standards [V.J. reasonableness, acetochlor and metolachlor]

Based on the assessment protocol described above in Section V.J.3, Agency staff have completed a preliminary assessment of MDA monitoring data for acetochlor and metolachlor to try and determine if there are waters that would not meet the proposed standards. The potential of future listing of waterbodies for acetochlor or metolachlor impairment on the 303(d) list has ramifications for cost estimates and affected parties. Examination of complete monitoring and hydrograph data for the years 2002 to 2004 found:

- No stream stations or survey sites had any one-day average metolachlor concentrations that exceed the proposed maximum standard (MS; 271 µg/L) or four-day average concentrations exceeding the proposed chronic standards (CS; 23 µg/L);
- No stream stations or survey sites had any one-day average acetochlor concentrations above the proposed MS (86 µg/L);
- Three stream stations had four-day average acetochlor concentrations that exceed the proposed CS (1.7 µg/L): Middle Fork (Branch) of the Whitewater River (June 2002), Le Sueur River (May 2003, two four-day violations), and Seven Mile Creek (May 2004).

A limited review of MDA pesticide monitoring data and U. S. Geological Survey long-term National Water Quality Assessment Program data in Minnesota going back to 1996 suggests that the Agency would not find any violations of the proposed MS or CS for metolachlor or the proposed MS for acetochlor. Individual sampling results at concentrations above the proposed CS for acetochlor present the possibility of other violations and potential 303(d) listings.

Two violations of the CS in three years, given the minimum data set, meets the criteria for listing a waterbody as impaired on the 303(d) list. At this time, the results on the Le Sueur River from May 2003 meet the criteria for 303(d) listing, however, the Agency recently submitted the draft 2006 303(d) list of impaired waters to EPA, so will not complete another round of impaired water assessments and listings until 2007-2008. A final determination of listing on the 2008 303(d) list will be based on more monitoring data (both older and newer), the final acetochlor standard adopted into rule, and review by the professional judgment groups (Exhibit A-7).

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[54] MDH. 2004. Draft Minnesota's Health Risk Limits for Ground Water Rule (Minn. R. 4714.7810 to 4717.7890) and Draft Statement of Need and Reasonableness. MDH, Environmental Surveillance and Assessment Section.

[55] EPA. 2003. Interim Reregistration Eligibility Decision for Atrazine: Case no. 0062. EPA; Office of Prevention, Pesticides and Toxic Substances.

K. CONCLUSIONS, REASONABLENESS [V. acetochlor and metolachlor]

The proposed acute (FAV and MS) and chronic standards for acetochlor and metolachlor are based on EPA's and the Agency's methodology and rules for developing water quality standards. The methods used provide scientifically-defensible values for protecting the designated beneficial uses of Class 2 surface waters as required by the Clean Water Act. The proposed standards are based on complete background searches for relevant data, thorough assessment of the data for acceptability, and sound statistical and professional analysis of the acceptable data sets for both human health and aquatic organism toxicity.

The FAV and MS values are calculated using an approved "Tier II" method adopted by EPA for the Great Lakes Initiative in 1995 (Minn. R. ch. 7052) and adopted by the Agency for statewide use in 2000. The chronic standards are based on toxicity data for aquatic plants using the draft EPA criterion for atrazine as a guide. This is reasonable given the fact that herbicides are plant poisons. The proposed standards are listed in Tables III-6 and III-7.

L. ECONOMIC IMPACT [V. acetochlor and metolachlor]

1. <u>Introduction</u> [V.L. economics, acetochlor and metolachlor]

Benefits resulting from the adoption of water quality standards for the two corn herbicides, acetochlor and metolachlor are discussed under the required questions in Section V.C.2.

Promulgation of the new water quality standards for acetochlor and metolachlor are not expected to result in any additional costs or redirection of resources initially.

- The MDA has the primary responsibility for addressing pesticides in surface and ground waters and already monitors for acetochlor and metolachlor in corn-growing portions of the state.
- The MDA has already developed voluntary best management practices (BMPs) specifically for acetochlor from the advisory values developed previously by the Agency to address detections in surface waters. A metolachlor BMP was developed to address detections in ground water, and the MDA has been using the Agency's previously developed metolachlor advisory value as a reference value to evaluate the need for metolachlor-specific surface water BMPs. The currently adopted BMP for metolachlor in ground water likely contributes to surface water protection.
- Current pesticide management activities that include acetochlor and metolachlor are voluntary for implementation by corn producers and have potential to reduce surface water impacts prior to any impairment.

Future costs or redirection of resources would stem from determination of impairment and listing of river segments or lakes on the 303(d) impaired waters list.

- Impaired waters listing results in regulatory requirements by the Clean Water Act to develop Total Maximum Daily Load (TMDL) studies.
- The Agency would incur costs requiring redirecting the available resources for TMDL development to address an acetochlor impairment; MDA would likely incur costs related to the TMDL.
- Implementation of strategies to return waters to compliance would likely affect and add costs to or redirect resources by the Agency, MDA, corn producers in listed watersheds, and potentially the principal registrant for acetochlor, Monsanto Company.

The Agency has not listed any surface waters for pesticide impairments, so cost estimates are based on consideration of costs related to TMDLs for conventional pollutants for which the loading to surface waters is dominated by nonpoint sources. To arrive at the estimates we consulted with Agency TMDL staff in the St. Paul and the Regional Offices, MDA experts in pesticide management, and other states that have done TMDLs for herbicides.

2. Initial Costs with Promulgation of Standards [V.L. economics, acetochlor and metolachlor]

a) Minnesota Pollution Control Agency [V.L. economics, acetochlor and metolachlor]

The adoption of new water quality standards in Minnesota Rule would likely be supported by surface water monitoring, assessment of monitoring data for compliance to standards, and setting effluent limits for surface water dischargers. The Agency is not expected to incur costs for acetochlor and metolachlor monitoring in surface waters. The MDA is the lead state agency for addressing pesticide impacts and has responsibility for surface and ground water monitoring.[29] MDA has dedicated funds for pesticide monitoring and already includes acetochlor and metolachlor in their monitoring program. The Agency would see an increase in the amount of monitoring data to review and fully assess for compliance for impairment listing with the addition of the new standards, however, based on the preliminary review undertaken by Agency staff to support the proposed standards, the additional resources needed for the assessments could be adsorbed into normal work loads and current budgets. Because the principal source of acetochlor and metolachlor into surface waters is likely from nonpoint sources (rural land application and the subsequent leaching into ground water or runoff from precipitation) rather than point sources, there would be no costs for development of effluent limits or monitoring plans for dischargers with NPDES/SDS permits.

b) Minnesota Department of Agriculture [V.L. economics, acetochlor and metolachlor]

As described in the Acetochlor and Metolachlor Supplements (Exhibit H-4 and H-5), MDA has the lead role in pesticide monitoring. MDA has a long-term surface water pesticide monitoring program in the primarily agricultural areas of the state that has included sampling streams for acetochlor and metolachlor.[34] MDA is continuously assessing and refining their pesticide monitoring program and in 2002 started supplementing data from the permanent stream stations with surveys of streams statewide. As MDA already monitors for acetochlor and metolachlor in corn-growing sections of the state, the addition of the water quality standards would initially not result in additional monitoring costs. However, monitoring costs would likely increase over time if TMDL processes are implemented

The MDA has already developed and is promoting BMPs for acetochlor and metolachlor, including changes in application rates and farming practices that are voluntary for corn producers and have potential to reduce concentrations in surface waters (Exhibit H-8). MDA has used the advisory values for acetochlor and metolachlor developed by the Agency to assess potential impacts of these herbicides to aquatic life and human health. MDA developed voluntary BMPs in 2004 specifically to address acetochlor in surface waters when the MDA Commissioner determined that, based on their Pesticide Management Plan, the detections in surface water met the criteria for further management. Metolachlor voluntary BMPs were developed in response to ground water detections, but the same BMPs also can reduce surface water impacts. As MDA has already put resources into chemical-specific voluntary BMPs, promulgation of the water quality standards for acetochlor and metolachlor will not necessarily require development of significantly new practices.

3. Costs for 303(d) Impaired Waters Listing and TMDL Study [V.L. economics, acetochlor and metolachlor]

a) Minnesota Pollution Control Agency [V.L. economics, acetochlor and metolachlor]

With the assessment of surface water monitoring data comes the possibility of identifying waters that do not meet the water quality standards for acetochlor and metolachlor. Waters not meeting standards are listed on the 303(d) list and included in the total maximum daily load (TMDL) program mandated by the CWA. The TMDL process requires a pollutant reduction study that determines the sources of the pollutant and necessary reductions needed to return the waters to compliance.[56] The TMDL study would provide the basis for implementing voluntary and regulatory efforts to ensure sources reduce loads accordingly under the Agency's TMDL implementation policies.

Total Maximum Daily Load studies require Agency funds and staff resources. The draft 2006 303(d) has 965 non-mercury impairment listings slotted to be addressed in 290 TMDL studies.[56] The Agency has 15 years to complete a TMDL study for each listing. Once started the studies generally take about four years to complete, followed by one year of implementation planning. The Agency has not had a 303(d) listing for a pesticide, so cost estimates are based on information compiled for TMDLs for conventional pollutants such as fecal coliform, turbidity, excess nutrients and dissolved oxygen. Agency staffing estimate to complete each TMDL study typically ranges from 0.2 to 1.5 full-time equivalents (FTEs) per project year, with an average of 0.3 FTEs per year. Agency staffing estimates related to implementation activities for an approved TMDL typically averages 0.05-0.1 FTEs per year. Overall costs for TMDLs studies have primarily ranged from $50,000 to $400,000, with an average of $150,000. TMDLs for the largest river watersheds (Mississippi and Minnesota Rivers) have study costs closer to $1 million.

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[56] MPCA. 2006. Background on: Total Maximum Daily Loads. MPCA Fact Sheet. January 2006.

Funding for the studies comes from the Federal Section 319 Nonpoint Source Management Program grant and matching state funds. The Agency has approximately $1 million annually to allocate to TMDL study development. About two-thirds of funded projects are led by qualified local partners, including counties, soil and water conservation districts, and watershed management organizations.[57] The Agency leads remaining projects. Activities include conducting additional monitoring and land-use assessments, computer modeling to develop pollutant load allocations and reductions, and facilitating stakeholder participation throughout the process. Costs are largely dependent on project complexity, which is relative to the type of pollutant causing the impairment, the geographic size of the watershed, and the variety and number of impairments being addressed.

A number of factors are considered for estimating the economic impact to the Agency for a possible 303(d) listing and TMDL study for acetochlor. First, is the relative priority of an acetochlor listing in comparison to the other 290+ TMDL studies on the Agency's list. The Agency does not currently have adequate funding to initiate TMDL projects scheduled for a given year, so prioritization of a study for acetochlor would potentially delay start of another needed study and increase the project backlog. Estimates for a pesticide TMDL may be higher than average for a watershed impaired with a conventional pollutant, such as fecal coliform, because analytical costs for monitoring pesticides are higher and models will differ from those developed for more common conventional pollutants. The possible listings are on river sites and the Agency has found TMDL study costs are higher for river impairments than lakes.[57]

Other states have 303(d) listings for pesticides and have completed TMDL studies. States have flexibility in the how to carry out TMDL studies, and TMDLs vary considerably in size, complexity, and the choice of tools used in the analysis, resulting in a wide range of costs. Upon request, the Agency received information from four states on their costs for herbicide TMDLs.

Iowa has completed two TMDL studies for atrazine: one on a reservoir and one on a lake; Iowa's TMDL program coordinator estimates costs for the studies ranged from $10,000 to $15,000, not including monitoring costs.[58] Kansas estimated they spent $5000 for a TMDL study plus $30,000 annually on monitoring. Kansas did not use models, thereby substantially reducing costs. [59] Illinois has not completed their TMDL study, but estimates costs of $44,500 for a contractor to complete the study and implementation plan.[60] Texas provided the Agency a very detailed account of all TMDL related costs. The TMDL study and implementation plan for an impaired drinking water reservoir (atrazine) in Texas cost approximately $520,000.[61]

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[57] MPCA. 2003. Minnesota's Impaired Waters, Report to the Legislature. March 2003. Available at http://www.pca.state.mn.us/water/tmdl/index.html.

[58] Van Gorp, Chris, Iowa Dept. of Natural Resources. 2006. Email: Estimates of costs associated with TMDLs for pesticides. To: A. Preimesberger, MPCA. February 21, 2006.

[59] Stiles, Thomas C., Kansas Dept. of Health and Environment. 2006. Email: Estimates of costs associated with TMDLs for pesticides. To: A. Preimesberger, MPCA. March 28 and 30, 2006.

[60] Yurdin, Bruce, Illinois EPA. 2006. Email: Estimates of costs associated with TMDLs for pesticides. To: A. Preimesberger, MPCA. March 30, 2006.

[61] Wendt, Aaron, Texas State Soil and Water Conservation Board. 2006. 2006. Email: Estimates of costs associated with TMDLs for pesticides. To: A. Preimesberger, MPCA. March 29 and 30, 2006.

b) Minnesota Department of Agriculture [V.L. economics, acetochlor and metolachlor]

The Agency would have the lead and oversee the funding for any TMDL study for pesticides. However, because of MDA's expertise on pesticide issues and broad connections from the national to the local level with the agricultural community, MDA would play a key role in partnering with the Agency to assist with a TMDL study. Cooperation by the agencies would make the most use out of available resources. Costs to MDA may be offset by Federal Section 319 grants.

The MDA has also responded to requests by the Agency to increase monitoring at sites that have had elevated concentrations of pesticides with water quality standards. MDA and the Agency designed a sampling protocol to address these sites with ramped up monitoring for a number of years. MDA relies on partners for some of this sample collection, but does have increased analytical costs with the additional samples.

4. <u>Costs of TMDL Implementation and Restoration Activities</u> [V.L. economics, acetochlor and metolachlor]

a) Minnesota Pollution Control Agency [V.L. economics, acetochlor and metolachlor]

As with the funding available to develop TMDL studies, a dedicated amount of funding from Federal Section 319 grants is used to implement restoration activities ($1.32 million dollars in Fiscal Year 2006.). The Agency would need to divert resources to TMDL implementation with the publication of a TMDL study for acetochlor. The Agency has estimated total costs related to TMDL restoration studies for all affected parties as ranging from $5 to $10 million in small watersheds, up to $40 million for large watersheds. Texas successfully returned the Aquilla Reservoir to compliance with the Federal atrazine drinking water standard and invested about $2.2 million in restoration projects.[61] Of total TMDL costs, approximately 50 percent of the funding was from Federal sources and 25 percent from state agency budgets. The Agency estimates that 0.05 to 0.1 FTEs are required to provide adequate agency oversight per TMDL implementation project.[57] For most nonpoint-related TMDLs, the Agency primarily contracts implementation activities to local government or watershed organizations, which receive a portion of the Federal Section 319 funds. In the case of a pesticide impairment, MDA would likely have a larger role than for other pollutants addressed thus far by the Agency in the TMDL program. The MDA or a local contractor would likely lead BMP implementation, monitoring, education/outreach, and other activities detailed in a TMDL implementation plan.

b) Minnesota Department of Agriculture [V.L. economics, acetochlor and metolachlor]

The MDA would partner with the Agency to address implementation and efficiently utilize resources from both Agencies as outlined in MDA's Pesticide Management Plan. Costs to MDA may be offset by Federal Section 319 funds from the Agency. MDA would likely utilize staff resources to assist with implementation; MDA is already involved with education and outreach to corn producers and other agricultural groups in response to publication of voluntary BMPs for acetochlor, metolachlor, and other corn herbicides; however, future costs and staffing needs would be expected to increase in order to direct more resources to any impaired watersheds. There is also the strong likelihood of increased use of technical staff time for TMDL implementation, though the exact increase in FTEs is uncertain. MDA would likely have a lead role and see increased costs for effectiveness monitoring of acetochlor or metolachlor in any listed watersheds.

c) Cost to Corn Producers [V.L. economics, acetochlor and metolachlor]

Costs would likely be limited to corn producers in the impaired watershed, specifically those with crop land in sensitive areas near surface waters or with connections to surface waters. The majority of corn producers in Minnesota, however, would not be in impaired watersheds and would not likely incur costs. As addressed in the Acetochlor and Metolachlor Supplements (Exhibit H-4 and H-5), estimating costs to corn producers is difficult based on the complexity of predicting annual herbicide needs, available products, and market values of corn crops versus viable alternatives. Controlling losses of applied acetochlor or metolachlor from cultivated fields could be addressed through a variety of BMPs as presented in MDA's voluntary BMP publications (Exhibit H-8). In addition, costs associated with implementing a range of options, such as reduction in application rates, switching to lower-cost herbicides, installation of buffer strips, or taking cropland out of production, is highly dependent on the amount and location of crop acres with acetochlor or metolachlor application that can reasonably be linked to the surface water contamination.

Information is available to examine annual costs per acre in implementing BMPs for pesticides and other nonpoint source pollutants. Use of alternate corn herbicides is an option depending on the weed pressures for a given year. For example, estimates of costs of acetochlor per acre range from $12 to $35 based on product type and application rate, with alternatives ranging from $7 to $44 per acre.[62] The Agency has estimated BMP costs for other nonpoint agricultural water pollutants: minimum tillage at $14/acre, stream buffers at $200/acre, and conservation easements in the Conservation Reserve Program at $100/acre/year.[63]

The economic impact to individual corn producers may be minimized, because MDA is already implementing voluntary BMPs offering a variety of options for reducing acetochlor and metolachlor impacts, providing advanced notice for corn producers and local agricultural groups to respond to the detections of acetochlor and other herbicides in surface water. In the case of acetochlor, BMP implementation could reduce concentrations in impaired surface waters, returning them to compliance prior to any long-term impairment to the aquatic community or the need for more prescriptive BMPs. Voluntary BMPs are already being developed and implemented through education and incentive programs in the agricultural parts of the states to address TMDLs for other nonpoint pollutants (e.g. fecal coliform). The same BMPs should also reduce pesticide runoff. Kansas found that changes in less costly herbicide application practice and not structural changes resulted in significant decreases in surface water concentrations.[59] Texas corn producers did invest money in BMP implementation through cost-share programs at

[62] MDA. 2005. Atrazine alternatives for corn production in Minnesota (chart based on University of Minnesota Extension's *2005 Cultural and Chemical Weed Control in Field Crops* and other sources), J. Zachmann, St. Paul.
[63] Yellow Medicine Watershed District (MPCA Approved). 2005. South Branch Yellow Medicine River Fecal Coliform Total Maximum Daily Load Report. Available at www.pca.state.mn.us/water/tmdl.

a total of $685,000.[61] The timeframe associated with TMDL implementation would allow corn producers to apply for and receive financial incentives and cost-sharing participation for implementation of more costly BMPs that might require taking land out of production for planting and restoring native habitat.

d) Registrants [V.L. economics, acetochlor and metolachlor]

The registrants of acetochlor, primary Monsanto Company, may see a slight change in acetochlor sales as a result of 303(d) listing of a specific waterbody in a watershed of limited size. Review of pesticide monitoring data in Minnesota from MDA and USGS points to a small number of watersheds with acetochlor concentrations near or above the proposed chronic water quality standard. Options for reducing these concentrations include reduced application rates of the herbicide, a possible change in herbicide products, installation of stream buffers, acquisition of conservation easements, etc. Within an impaired watershed there is likely to be a subset of corn producers amendable to altering acetochlor use. Because acetochlor is widely used across the United States corn belt, a reduction in use by limited growers in Minnesota may only result in minor revenue losses for the registrants.

M. CONCLUSION, ECONOMIC IMPACT [V. acetochlor and metolachlor]

The Minnesota Department of Agriculture (MDA) identified acetochlor and metolachlor as the two top pesticides in need of water quality standards, because of frequent detections in surface waters, with some acetochlor concentrations near previous Agency advisory values. Also, acetochlor and metolachlor use in corn production is high relative to other pesticides in Minnesota.

If the proposed acetochlor and metolachlor standards are adopted state agencies, farmers and the pesticide registrants are likely to incur costs. Estimating future costs is very difficult for the reasons discussed in this Section. And some costs to growers may be at least partially offset by grants or incentive programs.

VI. UPDATE HUMAN HEALTH-BASED STANDARDS FOR BENZENE AND NAPHTHALENE

A. INTRODUCTION [VI. benzene and naphthalene]

The Agency adopted standards for benzene and naphthalene in the 1990 and 1994 revisions of Minn. R. ch. 7050, respectively. The same benzene chronic standard in Minn. R. ch. 7050 is also listed in Minn. R. ch. 7052. The Agency elected not to propose a change to the benzene standard in Minn. R. ch. 7052, because it would be the only change for that rule in this rulemaking. It is not cost-effective in terms of the extra time and staff resources needed to include Minn. R. ch. 7052 in this revision for this one small change. The more current benzene standards in Minn. R. ch. 7050 are applicable statewide and will be used in the Lake Superior Basin. Naphthalene is not a listed standard in Minn. R. ch. 7052, but is incorporated by reference in Minn. R. ch. 7052.0100, subp.1.

The Minnesota Department of Health (MDH) staff has recently completed toxicological reviews of benzene and naphthalene and other chemicals for which the Agency has current water quality standards. Of these, only benzene and naphthalene resulted in human health criteria that are lower than current water quality standards. For a range of reasons the revised toxicological reviews do not result in more stringent standards for other toxicants, at least until such time as the Agency proposes to use children-protection “adjustment factors” in the calculation of human health-based standards.

The Agency is proposing to update only the chronic standards; the acute toxicity-based final acute values and maximum standards will not change.

B. NEED TO UPDATE BENZENE AND NAPHTHALENE STANDARDS [VI. benzene and naphthalene]

Water quality standards for protecting human health take into account both exposure and health effects. Research advances in these areas need to be accounted for in regulatory applications, in this case updating human health-based water quality standards. Enhanced understanding of how and how much humans may be exposed to a chemical and the health outcomes from such exposure serve to decrease the uncertainty in setting standards for pollutants. Application of the newer data benefits users of Minnesota’s waters for drinking and recreational uses by increasing the reliability of the values used to protect surface and ground waters for meeting these beneficial uses.

The Agency relies on EPA and the expertise of staff at the Minnesota Department of Health (MDH) for providing human health toxicity information for developing human health-based drinking water quality criteria and standards. MDH staff working on revisions to Health Risk Limits (HRLs) for groundwater have recently reviewed toxicological data for benzene and naphthalene (Exhibits HH-5 and HH-6). Newer toxicological data available since the Agency standards were promulgated show health effects can occur at lower doses. The best available toxicity data needs to be factored in when determining the numeric water quality standards for these chemicals (see table III-12). The human health-based chronic criteria values will be compared to criteria developed to protect aquatic organisms. The lowest or most stringent criteria values for each Class 2 designation will be promulgated into Minn. R. ch. 7050.0222 as chronic standards for that pollutant.

Table III-12. Results of MDH Toxicological Reviews and Example of Changes in Human Health-based Standards for Benzene and Naphthalene.

Chemical	Current Reference Dose	MDH Updated Reference Dose	Current Cancer Potency Factor	MDH Updated Cancer Potency Factor	**Examples** Current Chronic Standard for Class 2A	**Example** Proposed Chronic Standard for Class 2A
Units	mg/kg-d	mg/kg-d	$(mg/kg\text{-}d)^{-1}$	$(mg/kg\text{-}d)^{-1}$	µg/L	µg/L
Benzene	NA	(0.004)	0.0290	0.055*	9.7	5.4
Naphthalene	0.04	0.02	NA	NA	129 (criterion)	65

*Cancer potency slope is basis for the most protective human health-based standard.
NA: Not applicable-no toxicity value is available or required for this chemical.

Definitions from Minn. R. 7050.0218, subp. 3:
Cancer potency factor- a factor indicative of a chemical's human cancer causing potential in units of inverse milligrams per kilogram-day ($mg/kg\text{-}d^{-1}$).

Reference dose-an estimate of a daily exposure to the human population, including sensitive subpopulations, that is likely to be without appreciable risk or deleterious effects over a lifetime in units of milligrams per kilogram-day (mg/kg.d).

C. REASONABLENESS OF PROPOSED BENZENE AND NAPHTHALENE CHRONIC STANDARDS, REQUIRED INFORMATION [VI. benzene and naphthalene]

1. Introduction [VI.C. reasonableness, benzene & naphthalene]

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed benzene and naphthalene standards.

2. Classes of Persons Affected by the Proposed Rule Amendments, Including those Classes that Will Bear the Costs and Those that Will Benefit [VI.C. reasonableness, benzene and naphthalene]

Current water quality standards based on the most up-to-date scientific data benefit all users of Minnesota's waters and all citizens in general. Citizens rely on the Agency to set standards and effluent limits that protect human health and the environment. An important aspect of this responsibility is to ensure accuracy in standards. The CWA specifically requires states to revise water quality standards every three years to maintain their accuracy and reliability. The revisions to the benzene and naphthalene standards are based on the best scientific data. The standards are designed to protect the beneficial uses of surface waters and therefore benefit direct users and provide assurance to other citizens in general that pollutants in Minnesota's surface waters are being addressed.

As fully covered in Section VII.E, *Economic Impact*, the promulgation of the revised human health-based standards for benzene and naphthalene will not result in any costs.

3. <u>Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues</u> [VI.C. reasonableness, benzene and naphthalene]

The Agency does not expect there to be any additional costs to any party as a result of promulgation of the revised benzene and naphthalene water quality standards, including State Revenues (Section VII.E.).

4. <u>Determination of Whether There Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose</u> [VI.C. reasonableness, benzene and naphthalene]

There are no other options for achieving the purpose of updated benzene and naphthalene standards.

5. <u>Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments</u> [VI.C. reasonableness, benzene and naphthalene]

The Agency initially planned to update more human health standards taking into account additional protection for infants and children. As described in SONAR Book I Section II.D.2. and Section VI.A. in this Book, the Agency postponed those plans. No other alternatives for updating the benzene and naphthalene standards were considered.

6. <u>Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties</u> [VI.C. reasonableness, benzene and naphthalene]

The Agency does not expect any costs to affected parties as described in Section VII.E.

7. Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [VI.C. reasonableness, benzene and naphthalene]

The Agency believes there could be intangible "costs" to Minnesotans if water quality standards are not revised to reflect the most current and scientifically defensible data. Minnesotans place a high value on our water resources for drinking water and fish consumption, recreation, and healthy ecosystems (see example discussion for benefits of eutrophication standards in Book II, Section V.B). The Agency has a mandate to protect these designated beneficial uses and part of that is having accurate and reliable water quality standards. At certain levels of exposure, benzene and naphthalene can affect human health; benzene is classified as a known human carcinogen (See Section VII.D.2). Revised chronic water quality standards aim to protect humans from detrimental effects, which both can have direct and indirect "costs" to human health and quality of life and resultant true monetary losses.[35]

8. Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference [VI.C. reasonableness, benzene and naphthalene]

Federal regulations in the CWA and laid out in EPA guidance and water quality criteria documents provide the requirements and guidelines to develop water quality standards; the updated benzene and naphthalene standards developed by the Agency are consistent with these parameters. The CWA gives states the authority to promulgate water quality standards. EPA has published ambient water quality criteria for benzene in 2002; the Agency modified the standard based on the higher fish consumption rate used in Minnesota over the default general population rate used by EPA and used different bioaccumulation factors based on more defensible and newer methods (Section III.C.4).

9. Consideration and Implementation of the Legislative Policy Under Minn. Stat. §14.002 [VI.C. reasonableness, benzene and naphthalene]

Minnesota Stat. § 14.002 requires state agencies, whenever feasible, to develop rules and that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

The standards for benzene and naphthalene are "prescriptive" as are all numeric standards. The general concepts of how prescriptive or flexible a rule should be are discussed more in SONAR Book I, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [VI.C. reasonableness, benzene and naphthalene]

Minnesota Stat. § 14.131 requires the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

The Agency outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I, and its compliance with these specific statutes in Section IV.C.10.

11. Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local Governments [VI.C. reasonableness, benzene and naphthalene]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

12. Agency Determination Regarding Whether Cost of Complying with Proposed Rule in the First Year After the Rule Takes Effect Will Exceed $25,000 [VI.C. reasonableness, benzene and naphthalene]

The cost of complying with the revised benzene and naphthalene chronic standards in the first year after they take effect will not exceed $25,000 for: (1) any one business that has less than 50 full-time employees; or (2) any one statutory or home rule charter city that has less than ten full-time employees, because there are no cost to outside parties attributed to the benzene and naphthalene standards.

D. REASONABLENESS OF PROPOSED BENZENE AND NAPHTHALENE CHRONIC STANDARDS [VI. benzene and naphthalene]

1. Introduction [VI.D. reasonableness, benzene & naphthalene]

The MDH is the lead agency on setting or providing guidance on human health toxicity recommendations and has completed thorough reviews of benzene and naphthalene to establish toxicity values. The Agency applies the health review data to the established methods to set human health-based chronic criterion, as described in Minn. R. ch 7050.0218, subp. 6 and the BAF (bioaccumulation factor) methods described in Minn. R. ch. 7050.0218, subp. 7, with other guidance available in Exhibit HH-3.

2. Benzene [VI.D. reasonableness, benzene]

Benzene is a natural component of coal and petroleum, produced by extraction from these sources.[64] Benzene is one of the top organic chemicals produced in the United States. Primary uses for benzene include gasoline additive, intermediate in chemical manufacturing, commercial solvent, and chemical ingredient in dye, paints, and detergents.[65]

Benzene is a volatile organic chemical (VOC), meaning that it readily vaporizes into air. Its use in gasoline means exposure is primarily from automobile emissions and volatilization at filling stations.[64] Other air sources include emissions from industrial facilities using benzene and burning of coal, petroleum products, and wood (forest fires are a natural source of benzene). Benzene is also found in cigarette smoke, which can also contribute significantly to exposure.

Detection of benzene in ground or surface waters is rare and likely the result of direct input from improper disposal or spills and leaking underground gasoline storage tanks.[64] Nationwide, surface water samples have found benzene in 15 percent of samples analyzed for VOCs at concentrations typically between 1-2 µg/L. In Minnesota, annual river sampling by the Metropolitan Council Environmental Services (MCES) in the seven county Twin Cities metropolitan area has only detected benzene twice from 1978-2004 (Reporting Limit 1 µg/L).[66,67]

The recent toxicological review by MDH for the HRL revisions showed that benzene is a more potent carcinogen than previously determined (Exhibit HH-5). Benzene is a known human carcinogen with tumor sites in the blood system, resulting in leukemia. MDH concurred with the 2000 benzene health assessment by the EPA Integrated Risk Information System (IRIS), the principle source of human health toxicity evaluations for non-pesticides. The IRIS review determined a range of cancer potency slopes for benzene from 0.015 to 0.055 $(mg/kg\text{-}d)^{-1}$. MDH is using the upper bound cancer slope factor of 0.055 $(mg/kg\text{-}d)^{-1}$ for setting the cancer HRL, which is consistent with the results of the EPA IRIS assessment. Using the larger cancer slope factor provides the most health protection and results in a lower (more stringent) standard.[68] At higher doses (based on a reference dose of 0.004 mg/kg-d), benzene exposure is also linked to noncancer adverse effects to the blood system and developmental effects.

The Agency established the chronic standards for benzene in Minn. R. 7050 in 1990 and updated the human health-based WQS in 1994 (Exhibit HH-7). Table III-12 lists the current human health-based criteria based on a cancer potency factor of 0.0290 $(mg/kg\text{-}d)^{-1}$. The human health-

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[64] Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological Profile for Benzene. U. S. Department of Health and Human Services. 435p.

[65] U. S. Environmental Protection Agency (U. S. EPA). 1993. Technical factsheet on benzene. U. S. EPA, Office of Water, at www.epa.gov/OGWDW. Updated and Accessed in 2005.

[66] Metropolitan Council Environmental Services (MCES). 2005. River monitoring data (1994-2004), Personal Communication. T. O'Dea, Principal Environmental Scientist, MCES, Water Resource Assessment.

[67] Andrews, W. J., J. D. Fallon, and S. E. Kroening. 1995. Water-quality assessment of part of the Upper Mississippi River Basin, Minnesota and Wisconsin—volatile organic compounds in surface and ground water, 1978-1994. United States Geological Survey (USGS) Water-Resources Investigation Report 95-4216.

[68] MDH. 2005. Personal Communication. H. Goeden, Ph. D., Research Scientist III, MDH, Health Risk Assessment Unit.

based criteria for Classes 2A and 2Bd were also promulgated as the chronic standards, because these values are more stringent than the aquatic toxicity criterion of 114 µg/L. For Class 2B surface waters, the aquatic toxicity criterion value is the most stringent and applied as the chronic standard. Using the updated cancer slope factor and previously developed bioaccumulation factor (BAF) results in revised human health-based criteria that are more stringent than the current Class 2 water quality standards (Table III-13). All Class 2 chronic standards for benzene will now be based on protection of human health (Exhibit HH-8). While the changes in chronic standards are relatively small, because benzene is a carcinogen, any exposure has some increased risk for developing cancer, and standards need to reflect the latest findings on cancer potency.

Table III-13. Current and Proposed Benzene Standards in Minn. R. ch. 7050.

Benzene Parameters	Current Values	Proposed Values (Revised values are in bold.)
Toxicity-based (Tox) All Class 2		
Maximum Standard	4,487 µg/L	4,487 µg/L
Final Acute Value	8,974 µg/L	8,974 µg/L
Chronic Criterion	114 µg/L	114 µg/L
Human Health-based (HH)		
All Class 2		
Reference Dose	NA	0.004 mg/kg-d
Cancer Potency Factor*	0.0290 $(mg\text{-}kg\text{-}d)^{-1}$	**0.055 $(mg\text{-}kg\text{-}d)^{-1}$**
Class 2A		
Bioaccumulation Factor l/kg	16	16
Chronic Criterion	9.7 µg/L	**5.4 µg/L**
Class 2Bd		
Bioaccumulation Factor l/kg	4	4
Chronic Criterion	11 µg/L	**6.0 µg/L**
Class 2B/C/D		
Bioaccumulation Factor l/kg	4	4
Chronic Criterion	186 µg/L	**98 µg/L**
Final Water Quality Standards		
Maximum Standard	4,487 µg/L (Tox)	4,487 µg/L (Tox)
Final Acute Value	8,974 µg/L (Tox)	8,974 µg/L (Tox)
Chronic Standards		
Class 2A	9.7 µg/L (HH)	**5.4 µg/L (HH)**
Class 2Bd	11 µg/L (HH)	**6.0 µg/L (HH)**
Class 2B/C/D	114 µg/L (Tox)	**98 µg/L (HH)**
*Basis for chronic criterion; calculation with reference dose results in a higher value.		

3. Naphthalene [VI.D. reasonableness, naphthalene]

Naphthalene is a chemical formed naturally in coal tar and crude oil.[69] Based on sources and chemical structure, naphthalene is classified as a PAH (polynuclear aromatic hydrocarbon); a

[69] U. S. EPA. 2003. Health effects support document for naphthalene. U. S. EPA, Office of Water, EPA 822-R-03-005, 149p.

group well known for being released from combustion or burning of organic carbon, including wood, coal, petroleum products, cigarettes, and meats. Naphthalene is also extracted and used in chemical processes for producing plastics, dyes, pharmaceuticals, insecticides, and mothballs.

Naphthalene is also classified as a VOC. Exposure evaluations find that humans are primarily exposed to naphthalene from inhalation of smoke and exhaust from combustion of wood and petroleum in automobile exhaust and power plants. Ambient air concentrations are highest in urban areas. Indoor air concentrations can exceed those of ambient air with cigarette and mothball exposure.

Occurrence of naphthalene in surface and ground waters would result from direct releases or runoff from land contamination. Ground water contamination has occurred from improper disposal or spills of petroleum based products and general urban sources and contamination. National monitoring of surface waters has shown median concentrations of 3.9 µg/L in urban areas and 0.4 µg/L in rural areas, but generally measured concentrations above analytical reporting limits are uncommon.[69] River monitoring by the MCES around the metropolitan area between 1978-2004 has not detected naphthalene (above a Reporting Limit 2 µg/L).[66,67] A limited statewide survey of Minnesota's surface waters by the Agency and USGS did not find naphthalene above the Reporting Limit of 0.5 µg/L.[70]

As previously stated, MDH has recently competed a toxicological evaluation of naphthalene (Exhibit HH-6). Naphthalene is classified as a carcinogen, but sufficient data is lacking to determine an oral cancer potency slope needed for determining risk for water ingestion. MDH concurred with the 1998 naphthalene health assessment in IRIS. IRIS set a reference dose of 0.02 mg/kg-d based on decreased body weight in a rodent study and uncertainty factors. Other effects at higher doses observed in animals and humans include hematological, developmental, nervous system, and death.

The Agency promulgated the current naphthalene standards in Minn. R. 7050 in 1994 (Exhibit HH-9). The lowest chronic criterion for all Class 2 waters is based on toxicity to aquatic organisms. The aquatic toxicity-based criterion and water quality chronic standard is 81 µg/L. Based on the previous reference dose 0.04 mg/kg-d, the human health-based criteria were at concentrations less stringent than the aquatic toxicity-based value (see Table III-14). Use of the previously developed BAF and updated reference dose results in human health-based criterion that is lower than the aquatic toxicity standard for Class 2A waters; Agency proposes to promulgate the human health-based criterion for Class 2A as the chronic standard (Exhibit HH-10).

[70] Lee, K. L., L. B. Barber, E. T. Furlong, et al. 2004. Presence and distribution of organic wastewater compounds in wastewater, surface, ground, and drinking waters, Minnesota, 2000-02. USGS Scientific Investigation Report 2004-5138.

Table III-14. Current and Proposed Naphthalene Standards in Minn. R. ch. 7050.

Naphthalene Parameters	**Current Values**	**Proposed Values (Revised values are in bold.)**
Toxicity-based (Tox) All Class 2		
Maximum Standard	409 µg/L	409 µg/L
Final Acute Value (FAV)	818 µg/L	818 µg/L
Chronic Criterion	81 µg/L	81 µg/L
Human Health-based (HH)		
All Class 2		
Reference Dose	0.04 mg/kg-d	**0.02 mg/kg-d**
Cancer Potency Factor*	NA	NA
Class 2A		
Bioaccumulation Factor l/kg	77.61	77.61
Chronic Criterion	130 µg/L	**65 µg/L**
Class 2Bd		
Bioaccumulation Factor l/kg	38.80	38.80
Chronic Criterion	177 µg/L	**88.5 µg/L**
Class 2B/C/D		
Bioaccumulation Factor l/kg	38.80	38.80
Chronic Criterion	477 µg/L	238.5 µg/L
Final Water Quality Standards		
Maximum Standard (MS)	409 µg/L (Tox)	409 µg/L (Tox)
Final Acute Value (FAV)	818 µg/L (Tox)	818 µg/L (Tox)
Chronic Standards		
Class 2A	81 µg/L (Tox)	**65 µg/L (HH)**
Class 2Bd	81 µg/L (Tox)	81 µg/L (Tox)
Class 2B/C/D	81 µg/L (Tox)	81 µg/L (Tox)

4. Implementation of Benzene and Naphthalene Standards [VI.D. reasonableness, benzene & naphthalene]

Water quality standards are an important factor in setting effluent limits in NPDES (National Pollutant Discharge Elimination System) and State Disposal System (SDS) permits and establishing clean-up goals at spill and remediation sites. Because direct sources of contaminated wastewater are the primary route for VOCs to enter surface waters, it is important and reasonable to set standards and keep them current on these pollutants. In August 2005, there were 46 active NPDES and/or SDS permits for benzene: 31 contaminated ground water pump-outs, seven tank farms, and five other types. The Agency has 18 active NPDES/SDS permits with naphthalene effluent limits; 13 of the permits are for contaminated ground water pump-outs, three for processes at industrial facilities, and two of other types.

E. ECONOMIC IMPACT [VI. benzene and naphthalene]

1. Introduction [VI.E. economics, benzene & naphthalene]

Water quality standards designed to protect the beneficial uses of surface waters are requirements of the Clean Water Act. Economics is not taken into consideration when determining water quality criteria and standards – these values are driven strictly by toxicological and other scientific data (Clean Water Act Sections 303(a) and 304(a); Minn. R. ch. 7050 and 7052). However, economics must be considered when water quality standards are implemented. And Minnesota Stat. ch. 14 requires the review of costs of rule changes to affected parties.

Changes to water quality standards can affect the effluent limits and monitoring requirements for pollutants in NPDES and SDS permits. A combination of state and federal permit rules, facility or permit type, best available, economically-achievable technology, classification of surface water, contaminant (or indicator contaminant) characteristics, and analytic methods determine the resultant effluent limit for permit holders. Effluent limits are established based on the more stringent of a technology-based effluent limitation (TBEL) or applicable water quality-based effluent limit (WQBEL). The EPA-approved analytical methods and detection limits, as listed in 40 CFR 136[71], can become effluent limits if analytical detection limits are at higher concentrations than the TBEL or WQBEL. Ultimately, the effluent limit ensures that the applicable water quality standard for that pollutant is not exceeded in the receiving water.

2. Benzene [VI.E. economics, benzene]

The adoption of the proposed human health-based standards for benzene in Minn. R. ch. 7050 will have no effect or very minimal effect on NPDES/SDS permit holders because:

- Best, available, affordable, and commonly used treatment systems by permit holders generally remove benzene to concentrations below 1-5 µg/L;
- The decreases in chronic standards needed to protect human health are relatively small and remain above the TBEL (see Tables III-13 and III-14);
- The proposed human health-based standards for drinking water protection are at almost the same concentrations as the current effluent limit of 6 µg/L already in place for these waters;
- Current analytical methods and detection limits will still be adequate for ensuring compliance.

Current effluent limits for benzene are primarily set at chronic water quality standards (Table III-15). Discharge points to surface water (and for some SDS permits, ground water) have effluent limits at the current or past chronic standard for that classification of water. Benzene effluent limits for dischargers into Class 2A or 2Bd waters, which are protected for drinking water use, are 6 µg/L based on statewide 1990 benzene human health-based standards. The Agency revised

[71] *Guidelines establishing test procedures for the analysis of pollutants*, 40 Code of Federal Regulations Part 136.1-136.3 (2004).

these standards in 1994 to the current standards of 9.7 and 11 µg/L, respectively, based on a new cancer potency slope, but the effluent limits would have remained at the more stringent concentration to meet anti-backsliding requirements for NPDES permits.[72] Current dischargers into any 2B/C/D surface waters have effluent limits based on the aquatic toxicity-based standard of 114 µg/L, which has been in Minn. R. ch. 7050 since 1990.

Table III-15. Comparison of Proposed Benzene Standards and Current NPDES Effluent Limits.

Water Quality Standards	Proposed Values 7050 (Basis)	Current NPDES Effluent Limits (Basis)	Proposed NPDES Effluent Limits-Contaminated Groundwater (Basis)
Lake Superior	NA	No permits	5 µg/L (TBEL)
Class 2A	5.4 µg/L (HH)	6 µg/L (WQBEL)	5 µg/L (TBEL)
Class 2Bd	6.0 µg/L (HH)	6 µg/L (WQBEL)	5 µg/L (TBEL)
Class 2B/C/D	98 µg/L (HH)	114 µg/L (WQBEL)	5 µg/L (TBEL)

The typical treatment systems used for removal of benzene and other VOCs, air stripping and carbon adsorption or granular activated carbon, are highly effective (Exhibit HH-11). Review of removal capabilities show air stripping at 95 percent removal efficiencies, and activated carbon at better than 99 percent. Multiple systems or a combination of both may be needed to reduce high source concentrations of benzene or other VOCs to levels below detection. These treatment systems are considered best available, economically achievable technology.

The Agency is required by the Clean Water Act to use the best available treatment technologies to meet effluent limits (Exhibit HH-11). The proven high removal efficiency, readily available and economically achievable technology reduces benzene concentrations below water quality standards or WQBELs (Table III-14). EPA guidance on VOC treatment technology has recommended a TBEL of 5 µg/L for benzene. A review of monitoring results submitted to the Agency in Discharge Monitoring Reports (DMRs) by NPDES/SDS permit holders (2001 to 2005) supports the effectiveness of treatment technology, with median benzene concentrations below 1 µg/L.

Federal regulations by the U. S. EPA generally provide the basis for approved analytical methods for NPDES permit holders. The EPA lists approved methods in 40 CFR 136 by pollutant.[71] Approved methods for benzene analysis include three EPA Methods (602, 624, 1624B) and five Standard Methods (6200 B [20th], 6210 B [18th, 19th], 6200 C [20th], and 6220 B [18th, 19th]). The Agency also includes MDH laboratory methods based on the approved EPA 40 CFR 136 list in NPDES permit requirements (MDH 465E, replaced by MDH 498-equivalent to EPA Method

[72] U. S. EPA. 1996. U. S. EPA NPDES Permit Writers' Manual. U. S. EPA. Office of Water, EPA-833-B-96-003, p.178. Anti-backsliding restricts the relaxation of NPDES effluent limits above existing effluent limits, except under specific conditions.

SW 8260[73]). The methods cover a suite of VOCs that include benzene and have detection limits ranging from 0.01 to 10 µg/L.[74,75] The EPA methods are still adequate to detect benzene at the proposed lower standards.

Monitoring is required for some NPDES/SDS permit holders, some with effluent limits and some without. DMRs from 2001 to 2005 show that most facilities use analytical methods with reporting limits (highest detection limit) at 1 µg/L. Occasionally the reporting limit was 10 µg/L, but that was at facilities with an effluent limit of 114 µg/L. Current analytical methods and reporting limits are adequate for current and proposed benzene water quality standards.

Revisions to water quality standards for benzene are not expected to affect NPDES or SDS permits or remediation responses. The proposed standards are close to existing limits and above technology limits. No changes in recommendations or requirements for handling contaminated water are expected. In addition, many sites with benzene limits are contaminated ground water pump-outs or industrial processes with limits for multiple pollutants. The effluent limits for these other pollutants may be more stringent, driving the treatment process; therefore, changes in the benzene effluent limits will have no effect.

3. Naphthalene [VI.E. economics, naphthalene]

Like benzene, the adoption of the proposed human health-based standards for naphthalene in Minn. R. ch. 7050 will have no effect or minimal effect on NPDES or SDS permit holders because:

- The decrease in a chronic standard needed to protect human health is small and only occurs in Class 2A waters (see Tables III-13);
- The proposed human health-based standards for drinking water protection and fish consumption in Class 2A, 65 µg/L, is still above the 50 µg/L effluent limit already in place for most NPDES/SDS permits (Table III-15);
- Available and commonly used treatment systems by permit holders generally remove naphthalene to concentrations below 1-20 µg/L;
- Current analytical methods and detection limits will still be adequate for ensuring compliance.

NPDES permit effluent limits for naphthalene for direct discharges to surface waters were set at 50 µg/L (Table III-16). Lowering the Class 2A chronic standard to 65 µg/L would not affect the effluent limit as it is already more stringent. Review by EPA of treatment technology for naphthalene found 20 µg/L to be an achievable limit; the Agency is proposing to use this value as the effluent limit for naphthalene in most NPDES/SDS permits (Exhibit HH-11).

[73] MPCA. 2005. Personal Communication R. Fisher, Water Quality QA/QC Coordinator, Environmental Analysis and Outcomes.
[74] U. S. EPA and USGS. 2005. National Environmental Methods Index: Benzene (71-43-2). National Water Quality Monitoring Council and Methods and Data Comparability Board at www.nemi.gov, Accessed 2005.
[75] MDH. 2004. Environmental Laboratory Handbook FY 2004. MDH, Public Health Laboratory Division.

Table III-16. Comparison of Proposed Naphthalene Standards and Current NPDES Effluent Limits.

Water Quality Standards	Proposed Values 7050 (Basis)	Current NPDES Effluent Limits (Basis)	**Proposed NPDES Effluent Limits- Contaminated Groundwater (Basis)**
Class 2A	65 µg/L (HH)	50 µg/L	**20 µg/L (TBEL)**
Class 2Bd and 2B/C/D	**81 µg/L (Tox)**	**50 µg/L**	**20 µg/L (TBEL)**

The monitoring results from NPDES/SDS permitted facilities have shown that common technology used to remove naphthalene and other PAHs and VOCs, air stripping and carbon adsorption, is very effective (Exhibit HH-11). Based on chemical characteristics related to volatilization and adsorption to carbon (Henry's Law constant), naphthalene is expected to be removed to low concentrations (at or below laboratory reporting levels) by standard treatment technologies. With only a few exceptions, naphthalene concentrations are found below 1 µg/L in DMRs covering 2001 through 2005.

The EPA lists several approved methods for analysis of naphthalene in 40 CFR 136[71]; naphthalene can be analyzed by methods for semivolatiles (EPA Method 625 and 1625 B, Standard Method 6410 B [18th, 19th, 20th] and for PAHs (EPA Method 610; Standard Method 6440). MDH also has comparable methods available covering the range of analyses (402, 498, 473, and PAH scans).[75] Except for the MDH selective PAH scan with a detection limit of 50 µg/L, all other methods have detection limits ranging from 1 to 10 µg/L.[74,75] As such, the proposed change in the naphthalene standard should have no impact on analysis of this pollutant.

Some facilities with NPDES/SDS limits and requirements monitor discharges for naphthalene. Review of DMRs demonstrates that most have analytical methods that achieve reporting limits of <1 µg/L and all have reporting limits less than 50 µg/L. Facilities already have in place analytical methods and labs that can comply with a lower chronic standard for naphthalene.

F. CONCLUSIONS [VI. benzene and naphthalene]

The proposed changes to benzene and naphthalene human health-based chronic standards are needed to meet the current risk assessments associated with these chemicals. The proposed standards reflect the most recent expert analysis of human health effects from EPA and MDH, and are reasonable. Updating numeric standards meets the requirements of the Clean Water Act.

The technology-based treatment requirements for benzene and naphthalene that have been included in NPDES/SDS for many years can meet the proposed standards. Current analytical methods are adequate to measure concentrations at the levels of the proposed chronic standards. There will be only minimal, if any, economic impact from the adoption of the proposed standards.

VII. ADOPTION OF *E. COLI* STANDARD

A. INTRODUCTION [VII. *E. coli*]

1. <u>Background and Recreational Uses</u> [VII.A. introduction, *E. coli*]

Bacteriological water quality standards are the only standards designed specifically to protect people from getting sick while swimming. It is the role of the bacteriological standard to protect the recreation part of the Class 2 aquatic life and **recreation** beneficial use, and to meet the swimmable part of the Clean Water Act goal of achieving "fishable/**swimmable**" waters where attainable (CWA, § 101(a)(2)). Just as the term "fishable" is a surrogate for protection of the entire aquatic community, not just fish, the term "swimmable" is a surrogate term for any form of swimming-like recreation (see below).

The Agency's current Class 2 bacteriological standard, fecal coliform bacteria, is shown in Table III-17, along with the proposed *Escherichia coli* (*E. coli*)[76] standard. The proposed *E. coli* standard will replace the current fecal coliform standard. Exhibit EC-3 provides background information on the Agency's fecal coliform standard, pathogenic organisms and fecal bacteriological issues in general.

Water contaminated with bacteria from human or animal fecal material can cause illness in humans if ingested. Illnesses in humans are generally limited to gastroenteritis (nausea, vomiting, fever, headache and diarrhea[77]), but more serious illness and even death are a possibility.[78] The risk to people depends on the type of recreational activity. For purposes of bacteriological standards, recreation in or on the water is divided into two types:

1. <u>Primary body contact</u> – any type of water recreation during which the accidental ingestion of a small amount of water is **likely**. This is often referred to as "incidental" ingestion. Examples include swimming, snorkeling, SCUBA, water skiing, kayaking, tubing and wading by young children.
2. <u>Secondary body contact</u> – any type of water recreation during which the accidental ingestion of a small amount of water is **unlikely**. Examples include boating, canoeing, fishing and wading by older children and adults.

Wading is usually considered a secondary body contact activity; i.e., there is little chance of someone inadvertently ingesting small quantities of water while wading. The Agency does not disagree with this in general, except that we believe wading by children can and should be considered primary body contact. Children may spend hours wading and playing in shallow water doing the things kids do, digging in the sand or mud, splashing water, hunting for frogs or crayfish, etc. There is ample opportunity for these children to fall in, splash water on their faces

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[76] *Escherichia coli* or *E. coli* is written in italics because it is the scientific name of a species of bacteria.

[77] Gastroenteritis caused by drinking contaminated water is often called "acute gastroenteritis" because onset is within hours or days of exposure. However, the geometric mean standard is analogous to other "chronic" standards; it is meant to protect swimmers exposed over both the short and long-term.

[78] Some well known waterborne diseases caused by fecal bacteria include cholera and typhoid fever.

or put their hands in their mouth. The Agency believes this activity should be considered primary body contact, and it could occur in almost any type of waterbody.

It is worth noting that the Agency has quantified incidental ingestion as 10 milliliters of water ingested per day (0.01 liter/day). This value was adopted in 1990 for the purpose of calculating human health-based water quality standards for waters protected for recreation but not for drinking[79]. This is the amount of water, about one mouthful, the Agency assumes people ingest each day while swimming or doing other types of primary body contact recreation. This value, 0.01 liter/day, however, does not enter into the calculation of the existing fecal coliform standard or the proposed *E. coli* standard.

In Minnesota the vast majority of surface waters (all Class 2 waters) rivers, streams, lakes, ponds and wetlands are protected for swimming, "***for which the waters are usable***" (emphasis added). Thus, all class 2 waters are protected for at least the potential, if not actual swimming use. All Class 2 waters have essentially the same bacteriological standard now and will have if the proposed *E. coli* standard is adopted (the current 10 percent maximum standard for trout waters and warm waters is different, see Section VII.E.3).

Limited resource value waters (Class 7) are protected for secondary body contact. All of the approximately 240 Class 7 waters have been individually assessed and their classification changed though rulemaking. Most are channelized, low-flow ditches that often stop flowing in a dry year (see Section XI).

Because Minnesota's assignment of primary body contact use is nearly universal (Class 7 waters are the exception), the "where usable" phrase, emphasized above, is very important. The phrase is repeated for each subclass of Class 2 waters.[80] It gives the Agency the necessary flexibility to assess a given waterbody on a site-specific basis to determine whether swimming or any Class 2 use, is useable or attainable in that waterbody. The Agency is well aware that many Class 2 surface waters may not provide suitable opportunities for swimming for a variety of reasons (e.g., inaccessible, unsafe, too swift, too shallow, too muddy, too weedy, too much boat traffic, etc.). Some waterbodies may be suitable for swimming only part of the summer season. Given the huge number of lakes and wetlands and the thousands of miles of rivers and streams, and seasonal variability, the Agency cannot possibly know ahead of time whether a given waterbody might be used for primary body contact. A waterbody may appear to be unsuitable for swimming to most observers but still provide primary body contact recreation opportunities for some. It is appropriate in Minnesota, which is so rich in water resources, that primary body contact use is assumed to be attainable and the use protected, until such time that a waterbody-specific analysis is carried out which demonstrates (with reasonable assurance) that the use is not attainable. In the Agency's many years experience implementing water quality standards, problems associated with the current classifications system seldom become an issue, and if they do, current water quality rules provide the flexibility to deal with the issues.

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[79] Minn. R. 7050.0218, subp. 6.
[80] Minn. R. 7050.0222, subp. 2, 3, 4 and 5.

Table III-17. Current Fecal Coliform and Proposed *E. coli* Standards (in Shaded Cells) Shown for Class 2 and Class 7 Waters.

Use	Water Classification and Type	Monthly geometric mean of not less than 5 samples, cfu/100 ml		10 % of values not to exceed, cfu/100 ml	
		Fecal coliform	*E. coli*	Fecal coliform	*E. coli*
Primary Body Contact*	Class 2A Trout waters	200	126	400	1260
	Class 2B, 2C, 2D Warm waters	200	126	2000	1260
Secondary Body Contact**	Class 7 Limited resource value waters	1000	630	2000	1260

cfu = colony forming units
*Standard applicable from April 1 through October 31
**Standard applicable from May1 through October 31

2. <u>History of Bacteriological Ambient Standards in Minnesota</u> [VII.A. introduction, *E. coli*]

The bacteriological standard adopted in the first statewide water quality rule in 1967 was for total coliform bacteria (see Figure III-5). The standards were 1000 organisms per 100 ml for Class 2A and 2B waters and 5000 organisms per 100 ml for Class 2C waters. No conditions, such as monthly geometric mean, minimum number of samples, etc. were specified. In 1973, the standards were changed to fecal coliform bacteria, the narrative guidance was added, and the Class 2C standards were "upgraded" to be the same as the Class 2B waters, as shown below. They have remained largely unchanged since.

Fecal coliform organisms Class 2 A waters (primary body contact)	200 most probable number per 100 milliliters as a monthly geometric mean based on not less than 5 samples per month, nor exceed 400 most probable number per 100 milliliters in more than 10 % of all samples during any month.
Fecal coliform organisms Class 2 B and 2C waters (primary body contact)	200 most probable number per 100 milliliters as a monthly geometric mean based on not less than 5 samples per month, nor equal or exceed 2000 most probable number per 100 milliliters in more than 10 % of all samples during any month.

The 1973 standards were applicable year-round, as was the fecal coliform effluent limit, even though there is very little swimming in Minnesota in the winter months. In 1980 the Agency proposed to make the fecal coliform standard applicable only during the warm months, and seasonally applicable standards were adopted in 1981. Class 2 standards were applicable from March 1 through October 31 and Class 7 standards were applicable from May 1 through October 31. The fecal coliform effluent limits were changed to seasonal limits as well, to match the ambient standards. In 2000, the season for Class 2 waters was shortened by one month, from April 1 though October 31. Again, the effluent limit was changed to match. Since 1973 the narrative portion of the standard has been altered from time to time to reflect improved analytical methods, and to clarify sampling procedures. The Agency also promulgated Class 7 (limited resource value) waters in the 1980 rulemaking.

The proposed change from a fecal coliform to *E. coli* affects the ambient standard only, i.e., the standard applicable to surface waters. The existing fecal coliform effluent limit is not proposed for change (Section VII.G).

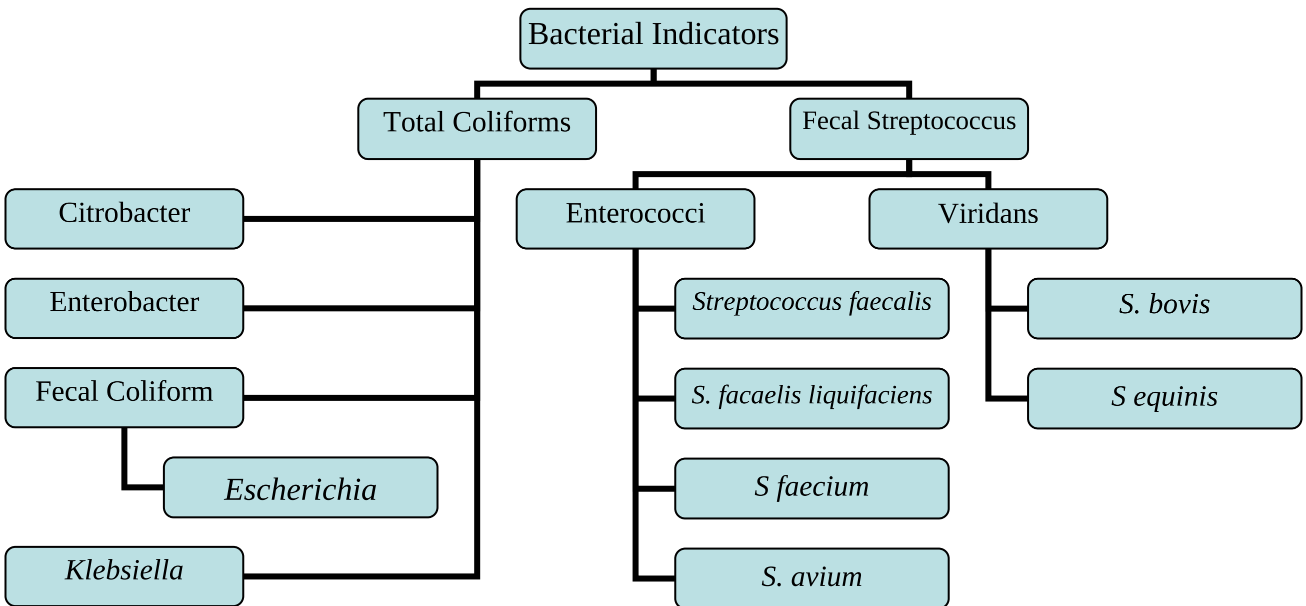
3. <u>Indicator Organisms</u> [VII.A. introduction, *E. coli*]

Neither the existing fecal coliform nor the proposed *E. coli* standards measure waterborne pathogens directly. Both are **indicators** of the potential presence of waterborne pathogens. It would be impractical and very expensive to try to measure the many potential human pathogens individually in surface waters. Since the early 1900s the monitoring of fecal contamination in water has relied on the measurement of indicator organisms. The preferred indicator organism has changed over the years (e.g., Exhibit EC-4).

Almost all the bacteria in human feces, over 96 percent, are in the fecal coliform group (Figure III-5). And about 95 percent of the fecal coliforms are *E. coli*. *Escherichia coli* is the dominant species of bacteria in the feces of all warm-blooded animals. Given these numbers, the very strong relationship between levels of fecal coliform and *E. coli* discussed in Section VII.D.5 is not surprising.

Most fecal bacteria are not pathogenic, and are a natural and important component of fecal material. Indeed, the presence of bacteria in the guts of warm-blooded animals is important for survival. Figure III-5 shows the relationships between various bacterial groups, indicators and some pathogens.

Figure III-5. Fecal Bacteria Indicators, Relationships of Indicator Groups and Species.



Notes:
Klebsiella occurs in the human gut, some species are pathogens, but *Klebsiella* also may come from non-human sources such as paper mill wastewater.
Streptococcus facaelis liquifaciens is associated with soil, plants and insects
S. bovis and *S. equines* are associated with non-human animals, and are short lived in water
S. avium is from the feces of fowl.

Not all waterborne pathogenic organisms are bacteria. Viruses and parasitic protozoans can cause gastroenteritis and other illness, and the measurement of fecal bacteria does not include these organisms (Exhibits EC-3 and EC-4). Common examples are:

- Viruses: Enteric viruses including hepatitis A, Norwalk-type, rotaviruses and reoviruses; and
- Protozoans: *Giardia limblia, Cryptosporidium parvum.*[81]

No single indicator organism or standard can predict the risk of gastroenteritis consistently in all environments at all times, for the reasons summarized here:

- Wide array of pathogens associated with gastroenteritis;
- Not all pathogens are measured by the test for the indicator group or organism;

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[81] In the spring of 1993 Milwaukee's municipal drinking water supply was contaminated with *Cryptosporidium*. An estimated 400,000 people became ill. At the time Milwaukee was in compliance with all state and federal drinking water standards. USDA Water Quality Program Water Treatment Notes. Fact sheet no. 15, 1996, updated in 2004.

- Variation in survival rates of pathogens/indicators in the water environment;
- Natural variability in pathogen/indicator relationships; and
- Analytical variability.

In spite of these drawbacks the very large body of literature in this area supports the use of indicators to predict risk, and there is ample support for the *E. coli* levels proposed by the EPA as standards (e.g. Exhibits EC-4 and EC-5). The use of an indicator standard to define a safe or acceptable level of fecal contamination is well supported by science, as well as decades of practice.

4. <u>Analytical Methods</u> [VII.A. introduction, *E. coli*]

A detailed discussion of analytical methods for measuring *E. coli* and fecal bacteria in water is outside the scope of this SONAR. Many of the Agency's bacterial samples are analyzed by the Minnesota Department of Health (MDH) Environmental Laboratory using a membrane filter method (Exhibit EC-6a). In the side-by-side paired analyses of fecal coliform and *E. coli* samples, the membrane filter method was used for both indicators.

The switch to *E. coli* as the preferred indicator has prompted EPA to review and approve several new, simpler and less costly analytical methods for measuring *E. coli*. In July 2003 EPA approved five new methods and EPA is reviewing additional methods at this time (Exhibits EC-6b and EC-6c). A major advantage of at least some of the newer *E. coli* methods is that the cost per analysis is far less than the cost of a membrane filter analysis.[82] Also, the new methods can perform as well as the more expensive membrane filter method.

MDH does not analyze all of the Agency's bacteriological samples. Because of the short "holding time" of six hours for bacteriological samples, the Agency has contracted with eight private labs around the state for bacteriological sample analyses (holding time is the maximum recommended time between taking the sample and the analysis to assure an accurate measurement, as established by EPA and *Standard Methods*). The shorter travel time to the closest contract lab means samples can arrive at the lab for analysis within the six-hour time requirement. The per analysis costs charged by these labs are generally in the $12.00 to $15.00 range, depending on the method and whether it is for fecal coliform or *E. coli* (Exhibit EC-24).

The analysis of bacteriological samples normally takes a minimum of 24 hours. Entities that monitor beaches have faced for years the problem of waiting for sample results to make critical decisions about posting warnings or closing beaches for swimming. These entities are forced to post warnings or close beaches based on yesterday's bacterial levels. Methods that can return results in as little as two hours are being investigated (Exhibit EC-7).

[82] Beginning with the 2006 summer season, bacteria samples collected as part of the Agency's Milestone (routine) monitoring program are being analyzed for *E. coli* using the Quanti-Tray method ($10.00 per sample) rather than the membrane filter method ($41.00 per sample).

5. <u>Agency Goals in Changing from Fecal Coliform to *E. coli*</u> [VII.A. introduction, *E. coli*]

The Agency is proposing to adopt *E. coli* standards that are consistent with the EPA criterion (Exhibit EC-1) and are approvable by EPA. The Agency's goal is to replace the current fecal coliform standard with an *E. coli* standard with as little disruption as possible to ongoing programs, while making minor improvements to the narrative part of the standard. Specifically it is the Agency's intent to:

1. Keep the protection level for swimmers the same as it is now;
2. Not significantly increase or decrease the number of waters considered impaired for swimming in the future;
3. Not have to change the current assessment methods for determination of bacteriological impairment;
4. Minimize the impact on ongoing bacteriological total maximum daily load (TMDL) studies;
5. Make the transition from a fecal coliform to an *E. coli* data base as smooth as possible with minimum additional cost;
6. Not impact the Minnesota Beach program on Lake Superior beaches; and
7. Not impact the monitoring and assessment of beaches by local entities responsible for beach safety.

The Agency strongly believes that the proposed *E. coli* standard is consistent with these goals, and that it will be at least as protective of recreational uses as the current standard. These goals will be discussed further in the *reasonableness* sections.

6. <u>How Bacteriological Standards are Used</u> [VII.A. introduction, *E. coli*]

By and large, bacteriological standards are used in two rather distinctly different ways.

1. The monitoring of water at organized public beaches to warn swimmers of unsafe conditions, or to close beaches to swimming, if necessary, to protect the health of swimmers.

2. Assess surface waters for possible exceedance of the standards through a review of bacteriological data over a 10-year period. A variation of this use would be the more intensive monitoring of bacteria associated with special studies, or as part of a TMDL study, to identify sources, allocate loadings, and assess the effectiveness of remedial measures. The standard is also used to make de-listing decisions (removal from the 303(d) list) following the remedial steps.

The first use listed above is not normally the role of the Agency. Except for the Beach monitoring program on Lake Superior, discussed in Section VII.F.1, the Agency does not monitor public beaches. Organized beaches are typically monitored for fecal bacteria by the local entity that is responsible for maintaining and staffing the beach.[83] For example, city or county governments or park and recreation boards have this responsibility for the beaches on metro area lakes. These entities regularly sample the water at their beaches, assess the results, and post warnings or close beaches as necessary. They also try to educate beach-goers on ways to minimize risks. Representatives of the metro area entities meet periodically to discuss issues of mutual interest, such as the number and frequency of samples needed to make decisions, appropriate standards or thresholds to use to trigger warnings, choice of analytical methods, and consistency in approaches (Exhibit EC-19). All seven of the metro area jurisdictions that monitor Twin Cities area beaches and belong to a "Beach Monitoring Committee" have made the change to *E. coli* (Exhibit EC-19). Agency staff has attended some of the Beach Monitoring Committee meetings to explain its plans to replace the fecal coliform standard with *E. coli*.

Most of the Agency's long-term bacteriological data is a result of monitoring at a network of 80 stations throughout the state, called Milestone stations.[84] Milestone stations are sampled once per month (except for two months in the winter) two out of every five years. Essentially all Milestone stations are on rivers and not associated with designated beaches. As noted, the Agency's fecal coliform data are used mostly to assess the overall quality of the state's rivers, to assess waters for potential impairment, and to look for trends over time. The Agency has developed protocols in guidance (Exhibit A-7) to make the best use of data from the Milestone monitoring program, which collects samples only once each month. The Milestone program cannot meet the specified minimum of five samples per month (Table III-17), and the protocol describes an assessment approach that matches as well as possible the requirements of the standards with the constraints of the Milestone program. In the last eight to ten years the Agency has done more special localized studies on fecal bacterial levels, some associated with TMDLs. These localized studies include more frequent monitoring at more locations (Exhibits EC-8 and EC-9). The Agency's lake sampling program focuses on nutrients and trophic conditions, and fecal bacteria are normally not measured in lakes.

B. NEED TO ADOPT *E. COLI* STANDARD [VII. *E. coli*]

1. <u>Introduction</u> [VII.B. need, *E. coli*]

The EPA issued the current bacteriological criteria document in 1986 (Exhibit EC-1). States were slow to adopt the recommended new criteria. As of June 2003, 17 states had adopted an *E. coli* standard for freshwaters, an additional three adopted an enterococci standard; three of the 20 states had adopted both *E. coli* and enterococci standards[85]. In a little more recent survey of states by New York (May 2004), to which 30 states responded, two more states indicated they had adopted a new standard based on the EPA criteria. It is significant, however, that of the 17 states responding "no" to having adopted a new standard in the New York survey, all but two

[83] An organized beach is a beach area with a lifeguard, parking areas and probably toilet and changing facilities.
[84] The number of Milestone stations has varied slightly over the years; see this Web page for information on the Milestone monitoring program: http://www.pca.state.mn.us/water/milestone.html.
[85] EPA 2003. Bacterial water quality standards for recreational waters (freshwater and marine waters) status report. EPA-823-R-03-008. In a November 2003 draft of EPA's implementation guidance (Exhibit EC-2), EPA says 23 states have adopted either *E. coli* or enterococci standards.

indicated they were planning to do so, including Minnesota. It may be that the new epidemiological studies that support *E. coli* as a better indicator plus newer/cheaper analytical methods have helped overcome earlier reluctance on the part of states to adopt *E. coli*. At this time, three EPA Region 5 states, Indiana, Michigan and Ohio have adopted an *E. coli* standard; and three have not, Illinois, Wisconsin and Minnesota.

It is a fact that the Agency has delayed adopting an *E. coli* standard for many years. Agency staff had concerns about the adequacy of the data supporting the 1986 EPA criteria, and questioned how much of an improvement *E. coli* would be over fecal coliform as an indicator standard. In spite of EPA's claim in the criteria document that *E. coli* is a superior indicator, the Agency felt that making the change was a low priority relative to other needs for the Agency rulemaking resources. What has changed and why the Agency is proposing to adopt *E. coli* now establishes the need for making the change.

The EPA has published a series of implementation guidance documents, mostly draft (Jan. 2000, May 2002, Nov. 2003, and March 2004) to assist states with many of the questions and issues surrounding bacteriological standards, including identifying risk levels, selecting an appropriate criterion, how to implement the standard, and how to deal with the transition from the old to the new standard. The Agency commented on the May 2002 draft implementation guidance in a letter dated August 6, 2002 (Exhibit EC-20). The March 2004 guidance is included as Exhibit EC-2 because it provides useful insight into EPA's recommendations and reasoning; however, EPA's final position and guidance on numerous questions is contained in the response to comments and discussions in the final promulgation of standards for states covered under the BEACH act (69 FR 67218, Exhibit EC-17; see Section VII.F.1).

2. <u>Additional Support for *E. coli* as an Indicator of Potential Illness</u> [VII.B. need, *E. coli*]

Since EPA published the *E. coli* and enterococci criteria in 1986 new studies have supported *E. coli* as a better indicator of potential gastroenteritis than fecal coliform. EPA re-evaluated the epidemiological studies on which the 1986 criteria are based and concluded that there was no basis to recommend a change in the criteria (Exhibit EC-2 and EC-17, page 67235). EPA also reviewed the epidemiological studies conducted since 1984 (most conducted at marine beaches) and concluded that, taken together, they did not support a change to the 1986 criteria (Exhibit EC-2, page 76). Others have reviewed data they have collected, as well as the available epidemiological studies, and come to the same conclusion; i.e., EPA's recommended *E. coli* and enterococci criteria are superior to other indicators (e.g., Exhibits EC-5 and EC-10). As noted, all the jurisdictions that monitor Twin Cities area beaches have changed to *E. coli* (Exhibit EC-19).

3. <u>EPA Criteria and EPA Guidance to Adopt</u> [VII. need, *E. coli*]

The EPA criteria document recommends an *E. coli* or enterococci indicator for fresh waters and an enterococci indicator for marine waters. EPA has been urging states to update their bacteriological standards since the new criteria appeared in 1986. As time has gone by, EPA has been applying increasing pressure on states that have not adopted the new criteria to do so (e.g., Exhibit EC-2 and EC-17, page 67228). Several years ago, the Agency agreed to adopt an *E. coli* standard, and committed to this in the inter-agency program plan agreements with EPA (Environmental Project Performance Agreement).

4. Promulgation of Criteria Under BEACH Act [VII.B. need, *E. coli*]

On November 16, 2004, under the BEACH act, EPA promulgated the 1986 *E. coli* and enterococci criteria as standards for Minnesota and 20 other states that failed to adopt the criteria on their own by the April 10, 2004, deadline. The BEACH act only pertains to coastal and Great Lakes states and only to waters at coastal (marine) and Great Lakes beaches. While EPA has already promulgated the criteria for the Lake Superior beaches in Minnesota, EPA still encourages states to adopt their own standard based on local information, which is what the Agency is proposing to do. EPA's action enhances the need for Minnesota to complete the change from fecal coliform to *E. coli*. It is preferable to have standards for one indicator rather than two. The Minnesota Beach monitoring program from its inception in 2003 has measured both *E. coli* and fecal coliform (see Section VII.F.1).

5. Increased Interest in Bacterial Contaminants [VII.B. need, *E. coli*]

There appears to be an increased interest in assessing bacterial contaminants in surface waters among governments at various levels and by other responsible parties. Associated with this new emphasis on monitoring is a desire to use the best indicator(s) available with which to assess results. The recent monitoring done by the Minnehaha Creek Watershed District is an example (Exhibit EC-11). Also, the listing of waters as impaired due to fecal bacteria seems to have elevated, not only interest in waterborne fecal bacteria, but increased the level of scrutiny on bacteriological standards as well. There is a legitimate need to use the best tools available to assess surface waters, and to have the best thresholds (standards) available for the subsequent TMDL studies. More intensive monitoring is usually the first step in the TMDL study. This monitoring will lay the foundation for ultimate de-listing of the waterbody when compliance with the standards is achieved. The time is right to make the change to a better indicator standard.

C. REASONABLENESS OF PROPOSED *E. COLI* STANDARDS, REQUIRED INFORMATION [VII. *E. coli*]

1. Introduction [VII.C. reasonableness, *E. coli*]

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed *E. coli* standard.

2. Classes of Persons Affected by the Proposed Rule Amendments, Including those Classes that Will Bear the Costs and Those that Will Benefit [VII.C. reasonableness, *E. coli*]

Minnesotans and visitors to Minnesota that engage in any form of water-orientated recreation could be affected by the proposed change from a fecal coliform to *E. coli* standard. More specifically, individuals that swim (including all forms of full body contact) such that inadvertent ingestion is possible, may be affected. But it is very unlikely that many will notice the change. Also, the Agency believes the overall affect on these individuals will be negligible because the *E. coli* standard that is replacing the fecal coliform standard should provide essentially the same level of protection to the swimming public. There could be a modest benefit to the swimming public due to the change because evidence suggests that *E. coli* is a better indicator of potential gastroenteritis than fecal coliform, and some of the new analytical methods for *E. coli* are less expensive. These benefits will be largely invisible to the general public.

The local units of government that manage and monitor the bacterial quality at local swimming beaches will be affected by the change in standards. However, direct impacts are difficult to define, due in part to the fact that some of these entities (those in the Twin Cities metro area) have already started monitoring for *E. coli*. The Agency would encourage any that have not switched, to do so when the new standard is adopted (assuming it is). Possible costs might be associated with becoming familiar with the new standards, deciding on thresholds for the posting of warnings/closings, and meeting with other local entities to discuss the changes. They may wish to make some adjustments to their beach monitoring programs as a result of the change, but the change in standards itself does not require any changes to their monitoring and beach posting protocols. Analytical cost should be about the same for fecal coliform or *E. coli*, but cost savings with *E. coli* are a possibility. Substantial costs will be incurred if parties decide to monitor for both fecal coliform and *E. coli* during the transition period.

A sector of outside parties that probably will experience some added costs are the certified analytical laboratories that do bacteriological analyses for clients. Typically these labs have some "start-up" costs when they develop and offer new analytical services. They may need to purchase new equipment and supplies, train or possibly hire staff, research approved methods and perform trial runs, apply for certification for the new methods, and prepare new promotional and marketing materials. The Agency is not aware of the typical range for such costs, but many affected labs have already gone through this process because many programs and jurisdictions are already requesting *E. coli* analyses.

The following local groups have indicated an interest or may be interested in the change to *E. coli*; this list is not intended to be complete.

- County health departments
- City health departments
- Park and recreational boards or departments
- Watershed districts and lake associations
- Minnesota Department of Health
- Environmental and citizen groups
- Private analytical laboratories
- Municipal wastewater treatment plant operators
- Other state and federal agencies

The Agency's Beach program on Lake Superior currently monitors for both fecal coliform and *E. coli*, but they plan to discontinue fecal coliform after the standard changes (Section VII.F.1).

In summary, the change from a fecal coliform to an *E. coli* standard could result in modest increased costs to entities that monitor beaches due to transition planning, and to analytical laboratories that incur start-up costs. Otherwise, there should be no other added costs for local units of government or any other entity due to this change.

3. <u>Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues</u> [VII.C. reasonableness, *E. coli*]

The Agency has already incurred increased costs as a result of the potential change to *E. coli*, and is likely to incur additional costs in the future. Future costs are difficult if not impossible to estimate because amounts depend on monitoring decisions that have not been made yet. Potential costs to the Agency due to the change in standards are discussed in Section VII.J. The change will not impact overall Agency budgets, staff needs or state revenues. The change to *E. coli* will not mean any added costs to other state agencies.

4. <u>Determination of Whether there Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose</u> [VII.C. reasonableness, *E. coli*]

There are no options open to the Agency that conceivably could be less costly and less intrusive than what the Agency is proposing, and would still satisfy EPA's criteria and guidance. The Agency's clearly stated goal is to make the change to *E. coli* with the least impact to ongoing bacteriological activities as possible (Section VII.A.5). Duplicate monitoring was needed to support the proposed standard, and additional duplicate monitoring is likely as part of the transition from one indicator to the other. The Agency believes it has proposed an *E. coli* standard that achieves the goals and meets EPA requirements for an *E. coli* standard that is "as-protective-as" the EPA criterion. The Agency is promoting using the minimum amount of added monitoring needed during the transition period.

5. <u>Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments</u> [VII.C. reasonableness, *E. coli*]

The most logical alternative to replacing the existing fecal coliform standard with *E. coli* is to retain the former and do nothing. In fact, until a few years ago, this alternative was the Agency's position since the *E. coli* criterion was published in 1986. The Agency believes that this alternative is no longer a realistic option, and the Agency has not considered any other options. The reason the Agency has decided to make the change now is outlined in the *Need* section. In summary, the reasons are:

- Evidence suggests that *E. coli* is a better indicator of gastroenteritis that fecal coliform;
- EPA has made the adoption of either *E. coli* or enterococci criteria by states a high priority;

- EPA has already promulgated an *E. coli* standard for Minnesota applicable to Lake Superior beaches under the BEACH act; and
- A range of analytical methods are available for *E. coli*, some of which are less expensive than methods for fecal coliform.

The Agency prefers to adopt an *E. coli* standard of its own development based on an analysis of Minnesota data; and to adopt a standard that is consistent with our transition goals, rather than risk having EPA promulgate a criterion for us.

6. <u>Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties</u> [VII.C. reasonableness, *E. coli*]

The possible costs to outside parties are largely due to the need to plan for and execute the transition to the new *E. coli* standard (Section VII.C.2). There are no added costs to outside parties resulting from future compliance with the new standard because compliance will be achieved as it has under the existing fecal coliform standard.

7. <u>Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties</u> [VII.C. reasonableness, *E. coli*]

It is unlikely that there will be direct costs to outside parties if the *E. coli* standards are not adopted. Many entities that monitor swimming beaches and the Agency's own Beach program on Lake Superior are already using *E. coli*. These programs are not likely to change back to monitoring for fecal coliform. Not changing the fecal coliform standard would render much of the paired fecal coliform/*E. coli* monitoring and other transition planning unnecessary, but these costs have already been incurred.

It is conceivable that there might be some cost **savings** if the standard was not adopted. For example, it would simplify the analysis of the Agency's long-term fecal coliform data base for water quality assessments and trend analysis. No transition would be required from fecal coliform to *E. coli*. Also, laboratories are already set up and experienced in doing the fecal coliform tests and they would not need to develop methods for *E. coli* (but it appears that many have already assumed these start-up costs).

8. <u>Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference</u> [VII.C. reasonableness, *E. coli*]

The proposed *E. coli* standards are consistent with federal regulations and guidance.

9. <u>Consideration and Implementation of the Legislative Policy Under Minn. Stat. §§ 14.002 and 14.131</u> [VII.C. reasonableness, *E. coli*]

Minnesota Stats. §§ 14.002 and 14.131 require state agencies, whenever feasible, to develop rules and that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

The proposed numeric *E. coli* standards are "prescriptive" as are all numeric standards, and there is little that can be done to make a numeric standard less prescriptive. Flexibility enters into the process when standards are implemented, which is true for all numeric standards.

The general concepts of how prescriptive or flexible a water quality rule should be are discussed more in SONAR Book I, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [VII.C. reasonableness, *E. coli*]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

These specific notification requirements are discussed in Section IV.C.10 and will not be repeated here. The Agency outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I.

11. Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local Governments [VII.C. reasonableness, *E. coli*]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

12. Agency Determination Regarding Whether Cost of Complying with Proposed Rule in the First Year after the Rule Takes Effects will Exceed $25,000 [VII.C. reasonableness, *E. coli*]

The cost of complying with the proposed *E. coli* standards in the first year after they take effect will not exceed $25,000 for: (1) any one business that has less than 50 full-time employees; or (2) any one statutory or home rule charter city that has less than ten full-time employees. The Agency believes that business small or large will not be impacted by this change. Small cities might be impacted if their responsibilities include managing and monitoring a public beach; however the transition to *E. coli* will not cost more than $25,000 in the first year.

D. REASONABLENESS, EPA BACTERIOLOGICAL CRITERIA AND DATA ANALYSIS [VII. *E. coli*]

1. Introduction and Assumed Risk [VII.D. reasonableness, *E. coli*]

As stated under *Need* the Agency's goal in making the change from fecal coliform to *E. coli* is to make the change with as little disruption to current practices and ongoing programs as possible, including retaining the current level of protection to swimmers assumed by the fecal coliform standard.

In proposing the *E. coli* criteria EPA recommended a 99.2 percent level of protection to exposed individuals. This translates to an accepted risk level of eight illnesses per 1000 swimmers (0.8 %). This is based on the risk level EPA attributed to the preceding fecal coliform criterion of 200 cfu/100 ml;[86] and EPA selected an *E. coli* level (126 cfu/100 ml) that provided the same level of protection (Exhibit EC-1). Similarly, the Agency assumes the current fecal coliform standard provides a 99.2 percent level of protection, and intends to retain that level of protection in the adoption of the Class 2 *E. coli* standards.

The Agency knows from its own experience and data analysis, and EPA readily acknowledges, that the true risk to swimmers can only be estimated at best (Exhibit EC-2. page 19). This reality does not negate the fundamental premise underlying any bacteriological indicator standard, which is: as the number of indicator organisms increases the chance of exposed individuals becoming ill also increases. This premise has been widely accepted for decades. However, the increase in risk as bacterial counts increase is not linear. If indicator counts get above a certain level (levels equated with a risk greater than 2 percent), the risk of getting sick increases sharply (Exhibit EC-2, page 9). The proposal to retain the assumed risk at 0.8 percent is reasonable.

2. <u>EPA *E. coli* Criteria</u> [VII.D. reasonableness, *E. coli*]

The 1986 EPA bacteriological criteria document (Exhibit EC-1) includes criteria for *E. coli* and enterococci. EPA says states can use either indicator for fresh waters, but recommended only enterococci for marine waters. Most states have selected *E. coli* over enterococci as the standard for fresh waters and Minnesota is doing the same. The Agency sampled fecal coliform, *E. coli* and enterococci together in the mid 1980s. These data suggested that the EPA enterococci criterion of 33 cfu/100 ml would be considerably more stringent than the current fecal coliform standard. As a result, the Agency abandoned any further investigation of enterococci and focused on *E. coli*.

The EPA *E. coli* criteria are shown in Table III-18. As mentioned, the calendar month geometric mean of 126 cfu/100 ml is based on a risk level of eight cases of gastroenteritis per 1000 exposures (swimmers). The geometric mean standard is calculated as follows (Exhibit EC-1).

E. coli (geometric mean) = Antilog_{10} (illness rate/1000 + 11.74)/9.40
E. coli (geometric mean) = Antilog_{10} (8 + 11.74)/9.40
E. coli (geometric mean) = Antilog_{10} 2.1 = 126 cfu

The 0.8 percent risk level is incorporated into the 10 percent maximum standard (10 % MS) by including the 126 cfu/100 ml geometric mean value in the calculation, as follows:

[86] cfu = colony-forming units.

10 % MS = Antilog$_{10}$ ((Log$_{10}$ 126) + (Conf. Level Factor) * (Log Standard Deviation))
10 % MS = Antilog$_{10}$ ((2.1) + (1.25) * (0.8)) = 3.10
10 % MS = Antilog$_{10}$ (3.10) = 1259 cfu/100 ml (rounded to 1260 cfu.100 ml)

Where: Confidence level factor determined by area under normal probability curve (the one-sided z value)
Log standard deviation is the standard deviation of the log transferred 2000-2002 Milestone *E. coli* data (see Section VII.D.5)

The EPA allows states to exercise risk management discretion in the selection of an *E. coli* standard, as long as it meets EPA's "as-protective-as" requirements (EC-17). The areas of flexibility suggested by the EPA criteria are listed below. The full range of options is shown in Table III-18. How the flexibility enters into determining Minnesota's proposed 10 percent MS is detailed in Section VII.E.2.

<u>Geometric Mean Standard</u>

1. States are allowed to select their own risk level, as expressed in the gastroenteritis illness rate per 1000 exposures. EPA recommends a risk level in the range of 8 to 10 illnesses per 1000 swimmers for fresh waters. The Agency is proposing 8 illnesses/1000.

<u>10 Percent Maximum Standard</u>

1. The standard can vary with a designated level of use, as shown in Table III-18. Levels of use are assigned different confidence limits.
2. The standard can reflect the variability in local bacteriological data. EPA will accept a site-specific log standard deviation for *E. coli*. In the absence of site-specific data, EPA suggests a log standard deviation of 0.4.

Table III-18. EPA *E. coli* Geometric Mean Criteria at Three Illness Rates, and Ten Percent Maximum Criteria for Four Levels of Primary Body Contact Use (Exhibits EC-1 and EC-17)[87].

Parameter/Criteria	*E. coli* 30-Day Geometric Mean Criteria		
Illness Rate per 1000 Exposures	8	9	10
Geo. Mean cfu/100 ml	126	161	206

Parameter/Criteria	*E. coli* 10 % Maximum Criteria (8 illnesses/1000)			
Level of Primary Body Contact Use	Designated beach area	Moderate Use	Light Use	Infrequent Use
CL or percentile value, one-sided	75%	82%	90%	95%
Factor (z value)	0.675	0.935	1.28	1.65
10 % MS cfu/100 ml	235	298	409	575

CL = confidence limit

The Agency has used the flexibility described above in proposing a 10 percent maximum standard that is larger than the numbers in the EPA criterion shown in Table III-18. The reasons for departing from the EPA criteria numbers, and why the Agency believes strongly that the proposed 10 percent maximum standard being proposed is well supported and reasonable, are described in Section VI.E.2. The Agency's proposed calendar month geometric mean standard of 126 cfu/100 ml is the same as the EPA geometric mean criterion.

3. <u>Advantages of *E. coli* as an Indicator</u> [VII.D. reasonableness, *E. coli*]

The EPA makes a strong argument in Exhibit EC-1 that *E. coli* has a much stronger correlation with the risk of gastroenteritis than fecal coliform. In Exhibit EC-2 (Appendix B) EPA reaffirms the 1986 criteria through a reevaluation of the original epidemiological studies upon which the *E. coli* criteria are based, and several more recent epidemiological studies.

A major advantage of *E. coli* over fecal coliform is that the *E. coli* analysis does not measure a group of bacteria that can occur in high numbers but contribute little to illness risk. The fecal coliform analysis can include this group, called *Klebsiella* (see Figure III-5). It is preferable to have an indicator that does not include organisms like *Klebsiella* that can lead to an over estimation of risk. Most species of *Klebsiella* are commonly considered to be opportunistic and low risk pathogens that have not been associated with any disease outbreaks in swimmers. High levels of *Klebsiella* in surface waters have been associated with wastewater discharges from paper mills and wood product operations.

[87] The 10% MS values in the 1986 criteria document and in 69 FR 67221 (Exhibit EC-17) differ slightly, the Agency is using the latter.

The advantages of *E. coli* can be summarized as follows:

- *E. coli* is highly specific to warm-blooded animal fecal sources.
- *E. coli* does not enumerate *Klebsiella* species. Use of fecal coliform may overstate health risks, particularly in waters with a high wood waste component.
- Studies of swimmers in fresh water show *E. coli* to be an effective indicator of the risk of gastroenteritis.
- EPA strongly supports the use of *E. coli* as a freshwater indicator.
- *E. coli* is already being used by some entities that monitor beaches, and the trend among states is to adopt *E. coli* for fresh waters.
- *E. coli* can be correlated with the Agency's historical fecal coliform data base.
- Costs of laboratory analysis for *E. coli* are generally about the same, but range from substantially less to slightly more expensive than fecal coliform.

4. <u>Human Versus Animal Sources of Fecal Bacteria</u> [VII.D. reasonableness, *E. coli*]

Analyses for neither the current fecal coliform nor the proposed *E. coli* indicators distinguish human versus animal sources of fecal bacteria. We make the assumption that the risk to swimmers is the same regardless of the source of the bacteria. This is consistent with EPA's revised policy on this issue (Exhibits EC-2, page 28 and EC-20). Conventional opinion is that there is a greater chance of pathogens being present if the bacterial source is human rather than animal. Nonetheless, the concern about exposure to animal fecal bacteria is increasing, and several recent incidents described in Exhibit EC-2 lend credence to this concern (including the *Cryptosporidium* outbreak in Milwaukee that caused over 400,000 illnesses and about 100 deaths). It remains difficult, if not impossible, however, to quantify the risk to humans from animal fecal bacteria because the *E. coli* criterion is based on epidemiological studies where the contamination was dominated by human sources.

Aside from the uncertainties about risk and the need to be protective, there is little practical means of quickly identifying the source of fecal coliform or *E. coli* bacteria in a surface water sample. Methods are available or under development to identify the sources of fecal bacteria; not only to differentiate between animal and human, but through DNA typing, to narrow the source of the fecal material to dog, cow, horse, geese, etc. These methods are still somewhat experimental and expensive[88]. The Agency's assumption that all fecal bacteria provide the same level of risk is consistent with past Agency practice, EPA's revised policy, practical limitations and a protective approach; it is a prudent and reasonable policy.

5. <u>Analysis of Paired Fecal Coliform and *E. coli* Data</u> [VII.D. reasonableness, *E. coli*]

In order to understand the relationship between fecal coliform and *E. coli* levels in surface waters, the Agency initiated paired monitoring of fecal coliform and *E. coli*. Paired sampling is the collection of a sample for both fecal coliform and *E. coli* analysis at the same sampling

[88] For example Source Molecular Corp., http://www.sourcemolecular.com/index.html

station at the same time. The results are side-by-side or paired fecal coliform and *E. coli* levels, which allows the Agency to establish the relationships between the two indicators.

The first paired study focused on the rivers in the metro area (Exhibit EC-12), and was carried out in response to the publication of the epidemiological research by Dufour in 1984. Dufour's work (Exhibit EC-13) became the basis for the EPA freshwater criteria (Exhibit EC-1). Paired monitoring was expanded state-wide through the network of Milestone monitoring stations in the mid 1980s. State-wide paired monitoring was resumed in the early-2000s when the Agency decided to adopt an *E. coli* standard. The analysis described in this reasonableness section is based on the two state-wide paired studies (which have not been published in reports), supplemented by the site-specific Zumbro River study (Exhibit EC-8).

Thus, three sets of paired data, which together form a very robust data set, support the proposed *E. coli* standards.

1. Data collected in the mid 1980s from about 80 Milestone stations (rivers),
2. Data collected from 2000 – 2002 from about 89 Milestone stations, and
3. Data from the special study on the Zumbro River.

The analysis of these data focused on three questions concerning the relationship between fecal coliform and *E. coli* levels, as follows:

1. Define the relationship between fecal coliform and *E. coli* levels in rivers;
2. Determine the *E. coli* levels that are "equivalent" to current fecal coliform standards; and
3. Calculate the level of exceedances of potential *E. coli* standards, and compared these to exceedances of the current standards.

In addition, we were interested in the variability in *E. coli* levels measured in rivers statewide, because the 10 percent maximum standard selected by states can vary from the EPA criterion based on local variability. The results of these analyses form the basis for the proposed *E. coli* standards (Exhibit EC-14).

A brief description of the analysis and the results follow:

1. <u>Relationship</u>. Log *E. coli* plotted against log fecal coliform for the three data sets combined shows a strong direct relationship, as shown in Figure III-6.

2. <u>Equivalency</u>. *E. coli* levels "equivalent" to the current fecal coliform standards were determined by fitting a line through the center of the data (the "SD" line) that lies between the two regression lines (*E. coli* as a function of fecal coliform and fecal coliform as a function of *E. coli*). Because the data are not normally distributed "equivalent" values may be thought of as the *E. coli* value at the same percentile as 200 and 2000 fecal coliform. The results suggest the proposed *E. coli* standard may be slightly more stringent than the current standard (Table III-19).

3. Exceedance. The projected number of exceedances of proposed *E. coli* values compared to exceedances of the fecal coliform standard, based on the 2000-2002 data, are shown in Table III-20. This analysis also suggests that the proposed standard may be slightly more stringent than the current standard.

Figure III-6 shows the natural log *E. coli* plotted against natural log fecal coliform. The strong relationship between the two indicators is not unexpected since *E. coli* is a major component of fecal coliform bacteria. Results of paired monitoring carried out in Illinois, shown in Figure III-7, shows a similar strong relationship. Other investigators have reported finding similar positive relationships (e.g., Exhibits EC-10, EC-21 and EC-22). This lends confidence to the notion that the transition from one indicator to the other can be made easily and with minimal impact on ongoing programs. Lines representing 200 and 126 cfu/100 ml fecal coliform and *E. coli* on the log X and Y axes are drawn in Figure III-6 to show where they interest in the mass of data. The point of intersection is close, but not exactly in the middle of the mass of data points, which is consistent with the results of the "equivalency" and "exceedance" analyses.

Results of the "equivalency" analysis are shown in Table III-19. The "ideal" or perfect results of this analysis would be for the proposed *E. coli* standards (126 and 1260 cfu/100 ml) to be exactly equivalent to (match exactly) the current fecal coliform standards. For the most part, the equivalent *E. coli* values are larger than the proposed standards, except for the Zumbro River data, which is lower than the target value (*E. coli* value of 110 equivalent to 200 fecal coliform). In contrast, the *E. coli* value equivalent to 2000 fecal coliform from the same data is much higher (1960 cfu/100 ml), which may reflect the greater variability in the smaller data set (Table III-19).

Figure III-6. Log Fecal Coliform Plotted Against Log *E. coli* From the Three Paired Data Sets, Plus Percent Exceedances.

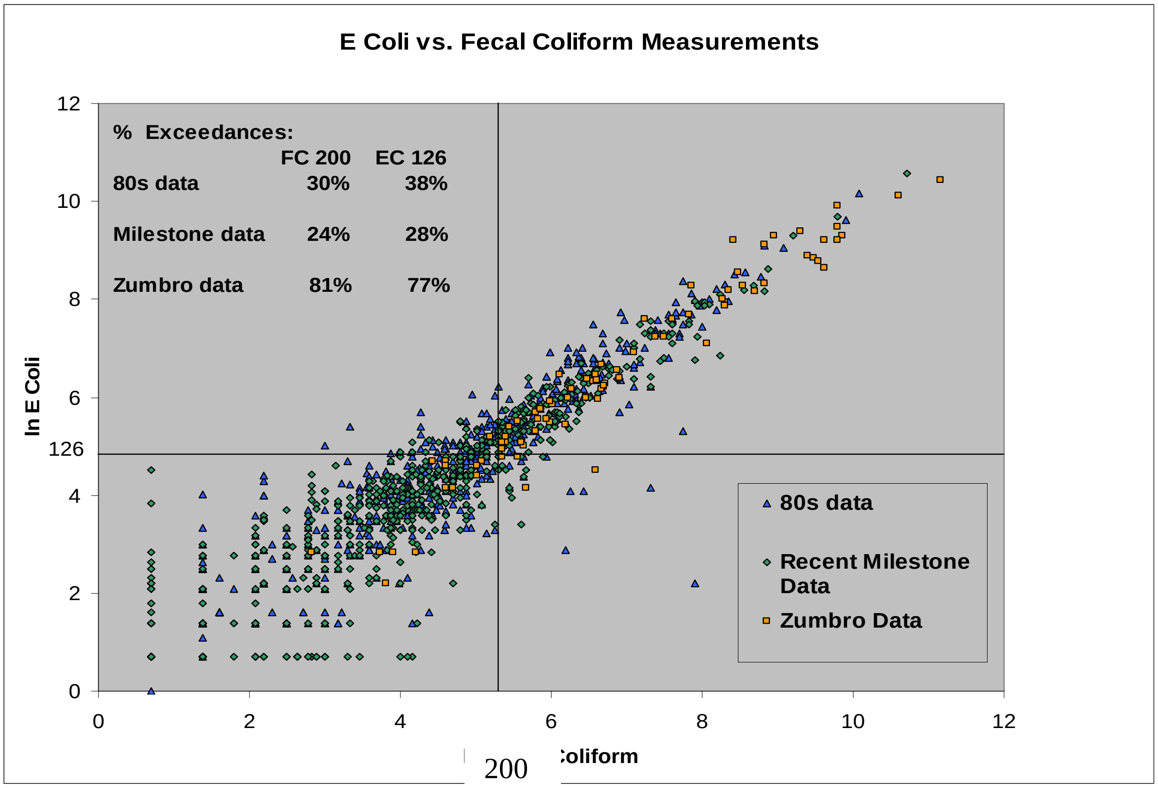
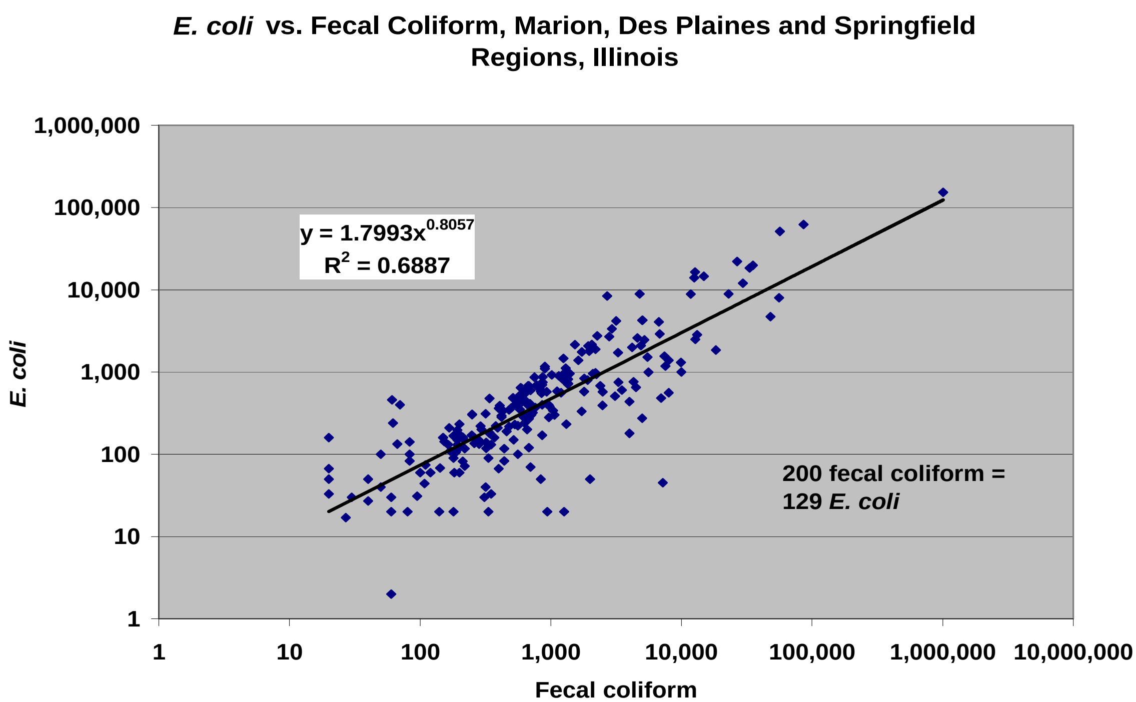


Figure III-7. Data from Illinois, Fecal Coliform Plotted Against *E. coli* (Data from Bob Mosher, Illinois EPA).



This indicates as well that the proposed *E coli* standards may be more stringent than the current standards, but given the variability of bacteriological data, and the many other uncertainties that enter into setting an indicator standard, the Agency believes the proposed *E. coli* standards are consistent with the Agency's goals and are reasonable.

Table III-19. *E. coli* Levels Equivalent to 200 and 2000 Fecal Coliform from the Three Data Sets (cfu/100 ml).

Data Set	*E. coli* at 200 fc	*E. coli* at 2000 fc	N
Milestone, 1980s	170	1770	660
Milestone, 2000-'02	150	1500	643
Zumbro River	110	1960	84
Target E. coli	*126*	*1260*	

fc = fecal coliform

The third part of this analysis was to determine the number of exceedances of the proposed *E. coli* values compared to exceedances of the fecal coliform standard. This analysis helps the Agency predict whether the number of waterbodies that will be considered impaired due to fecal bacteria in the future will go up, down or stay about the same. The goal is for them to stay about the same. The results using the more recent 2000-2002 data are shown in Table III-20. This analysis shows that the proposed *E. coli* standards are exceeded slightly more often than the fecal coliform standards. For example, an *E. coli* level of about 1500 cfu/100 ml is more comparable to the current fecal coliform maximum standard of 2000 cfu/100 ml. These results are consistent with the other analyses, that the proposed standard may be slightly more stringent than the current standard.

Table III-20 shows exceedances for a range of values around the proposed 10 percent MS of 1260, because the Agency's proposed 10 percent MS is larger than the EPA maximum criteria. Based on the large Minnesota data set, however, the proposed standard is as-protective-as the EPA criteria (Section VII.E.2).

Table III-20. Projected Exceedances, *E. coli* Standard Compared to Fecal Coliform Standard in Percent of Individual Values and Number of Milestone Stations Showing Exceedances (Proposed standards in shaded rows, 2000-2002 paired data).

Indicator Levels	Percent Exceedance n = 643	No. of Milestone Stations Showing Exceedances n = 89
	Geometric Mean	
126 *E. coli*	28 %	20
200 fecal coliform	24 %	16
	10 % Maximum	
500 *E. coli*	10 %	35
1000 *E. coli*	5 %	25
1260 *E. coli*	5 %	22
1400 *E. coli*	4 %	21
1500 *E. coli*	3 %	19
2000 *E. coli*	2 %	13
2000 fecal coliform	3 %	16

In the box in the upper left of Figure III-6 is the percent exceedance of the fecal coliform standard and the proposed *E. coli* standard for all three data sets. The *E. coli* standard was exceeded more often in the statewide data, but not in the more local Zumbro River data.

Assessment of the variability in Minnesota *E. coli* data is the final part of the Agency's analysis of the three data sets (this analysis involves only the *E. coli* data). The Minnesota data show considerable more variability than the EPA data used to support the national criteria (Exhibit EC-1). The log standard deviation for all Milestone stations (2000-2002 data) is 0.803. When the data are divided into four geographic quadrants (Northeast, Southeast etc.), the log standard deviations range from 0.679 to 0.804. Log standard deviations for the more site-specific Zumbro River data are slightly greater (range: 0.776 to 0.887 at four stations).

The greater variability in the Minnesota data is not surprising. The EPA log standard deviation of 0.4 reflects variability measured at ocean or large lake beaches during the epidemiological studies upon which the EPA criteria are based. The source of fecal contamination at these beaches was from continuous discharge of apparently inadequately disinfected domestic wastewater. The variability measured in Minnesota's rivers reflects both point and nonpoint sources. As expected, the relative contribution from nonpoint source runoff increases dramatically during wet periods (Exhibit EC-9, page 53). Typically very high bacteria counts are measured in rivers during runoff events, and much lower counts are measured during dry or base-flow periods. The resulting large range between high and low values increases the variability of bacterial data.

In conclusion, this analysis of the Minnesota paired data suggests that the proposed *E. coli* standard may be slightly more stringent than the current fecal coliform standard, and result in a slight increase in the number of waterbodies considered impaired by fecal bacteria. However, because of the variability in the Minnesota data, and the uncertainties associated with bacterial indicators, the analysis does not support proposing a geometric mean standard different from the EPA criterion of 126 cfu/100 ml. Compliance or non-compliance with any bacteriological standard is more a function of sample timing (wet or dry periods) than which indicator is used.

E. REASONABLENESS OF PROPOSED *E. COLI* STANDARDS [VII. *E. coli*]

1. <u>Proposed 30-Day Geometric Mean *E. coli* Standard</u> [VII.E. reasonableness, *E. coli*]

The Agency is proposing to adopt the EPA *E. coli* criterion of 126 cfu/100 ml as the Minnesota standard, to be met as a geometric mean over a calendar month. As described in the previous Section, the analysis of the paired fecal coliform and *E. coli* measurements indicates that an *E. coli* standard of 126 is reasonably equivalent to the current standard. This will achieve the goal of retaining the eight illnesses per 1000 exposure protection level that the current standard is estimated to provide. The proposed geometric mean standard is consistent with the EPA criteria and guidance, and is reasonable.

2. <u>Proposed 10 Percent Maximum Standard</u> [VII.E. reasonableness, *E. coli*]

The Agency is proposing 1260 cfu/100 ml as the 10 percent maximum standard (10 % MS) for both Class 2 and Class 7 waters. As noted, this number is larger than the EPA 10 percent MS criteria, which range from 235 to 576 cfu/100 ml (Exhibit EC-1). This section of the SONAR will explain the basis for this value and why it is "as protective as" the EPA criteria. To begin with, the Agency proposed 10 percent MS is based on the EPA-recommended protection level of 99.2 percent of all swimmers. The Agency strongly believes that the proposed standard is substantially supported by the very robust paired data sets. The proposed 10 percent MS is reasonable for Minnesota's surface waters. In fact, the data indicate this value is probably more stringent than the current 10 percent MS fecal coliform standard of 2000 cfu/100 ml.

As previously stated, the EPA criteria and guidance allow some flexibility to states to determine the appropriate maximum standard. Flexibility enters into the development of the 10 percent MS in three areas: 1) the selection of a risk level, 2) the selection of a recreational use category and 3) the determination of local variability.

<u>Risk Level</u>. The Agency is retaining the risk level of eight illnesses per 1000 swimmers (exposures). This is at the "low" or protective end of the EPA suggested range for fresh waters of 8 to 10 illnesses per 1000 (0.8 to 1.0 percent). Both the geometric mean and 10 percent MS should be and are, based on the same risk level.

<u>Level of Recreational Use</u>. EPA provides a range of 10 percent maximum criteria based on the level of expected primary body contact use the waterbody is likely to support. The use levels are described as: "designated beach area", "moderate full body contact", "lightly used full body

contact" and "infrequently used full body contact" (Tables III-18 and III-21). While "beach area" is pretty much self-explanatory, EPA does not explain the other descriptors in the criteria document (they are defined in Exhibit EC-17). The Agency's analysis shows that the proposed 10 percent MS falls between "moderate" and "light" use categories, or roughly in the middle of EPA's range of uses.

<u>Variability</u>. The EPA criterion (Exhibit EC-1, page 16) and Exhibit EC-17 (page 67221) say the 10 percent MS should be, "*based on a site-specific log standard deviation*;" or, if local data are insufficient, states should use the EPA standard deviation of 0.4. As shown, the Minnesota *E. coli* data is more variable than the EPA data (log standard deviation of 0.8 for the 2000-2002 Milestone data, see Section VII.D.5). The Agency feels it is reasonable to use the Minnesota statewide data to determine a "Minnesota-specific" 10 percent MS. This standard deviation reflects the variability the Agency has encountered in the past measuring fecal bacteria levels in rivers, and there is no reason to believe that this variability will be less in the future. The use of the Minnesota-specific log standard deviation of 0.8 is reasonable.

The Agency believes the EPA primary body contact use descriptors (beach area, etc), shown in Table III-18, have limited relevance to the Minnesota situation because our standards apply to all Class 2 waters, which range from very heavily to never used for swimming. Still, it is useful to show where the proposed *E. coli* 10 percent MS fits, in the context of EPA's primary body contact descriptors. Associated with the descriptors are one-sided upper percentile confidence limits (C.L.) and a factor representing the area under a normal distribution curve (the "z" value). The lower the C.L. the less confident one is that a measurement exceeding the criterion will result in illness; i.e., the lower the C.L. the more stringent the criterion. Using the Minnesota log standard deviation of 0.8 and the proposed 10 percent MS of 1260 cfu/100 ml one can "back" calculate the confidence limit. The result is a C.L. of about 89 percent, which is slightly more protective than EPA's "lightly used" full body contact category (Table III-21). Thus, the proposed 10 percent MS falls about in the middle of the EPA range of primary body contact use levels using the log standard deviation of 0.8.

Table III-21. Proposed 10 Percent Maximum *E. coli* Standard of 1260 cfu/100 ml (shaded cells) Compared to EPA *E. coli* Maximum Criteria.

Log Standard Deviation	Geometric mean 0.8 % risk	10 % Maximum Standard Related to the EPA Use Levels				
		Beach area 75% C.L. 0.675	Moderate 82% C.L. 0.935	89% C.L. 1.25	Light 90% C.L. 1.28	Infrequent 95% C.L. 1.65
0.4 (EPA)	126	235	298	--	406	576
0.8 (MPCA)	126	437	705	1260	1332	2633

The "equivalency" and "exceedance" analyses plus the log standard deviation of 0.8 are the primary basis for the proposed 10 percent MS. These analyses place the potential standard in a range of about 1200 to 1500 cfu/100 ml. Once this range was established, the Agency felt it was reasonable to apply a multiplier of 10 to the geometric mean standard to determine the exact proposed 10 percent MS of 1260. This maintains the same factor of 10 difference in the current

Class 2B, 2C and 2D fecal coliform standards. The 10 percent MS to geometric mean ratios are shown in Table III-22.

Table III-22. Ratios of 10 Percent Maximum to Geometric Mean Standards, Proposed *E. coli* Compared to Current Fecal Coliform Standard.

Indicator	Geometric mean	Maximum	Ratio, 10%MS/GM
E. coli			
Class 2A	126	1260	10
Class 2Bd, 2B, 2C, 2D	126	1260	10
Class 7	630	1260	2
Fecal Coliform			
Class 2A	200	400	2
Class 2Bd, 2B, 2C, 2D	200	2000	10
Class 7	1000	2000	2

Besides the greater variability in the Minnesota data, it is important to consider two additional factors when evaluating whether the Agency's proposed 10 percent MS is protective enough, in light of where it falls in the range of EPA use categories (Table III-21). First is the probable significant contribution of bacteria from animal sources when counts are high, and second is how the bacteriological standard is used by the Agency.

The high fecal bacteria levels measured in rivers during runoff events are probably dominated by animal sources and the relative contribution from human sources is reduced (Exhibit EC-9, page 53). This introduces additional uncertainty in estimating the illness risk to swimmers. It is likely that the dominance of animal sources tends to reduce the risk of gastroenteritis in humans (Section VII.D.4).

The second factor that supports the Agency's proposed 10 percent MS is the way the Agency implements the standard. As explained in Section VII.A.6, the Agency uses the standard primarily to assess rivers for potential impairment and to look for long-term trends in fecal bacteria levels. The standard is also used by entities to assess fecal bacteria levels at public beaches, but they can and have established their own protocols and thresholds for this purpose (Sections VII.A.6 and VII.F.1).

Finally, both the proposed geometric mean standard and the 10 percent MS, shown in Table III-20, show about the same level of increased exceedances, when compared to exceedances of the current standards. This suggests that the two parts of the proposed standard are similar in the level of protection provided.

In conclusion, the proposed 10 percent MS:

- Has as its foundation the EPA-recommended level of protection for swimmers of eight illnesses per 1000 exposures (99.2 %);

- Is about mid-way between EPA's "beach" and "infrequent" use levels for MS criteria;
- Is calculated using a log standard deviation representative of the variability in fecal bacterial levels in Minnesota rivers;
- Is about equivalent to, and is expected to be exceeded about a frequently as, the current fecal coliform standard of 2000 cfu, based on the analysis of the paired data sets; and
- Has the same factor of 10 relative to the monthly geometric mean standard as the current standard.

3. Proposed Change to Class 2A Ten Percent Maximum Standard [VII.E. reasonableness, *E. coli*]

The ratios in Table III-22 point out an aspect in the current fecal coliform standard that the Agency is proposing to change. Currently trout streams and lakes (Class 2A waters) have a more stringent 10 percent MS (400 cfu/100 ml) than is applicable to warm water habitats (Class 2B, 2C and 2D waters, 2000 cfu/100 ml). The Agency is proposing to make the 10 percent MS the same for all Class 2 waters. The Agency believes that the more stringent standard for trout waters is not needed, and that swimmers in any category of Class 2 waters should receive the same level of protection. The current standard dates to 1973, and seems to be a hold over from a time when trout waters were possibly given "special status," including more stringent standards, that may not have been based on sound science[89]. There seems to be no valid reason for providing a higher level of protection to swimmers in trout waters. In fact, most of the primary body contact recreation in Minnesota takes place in non-trout lakes and rivers, including such heavily used resources as the St. Croix River and Metro area lakes. If the proposed *E. coli* standards are protective of swimmers, and the Agency believes they are, this proposed change will not adversely impact trout streams or their users.

4. Proposed *E. coli* Standards for Limited Resource Value Waters [VII.E. reasonableness, *E. coli*]

The bacteriological standards applicable to limited resource value (Class 7) waters are designed to protect for the types of water recreation where emersion in the water is unlikely, such as wading and boating (secondary body contact). The Agency proposes to replace the current Class 7 standard with an *E. coli* standard that provides the same level of protection (see Table III-17 and the next section).

EPA does not provide an *E. coli* criterion for secondary body contact recreation. The EPA epidemiological studies, the basis for the primary body contact criteria, focused on swimmers and did not address risks for secondary body contact. EPA guidance suggests states apply a factor of five times the primary body contact geometric mean (Exhibit EC-2, page 45). Based on this guidance, the Agency is proposing a Class 7 monthly geometric mean standard of 630 cfu/100 ml. The factor of five is consistent with the difference between the current primary and secondary body contact fecal coliform geometric mean standards. The proposed 10 percent MS standards for Class 7 and Class 2 waters are the same, as is the case for the current fecal coliform standard. The proposed 10 percent MS of 1260 cfu/100 ml for Class 7 and all Class 2 waters (including trout waters) means that all surface waters of the state will have the same 10 percent MS.

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[89] For example, all trout waters in Minnesota are protected as a source of drinking water even though most are not used for this purpose.

5. <u>Narrative Portion of Proposed Standards</u> [VII.E. reasonableness, *E. coli*]

The proposed *E. coli* standards are shown below with the associated narrative portions.

All Class 2 Waters Primary body contact	*Escherichia* (*E.*) *coli* bacteria. Not to exceed 126 organisms per 100 milliliters as a geometric mean of not less than five samples representative of conditions over any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between April 1 and October 31.
Class 7 Secondary body contact	*Escherichia* (*E.*) *coli* bacteria. Not to exceed 630 organisms per 100 milliliters as a geometric mean of not less than five samples representative of conditions over any calendar month, nor shall more than ten percent of all samples taken during any calendar month individually exceed 1,260 organisms per 100 milliliters. The standard applies only between May 1 and October 31.

The major elements of the narrative portion of the standard are essentially the same as the current standard; unchanged are:

1. A geometric mean of all samples, but no less than five,
2. Averaged over a calendar month, and
3. No more than 10 percent of samples individually can exceed the maximum standard.
4. The standards are applicability only during the warmer months.

The narrative portion of the proposed standard is the same as the current narrative with one exception. The proposed new language is the phrase "*representative of conditions*". The intent of including this phrase is to instruct people that monitor for *E. coli* to sample at a frequency and interval so the samples have a reasonable chance of representing bacteriological conditions over the full calendar month. The Agency wishes to avoid a situation where five samples are taken on five consecutive days and none taken the rest of the month, for example; or five samples taken only during rain and runoff events, and none during dry periods. The Agency is interested in a geometric mean value that reasonably represents the bacteriological conditions over the full month, whether it is a wet or dry month. The Agency understands that when sampling is started in a given month, one does not know just how representative the sampling will end up being at the end of the month. Sampling schedules and the uncertainly of future weather conditions mean the sampling for any individual month may or may not be "reasonably" representative. Sampling at regular intervals each and every month is one way to deal with this issue. Over time, the possible bias from one month to the next tends to balance out as the number of months sampled increases. The Agency is not expecting perfect representation, but we want to advise people not to select an obviously unrepresentative sampling regime (unless the specific purpose of the monitoring dictates otherwise).

For a time the Agency considered changing "calendar month" to "30 days", but in the end decided against making this change for the reasons outlined below:

- There is a concern that using "30-days" may introduce the opportunity or even the incentive to bias the selection of the 30-day period to include or exclude data to fit one's purpose.
- Calendar month seems to have worked without difficulty over the years; i.e., there does not seem to a "problem" that needs fixing.
- Our current assessment methods are geared to assessing data by calendar month.

The current fecal coliform standard says the maximum standard should not be exceeded in more than 10 percent of the samples taken in a month. The Agency proposes to retain the 10 percent language in the *E. coli* standard. Specifying the maximum standard as not-to-be-exceeded by **any** sample would be unrealistically stringent. A single sample maximum together with the very high fecal bacteria counts associated with runoff events would result in many more exceedances of the standard, which would be inconsistent with, 1) the current standard, 2) a reasonable level of risk of gastroenteritis (0.8 percent), and 3) EPA guidance. EPA explicitly says the maximum standard is not intended to be applied as a single sample maximum (Exhibit EC-17, page 67255).

6. <u>Role of Minnesota Department of Health</u> [VII.E. reasonableness, *E. coli*]

The Minnesota Department of Health (MDH) staff were contacted early in the process of developing the proposed *E. coli* standard and they have not commented on the proposed standards. MDH, like the Agency has little to do with the actual monitoring of public beaches and the posting of warnings or closings, However MDH is contacted if there is an incidence of gastroenteritis or other illness, suspected to be caused by a waterborne pathogen.

The MDH Infectious Disease Epidemiology, Prevention and Control Division investigates outbreaks of gastroenteritis anywhere in the state. They interview the people that got sick, take samples, try to pinpoint the source of the pathogens, the source of the contamination, and recommend action if needed. MDH compiles all cases investigated over the calendar year and publishes a report describing each case.[90] Cases are reported in five categories: confirmed food-borne and waterborne, probable food-borne and waterborne, and non-food and non-water related cases. The data in Table III-23 are taken from the reports for the years 1995 – 2004.

[90] Reports available through this Web site.
http://www.health.state.mn.us/divs/idepc/dtopics/foodborne/outbreaksummary.html

Table III-23. Categories of Gastroenteritis Cases Investigated by MDH, 1995-2004.

Category	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
Confirmed water										
Beach	1	0	1	2	3	0	2	0	1	2
Pool	0	0	4	0	3	1	4	0	0	0
Drinking, other	0	2	0	2	1	0	1	2	0	3
Probable water										
Beach	0	0	0	1	0	0	0	0	0	0
Other	0	0	0	0	1	0	0	0	0	0
Confirmed Food	39	41	46	39	45	40	39	22	28	18
Probable Food	13	15	16	21	22	14	3	na	na	na
Non-food, non-water	55	55	57	47	56	31	na	24	na	11
Total	108	108	124	112	131	86	na	na	na	na

The reason for presenting the information in Table III-23 is to point out the relative uncommon occurrence of reported cases of gastroenteritis at beaches. Only 13 cases of gastroenteritis contracted at beaches were reported in the 10-year period shown in the shaded rows in Table III-23. The investigation of the eight cases at beaches from 2000 to 2004 reported that the pathogen causing the illnesses was viruses in three cases, *Cryptosporidium* in two, *Shigella* at two, *E. coli* at two and both *Cryptosporidium* and *Shigella* at one. Thus, the causes of the illness were often non-bacterial pathogens. Interestingly in the three cases (two due to viruses and one due to *Cryptosporidium*/*Shigella*) where fecal coliform samples were taken, all three reported measured levels below the current standard of 200 cfu/10 ml. Typically, in the beach cases, the suspected sources are traced to babies with dirty diapers in the water, or contamination from a swimmer recently ill with gastroenteritis symptoms.

7. Standards Adopted by Other States [VII.E. reasonableness, *E. coli*]

EPA has tabulated the progress states and tribes have made in adopting bacteriological standards consistent with the 1986 criteria. EPA's most recent list is dated June 2003 (Exhibit EC-23). While this is not a very up-to-date listing, it provides a sampling of the *E. coli* values states are adopting as standards. Of the 18 states EPA lists as having adopted *E. coli*, all but one (Maine) adopted 126 cfu/100 ml, or a number very close, as a 30-day or monthly geometric mean. Most states adopted *E. coli* 10 percent MSs ranging from 235 to 576 cfu/100 ml, matching the EPA criteria. None had adopted a 10 percent MS as high as 1260 cfu/100 ml, however, a few included options to use a number higher than 235 - 576 if local data support a higher number.

Based on this sample of states, Minnesota is outside the norm in proposing an *E. coli* 10 percent MS of 1260 cfu/100 ml. In spite of this the Agency feels strongly that our proposed standards are well supported by the extensive paired data sets discussed here. Based on these data, we can conclude with confidence that the proposed *E. coli* standards will provide the same, if not a slightly greater level of protection, than the current fecal coliform standard. This raises the question, however: does the current standard, in place since 1973, provide an adequate or desired level of protection to swimmers? This is a difficult question to answer definitively. However, the infrequency of reported cases of gastroenteritis at beaches (Table III-23) would suggest that the current standard is adequately protective.[91] This question may be open for future discussions, and it may be almost as much a policy decision as a science-based one. For example, as the human and domestic animal populations continue to expand in Minnesota, as we gain more information on the health risks from animal fecal contamination, and as we lean more about the survival and persistence of fecal bacteria in sediments and the natural environment, there may be a need to reevaluate bacteriological standards again. Indeed, EPA has discussed plans to revise the bacteriological criteria in the future as new epidemiological data becomes available.

For now the available information, including the 30 plus year history, suggests that the current fecal coliform provides adequate protection; and that the Agency's goal for promulgating an *E. coli* standard that is "equivalent" to the current standard is also protective and reasonable.

F. REASONABLENESS, IMPLEMENTATION AND TRANSITION TO *E. COLI* STANDARD [VII. *E. coli*]

1. Beach Program on Lake Superior and EPA Promulgation of *E. coli* Criteria [VII.F. reasonableness, *E. coli*]

a) Minnesota Beach Program [VII.F. reasonableness, *E. coli*]

In October of 2000 the BEACH act (Beach Environmental Assessment and Coastal Health) was passed (Exhibit EC-15). The purpose of this amendment to the Clean Water Act was to protect the health of swimmers at the nation's major beaches[92]. The act defines "coastal recreation waters" as:

- Great Lakes waters, and
- Marine coastal waters, including estuaries, that are designated by the state for primary body contact (swimming).

Under the BEACH act the Agency began monitoring 34 beaches along the North Shore in 2003. The EPA provides funds to the states to support the monitoring and notify the pubic. Samples are collected at beaches from Duluth harbor to the Canadian border once a week at all beaches and twice weekly at nine priority beaches (Exhibit EC-18).[93] Samples are analyzed by a contract lab. The *E. coli* and fecal coliform maximum criteria/standards of 235 and 400 cfu/100 ml, respectively, are the triggers the Agency uses to post "water contact not recommended at

[91] The Agency is aware that some cases will go unreported or may be attributed to other causes.

[92] In 2001 EPA estimated that there were 910 million trips to the nation's beaches each year, during which people spent $44 billion. EPA Environmental News, EPA Administrator releases funds for beaches, May 25, 2001.

[93] Beach program fact sheet, http://www.pca.state.mn.us/publications/gp5-06.pdf.

this time" signs at beaches that exceed these triggers (Exhibit EC-18). The warnings are advisory and the beaches are not officially "closed", but postings generally have that effect.

From its inception the Minnesota Beach program monitored for both fecal coliform and *E. coli*. Because EPA has promulgated an *E. coli* criterion for coastal and Great Lakes beaches (see below), the Minnesota Beach program discontinued monitoring for fecal coliform beginning with the 2006 monitoring season, and is now monitoring for *E. coli* alone. The proposed change to the state-wide standard will have essentially no impact on the Minnesota Beach program since the Agency has been using an *E. coli* criterion consistent with the values promulgated by EPA.

The decision to discontinue fecal coliform monitoring is supported by the following statistics from the 2003 Beach sampling season.

1. The *E. coli* criterion of 235 cfu/100 ml triggered 22 advisories.
2. The fecal coliform standard of 400 cfu/100 ml triggered 22 advisories.
3. An *E. coli* criterion of 126 cfu/100 ml would have triggered an additional 28 advisories.
4. A fecal coliform standard of 200 cfu/100 ml would have triggered an additional 26 advisories.

These results show a remarkable consistency between the two indicators at both the 10 percent MS and geometric mean levels, which suggests that the continued analysis of fecal coliform would not add very much to the decision making process.

b) EPA Promulgation of *E. coli* Criteria [VII.F. reasonableness, *E. coli*]

Under EPA's administration, the BEACH act required coastal and Great Lakes states to adopt bacteriological criteria as protective as the EPA criteria by April 2004. If states failed to act by the deadline, the law further required EPA to adopt criteria for those states (Exhibits EC-16a and EC-16b). Minnesota was one of 21 states (out of 30 affected by the BEACH act) that did not meet the deadline. EPA promulgated standards on November 16, 2004, that supplement but do not replace standards the states already have in place (Exhibit EC-17).[94]

The EPA promulgated standards for both *E. coli* and enterococci for the fresh water beaches of the Great Lakes, and states have the option of using one or the other (Exhibit EC-17, page 11). As stated, the Agency has been using *E. coli* since before the EPA promulgation, and will continue to use *E. coli* rather than enterococci. The *E. coli* criteria promulgated for Minnesota are the 1986 EPA criteria, including both a geometric mean of 126 cfu/100 ml, and the range (235-575 cfu.100 ml) for the maximum standard (10% MS). The range for the 10 percent MSs reflects various levels of primary body contact use described previously (Table III-18). By Minnesota's use of the *E. coli* criterion of 235 cfu/100 ml, presumably the Agency has thereby "adopted" this value as the Lake Superior beach standard, as a result of the EPA promulgation. Use of the EPA "beach" maximum criterion of 235 cfu/100 ml is an appropriate trigger for this program since it is clearly being applied to beaches.

[94] Of the six EPA Region 5 states, Indiana and Michigan met the deadline, Illinois, Ohio, Wisconsin and Minnesota did not.

Clearly the Agency's proposed statewide 10 percent MS of 1260 cfu/100 ml is more lenient than the 235 cfu/100 ml 10 percent MS adopted for use at the Lake Superior beaches. The promulgation of a different statewide standard by the Agency will not affect the Beach program. The Beach program will continue to use the 235 cfu/100 ml trigger after the *E. coli* statewide standards are adopted.

The Agency asked EPA staff at Region 5 if the use of a trigger for the Lake Superior beaches more stringent than the proposed statewide standard was acceptable, and they agreed that it was.[95] The reasons EPA gave for accepting a potentially different statewide standard are: first, the two standards are used for completely different purposes; and second, the use of a precautionary approach at beaches is warranted. The Agency agrees with these reasons. As explained in Section VII.A.6, the Agency uses the statewide standard most often with historical data to make impairment decisions. The question being asked in this context is: are fecal bacterial levels below the standard over the long-term, and is the recreational (swimming) use being protected. It is appropriate for a beach monitoring program to use a different *E. coli* level to trigger a recreational advisory. In the beach context, the question being addressed is, is the water safe for recreation right now? The immediate protection of human health is the first priority; the goal being to avoid making a decision that the bacteria levels are safe when they were really unsafe. Also, a decision must be made as soon as results are back (usually a minimum of 24 hours) based on very few samples. A conservative single sample maximum is the right trigger in this situation.

The Agency is proposing, as part of the adoption of an *E. coli* standard, to eliminate the more stringent 10 percent MS for trout waters. Under the proposal, all surface waters (Class 2 and Class 7) would have the same 10 percent MS (see Section VII.E.3). This should have no impact on the Agency's Beach program (Lake Superior is a trout water) because of our use of the *E. coli* criterion and EPA's promulgation.

The standards promulgated by EPA will remain in effect for Lake Superior after the adoption of the proposed standards, but the Agency is not proposing to include them in Minn. R. ch. 7050 because of their limited applicability. Also, Minn. R. ch. 7052 might be the logical place for the Lake Superior standards.

Under the BEACH act, EPA expects states to begin replacing fecal coliform effluent limits with *E. coli* limits in NPDES/SDS permits as they are reissued. This is discussed in Section VII.G below.

2. <u>Other Beach Monitoring Programs</u> [VII.F. reasonableness, *E. coli*]

The entities that monitor public beaches face decisions similar to those faced by the Agency in the Beach program. Cities, counties, park boards and other entities that monitor beaches need to establish protocols for monitoring and decision making, plus select a criterion/standard. The entities with this responsibility in the metro have done so, and they meet regularly to discuss issues of mutual interest. Many of these entities have already changed over to monitoring *E. coli*

[95] Personal communication, October 22, 2003.

and many use EPA's 10 percent MS of 235 cfu/100 ml criterion as the main trigger (Exhibit EC-19). Again, the Agency agrees that the more stringent threshold is appropriate in the context of a public beach, which may be crowded with swimmers (i.e., obvious potential for fecal contamination from human sources), and because of the need to make rapid decisions based on few samples.

3. <u>Transition to *E. coli* Standard</u> [VII.F. reasonableness, *E. coli*]

The Agency and outside entities that monitor for fecal bacteria, such as watershed districts for example, will want to make the transition from fecal coliform to *E. coli* when the new standard is adopted (if they have not already done so). We think this change can be made with little difficulty and little extra expense, in keeping with the Agency's goal of making this change as simply as possible.

The advice the Agency has been giving to interested parties for some time regarding the transition is:

1. Explore laboratory capabilities and costs for *E. coli* analyses prior to switching.
2. Begin monitoring for *E. coli* at a time that best suits the particular project. For example, start with the new indicator at the beginning of a recreational season. Some parties have anticipated the change and started monitoring for *E. coli* already. Projects beginning monitoring in 2007 should begin *E. coli* monitoring. Projects that have been monitoring for fecal coliform and plan to finish monitoring in 2007 may wish to continue with fecal coliform for the final year, or do some duplicate monitoring.
3. Monitoring can be continued using the same procedures, at the same interval and frequency that was used with fecal coliform.
4. A period of duplicate monitoring is not considered necessary, unless the determination of the local relationship between the two indicators is important for the project. A decision on whether to afford duplicate monitoring should be made on a case-by-case basis. The potential doubling of analytical costs will be a major consideration. If a local fecal coliform/*E. coli* relationship is not needed, relationships reported in the literature or the Agency's statewide relationships can be used. An important consideration for decision makers is that, while local differences in fecal coliform/*E. coli* relationship have been demonstrated, given the variability in bacteria levels and other uncertainties, locally measured differences may not be significantly different or even accurate (especially if the data set is small).
5. Newly obtained, as well as historical, fecal coliform data can still be compared to the "old" fecal coliform standard for as long as fecal coliform samples are taken and the historical data are relevant. The Agency is not recommending the continued monitoring of fecal coliform unless there are valid reasons for doing so. Over time the *E. coli* data will replace the fecal coliform data. The transformation of one indicator data set to the other using conversion factors is not necessary, but is an option.

For large-scale projects such as a basin-wide or watershed bacteria TMDL addressing multiple impairments, establishing a relationship between the indicators may be needed. Large regional TMDLs are expensive undertakings (see Section V.L.3). An investment in at least some paired monitoring may be worth the expense in these situations to help establish supportable delisting goals. In addition to project scale or scope, the interests of stakeholders should be taken into consideration. If some stakeholders feel strongly about the need to investigate fecal coliform/*E. coli* relationships, a good-faith effort to address the question may be warranted.

G. REASONABLENESS, NO CHANGE TO FECAL COLIFORM EFFLUENT LIMIT [VII.G. *E. coli*]

The Agency is proposing **no** change to the current monthly mean fecal coliform **effluent limit** of 200 cfu/100 ml, applicable from April 1 – October 31 (May 1 – October 31 for Class 7 waters). This effluent limit is part of Minnesota's definition of minimum, technology-based treatment required of all discharges that treat domestic wastewater. Including fecal coliform as a minimum treatment (technology-based) limit is a Minnesota requirement. Limits for fecal bacteria are not part of the federal technology-based definition of secondary treatment (40 CFR 133.103). Also, the Agency questions whether a change to an *E. coli* effluent limit is needed to comply with federal regulations on water quality-based effluent limits (except discharges to Lake Superior) as discussed below.

All of the existing Minn. R. 7050.0211, subp. 1 is shown below, to show the fecal coliform limit in the context of the other secondary treatment requirements.

7050.0211 FACILITY STANDARDS.

Subpart 1. ***Minimum secondary treatment for municipal point source and other point source dischargers of sewage.*** *It is established that the agency shall require secondary treatment as a minimum for all municipal point source dischargers and other point source dischargers of sewage. For purposes of this part, municipal has the adjective meaning of municipality as defined in part 7001.1020, subpart 18. Secondary treatment facilities are defined as works which will provide effective sedimentation, biochemical oxidation, and disinfection, or the equivalent, including effluents conforming to the following:*

Substance or Characteristic	*Limiting Concentration or Range**
*Five-day carbonaceous biochemical oxygen demand**	*25 milligrams per liter*
*Fecal coliform group organisms ***	*200 organisms per 100 milliliters*
*Total suspended solids**	*30 milligrams per liter*
Oil	*Essentially free of visible oil*
Phosphorus	*See subpart 1a*

pH range	*6.0 - 9.0*
Toxic or corrosive pollutants	*Concentrations of toxic or corrosive pollutants shall not cause acute toxicity to humans or other animals or plant life or directly damage real property or exceed the final acute value unless the effluent satisfies the whole effluent toxicity test below. If a whole effluent toxicity test performed on the effluent results in less than 50 percent mortality of the test organisms, the effluent will not be considered acutely toxic unless the commissioner finds that the test species do not represent sensitive organisms in the affected surface water body or the whole effluent test was performed on a sample not representative of the effluent quality. The final acute value and whole effluent toxicity test are defined in part 7050.0218, subpart 3, items O and HH, respectively*

**The arithmetic mean for concentrations of five-day carbonaceous biochemical oxygen demand and total suspended solids shall not exceed the stated values in any calendar month. In any calendar week, the arithmetic mean for concentrations of five-day carbonaceous biochemical oxygen demand shall not exceed 40 milligrams per liter and total suspended solids shall not exceed 45 milligrams per liter.*

***Disinfection of wastewater effluents to reduce the levels of fecal coliform organisms to the stated value is required from April 1 through October 31 (Class 2 waters) and May 1 through October 31 (Class 7 waters) except that where the effluent is discharged 25 miles or less upstream of a water intake supplying a potable water system, the reduction to the stated value is required year around. The stated value is not to be exceeded in any calendar month as determined by the geometric mean of all the samples collected in a given calendar month. The application of the fecal coliform group organism standards* *shall be limited to sewage or other effluents containing admixtures of sewage and shall not apply to industrial wastes except where the presence of sewage, fecal coliform organisms, or viable pathogenic organisms in such wastes is known or reasonably certain. Analysis of samples for fecal coliform group organisms by either the multiple tube fermentation or the membrane filter techniques is acceptable.*

The Agency believes there is little advantage to replacing the 200 cfu/100 ml fecal coliform limit with an *E. coli* limit of 126 cfu/100 ml, at least at this time. The Agency decided early in the planning phase of this rulemaking not to propose a change to the fecal coliform effluent limit because of the amount of time and effort required seemed inconsistent with the gain. The Agency may propose a change to the effluent limit in a future rulemaking, especially if inexpensive analytical methods are approved by EPA. Potential savings in analytical costs would be an important incentive for dischargers to make the change to *E. coli*.

The primary function of a bacterial effluent limit is to assure the wastewater treatment plant operator, and the Agency, that the effluent is being adequately treated with a disinfectant to assure a complete or near-complete kill of fecal bacteria before discharge to the receiving stream. This can be accomplished equally well by using either indicator. The Agency believes the advantages of changing the effluent limit to *E. coli* are limited to:

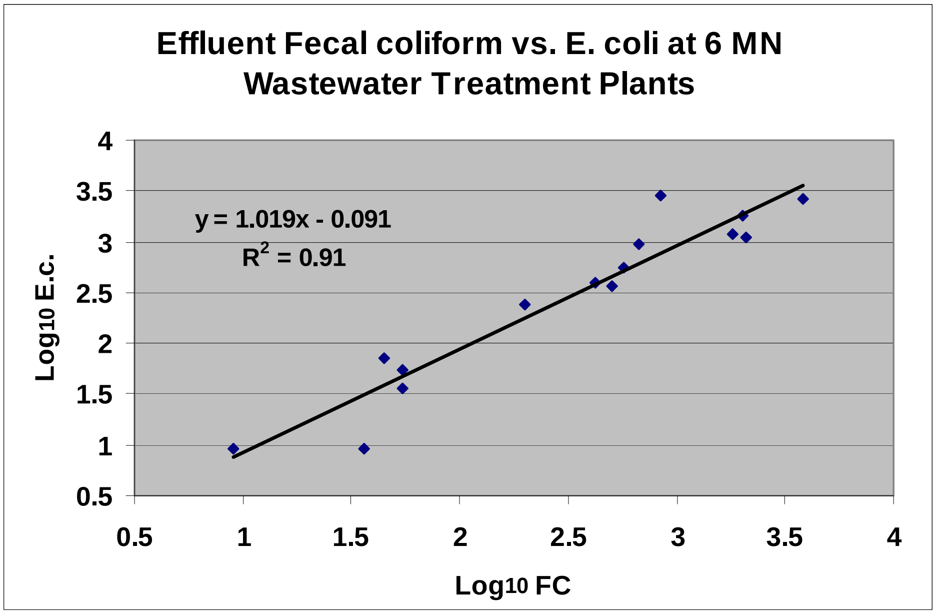
- The state would have one fecal bacteria indicator for ambient waters and effluents, as it has now; and
- Eliminate any question about compliance with EPA guidance or regulations (Exhibit EC-2, page 52).

The Agency believes the disadvantages, at least for this rulemaking, are:

- The time, effort and expense to the Agency of informing about 600 dischargers that they will need to switch from fecal coliform to *E. coli* by a certain date, including;
- Fielding questions and dealing with problems that arise anytime a wide-scale change is made to a common and long-standing effluent limit, even if the changes seems simple and straightforward.
- The change could result in increased cost to dischargers for *E. coli* analyses, depending on the choice of analytical methods, the availability of contract labs, and whether the discharger will experience any start-up costs (cost savings are a possibility too, if less expensive methods are approved by EPA).
- The change may result in an unintended increase in the number of violations of the bacteriological effluent limit (based on the relationship between effluent fecal coliform and *E. coli*), which in turn;
- Could lead to increased use of chemicals, such as chlorine on the part of operators, to meet the new effluent limit.

Paired fecal coliform and *E. coli* data from the chlorinated effluents of six Minnesota wastewater treatment plants indicate that a fecal coliform count of 200 organisms per 100 ml relates to 179 *E. coli* per 100 ml (n = 15 pairs, R^2 = 0.91). While this is a very small sample size, it may indicate that an *E. coli* effluent limit of 126 cfu/100 ml might be more stringent than the current limit (Figure III-8).

Figure III-8. Fecal Coliform Plotted Against *E. coli* From the Effluents of Six Wastewater Treatment Plants.



The EPA guidance on the implementation of *E. coli* standards and the promulgation of the final BEACH act rule (December 16, 2004, 69 FR 67217) could impact the Agency's decision not to change the fecal coliform effluent limits at this time.

The EPA guidance in Exhibit EC-2 offers states flexibility if assigning effluent limits for bacterial indicators, but seems to imply that a newly adopted *E. coli* standard should be the basis for future effluent limits. Pertinent language from Exhibit EC-2 (page 52) is quoted below:

> With respect to determining whether WQBELs for bacteria are needed for a specific discharge, the Agency expects permitting authorities to use the same approach that applies to other pollutants. Thus, the permitting authority must include a WQBEL in the NPDES permit for a discharger if it determines that a pollutant (including all bacteria pollutants) is or may be discharged at a level which will cause, have reasonable potential to cause, or contribute to an exceedance of any state or tribal water quality standard. See 40 CFR 122.44(d)(1)(i). When a state or authorized tribe adopts, and EPA approves, new water quality criteria for *E. coli* and/or enterococci, the permitting authority (in most cases, the state) must immediately begin implementing these criteria through limits incorporated into any new or reissued NPDES permit, **unless the state or tribal water quality standards authorize another approach. Additionally, if the state or authorized tribe chooses to retain an existing water quality criterion for fecal coliforms, the permitting authority must continue to implement this criterion in the form of a WQBEL as well**, unless otherwise specified in the state or tribal water quality standards. [emphasis added, WQBEL means water quality-based effluent limit]

The bolded portion of the above quote seems to provide states the flexibility to retain fecal coliform limits if they choose to do so. In essence Minnesota is authorizing "another approach" by retaining the fecal coliform limit, in the belief that is can perform in the role of an "end-of-pipe limit" effluent limit as well as *E. coli*. EPA adds that the effluent limit should be applied in the form of a WQBEL (water quality-based effluent limit). In this case, the fecal coliform limit is not just water quality-based limit but the limit **is** the water quality standard (see below).

The CFR reference in the quote above deals with requirements to set effluent limits if a pollutant is discharged in amounts that will cause an exceedance of a water quality standard downstream (i.e., a WQBEL). It is shown below.

> [40 CFR 122.44] (d) Water quality standards and State requirements: any requirements in addition to or more stringent than promulgated effluent limitations guidelines or standards under sections 301, 304, 306, 307, 318 and 405 of CWA necessary to:
>
> (1) Achieve water quality standards established under section 303 of the CWA, including State narrative criteria for water quality.
>
> (i) Limitations must control all pollutants or pollutant parameters (either conventional, nonconventional, or toxic pollutants) which the Director determines are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, including State narrative criteria for water quality.
>
> (iii) [then] …the permit must contain effluent limits for that pollutant.

The CFR and EPA's discussion of *E. coli* effluent limits in the guidance is in terms of WQBELs. WQBELs are set at a level needed to protect in-stream water quality standards below a discharge. They typically vary with available dilution – the more dilution provided by the receiving stream, the greater the acceptable WQBEL concentration (up to certain defined maximums). In a simplified example, if the receiving stream provides no dilution (a zero $7Q_{10}$ flow), the effluent limit must equal the water quality standard to avoid a downstream exceedance; if the ratio of receiving stream flow to discharge flow is 1 to 1 (at the $7Q_{10}$), the effluent limit concentration can be double the standard (assumes concentration of pollutant upstream is zero). Minnesota's fecal coliform limit **equals** the geometric mean ambient standard. Thus, the limit is applied with no allowance for dilution to all dischargers; i.e., as if every discharge is to a zero flow stream.

An effluent limit equal to the ambient standard essentially guarantees that the water quality standard in the receiving water cannot be exceeded as long as the discharger is in compliance with their permit limit. Furthermore, meeting the existing 200 cfu/100 ml fecal coliform limit should mean that an "equivalent" *E. coli* limit would be met as well (see Economic Analysis [Section VIII] on page 67237 of Exhibit EC-17). The existing fecal coliform limit will accomplish the goal of preventing water quality exceedances of an *E. coli* standard. Also, the disinfection of sewage effluents, particularly when chlorine is used, has an "all or none" aspect to it. That is, if disinfection as adequate to meet the limit, the bacterial kill is often near complete, and if disinfection is inadequate, bacterial levels will often be well above the 200 limit.

The BEACH act is more explicit (Exhibit EC-15):

[40 CFR 131.41(f)] … `All dischargers shall promptly comply with any new or more restrictive water quality-based effluent limitations based on the water quality criteria set forth in this section.`

The *Federal Register* (Exhibit EC-17) says EPA expects states will begin incorporating *E. coli* into their water quality programs, including as effluent limits in NPDES/SDS permits (Exhibit EC-17, pages 67228 and 67240). This discussion centers on the same requirements concerning WQBELs in 40 CFR 122.44 discussed above, except the BEACH act only pertains to discharges to Lake Superior in Minnesota. The Agency believes that the same points made above for retaining the fecal coliform limit, (i.e., the limit equals the water quality standard, the limit is not a WQBEL *per se,* and the limit is more technology-based), applies equally to Lake Superior discharges.

The state of Michigan whose dischargers to the Great Lakes are subject to the BEACH act has retained a fecal coliform limit. EPA indicates that this has caused little problem in terms of implementing bacteria related TMDLs, as long as the state can demonstrate that the fecal coliform limit is comparable to an *E. coli* limit.[96] EPA has made this demonstration on a broad scale (Exhibits EC-1 and EC-17).

While the Agency is not proposing to change the fecal coliform effluent limit in this rulemaking, *E. coli* monitoring and even limits may be added to NPDES/SDS permits now in consultation with the permittees. These "limits" may take the form of non-enforceable numbers included as special requirements in the permit. The fecal coliform limit would still be the enforceable limit. This approach may be amenable to all parties, particularly for dischargers to Lake Superior prior to making a formal change to the rule. A few dischargers have expressed interest in monitoring for *E coli* for their own interest. The Agency would encourage this.

In summary, the Agency is not proposing to change the existing fecal coliform effluent limit in Minn. R. 7053.0215 for the reasons outlined below.

- The choice of indicator organism is not critical in the context of bacterial disinfection and effluent limits.
- Compliance with either indicator will assure the protection of the receiving waters for swimming and compliance with the proposed *E. coli* standard.
- The current fecal coliform limit equals the current fecal coliform water quality standard and does not change as dilution increases.
- Very extensive ambient data and limited effluent data show that fecal coliform and *E. coli* counts are comparable (although a limit of 126 cfu *E. coli* may be more stringent than 200 cfu fecal coliform).
- *E. coli* limits, special conditions or monitoring could be added to permits now in consultation with the pemittee.

[96] E-mail to MPCA from EPA staff in Region 5, September 27, 2006.

Retaining the current fecal coliform effluent limit in NPDES permits is cost-effective and reasonable at this time.

H. CONCLUSIONS, REASONABLENESS [VII. *E. coli*]

The Agency's goal is to replace the current fecal coliform standard with an *E. coli* standard that meets EPA's requirements, and:

- Provides the same level of protection to swimmers the fecal coliform standard does;
- Causes the least amount of disruption to ongoing bacteriological monitoring and programs;
- Minimized transition costs; and
- Does not significantly impact the water quality assessment process and the number of waters that will be considered impaired in the future due to fecal contamination.

The Agency believes these are reasonable goals and that the proposed *E. coli* standards accomplish them.

The proposed *E. coli* standards are based on the analysis of a very robust data set of paired fecal coliform/*E. coli* data that show the proposed standards are about as protective as, or slightly more protective as, the current standard. The narrative portion of the proposed standard is essentially unchanged from the current standard.

The key factors upon which the proposed *E. coli* standards are based are:

1. Achieve a protection level of eight illnesses per 1000 exposures for both the geometric mean and 10 percent maximum (10 percent MS) standards, consistent with the more protective end of the protection-level range recommended by EPA (8 – 10 illnesses per 1000);
2. Adopt a geometric mean standard that is the same as the EPA geometric mean criterion;
3. Select a geometric mean and 10 percent MS, based on the "relationship," "equivalency" and "exceedance" analysis of paired data, that is consistent with the current standard and EPA guidance;
4. Use a log standard deviation (0.8) that reflects the variability in fecal bacterial levels observed in Minnesota rivers to define the "use protection level" for the 10 percent MS;
5. Remove the more restrictive 10 percent MS for trout waters so all Class 2 waters receive the same level of protection for swimming; and
6. Adopt a secondary body contact geometric standard for Class 7 waters five times the primary body contact geometric mean standard.

The proposed *E. coli* standards for both Class 2 and Class 7 waters are both needed and reasonable.

I. ECONOMIC IMPACT OF PROPOSED *E. COLI* STANDARD [VII. *E. coli*]

This Section will focus on potential costs of adopting an *E. coli* standard. Possible benefits cannot be quantified, but use of an improved indicator standard should improve the ability of responsible entities to assess conditions at swimming beaches to protect the health of swimmers. And it should improve the Agency's assessment of overall recreational suitability of surface waters throughout the state.

The proposed change in bacteriological standards will cost the Agency some money, and it will mean added costs to certain outside entities as well. A large portion of these costs have already been incurred by the Agency and by at least some of the outside parties. Future costs will not change the overall Agency budgets or staff resources.

The largest potential cost to the Agency is the possible need to monitor for both indicators, fecal coliform and *E. coli*, during the transition period. The added cost of duplicate samples is due largely to the costs of the extra analyses. The additional cost of the analyses could range from a low of about one third more to over twice as much, depending on the lab used and the choice of analytical methods. It is impossible to predict future added costs for the additional analyses because we don't know which of the several monitoring programs will decide duplicate samples are needed. It is reasonable to assume that some additional staff time will be required to review the results of the duplicate sampling.

Duplicate fecal coliform/*E. coli* sampling as part of the Agency's long-term (routine) Milestone station monitoring program was discontinued several years ago, and the Agency has no plans to resume paired analyses in that program. The Agency took hundreds of duplicate samples at Milestone stations in the late-1980s and again in the early-2000s to establish the fecal coliform/*E. coli* relationships needed to support the proposed *E. coli* standards (Section VIII.D.5). Some of the Agency's more site-specific monitoring programs that focused on fecal bacteria have also discontinued paired analyses. In general, water quality standards staff is not recommending the continuation of paired monitoring unless there is a specific need to establish the local fecal coliform/E coli relationship. Watershed, TMDL and monitoring program managers, on a case-by-case basis, may decide that they need the paired results. These decisions are ongoing and can change each sampling season. It is difficult to predict which programs may decide to take paired samples; and, if they do, we don't know the number of samples, the choice of labs and analytical methods that will be used.

Examples of the plans, in some cases tentative, for bacteriological monitoring as part of several ongoing localized monitoring programs are:

- South East Regional fecal coliform TMDL. No additional bacteriological monitoring is scheduled for 2006. It has not been determined at this time whether duplicate or just *E. coli* analyses will be performed when bacteriological sampling resumes.
- Special Study, South Branch Root River (associated with the SE TMDL). Fecal coliform and *E. coli* analyses using the MDH lab and the membrane filter method were carried out (funding provided by EPA Clean Water Partnership 319 grant). The continuation of paired sampling is uncertain at this time.

- Special Study, Blue Earth River (part of a fecal coliform TMDL). Mostly fecal coliform monitoring only; some paired monitoring. Analyses for *E. coli* were done with the relatively inexpensive Quanti-Tray method. This phase of the monitoring is winding down.
- Special Study, South Branch Whitewater River. Bacteriological monitoring is planned for 2006 and 2007 using the MDH lab, but the method has not been determined at this time (funding provided by EPA 319 grant).
- Ongoing Special Study, North Shore streams. No bacteriological monitoring planned for the foreseeable future.

Once the need for duplicate analyses subsides, the change to *E. coli* could mean savings in analytical costs for the Agency. The change to *E. coli* expands the choices of analytical methods, and some of the newer methods are considerably cheaper than the heretofore preferred membrane filter method. The Agency's Milestone station monitoring program changed from fecal coliform to *E. coli* for the 2005 summer sampling season. Each year about 27 of the 80 milestone stations are sampled once per month for seven months.[97] In 2005, *E. coli* samples were analyzed using the membrane filter method, which is more expensive than a fecal coliform membrane filter analysis ($41.00 vs. $35.00, FY '05 costs).[98] The higher cost of the *E. coli* membrane filter analysis is due to extra steps in the analysis that requires additional staff time. Starting in April 2006, *E. coli* samples are being analyzed using the much less expensive Quanti-Tray method. Table III-24 shows the increased costs incurred using the membrane filter method, and the projected cost savings in 2006 of using the Quanti-Tray method, using FY '06 prices.

Table III-24. Monitoring at Milestone Stations – Costs per Year for Fecal coliform and *E. coli* Analysis Using Membrane Filter and Quant-Tray Methods, MDH Lab, FY '06 Prices.

Analysis For:	Method	Cost per analysis, FY2006 prices	Approx. no. of samples per year (27 X 7 = 189)	Total cost per year	Cost Increase in 2005 (+) Cost Saving in 2006 (-)
Fecal Coliform	Membrane filter	$37.00	189	$6,993.00	na
E. coli	Membrane filter	$44.00	189	$8,316.00	+ $567.00
E. coli	Quanti-Tray	$12.00	189	$2,268.00	- $6,048.00

Potential cost savings for the Agency's regional monitoring programs that monitor for fecal bacteria may not be as dramatic as the Milestone monitoring example shown in Table III-24. Depending on location, these programs may be more likely to use local contract labs, and the

[97] Monitoring at Milestone stations is rotated through 10 major watersheds in Minnesota. Three to four watersheds are monitored each year so each Milestone station is sampled every other or every third year. Each year approximately 27 Milestone stations are sampled. The fecal coliform and proposed *E. coli* standards only apply from April 1 through October 31, or seven months out of the year.

[98] MDH prices changed on July 1, 2006, the beginning of the fiscal year (FY), which is in the middle of the sampling season. For simplicity just FY '06 costs are used in Table III-24.

differences in analytical costs between fecal coliform vs. *E coli* for a range of methods is usually not as great, or they may be the same (Exhibit EC-24).

There will be no increase in analytical expenses for Minnesota's Beach program due to the change to *E. coli*. The contract for analytical services for the Beach program currently has the same cost ($10.50) for both fecal coliform and *E. coli*. With the discontinuation of fecal coliform monitoring in the spring of 2006, the analytical costs for this program have been reduced by half.

We do not expect any other state agency, including the Minnesota Department of Health, to be impacted monetarily by the proposed amendments.

Possible added costs to outside parties, mainly entities that monitor public beaches and the analytical labs that might incur some start-up costs, are discussed in Section VII.C.2.

VIII. CLASS 3 INDUSTRIAL USE CLASSIFICATION CHANGES

A. INTRODUCTION AND CLASS 3 USE [VIII. class 3]

1. Introduction [VIII.A. introduction, class 3]

The Agency is proposing to change the Class 3 industrial use sub-classification applicable to most surface waters of the state from Class 3B to 3C. This would be accomplished by changing the "default" industrial use classification for most surface waters from Class 3B to 3C. For consistency, the Agency also proposes to change the classification of 106 specifically-listed waters in Minn. R. 7050.0470 from 3B to 3C. This will have the effect of relaxing the Class 3 chlorides[99] and hardness water quality standards applicable to most surface waters. The Class 3 standards are listed in Table III-25 (Minn. R. 7050.0223). The Class 3C standards are highlighted in the shaded columns. The Class 2B (aquatic life and recreation) standards are included for comparison.

Table III-25. Class 3 Industrial Use Water Quality Standards. Class 2B Aquatic Life Standards Shown for Comparison.

Substance, characteristic or pollutant, units	Class 3A	Class 3B	Class 3C	Class 3D*	Class 2B
Chlorides (Cl), mg/L	50	100	250	Mb	230
Hardness, mg/L Ca+Mg as $CaCo_3$	50	250	500	Mb	Na
pH, minimum, su	6.5	6.0	6.0	Mb	6.5
pH, maximum, su	8.5	9.0	9.0	Mb	9.0

*Mb means maintain background. Class 3D applies to wetlands.

2. Class 3 Beneficial Use and Water Quality Standards [VIII.A. introduction, class 3]

As described in Section IX.A below and in Book I, Section II.B.1, Minnesota assigns multiple water use classifications to surface waters of the state. Included in this multi-use classification system is Class 3, which is divided into four subclasses, Class 3A, 3B, 3C, or 3D (Table III-25).

Most of the waters affected by the proposed Class 3B to 3C changes are classified pursuant to the "Unlisted Waters" provisions of Minn. R. 7050.0430. Minnesota R 7050.0430 is sometimes referred to as the "default classification" since all non-wetland surface waters of the state that are not specifically listed in Minn. R. 7050.0470 are assigned the following "default" use classifications: Class 2B, 3B, 4A, 4B, 5, and 6. The Class 4 (agriculture and wildlife), Class 5 (aesthetic enjoyment and navigation), and Class 6 (other uses) make up the "core set" of use classes assigned to all surface waters of the state. The assignment of the Class 2B (aquatic life

[99] The standard is listed as "Chlorides" with an "s" in Minn. R. 7050.0223; for simplicity we will drop the "s" when referring to the chloride standard in this discussion.

and recreation) and Class 3B (industrial consumption) use classifications for waters covered under the unlisted waters provision was originally adopted into state-wide water quality standards rules in the late-1960s. Then, as now, the Class 2B and 3B uses were and are presumptive use class assignments. In other words, all surface waters of the state are presumed to be suitable for these uses unless and until water use reclassifications are proposed through a public hearing rulemaking proceeding. During this rulemaking, the Agency proposes to change the assigned industrial use classification from Class 3B to Class 3C for all the waters classified under the unlisted waters provision. For consistency, Class 3B to Class 3C changes are also proposed for 106 waters specifically listed in Minn. R. 7050.0470.

The assignment of Class 3B to most surface waters means the Class 3B chloride water quality standard of 100 mg/L is the most restrictive chloride standard (see Minn. R. 7050.0450). The Class 3 water quality standards are interpreted as 30-day average standards by the Agency for purposes of using them as the basis for an effluent limit. Should the proposed Class 3B to Class 3C amendments be adopted into rule, the Class 2A, 2B, or 2C chronic standard of 230 mg/L chloride becomes the most restrictive applicable chloride water quality standard for non-Class 7 waters. This would also apply for Class 1 waters used for domestic consumption purposes, which contain a secondary drinking water standard for chloride of 250 mg/L. The averaging duration for the Class 2 chronic standard for chloride is based on a four-day average. For Class 7 waters, the Class 3C chloride standard remains the same at 250 mg/L. As noted in Table III-25 above, the proposed Class 3B to 3C amendments would also result in a change in the industrial consumption total hardness standard for most waters from 250 mg/L to 500 mg/L (expressed as $CaCO_3$ equivalents). The current Class 3 pH standards will not change.

As noted above, the Class 3B to Class 3C change will affect the majority of surface waters throughout the state. The Agency is proposing that this change should **not** pertain to certain categories of waters. The set of waters not being proposed for the Class 3B to Class 3C changes include:

- Outstanding Resource Value Waters covered under the prohibited discharges provisions of Minn. R. 7050.0180, subp. 3. (These waters include waters within: the Voyageur's National Park; the Boundary Waters Canoe Area Wilderness; designated Scientific and Natural Areas identified in Minn. R. 7050.0180, subp. 4; and designated Wild River segments identified in Minn. R. 7050.0180, subp.5.);
- Trout waters (Class 2A waters) identified in Minn. R. 7050.0420 and 7050.0470; and
- Wild rice waters specifically identified in Minn. R. 7050.0470.

3. <u>Protection of Industrial Consumption</u> [VIII.A. introduction, class 3]

The Class 3 use is intended to protect surface waters for industrial consumption uses. These industrial uses may include such things as raw product cleaning and transport at the factory sites, use of the water in the actual production of finished products, and for equipment and other process cooling purposes. Industrial water supply uses can also be categorized as consumptive or non-consumptive. An example of a non-consumptive use would be a non-recirculating (once-through) cooling water system where water is withdrawn from the supply source, utilized by the water appropriator, and returned to the waterbody where it remains available for other uses.

Consumptive use, as the name implies, utilizes the water in such a manner that it is no longer available for potential users in the immediate vicinity because it is incorporated into the product or it is lost due to evaporation, transpiration, or percolation. The water appropriated for crop irrigation is almost always considered to be a consumptive use.

4. Summary and Possible Future Amendments [VIII.A. introduction, class 3]

The industrial use classification amendments being proposed would change the assigned industrial use classification for unlisted waters classified under Minn. R. 7050.0430 and certain other waters specifically listed in Minn. R. 7050.0470. The reclassifications from a Class 3B water use to a Class 3C water use would affect the majority of surface waters in the state. If adopted, these changes would result in the assignment of less restrictive chloride and total hardness water quality standards for these waters.

The proposed set of Class 3B to Class 3C changes are viewed as a first step toward a more comprehensive examination of the salinity related standards in the State's Class 2 aquatic life, Class 3 industrial consumption and Class 4 agriculture and wildlife water use classifications. Many of the standards under the Class 3 and 4 uses are based on information that was available in the mid-1960s that reflects guidelines proposed twenty or more years before that time period. The future re-examination of these salinity-related water quality standards will include input from the Minnesota Department of Agriculture, Minnesota Department of Natural Resources, and the U. S. Department of Agriculture - Agricultural Research Service's Salinity Laboratory, as well as others from the agricultural, industrial, and environmental protection communities. Any recommended rule changes resulting from the re-examination of these standards will be addressed as part of a future revision of Minn. R. 7050.

B. BACKGROUND INFORMATION [VIII.B. class 3]

1. Introduction [VIII.B. background, class 3]

Chloride and total hardness concentrations in surface waters vary greatly from one part of the state to another. This section describes these water quality characteristics and their typical concentrations in surface waters throughout Minnesota.

2. Chloride [VIII.B. background, class 3]

Chloride is one of the major anions commonly found in surface and ground waters throughout Minnesota. Besides natural background concentrations, contributing sources of chloride in both surface and ground waters include municipal and industrial wastewaters, de-icing salt storage, roadway de-icing and dust suppression activities, agricultural runoff, and irrigation return waters. From an industrial water use supply standpoint, chlorides can contribute to corrosion of pipes and equipment, can add to the total dissolved solids content in recycled cooling water and boiler systems, and depending on the industry, can interfere with manufacturing processes that affects the quality of the product being produced.

To provide some perspective, water quality data contained within the EPA's STORET data base was evaluated to characterize surface water chloride concentrations throughout the state. Data was retrieved for individual sampling stations within each of the thirteen sub-regional hydrologic unit watersheds defined for Minnesota. These thirteen sub-regional unit watersheds make up the four major regional hydrologic basins that cover the state: unit code (04) Great Lakes; unit code (07) Upper Mississippi; unit code (09) Souris-Red-Rainy; and unit code (10) Missouri. Averages of the station mean chloride concentrations for twelve of the thirteen sub-regional watersheds are listed in Table III-26. These values were derived from data contained in Exhibit UC-21.

Table III-26. Average Chloride Concentrations (mg/L) in Minnesota's Sub-regional Watersheds.

Sub-regional Watershed Unit	Mean Chloride mg/L	Sub-regional Watershed Unit	Mean Chloride mg/L
0401 Lake Superior basin	18.3	0708 Cedar R. basin	49
0402 Lake Superior (lake samples)	2.1	0702 Des Moines R. basin	87
0701 Upper Mississippi R. basin	49	0902 Red River of the North basin	24
0702 Minnesota R basin	53	0903 Rainy R. basin	9.4
0703 St. Croix R. basin	9.1	1017 Rock R. basin	51
0704 Lower Mississippi R. basin	31	1023 Little Sioux R. basin	Insufficient data
0706 Lower Mississippi R. basin	61		

3. Total Hardness [VIII.B. background, class 3]

Total hardness of water refers to a physical-chemical characteristic that is commonly recognized by the increased quantity of soap needed to produce a lather or by the scale forming potential when these waters are heated. Hardness has come to be defined as the sum of the total concentration of the calcium and magnesium ions. Total hardness concentrations are expressed as calcium carbonate ($CaCO_3$) equivalents. For example, if a chemical analysis of a water sample shows that the concentration of total calcium is 120 mg/L and the concentration of total magnesium is 30 mg/L, the respective equivalent $CaCO_3$ concentrations for these two cations would be 300 mg/L as $CaCO_3$ and 123 mg/L $CaCO_3$, respectively. The summation of these two concentrations yields a total hardness value of 423 mg/L as $CaCO_3$. While hydrogen ions and all polyvalent metal cations (such as iron and manganese) can contribute to the soap consumptive properties of the water, they are generally in such low concentrations in water supplies that their influence is not considered to be significant and are therefore not factored into the total hardness calculation. A widely accepted descriptive classification of the hardness of water is shown in Table III-27.

Table III-27. Classification of Total Hardness Ranges.

Classification	Range in mg/L	Range in grains/gallon*
Soft	0 – 17.1	0 – 1
Slightly Hard	17.1 – 60	1 – 3.5
Moderately Hard	60 – 120	3.5 – 7.0
Hard	120 – 180	7.0 – 10.5
Very Hard	180 & over	10.5 & over

*Grains of hardness per gallon is a standard unit of measure to describe the hardness of water commonly used in the water softening industry. A conversion factor of 17.1 is used to convert hardness values expressed in grains per gallon into hardness concentrations expressed in mg/L as $CaCO_3$.

Water concentrations of calcium and magnesium, and the resulting hardness levels in surface and ground waters, are influenced by watershed geology and the aquifers from which these waters are obtained. Ground water hardness values within a given region of the state will often be higher than the surface water hardness values. In Minnesota, surface water hardness values vary considerably with most of the soft-to-slightly hard water conditions in the northern/northeastern part of the state. Throughout much of the rest of the region, water hardness is classified as being hard to very hard, with the highest hardness concentrations in the southwestern one-third of the state. Exhibit UC-22 is a graphical representation of surface water hardness concentrations throughout the United States, and Exhibit UC-23 is a map showing ground water total hardness concentrations from 954 domestic drinking water wells across Minnesota.

From an industrial use perspective, excessive hardness levels can be problematic since they can lead to scale formation and other deposits inside piping and on surfaces of operational and manufacturing equipment. In certain food and beverage industries, high levels of hardness can also lead to the formation of undesirable precipitants in the products made and processed. While hardness is defined as the sum of the calcium and magnesium cations, industrial water supply hardness can be further classified according to the corresponding anions associated with the calcium and magnesium. Where carbonate or bicarbonate anions are present in concentrations equivalent to or greater than the calcium and magnesium concentrations, the scale that will form upon evaporation or heating will consist primarily of calcium carbonate and magnesium hydroxide. This type of hardness is characterized as “carbonate” or “temporary” hardness since the resulting scale can be removed with acid. When carbonate and bicarbonate anion concentrations are low, sulfates and chlorides combining with the calcium and magnesium may form scale deposits that are referred to as “non-carbonate” or “permanent” hardness. These hardness related scale deposits can be more difficult to deal with since they cannot be easily removed by acid treatment. Pre-treatment water conditioning practices are commonly employed by industrial appropriators of surface waters in order to meet certain quality specifications. Solids removal, hardness removal (water softening), turbidity removal, removal of dissolved solids and dissolved gases, and pH adjustment make up the majority of water treatment processes these surface waters undergo prior to factory use.

Aside from the noted problems associated with elevated hardness concentrations, water hardness also has some beneficial properties associated with it. Total hardness plays an important role in the toxicity of certain trace metals. In general, as hardness concentrations increase, the toxicity of hardness dependent metals decreases. The hardness dependent metals standards in Minn. R. 7050 include cadmium, tri-valent chromium, copper, lead, nickel, silver (acute standards only), and zinc. Calcium is also reported to be beneficial in water as one of the factors that tend to inhibit corrosion of cast iron and steel. Waters with hardness greater than 125 mg/L can form a protective coating on lead pipes which can reduce, but not eliminate, the dissolution of lead into the water.

A data analysis was also conducted for total hardness concentrations within the thirteen sub-regional watershed units comprising the four major watersheds in Minnesota (Table III-28. Averages of the station mean total hardness concentrations were derived from the EPA STORET data presented Exhibit UC-24.

Table III-28. Average Total Hardness Concentrations (mg/L) in Minnesota's Sub-regional Watersheds.

Sub-regional Watershed Unit	Mean Total Hardness Mg/L	Sub-regional Watershed Unit	Mean Total hardness Mg/L
0401 Lake Superior basin	108	0708 Cedar R. basin	269
0402 Lake Superior (lake samples)	45	0702 Des Moines R. basin	587
0701 Upper Mississippi R. basin	236	0902 Red River of the North basin	284
0702 Minnesota R basin	436	0903 Rainy R. basin	80
0703 St. Croix R. basin	135	1017 Rock R. basin	374
0704 Lower Mississippi R. basin	281	1023 Little Sioux R. basin	372
0706 Lower Mississippi R. basin	270		

C. BASIS FOR EXISTING CLASS 3 WATER QUALITY STANDARDS [VIII. class 3]

The narrative descriptions of the Class 3 water use subcategories (Class 3A, 3B, 3C), along with the Class 3 chloride and hardness water quality standards, were first adopted by the Minnesota Water Pollution Control Commission in 1967 (precursor of the MPCA) and they have remained largely the same since that time. There are several notable differences between the 1967 Class 3 standards and those of today. In the 1967 rule, the Class 3 water use classification also included water quality standards for temperature and coliform bacteria in addition to the chloride, hardness, and pH. Another notable difference, pertinent to the proposed amendments, was that the 1967 rule included a separate ground water standard for hardness in the Class 3A and Class 3B subcategories. These hardness standards were listed as 250 mg/L and 350 mg/L, respectively. Subsequent rule amendments removed these ground water standards from the

Class 3 use classifications as well as the temperature and coliform bacteria standards. The Class 3D use classification was added to Minn. R. 7050 in 1994 along with other wetland use classifications.

A review of the public hearing testimony and the exhibits presented during the water quality rule hearings in the 1960's and early-1970's has provided some insights into the rational behind the adoption of the Class 3 water standards. Two documents in particular, containing information on industrial water supply uses, appear to have been the primary references used in the establishment of the chloride, hardness, and pH standards for the Class 3 water use classifications. The first document, which at the time, was a widely distributed, comprehensive resource on water pollution control information, is titled *Water Quality Criteria, Second Edition*, by Jack E. McKee and Harold W. Wolf, California State Water Resources Control Board, 1963, and is referred to in this section of the SONAR as McKee and Wolf. (Excerpted pages 92 – 106 of McKee and Wolf discussing industrial water supplies are identified as Exhibit UC-25).

The second resource is titled *Manual on Industrial Water and Industrial Waste Water* - American Society for Testing and Materials (ASTM). The first edition of this manual, titled *Manual on Industrial Water* was published in 1953. Subsequent revisions of this manual were published in 1956, 1959, and 1966. The 1959 version of the manual was the first to include the sections on industrial wastewater (Second Edition, ASTM Special Publication No. 148 – D) and was the most current version available during the initial development of the Class 3 criteria during the mid-1960s. In particular, Table II titled "Water Quality Tolerances for Industrial Applications", which are the same in both the 1959 and 1966 manuals, is thought to have been a likely resource consulted at the time (Exhibit UC-26). Table II in Exhibit UC-26 provides a summary of the water quality criteria for a number of industries. A qualifying statement in the text describing this table indicates that *"The figures in Table II are general averages and cannot be applied to individual cases without regard for local conditions."*

McKee and Wolf, and the ASTM Manual(s) along with general guidelines contained in *Guidelines for Establishing Water Quality Standards for Interstate Waters*, Federal Water Pollution Control Administration, May 1966 (Exhibit UC-27) appear to be the key resources used by staff of the Minnesota Water Pollution Control Commission to develop criteria for subsequent inclusion in the water quality rules adopted in 1967.

In 1968 the Federal Water Pollution Control Administration issued a report titled "Report of the Committee on Water Quality Criteria" Federal Water Pollution Control Administration, April 1968. This document, (commonly referred to as the "Green Book"), was completed by the National Technical Advisory Committee on Water Quality Criteria. The Secretary of the Interior first established this advisory committee in February 1967. The Green Book, which contains a section on industrial uses, was entered as an exhibit during the 1973 rule hearings on Minnesota Water Quality rules WPC 14, 15, and 23. The Green Book contains information the raw water and point-of-use (where the water is withdrawn) water quality characteristics for various industries. (Exhibit UC-28, excerpt pages 185–215).

During the 1973 rulemaking hearings on WPC 14 and 15, a position paper titled "Categorization of Surface Waters for Industrial Consumption for WPC-15", MPCA Division of Water Quality, Section of Industrial and Other Wastes, was introduced as an exhibit into the hearing record.[100] This exhibit, entered into the record by George Koonce, Acting Chief of the Section of Industrial and Other Wastes, was identified at the time as PCA Exhibit 41, entry dated 5-31-73 and is identified here as Exhibit UC-29.

Exhibit UC-29 contained the following general statements in the support of the established Class 3 water quality standards:

- Industries require a consistently good quality source of water for their process and cooling needs;
- The water quality requirements vary widely depending on the industrial processes; and
- While surface waters are not considered the primary water supply source for industrial users, there is a reasonable expectation that increased industrial consumptive use of surface waters will occur in the future.

This exhibit also cited an ASTM list summarizing problems affecting industries caused by the quality of water on their products, deterioration of equipment, and reductions of efficiency or capacity. Finally, Exhibit UC-29 provided a brief discussion for the inclusion of the Class 3 chloride, hardness, pH, temperature, and bacteria standards. The limited amount of testimony pertinent to the Class 3 standards during the 1966-1967 and 1973 rule hearings centered on the inclusion of temperature standards under the industrial water use classification. The majority of people providing testimony preferred the removal of the Class 3 temperature standards in deference to the Class 2 aquatic life and recreation use temperature standards. (These recommendations were considered to be a valid alternative approach and the Class 3 temperature standards were subsequently withdrawn from the Class 3 uses categories.) The only testimony found specific to either the chloride or hardness Class 3 water quality standards offered by interested parties was in testimony presented on April 20, 1967, by the then General Manager of the Wilson and Company meat processing plant in Albert Lea, Minnesota. The statement concerned the company's inability to meet the 100 mg/L chloride standard being proposed for the Shellrock River and Albert Lea Lake, receiving waters for the company's wastewater discharge.

The recommended threshold concentrations for chlorides and hardness levels cited in Mr. Koonce's exhibit appear to have been based on information presented in McKee and Wolf. Exhibit UC-29 stated that "In general the industrial consumption criteria follows the 'Ranges of Promulgated Standards for Raw Water Sources of Domestic Water Supply' recommended by the U. S. Public Health Service." The basis for this statement appears to stem from an entry on page 92 of McKee and Wolf which states:

> *"Industries are generally willing to accept for most processes water that meets drinking water standards. Where water of higher quality is needed, e.g., for television-picture-*

[100] In 1973 WPC-14 was the rule governing water quality standards for intrastate waters of Minnesota. A parallel rule, WPC-15 contained water quality standards for interstate waters. These two rules, along with their companion water use classification rules WPC-24 and 25, were ultimately merged into one rule, which was the predecessor to the current Minn. R. ch. 7050.

tube manufacture, certain food and beverage preparation, or for high pressure boilers, industry recognizes that additional treatment is the responsibility of the water user."

Table 5-3 on page 93 of McKee and Wolf (Exhibit UC-25) which is titled "Ranges of Promulgated Standards for Raw Water Sources of Domestic Water Supply" is believed to be the reference cited by Mr. Koonce (Exhibit UC-29 at page 4). In this table, constituent ranges are given for water supply sources and these source supplies are broken down into one of three categories; Excellent, Good, and Poor. For the chloride entries, Excellent is described as 50 mg/L or less; Good is described as 50 – 250 mg/L; and Poor is described as being greater than 250 mg/L. The basis for the Class 3 chloride standards appears to parallel this three-tiered categorization of raw water supply sources. The 50 mg/L or less range under the "Excellent" category corresponds to the 50 mg/L Class 3A chloride standard, the 100 mg/L Class 3B chloride standard is close to the mid-point in the range given for the "Good" category, and the "Poor" category listing of chloride levels of "over 250" mg/L corresponds to the Class 3C chloride standard of 250 mg/L.

Table III-29 summarizes the range of recommended point of use threshold and limiting concentrations for chlorides from McKee and Wolf for the industrial sectors referenced under the chloride discussion in Exhibit UC-25.

Table III-29. Industrial Sector Recommended Chloride Criteria or Limiting Concentrations, McKee and Wolf (concentrations in mg/L).

Industrial Sector	McKee and Wolf Criteria
Brewing	60 – 100
Dairy	< 30
Pulp and Paper	75 – 200
Sugar Manufacturing	20

After an examination of the rulemaking records for the 1966-67, 1970, and 1973 rule amendments on state-wide water quality standards, Agency staff has concluded that the basis for the Class 3 total hardness standards was derived from information in both McKee and Wolf and the ASTM *Manual on Industrial Water and Waste Water*. Why the particular Class 3 total hardness standards were chosen at the concentration levels as they were, however, remains an uncertainty. A paragraph entry in Exhibit UC-29 appears to be the extent of the direct supporting documentation on the inclusion of the Class 3 total hardness standards. This entry states:

"Excessive hardness is undesirable in water used in laundries, carbonated beverages, metal finishing, dyeing, food processing, paper and pulp mills, bottle washing, photography and leather goods processing. In vegetable and fruit canning salts of calcium and magnesium may combine with pectous substances forming insoluble pectides that toughen the product. Hardness in sugar manufacturing may form precipitates that accumulate in refined sugar."

Table III-30 summarizes the range of recommended point of use threshold and limiting concentrations for total hardness concentrations for the industrial sectors referenced above as cited in either McKee and Wolf or the ASTM *Manual on Industrial Water and Waste Water*.

Table III-30. Industrial Sector Recommended Total Hardness Criteria or Limiting Concentrations, McKee and Wolf or ASTM (concentrations in mg/L as $CaCO_3$).

Industrial Sector	McKee and Wolf Criteria	1959/1966 ASTM Manual
Laundering	0 – 50	50
Carbonated Beverages	200 – 250	250
Metal Finishing	not given	no entry
Textile	0 – 50	20
Food Processing (general)	10 – 250	Not given
Fruit and Vegetable Canning and Freezing	100 – 200 legumes 25 – 75	not given legumes 25 – 75
Paper and Pulp Mills	100 – 200	50 – 180
Bottle Washing (under Dairy Industry)	< 180	No entry
Photography	< 200	No entry
Leather Goods	50 – 513	50 – 135
Sugar Manufacturing	90	No entry

A broader perspective on the quality characteristics of the raw surface waters that have been used by the various industries is found in the 1968 Green Book (Exhibit UC-28 at page 189). Updates to the Green Book discussions on industrial water use requirements were provided in *Water Quality Criteria 1972*, National Academy of Sciences – National Academy of Engineering, March 1973 (commonly referred to as the EPA "Blue Book", excerpt pages 368 – 396 are included as Exhibit UC-30). A brief entry on total hardness is also contained in *Quality Criteria for Water 1986*, EPA (commonly referred to as the EPA Gold Book). Exhibit UC-31 is the five page excerpt on hardness from the Gold Book, which cites to maximum hardness levels accepted by industry as a raw water source. The hardness concentrations presented in this document were taken from Blue Book Table VI-2 (Exhibit UC-30 at p. 370). The latest EPA criteria document update titled *National Recommended Water Quality Criteria: 2006*, Office of Water, Office of Science and Technology (4304T) does not contain specific criteria for industrial water use but does refer the reader back to the narrative statement in the Gold Book for the discussion on total hardness. Table VI-2 in the EPA Blue Book, titled *Summary of Specific Quality Characteristics of Surface Waters That Have Been Used as Sources for Industrial Water Supplies* is reproduced as Table III-31.

Strict adherence to the recommendations in Tables III-29 and III-30 indicates that it would seem to be necessary for a number of industrial surface water users to pre-treat raw water supply sources prior to the water's in-plant use and product manufacture. The possible exceptions would be those facilities located in the relatively "soft" water regions in northern and northeastern Minnesota. The conclusions and recommendations offered in the Industrial Water

Supplies section of the EPA Blue Book provide a good summary and approach in dealing with industrial water use criteria. These conclusions and recommendations are listed below:

Conclusions

- *Industry is diversified in kind, size, and product. It incorporates many processes, including different ones to achieve the same ends. Water quality requirements for different industries, for various industrial processes within a single plant, and for the same process in different plants vary widely.*
- *Water quality requirements at point of use, as distinguished from requirements at point of intake, are established for a number of industrial processes but are inadequately defined or nonexistent for others.*
- *Modern water quality treatment technology permits water of virtually any quality to be treated to provide the characteristics desired by industry at point of use. Occasionally, this may be costly; but in general the cost of treating water for specific processes is acceptable to industry, because it is only a small part of the total production and marketing costs.*
- *Although water quality at point of use is critical for many industrial processes, industry's intake water quality requirements are not as stringent as those for public water supplies, recreational or agricultural use, or support of aquatic life.*
- *Because of the diversity of industrial water quality requirements, it is not possible to state specific values for intake water quality characteristics for industrial use. Ordinarily these values lie between those that have been used by industries for sources of water and the quality recommended for other uses in other sections of this book.* [Table III-31, and Table VI-2 in Exhibit UC-30]

Recommendations

Desirable intake water quality characteristics for industrial water supplies can be meaningfully designated as a range lying between the values that have been used by industry for sources of water (Table VI-2) and the quality characteristics recommended for other water uses in other chapters of this Section. Values that exceed those in Table VI-2 would ordinarily not be acceptable to industry. [Table III-31]

Table III-31. Summary of Specific Quality Characteristics of Surface Waters Used As Sources for Industrial Water Supplies, Table VI-2 from page 370, Water Quality Criteria 1972, National Academy of Sciences, National Academy of Engineering, Washington D.C., 1972; (EPA "Blue Book" EPA.R3.73.033. March 1973.

TABLE VI-2—Summary of Specific Quality Characteristics of Surface Waters That Have Been Used as Sources for Industrial Water Supplies

(Unless otherwise indicated, units are mg/l and values are maximums. No one water will have all the maximum values shown)

Characteristics	Boiler Makeup water		Cooling Water				Process Water									
			Fresh		Brackish[a]								Mining Industry		Oil Recovery Injection Waters	
	Industrial 0 to 1,500 psig	Utility 700 to 5,000 psig	Once through	Makeup recycle	Once through	Makeup recycle	Textile Industry SIC-22	Lumber Industry SIC-24	Pulp and Paper Industry SIC-26	Chemical Industry SIC-28	Petroleum Industry SIC-29	Prim. Metals Industry SIC-33	Copper Sulfide Concentrator Process Water	Copper Leach Solution	Sea Water	Formation Water
Silica (SiO_2)	150	150	50	150	25	25	...	...	50	...	85					
Aluminum (Al)	3	3	3	3	...	...	...	...	...	...	...	...	...	12,000		
Iron (Fe)	80	80	14	80	1.0	1.0	0.3	...	2.6	10	15	...	...	12,000[g]	0.2	13
Manganese (Mn)	10	10	2.5	10	0.02	0.02	1.0	...	...	2						
Copper (Cu)	...	...	...	...	...	...	0.5									
Calcium (Ca)	...	...	500	500	1,200	1,200	...	...	...	250	220	...	1,610 ($CaCO_3$)	...	400	2,727
Magnesium (Mg)	...	...	...	...	...	...	...	...	...	100	85	...	...	12,000	1,272	655
Sodium & potassium (Na+K)	...	...	...	...	...	...	...	...	...	...	230	...	...	...	10,840	42,000
Ammonia (NH_3)	...	...	...	...	...	...	...	...	...	...	40					
Bicarbonate (HCO_3)	600	600	600	600	180	180	...	...	...	600	480	...	...	...	142	281
Sulfate (SO_4)	1,400	1,400	680	680	2,700	2,700	...	...	...	850	900	...	1,634	64,000	2,500	42
Chloride (Cl)	19,000	19,000	600	500	22,000	22,000	...	...	200[b]	500	1,600	500	12	...	18,980	72,782
Fluoride (F)	...	...	...	...	...	...	...	...	...	...	1.2					
Nitrate (NO_3)	...	...	30	30	...	...	...	...	...	...	8					
Phosphate (PO_4)	...	50	4	4	5	5										
Dissolved Solids	35,000	35,000	1,000	1,000	35,000	35,000	150	...	1,080	2,500	3,500	1,500	2,100	...	34,292	118,524
Suspended Solids	15,000	15,000	5,000	15,000	250	250	1,000	(c)	...	10,000	5,000	3,000				
Hardness ($CaCO_3$)	5,000	5,000	850	850	7,000	7,000	120	...	475	1,000	900	1,000	1,530			
Alkalinity ($CaCO_3$)	500	500	500	500	150	150	...	...	...	500	500	200	415			
Acidity ($CaCO_3$)	1,000	1,000	0	200	0	0	...	...	...	...	...	75				
pH, units	...	...	5.0-8.3	3.5-9.1	5.0-8.4	5.0-8.4	6.0-8.0	5-9	4.6-9.4	5.5-9.0	6.0-9.0	3-9	to 11.7	3-3.5	...	to 6.5
Color, units	1,200	1,200	...	1,200	...	...	...	...	360	500	25					
Organics:																
Methylene blue active substances	2[d]	10	1.3	1.3	...	1.3										
Carbon tetrachloride extract	100	100	(e)	100	(e)	100	...	...	...	...	...	30				
Chemical oxygen demand (COD)	100	500	...	100	...	200										
Hydrogen sulfide (H_2S)	...	...	...	...	4	4	...	...	...	...	20					
Temperature, F	120	120	100	120	100	120	...	...	95[f]	...	...	100				

[a] Water containing in excess of 1,000 mg/l dissolved solids.
[b] May be $\leq$1,000 for mechanical pulping operations.
[c] No particles $\geq$3 mm diameter.
[d] One mg/l for pressures above 700 psig.
[e] No floating oil.
[f] Applies to bleached chemical pulp and paper only.
[g] 12,000 mg/l Fe includes 6,000 Fe^{+}; and 6,000 Fe^{++}.
ASTM Standards 1970[a] or Standard Methods 1971[a]

D. NEED FOR 3B TO 3C USE CLASS CHANGE [VIII. class 3]

1. Introduction [VIII.D. need, class 3]

Two reasons have been identified for the need to implement the Class 3B to Class 3C changes. The first has to do with the overly restrictive nature of the Class 3B chloride and total hardness standards; and the second relates to the comparable standards that have been adopted by states adjacent to Minnesota as well as other states in EPA Region 5.

2. Restrictive Default Classification [VIII.D. need, class 3]

The broad application of the Class 3B use classification, particularly through the "Unlisted Waters" provisions of Minn. R. 7050.0430, needs to be reconsidered due to the restrictive nature of the chloride and total hardness standards that are assigned under this water use classification. The 100 mg/L chloride standard is overly restrictive in that it becomes the controlling standard that affects discharges to watercourses that have little potential for use as industrial source water supplies due to their limited stream flow characteristics. The 250 mg/L total hardness standard is also thought to be overly restrictive given the fact that in many areas of the state, natural background total hardness concentrations exceed this standard.

The salinity related parameters of chloride, sodium, salinity, total dissolved salts (total dissolved solids), bicarbonates, specific conductance, and total hardness have become increasingly problematic standards to address in the permitting process for a number of new or expanding facilities discharging to low flow receiving waters. For certain industrial and food processing sectors, increased salinity content in their wastewater effluents can be the result of process related chemical additions, water conditioning residues resulting from the pre-treatment of their incoming water supply to achieve a high degree of purity, and/or internal water conservation measures being practiced at the facility. These factors or practices can contribute to a build-up of dissolved solids in the effluent. Many of these dissolved constituents are not removed by conventional wastewater treatment technologies and therefore require specialized treatment processes for their removal.

A provision in Minnesota's water quality standards rule requires discharges of sewage, industrial waste, and other wastes to be controlled so that the applicable water quality standards will be maintained at all stream flows at or above the seven-day low flow with a 10-year recurrence interval ($7Q_{10}$; $30Q_{10}$ for ammonia; Minn. R. 7050.0210, subp. 7). Facilities discharging to low flow receiving waters that do not have adequate upstream dilution flows are faced with the potential of having the Class 3B standards applied as end-of-pipe effluent limits. Achievement of these limits can be costly; potentially requiring the addition of a reverse osmosis or nano-filtration types of treatment systems to remove the dissolved minerals from the waste stream. This type of treatment is also very energy intensive since the dissolved mineral constituents removed from the wastewater generally require an evaporative treatment step to concentrate the residual solids to an appropriate level that allows for landfill disposal. Given the capital and operating costs associated with these salt removal treatment technologies, there has been a notable increase in the number of variance requests from new and expanding industrial facilities faced with the assignment of effluent limits associated with these salinity related standards.

Even though the recent focus on salinity related parameters has been directed towards industrial dischargers, salinity related concentrations can also be found at elevated levels in certain municipal wastewater treatment facility effluents. The most likely source contributing to this problem comes from individual home water softening systems that discharge to these treatment plants. Most home water softening systems use an ion exchange unit. In this type of ion exchange process, the calcium and magnesium hardness cations are removed by passing the water through an ion exchange resin. When this is done, the calcium and magnesium cations are "exchanged" for the sodium ions in the resin. Periodic regeneration of the ion exchange resin is necessary in order to "strip" the resin of the accumulated calcium and magnesium ions and regenerate the sodium ion content of the resin material. This regeneration process is usually accomplished by flushing the resin material with a salt-brine (sodium chloride) solution. In municipalities, this brine solution is discharged to the sanitary sewer system, increasing the chloride load to the wastewater treatment facility.

While it is recognized that this ion exchange regeneration process can significantly increase the chloride concentration in municipal wastewater effluents, to date salinity related effluent limits have not been assigned to municipal facilities. Albeit a remote possibility at this time, the potential does exist where municipal treatment facilities could also be assigned stringent salinity related effluent limits, particularly if they are geographically located in hard water areas of the state. Should this happen, staff anticipates a dramatic increase in the number of variance applications from cities seeking relief from these limits.

From an administrative standpoint, if the Class 3B to Class 3C changes are adopted, fewer variance requests would be anticipated. Variance application, review, and processing can be time intensive and costly to both the state and the applicant. More importantly, however, is the fact that the proposed amendments will enable the Class 2 aquatic life based chloride standard to become the controlling standard for use in calculating chloride effluent limits. The Class 2 aquatic life based chloride standard has long been perceived to be a more defensible standard as compared with the Class 3B standard when processing variance applications. For those situations where the discharge is to a low flow watercourse, which due to the small flow, has limited potential for industrial uses, the Class 2 chloride standard becomes the more scientifically based and reasonable standard to protect the resource.

3. <u>Industrial Use Standards of Other States</u> [VIII.D. need, class 3]

The Class 3B to Class 3C changes would also bring Minnesota's chloride standards closer in-line with those of our neighboring states of North and South Dakota, Iowa, Wisconsin and the other EPA Region 5 states of Michigan, Illinois, Indiana and Ohio. While ambient total hardness concentrations are needed to determine water quality standards for certain trace metals, Minnesota is unique among these states in its inclusion of total hardness as an actual water quality standard. Exhibit UC-20 provides a comparison summary of the chloride water quality standards for Minnesota and these other states.

4. Summary [VIII.D. need, class 3]

The proposed changes to the “default” industrial use classification from Class 3B to Class 3C will allow for the application of less restrictive chloride and total hardness standards for all waters classified under the “unlisted waters” provisions of Minn. R. 7050.0430, and for a subset of waters classified in Minn. R. 7050.0470. These proposed changes will bring the chloride standards closer in-line with neighboring states’ standards. None of the other neighboring states or other Region 5 states has a water quality standard for total hardness. A need also exists for a broader evaluation of the salinity related standards found in Minn. R. 7050 and this review may result in proposed amendments for these standards during a future rulemaking.

E. REASONABLENESS OF CLASS 3B TO 3C CLASSIFICATION CHANGES, REQUIRED INFORMATION [VIII. reasonableness, class 3]

1. Introduction [VIII.E. reasonableness, class 3]

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed Class 3B to 3C water use classification changes.

2. Classes of Persons Affected by the Proposed Rule Amendments, Including Those Classes that Will Bear the Costs and Those that Will Benefit [VIII.E. reasonableness, class 3]

The persons potentially most impacted by the proposed change in the Class 3 default classification from 3B to 3C are the municipalities and industries that withdraw surface waters for drinking or for industrial uses, particularly those that take water from relatively low flow streams. These entities could see increases in the costs to treat the water they use because of possible increases in the concentrations of chloride and total hardness in the source water. Total hardness appears to be the standard most associated with potential increased costs because it is associated with water softening practices. In general, treatment costs increase as the concentrations of these constituents increase in source waters (see Sections VIII.G.3 and VIII.G.4)

For the most part the Agency’s analysis of potential increased treatment costs due to this proposed change represents the very high end of potential costs. True costs are likely to be much lower for most facilities and lower still for those facilities appropriating water from main-stem river systems with higher flow volumes.

If adopted, the proposed changes will likely provide the greatest benefit to certain industrial facilities in the food processing, ethanol, and water conditioning sectors that have an existing or future wastewater discharge to low flow receiving waters. This potential “benefit” is tempered by the fact that even with adoption of the proposed changes, the saline nature of some of these effluents indicates that additional source water or wastewater treatment will be required even to meet the less restrictive standards. There is a possibility that the classification changes will reduce the need for variances, which if true will save effected parties and the Agency administrative costs. The Agency has not attempted to quantify these possible cost savings, but they would likely to be small.

The citizens most likely to be impacted are those that live in the communities that appropriate surface waters for drinking water purposes from river systems that experience seasonal low flows. Additionally, more wide-spread and widely-distributed cost impacts could be felt by citizens and industry if the power generating facilities were to be impacted by the proposed Class 3 to Class 3C amendments. The potential costs incurred by municipal or industrial entities would be passed on to customers in the form of higher water usage charges or increased commodity prices.

The general public recreating on waters of the state will neither benefit or be impacted by the proposed changes. Agricultural, commercial, and other water appropriators using surface waters for irrigation purposes could be impacted by the proposed changes but these impacts are thought to be minimal since only one percent of the total surface water appropriations are for irrigation versus a 31 percent use of ground water for this purpose. Environmental groups may be concerned about potential environmental consequences of the proposed changes. These potential impacts are impossible to quantify. However, the Agency believes that any environmental harm should be negligible.

3. <u>Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues</u> [VIII.E. reasonableness, class 3]

The staff does not anticipate any costs to the Agency or other agencies as a result of the proposed Class 3 changes. The Agency might see modest cost savings, if the adopted changes result in fewer variance requests from permittees. Also the issuance of permits may be simplified for the affected dischargers.

4. <u>Determination of Whether There Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose</u> [VIII.E. reasonableness, class 3]

MPCA staff do not believe there is a less costly or less intrusive approach to solving this longstanding problem of the nearly universal applicability of unnecessarily stringent industrial use standards for chloride and total hardness.

5. <u>Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments</u> [VIII.E. reasonableness, class 3]

A change in the default Class 3 classification applicable to most surface waters (plus 106 waters listed in Minn. R. 7050.0470) is the least costly means open to the Agency to solve the problem mentioned in the previous Section. This approach is far less costly than the alternative of researching industrial use standards and proposing alternative numeric standards. Although this may be included as part of a future rulemaking because of the uncertain basis for the current Class 3 standards (Section VIII.C), and the fact that they have never been updated or revised since adopted in 1967. A complete review is overdue but it will be time consuming. The Agency did not seriously consider this alternative to what is being proposed because of the lack of time to include such a review in this rulemaking.

6. <u>Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties</u> [VIII.E. reasonableness, class 3]

The possible costs to affected parties are discussed in Section VIII.G.

7. <u>Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties</u> [VIII.E. reasonableness, class 3]

Not adopting the proposed Class 3 change would mean continuation of the status quo for the Agency and affected permittees. The need for certain permittees (those on low flow streams or those with high background concentrations in source water) to meet stringent standard-driven effluent limits would remain the same. Also the need for permittees to seek variances to the Class 3B standards (which they may need even with relaxed standards), and the complications associated with preparing and issuing permits for the impacted facilities would remain the same. However, not adopting the proposed change could save potentially affected parties added treatment costs as described in Sections VIII.G.3 and VIII.G.4.

8. <u>Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference</u> [VIII.E. reasonableness, class 3]

The Agency is not aware of any differences in what is being proposed and federal regulations.

9. <u>Consideration and Implementation of the Legislative Policy Under Minn. Stat. §§ 14.002 and 14.131</u> [VIII.E. reasonableness, class 3]

Minnesota Stats. §§ 14.002 and 14.131 require state agencies, whenever feasible, to develop rules and that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

Classification designations and the associated numeric standards are by necessity prescriptive, and therefore we believe not inconsistent with the spirit of this statute. The general concepts of how prescriptive or flexible a water quality rule should be are discussed in SONAR Book 1, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [VIII.E. reasonableness, class 3]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made. These specific notification requirements are discussed in Section IV.C.10 and will not be repeated here. The Agency outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I.

The Agency made a special effort to solicit comments and input from parties potentially impacted by the Class 3B to 3C change (Section VIII.G.5). A solicitation for comments was sent to members of the Minnesota Chamber of Commerce Environment and Water Quality Committee (Exhibit UC-34). This organization is comprised of a number of representatives in the food processing, power generation, mining, petroleum refining industries, water treatment engineering companies, municipal wastewater treatment facilities, consultants and law firms. In general, very few comments were received.

11. Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local Governments [VIII.E. reasonableness, class 3]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

12. Agency Determination Regarding Whether Cost of Complying with Proposed Rule in the First Year After the Rule Takes Effects Will Exceed $25,000 [VIII.E. reasonableness, class 3]

Minnesota Stat. § 14.127, subd. 1 and 2 requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees.

The Agency outlines potential "worst-case" costs in Section VIII.G, and costs could exceed $25,000 for some parties covered by this statute. However, it seems very unlikely that there will be any costs to any party in the first year if this proposal is adopted. The reasons are:

- The costs discussed in Section VIII.G are based on the rather extreme premise that instream chloride and total hardness concentrations will increase to match the level of the standards (250 mg/L chlorides and 500 mg/L hardness) after the change is adopted.
- Even if concentrations do increase over time as a result of the change in standards (we have no evidence that they will but they may increase for reasons independent of the standards), it is very unlikely they would increase measurably in one year after enactment.
- NPDES/SDS permits are valid for five years. Even if the permit for an impacted facility expires the day after the changes were adopted (and upstream concentrations increased necessitating additional treatment), the facility would be afforded time to design and build the additional treatment facilities.

It is conceivable that an impacted facility could incur costs greater than $25,000 in the first year if, 1) ambient chloride or hardness concentrations increase enough to trigger the need for additional treatment, and 2) they have the physical facilities and plant equipment in place for additional treatment and the added costs are due to changes in the operation of the facility. The Agency views this scenario as highly unlikely.

F. REASONABLENESS OF CLASS 3B TO 3C CLASSIFICATION CHANGES [VIII. reasonableness, class 3]

1. Introduction [VIII.F. reasonableness, class 3]

The proposed Class 3B to Class 3C amendments are reasonable because they mean a more defensible set of standards (chlorides and total hardness) and potential effluent limits applicable to:

- Facilities that employ water conservation measures; and
- Facilities located in areas of the state that have waters naturally high in dissolved solids (especially in relation to the hardness standard).

Also, the proposed Class 3B to Class 3C amendments:

- May help reduce the need for variances in the future; and
- The change in the use classifications does not mean a change in the water quality of Minnesota’s surface waters.

2. Limited Water Quantity Situations and Variances [VIII.F. reasonableness, class 3]

Under the current use classification system the Class 3B 100 mg/L chloride standard has become, or has the potential of becoming, the controlling standard for many discharges to low flow receiving waters. Recently this has prompted the filing of a number of variance applications from existing and potential dischargers to these receiving waters. Even with the proposed Class 3B to Class 3C amendments which would change the applicable water quality standard for chloride from 100 mg/L to 230 mg/L, (based on the Class 2B chronic standard for chloride), Agency staff anticipate that there will continue to be facilities who pursue variances from the more lenient chloride standard due to their source water quality and the number of times this water is recycled throughout the particular facility.

In analyzing the merits of these variance requests, it is reasonable to assess these discharges from the perspective of their potential impact on the aquatic community rather than from the perspective of a potential industrial use of these low flow receiving waters. The lack of water quantity limits these receiving waters for use as industrial, commercial, or municipal source water supplies. Assessing the potential aquatic life impacts in these instances relating to chloride and total hardness is believed to be a more defensible approach to use in variance evaluations and the process by which effluent limits are assigned.

3. <u>High Background Concentrations</u> [VIII.F. reasonableness, class 3]

In general, total hardness effluent limits have not been assigned to either industrial or municipal wastewater discharges. The only exception to this policy has been a mining facility in northeastern Minnesota. Over the last couple of years, however, greater scrutiny has been directed toward food processing and ethanol production facilities with effluents containing high levels of dissolved solids, including the calcium and magnesium ions which make-up total hardness. Many of these facilities are located or are being proposed in areas of the state where both surface and ground waters are high in dissolved solids. Some of these same areas of the state are places where water conservation measures are required given the scarcity of water resources to draw upon. For those facilities with wastewater discharges, the net effect is effluents high in dissolved solids being discharged to receiving waters that in many cases have little or no stream flows at $7Q_{10}$ conditions.

Historically, effluent hardness has not been considered to be a significant problem needing attention or control. Unlike the chloride standards, there is no comparable drinking water or aquatic life standard for either total hardness or the calcium and magnesium ions making up this water quality characteristic. The reasonableness of changing the Class 3B water use assignments to the Class 3C uses lies primarily with the fact that surface and ground waters in many areas of the state have background water quality that naturally exceed the Class 3B hardness water quality standard. Couple this with the water conservation provisions in Minn. R. 6115.0770 that promote the wise and efficient use of water resources. It seems inconsistent and counterproductive to implement water conservation practices (in-plant recycling) on one hand and then on the other, apply stringent effluent limits on the wastewater effluents that have elevated dissolved solids due in part to water conservation practices. Rather than being credited for implementing water conservation practices, these facilities are in a sense being penalized for their water conservation efforts. This makes implementing this largely voluntary program to conserve water that much more difficult to achieve.

4. <u>Change in Standards Does Mean Change in Water Quality</u> [VIII.F. reasonableness, class 3]

The Class 3B standards for chloride and total hardness when first adopted in the 1960s were intended to provide industries with source waters suitable for their general use with only a moderate degree of treatment. This remains the goal of the Agency. The proposed Class 3B to Class 3C amendments in themselves will not materially alter the quality of the raw source waters that are utilized by industrial facilities and therefore will not substantially impact the use of these surface waters for the industrial processes.

As a general rule, wet industries or power generation facilities are not likely to rely on low flow rivers or streams as their source water supplies. The Class 3B to Class 3C amendments are being proposed in order to provide some balance between the actual or potential costs of treating the water to an industry specific quality level with the actual or potential costs associated with chloride and/or total hardness removal from industrial or municipal wastewater effluents. If there are situations where chloride or total hardness effluent limits are needed to accommodate the quality requirements of a downstream water appropriator, then Agency staff believes that it is reasonable that these assignments be done on a case-by-case basis rather than through an effluent limit assignment process based on an automatic presumptive industrial use of the particular receiving water.

G. ECONOMIC IMPACT OF CLASS 3B TO 3C CLASSIFICATION CHANGES [VIII. economics, class 3]

1. <u>Introduction</u> [VIII. G. economics, class 3]

In this Section we assess the potential cost implications of the proposed Class 3B to Class 3C changes. Municipalities and industries that withdraw water for drinking or industrial uses may be impacted. In general, the Agency has evaluated potential added costs by making “worst-case” assumptions. In this way we can quantify “maximum” possible costs. True costs are likely to be much lower. This is because the fact that the standard changes does not mean that chloride and total hardness concentrations in rivers and streams will increase. Effluent limits and other controls on the discharge of these water quality characteristics are not changing and will still be implemented.

There is a possibility that the change will reduce the need for variances, which if true will save the effected party and the Agency administrative costs. The Agency has not attempted to quantify these possible cost savings, but they would likely to be small.

2. <u>Water Withdrawals</u> [VIII. G. economics, class 3]

Assessing the potential costs associated with the Class 3B to Class 3C changes first required the identification of those facilities in the state that utilize surface waters. The Minnesota Department of Natural Resources (MDNR) is the state agency responsible for the issuance of water appropriation permits and any individual, agency, corporation, or entity that appropriates water in excess of 10,000 gallons per day or 1 million gallons per year must obtain a water appropriation permit from the MDNR. MDNR provided the Agency with a listing of 642 active non-irrigation surface water permits. This list contains the name of the water appropriator, the water name and location of the water withdrawal, a descriptive water use code, the permitted pumping rate and yearly maximum water appropriation, and five years of reported water withdrawal records (Exhibit UC-32). Additional information was obtained from the MDNR water appropriations permit program's Web site that has a compilation of Minnesota water use data by major water use categories for 2005.

In Minnesota an estimated 1,428 billion gallons of surface and ground water was used by water appropriation permit holders in 2005. The major water use categories, water use percentage estimates, and a category description are listed as follows.

Power Generation – 63%. The water is used to cool power generating plant equipment. This is historically the largest volume of use and relies almost entirely on surface water sources. Power generation use is primarily non-consumptive, in that most of the water withdrawn is returned to its original source.

Public Supply – 15%. Water is distributed by community suppliers for domestic, commercial, industrial, and public users. The category relies on both surface and ground water sources.

Industrial Processing – 11%. Water under this category is used in mining activities, paper mill operations, and food processing. Three-fourths or more of withdrawals are from surface water sources.

Irrigation – 6%. Water is withdrawn from both surface water and ground water sources for major crop and noncrop uses. Nearly all irrigation is considered to be a consumptive use.

Other – 5%. This category refers to waters that are used for activities such as air conditioning, construction dewatering, water level maintenance, and pollution abatement.

Of the 642 active non-irrigation permits noted on Exhibit UC-32, approximately 500 permits (78%) have been issued for activities that include: sand and gravel washing operations (code 244); construction dewatering activities (code 252); lake level, mine, quarry, and sand/gravel pit dewatering activities (codes 261, 262, 263, and 264); aquaculture uses (code 272); snow and ice making (code 273); and wild rice operations (code 296). The proposed Class 3B to Class 3C amendments will have little to no impact on these activities.

The remaining water appropriation permits have been issued primarily for municipal waterworks (code 211); cooling water use for power generation facilities (codes 222, 223, 225, 226, 229); commercial cooling (code 231); agricultural food and livestock processing (code 241); pulp and paper processing (code 242); and mine processing (code 243). In this latter grouping, the municipal water treatment plants located in "hard" water areas of the state show the greatest potential for increased cost of treatment if the proposed Class 3B to Class 3C amendments were to be adopted and if there is an increase in the total hardness concentrations of the source water supplies.

3. <u>Municipal Water Treatment Facilities</u> [VIII. G. economics, class 3]

In order to quantify possible additional costs, data was obtained from the Minnesota Department of Health, which identified 22 community water systems that utilize surface waters, either wholly or in part, as their source water supplies. Seven of these communities withdraw water from Lake Superior, the Rainy River, or Burntside Lake. These waterbodies will retain their current Class 3A or Class 3B use classifications. Fifteen of these community water systems are on waters that would be affected by the proposed Class 3B to Class 3C changes. Of this list of fifteen, eight municipalities include water softening as part of their water treatment processes (Table III-32). The remaining seven of the fifteen are located in the soft water areas in the northeastern part of the state.

Table III-32. Municipalities Potentially Impacted by the Proposed Class 3B to 3C Classification Change.

Municipality	Surface Water Source	Avg. Daily Rate, gallons per day
Minneapolis	Mississippi River	70,000,000
St. Paul Regional Water Services	Mississippi River/ Chain of Lakes	45,000,000
St. Cloud	Mississippi River	7,473,521
Moorhead	Red River of the North	4,400,000
Fergus Falls	Otter Tail River via Hoot and Wright Lakes	1,500,000
Fairmont	Budd Lake	1,485,000
Thief River Falls	Red Lake River	1,180,000
East Grand Forks	Red Lake River	1,120,000

Drinking water sold to users from community water systems is based on a charge per unit of measure represented by either 1,000 gallons or 100 cubic feet. One-hundred cubic feet of water is equivalent to about 750 gallons. A 1995 reference published by the American Water Works Association indicated that in the United States the typical cost for drinking water was about $2.00 for 1,000 gallons. This same reference indicated that 1,000 gallons of water would serve one consumer for about 20 days. Of the amount charged for 1,000 gallons of tap water, about $0.30 - $0.40 goes to water treatment, the rest is for operation and maintenance of the plant, storage and distribution systems, and employee wages. Water softening costs would be a subset of this $0.30 - $0.40 per 1,000 gallon range in treatment costs.

In order to assess projected water softening costs for the community supply systems using surface waters identified above, Agency staff, working with the Minnesota Section of the American Water Works Association, sent an informal inquiry to these communities asking for estimated water softening treatment costs if the total hardness standard were to changed from 250 to 500 mg/L $CaCO_3$. Summaries of the responses are provided below. Potential chloride increases were not evaluated since the secondary drinking water standard for chloride is 250 mg/L, which is the same as the Class 3C chloride standard.

The following cost estimates assume the total hardness of the source water increases from existing ambient levels to the level of the Class 3C standard, 500 mg/L as $CaCO_3$. Thus the potential increased costs discussed below are considered worst case scenarios. As previously stated, the fact of changing the standard does not mean that concentrations in rivers and streams around the state will increase to the level of the standard or increase at all.

Minneapolis, St. Paul Regional Water Services, and St. Cloud. Representatives from these three water treatment plants indicated that the proposed Class 3B to Class 3C amendments would not be an issue of concern to their on-going water softening operations. This view in part was based, 1) on the high volume flow rate of the Mississippi River (the $7Q_{10}$ of the Mississippi River at Anoka is 1,300 cubic feet per second or approximately 840 million gallons per day), and 2) the remote likelihood that the total hardness of the river would ever have a sustained concentration anywhere near 500 mg/L $CaCO_3$. The total hardness of the Mississippi River in the north metropolitan area generally averages around 180 mg/L as $CaCO_3$.

Moorhead. A detailed response was provided by the city of Moorhead on hardness removal costs based on their 2006 chemical bid prices of $137.50 per ton for lime and $233 per ton of soda ash and an on-average cost for lime sludge disposal of $40 per million gallons of water treated. A range of projected costs were calculated for different types of hardness resulting from the variations of anions associated with the calcium and magnesium cations in the river water. Monitoring data from the Red River of the North in the Moorhead area shows an average total hardness of around 250 mg/L $CaCO_3$. The additional removal costs to treat for calcium and magnesium carbonate and bicarbonate hardness ranged from $130 - $220 per million gallons of water treated. The calcium and magnesium non-carbonate removal costs, hardness dominated by the presence of calcium and magnesium sulfates or chlorides, ranged from $300 - $480 per million gallons of water treated. Using the lower ($130) and upper ($480) projected cost estimates and an average of 1.337 billion gallons per year withdrawn from the Red River of the North results in a range of additional treatment costs for softening of raw water with a total hardness around 500 mg/L $CaCO_3$ from $174,000 - $642,000 per year. This translates to an average increase to a four-person residential household of $11.40 – $42.05 per year. This would represent a 4 – 15 percent increase in the yearly water-volume usage charge to the four-person household. (Four-person household cost increase estimates based on a 60 gallon per day per person water usage, a water volume charge of about $3.20 per 1,000 gallons at the tap, and average current total hardness concentration of 250 mg/L $CaCO_3$ for the Red River of the North at Moorhead, Minnesota.)

Fergus Falls. The total hardness of the water appropriated from Wright Lake by the Fergus Falls water treatment plant is generally in the range of 180 – 200 mg/L $CaCO_3$. In 2005 Fergus Falls used 482 tons of lime to soften 559,837,000 gallons of water to produce a finished water with a total hardness of around 84 mg/L $CaCO_3$. The total cost for the lime used in 2005 was $66,900. The 2005 cost of the lime chemical alone was approximately $120 per million gallons of water treated. This represents $10.50 per year for a four-person household to cover the softening cost of the lime used. If instead of treating raw water with a hardness of around 190 mg/L $CaCO_3$ the incoming water raises to a concentration of 500 mg/L, the estimated annual softening charge becomes $30 per four-person household. This estimate factors in a lime sludge disposal cost of $40 per million gallons of water treated.

Fairmont. The City of Fairmont uses a lime/soda ash chemical precipitation softening process to treat lake water from Budd Lake to a level between 85 - 100 mg/L hardness. At the time of the survey response, the lake water was running about 208 mg/L total hardness as $CaCO_3$ and the average daily production was 2.3 million gallons. The Fairmont Water/Wastewater Superintendent provided a breakdown on the individual costs for lime and soda ash to treat the raw water on an incremental basis over a total hardness range between 200 to 500 mg/L $CaCO_3$. Based on these calculations, it costs $125 per million gallons to soften incoming raw water at 200 mg/L hardness versus $316 per million gallons for incoming water at a total hardness of 500 mg/L $CaCO_3$. Chemical costs for water softening would increase from $105,100 to $265,400 per year to treat incoming water with a total hardness of 500 mg/L $CaCO_3$. After adding in an estimated lime sludge disposal cost comparable to that cited above, it would change the yearly softening proportion of the water bill for a household of four-persons from $14.45 to about $31 per year.

<u>Thief River Falls</u>. Total hardness of the Red Lake River in the Thief River Falls area ranges between 180 – 200 mg/L as $CaCO_3$. The city uses lime to soften the finished water to a total hardness of about 120 mg/L. In 2005 the city treated 433,654,000 gallons of water with a lime cost totaling $28,700. A proportional estimate to treat incoming raw water at a 500 mg/L hardness would result in a lime usage cost of approximately $75,500 per year. An additional $17,000 per year is estimated to cover the cost for spent lime sludge disposal.

<u>East Grand Forks</u>. The East Grand Forks water treatment plant's water intake on the Red Lake River is upstream of a low-head dam just upstream of the Red Lake River's confluence with the Red River of the North. Information received from the city indicated that they estimate that the combined costs for pretreatment and water softening chemicals to be approximately $0.40 per thousand gallons. Minnesota Department of Health data indicates that water plant uses cationic polyelectrolyte chemicals in the coagulation phase of their pretreatment process as well as lime and soda ash for their chemical precipitation water softening. Based on an average yearly water appropriation of 419 million gallons, and assuming about one third of the $0.40 per thousand gallons goes for water softening chemicals, the city currently spends about $55,300 per year on chemicals to soften the water for their customers. Treatment cost estimates for additional chemicals specific to treating incoming raw water with hardness levels at 500 mg/L would bring this yearly allocation to approximately $131,700.

The preceding cost estimates are offered as examples of potential costs associated with treating source waters with total hardness increases to 500 mg/L $CaCO_{3.}$ These estimates do not however, factor in other indirect costs related to higher solids removal requirements which could reduce the overall production capacities at these water treatment plants. On average, if source waters used by the above listed facilities increase to the Class 3C hardness standard, yearly softening costs might be expected to double or triple above the dollar amounts currently being spent for this water treatment process.

4. <u>Power Generating Facilities</u> [VIII. G. economics, class 3]

As noted above, power generation facilities as a category are the largest volume users of surface waters in the state; an estimated 902 billion gallons in 2005. Most of the water used at these facilities is once-through, non-contact cooling purposes although some of the surface water may also be used for boiler and other make-up water needs. These make-up waters, in particular water used in high pressure boilers, undergo extensive corrosion inhibition, scale control treatment, and water conditioning prior to use. The once-through, non-contact cooling water on the other hand is generally used untreated except for intermittent feed additions of biocidal chemicals normally during the summer months to kill or inhibit biological growth. In Exhibit UC-30 Table VI-2 at p. 370 and Table VI-5 at p. 377 characterize the chloride and total hardness water quality concentrations of cooling waters that have been used and considered acceptable source waters. Under the freshwater subcategory, the maximum chloride concentrations listed for once-through cooling waters is 600 mg/L and 500 mg/L for make-up recycle waters. Under this same freshwater subcategory, the total hardness concentration for the once-through cooling is 850 mg/L as $CaCO_3$ and make-up recycle waters ranging from 650 - 850 mg/L as $CaCO_3$.

For power generation facilities with closed-cycle, recirculating cooling water systems, less surface water appropriation is needed when compared to once-through cooling water systems, but water conditioning chemical additives are generally required to prevent corrosion, scale build-up, and biological fouling of the condensers, cooling towers, and water distribution lines. Water from these evaporative closed-cycle cooling systems is lost through evaporation, drift, or blowdown. Drift is defined as the mechanical entrainment of the water droplets in the rising air exhausted from the top of the cooling tower. In order to restore the water lost through evaporation and drift, a continuous quantity of make-up water must be added to the recirculating water system. As water evaporates from a closed-cycle cooling system, dissolved and suspended substances gradually build-up and remain in the recirculating cooling water. In order to control this build-up to reasonable levels, a quantity of the recirculating cooling water is purposely discharged on a continuous basis. The cooling water discharged is called blowdown, and it must be replenished by make-up water to maintain the water balance.

An example of a facility using a recirculating cooling system is the Xcel Energy Sherburne County Generating Plant (Sherco) at Becker, Minnesota. Sherco is Minnesota’s largest electric generating plant with three coal-fired units producing a total of 2,400 megawatts of electricity. This plant withdraws water from the Mississippi River for cooling water purposes. Water is also obtained from on-site wells and from the City of Becker’s water treatment plant for in-plant water uses and drinking water. Currently the MDNR allows this facility to appropriate 10,750 million gallons per year from the Mississippi River. The reported 2005 surface water withdrawal by Sherco was 6,885.8 million gallons, plus an additional 374.8 million gallons of ground water from wells on the site. Sherco intermittently discharges cooling tower blowdown as an effluent to the Mississippi River. In 2005, Sherco reportedly discharged 1,070.92 million gallons of cooling tower blowdown water.

Information presented in Sherco’s 2005 annual report indicates that the recirculating cooling water systems concentrate the solids and chemical constituents of ambient river water until the specific conductance of the cooling water reaches approximately 1900 – 2000 microsiemens per centimeter. When this level of specific conductance is reached, most chemical constituents and suspended and dissolved solids are concentrated approximately six to ten times higher than levels in the ambient river water. Upstream ambient monitoring of the Mississippi River over the last 22 years shows yearly average total hardness of 153.8 mg/L CaCO3 (range 130 – 178 mg/L) and an average chloride concentration of 7.8 mg/L (range 5 – 12 mg/L). Cooling tower blowdown water that does not get recycled-back for in-plant use is the only effluent discharge from the facility. The excess blowdown is discharged to the Mississippi River via a holding pond.

Many recirculating cooling water systems operate at a slightly scale-producing condition. The objective of this type of operation is to develop a calcium carbonate film on the metal surfaces to prevent, or retard, corrosion. An operational challenge to this method of corrosion control is to maintain coverage of the carbonate film yet manage the system so the film does not become so thick that it significantly reduces heat transfer or clogs the condenser tubes. Minimization of excessive amounts of calcium carbonate ($CaCO_3$) scale in large evaporative cooling water systems is commonly done through the addition of sulfuric acid to reduce alkalinity of the source water. This acid addition form of treatment converts calcium bicarbonate dissolved in the incoming make-up water to volatile carbon dioxide and calcium sulfate. Calcium sulfate is more soluble than calcium carbonate and is managed at acceptable operating levels through periodic blowdown of the cooling water system. While sulfuric acid addition is considered to be less expensive than complete softening, it requires the installation of automatic controls to adjust the acid feed rate and maintain pH conditions so as to not cause excessive corrosion.

The typical quantity of sulfuric acid used for cooling tower pH and alkalinity control at the Sherco facility is reported to be about 500,000 gallons of 92 percent H_2SO_4 per year.   Based on an estimated cost for sulfuric acid at $200 per ton, annual acid addition chemical costs for the closed-cycle cooling tower system is on the order of $746,000 per year. This estimated cost is in addition to the costs associated with the bromine and chlorine based additives to control biological growth and the molybdenum-based corrosion inhibiting salt also being used in the cooling water system. If under a hypothetical situation the hardness of the make-up water were to increase from 150 mg/L to 500 mg/L $CaCO_3$, this annual chemical cost would more than triple, assuming a linear relationship between the increases in total hardness and required acid addition volumes.

An incremental cost comparison such as this could be considered a conservative estimate based in part on the anionic chemical constituency of the hypothetical source water with a total hardness of 500 mg/L $CaCO_3$. If for instance this hypothetical source water was dominated by noncarbonate hardness compounds with high concentrations of the sulfate anion, the calcium sulfate $CaSO_4$ solubility product may be exceeded in the recirculating water which can then lead to precipitation and $CaSO_4$ scale development in the system.   The $CaSO_4$ concentrations could then become the limiting factor for this acid addition type of water conditioning for scale prevention. Should such a scenario develop, other more costly cooling water treatment methods such as cold lime-soda softening of the make-up water or sidestream filtration and warm lime-soda softening of a portion of the recirculating water could become viable alternatives (Exhibit UC-33 at p. 241). Another option in the operation of the facility which would accommodate the use of source waters with higher total hardness levels could be a reduction in the number of times the water is recycled in the cooling system through an increase in the blowdown rate. This operational management approach is best suited in situations where available source water quantities are plentiful.

5. <u>Comments from Industries and Impacts on the Paper Industry</u> [VIII. G. economics, class 3]

As noted earlier in the discussion on the municipal water treatment facilities located on the Mississippi River, significant increases in the total hardness or chloride concentrations on the major river systems where most of the major power plants and other large surface water users are located seems to be very remote. While there is value in estimating potential costs impacts to these facilities that theoretically could result from the Class 3B to Class 3C amendments, as a practical matter total hardness or chloride concentrations along these river systems are expected to remain close to their current concentrations irrespective of the proposed classification changes. Early on when the Class 3B to Class 3C changes were being considered by Agency staff, a solicitation for comment was sent to members of the Minnesota Chamber of Commerce Environment and Water Quality Committee (Exhibit UC-34). This organization is comprised of a number of representatives in the food processing, power generation, mining, petroleum refining industries, water treatment engineering companies, municipal wastewater treatment facilities, consultants and law firms. This solicitation requested input from an industrial user's perspective on the proposed change in the applicable chloride and total hardness standards for surface waters of the state that serve as source water supplies for many of these industries. One response was received to the solicitation from an individual representing Sappi Fine Paper North America, Sappi Paper Cloquet LLC (Sappi Paper) located in Cloquet, Minnesota. Sappi Paper's comments concerned three issues: 1) increased corrosion in their carbon steel lines; 2) recovery boiler tube corrosion and lower dust melting temperature; and 3) increased hardness/chloride concentrations resulting from increased closure in the system. As noted in the Agency's response, Exhibit UC-35, the source water supply for the Sappi Paper facility comes from Lake Superior, which is classified as a Class 3A water. No change in industrial use classification of Lake Superior is being proposed. Very few other comments were received.

While Sappi Paper will not be affected by the proposed Class 3B to Class 3C amendments, a discussion of the issues raised in their solicitation response follows. The Sappi Paper facility at Cloquet and the Boise Cascade mill along the Rainy River in International Falls are the two kraft paper mills in Minnesota. Wood pulp manufactured by the kraft pulping process basically separates the cellulose fibers from the lignins that bind these fibers together through a "cooking" process at high temperatures and pressure in an alkaline pulping liquor that contains sodium hydroxide and sodium sulfide. After separation producing this pulp, the spent pulping liquor is evaporated to a high concentration and then burned in a recovery boiler to recover energy to produce steam. The resulting inorganic chemical ash that remains after this combustion process is then used to re-constitute fresh pulping liquor. Some of these inorganic chemicals are also recovered in the electrostatic air emission control systems on the recovery furnaces.

As kraft mills increase their degree of internal recycling, non-process elements also accumulate within the system. Chloride and potassium are two non-process elements that can accumulate to high levels in highly closed pulp mills. High levels of chloride and potassium in the liquor can lead to operational problems in the recovery boilers by accelerating the plugging of the flue gas passages and increasing the rate of corrosion of the boilers by lowering the melting temperature of the ash generated during the firing process. This lowering of the melting point can result in a build-up of sticky deposits which can result in unscheduled maintenance downtime in order to go in and water wash these deposits from the boiler. A number of articles published in the Technical Association of the Pulp and Paper Industry Journal indicate that chloride and potassium are enriched in the electrostatic precipitator dust from the recovery boilers. Several studies indicate that the low dust temperature operational problems can be managed by various techniques that lower the chloride and potassium levels through: ion exchange treatment of dissolved electrostatic precipitator dust and certain process liquors, or periodic purges of a small fraction of the electrostatic precipitator dust that is collected from the air emission control systems (Exhibits UC-36, UC-37, and UC-38).

Total hardness concerns related to the build-up of scale in the mill's water supply are similar to those faced by other industries with scale build-up in piping and boiler systems that can diminish heat transfer capabilities and increase pumping requirements. A reference in Exhibit UC-30 at page 383 indicates that elevated levels of total hardness in paper mills can also interfere with washing operations and can cause fouling in the resin sizing (paper surface finishing) and the digestion processes. Recent published mineral scale management case studies of several paper mills show that specific types of mineral scale build-up in various mill processes can be minimized through improved process control and minor process changes. (Exhibit UC-39 and Exhibit UC-40).

As a practical matter, no significant increases in either the chloride or total hardness concentrations are expected in the source supply waters for the above mentioned mills, the paper mills in Duluth, or along the Mississippi River in Grand Rapids, Brainerd, and Sartell, Minnesota areas. To illustrate the basis for this expectation, the following hypothetical example is offered to demonstrate the quality and quantity from an upstream discharge flow required to raise the instream chloride concentration to 75 mg/L, the recommended chloride value which appears for groundwood papers and soda and sulfite pulp production in Exhibit UC-30, Table VI-15 at p.384. Chloride was chosen for the example since it is considered a conservative constituent.

Hypothetical Example Assumptions:

- Receiving Water – Mississippi River in the Grand Rapids, Minnesota area.
- Mississippi River Q_{90} flow value* – 374 cubic feet per second (242 million gallons per day), [USGS flow gagging station 05211000 in Grand Rapids].
- Background instream chloride concentration based on monitoring data collected between July 1967 and March 1991 from a sampling station on the Mississippi River eight miles southwest of Cohasset, Minnesota (upstream of Grand Rapids) – average value 4.2 mg/L chloride.
- Maximum instream source water target concentration – 75 mg/L chloride.
- Maximum allowable effluent chloride concentration based on Final Acute Value (FAV) end-of-pipe concentration – 1,720 mg/L chloride.

*In Minnesota, the MDNR has the ability to suspend consumptive water appropriation permits from main stem rivers, (Mississippi, Minnesota, Rainy, Red River of the North, and the St. Croix River) when the first designated main stem river gage downstream of the site of appropriation drops below the annual Q_{90} exceedance flow value (Minn. Stat. 103G.285, subd. 2). The Q_{90} flow is a statistical flow value that represents the river flow that is exceeded 90 percent of the time during the period of record analyzed. The annual Q_{90} flow values are significantly higher than the $7Q_{10}$ low flow down to which the chloride standards would apply for a given watercourse. In this instance, the $7Q_{10}$ low flow for the Mississippi River at Grand Rapids, Minnesota is 111 cubic feet per second.

Based on the assumptions listed above, an upstream discharge of 10.4 million gallons per day with an effluent chloride concentration of 1,720 mg/L would be needed to raise the instream chloride concentration of the Mississippi River to 75 mg/L at the Q_{90} flow. Again, when the Q_{90} flow is reached it triggers the suspension of consumptive water appropriations in the area. Thus, it would take a very sizable upstream discharge at the maximum allowable chloride concentration (the Class 2 chloride FAV), at the minimum allowable flow (Q_{90}) for the chloride concentration to reach the source water target concentration.

To provide a context for the size of this hypothetical effluent flow, the average annual design flow for the current Grand Rapids WWTP is 14.35 million gallons per day. This facility treats domestic wastewaters from the city (2000 census population 7,764) as well as the domestic and industrial wastewaters from the UPM Kymmene (formerly Blandin) paper mill in town. Annual average design flow for the current WWTP at Brainerd (population 13,178) is 3.07 million gallons per day and for the St. Cloud WWTP (population 59,107) the average annual design flow is 13 million gallons per day.

6. Summary of Potential Economic Impact [VIII. G. economics, class 3]

On average, **if** source waters used by the municipal facilities listed in Table III-32 increase to the Class 3C hardness standard, yearly softening costs might be expected to double or triple above the dollar amounts currently being spent for this water treatment process. Potential cost increases to certain industries that are associated with scale prevention techniques to treat the incoming water could triple if water treatment and conditioning were the primary techniques employed. These estimates, however, are offered as examples of possible costs if the total hardness of the source water increases from what it is now to 500 mg/L $CaCO_3$. The Agency has no evidence to suggest that chloride and total hardness concentrations will increase to such levels due to the change in classification from 3B to 3C.

H. SUMMARY [VIII. class 3]

The proposed Class 3B to Class 3C amendments are reasonable in that they are intended to strike a balance between the protection of the water quality needs of industrial users and the need to allow for the establishment of defensible effluent limits for discharges to low flow receiving waters that have limited potential for use as either industrial or municipal source water supplies. The fundamental assumption that all surface waters of the state can be used for industrial consumptive purposes does not realistically match the lack of water quantity associated with many of these waterbodies. The preferred method of insuring acceptable industrial source water quality is to assess the potential downstream impacts from current and future discharges that have the potential of impacting a specific industrial source water supply and to assign appropriate effluent limits designed to safeguard these uses. This site specific approach preserves the underlying intent to provide industrial users with suitable water sources. Effluent limits and the protection levels that they afford should be appropriate for the known and attainable uses of a given waterbody.

These proposed amendments address these issues through a use classification change that will be applicable to the majority of surface waters throughout the state. These amendments have been described as a first step towards a broader, more comprehensive analysis of the salinity related water quality standards contained in the State's Class 2, Class 3, and Class 4 water use classifications. Preliminary analysis indicates that such an effort will likely result in additional proposed amendments during a future rulemaking.

If adopted into rule, changes to the chloride and total hardness standards resulting from the Class 3B to Class 3C amendments will likely provide the greatest benefit to certain industrial facilities in the food processing, ethanol, and water conditioning sectors that have an existing or future wastewater discharge to low flow receiving waters. This potential "benefit" is tempered by the fact that even with adoption of the proposed changes, the saline nature of some of these effluents indicates that additional source water or wastewater treatment will be required even to meet the less restrictive standards.

Those entities that would most likely be affected by these proposed changes are those municipalities and small volume industrial water appropriators on relatively low flow streams and rivers that rely on these waters as source water supplies for either domestic or industrial consumption purposes. In these situations, total hardness appears to be the standard that would potentially cause the most concern relative to the increased costs associated with water softening practices.

IX. UPDATES, ADDITIONS AND CORRECTIONS TO USE CLASSIFICATION LANGUAGE, MINN. R. 7050.0400 TO 7050.0470

A. INTRODUCTION AND USE CLASSIFICATION SYSTEM [IX. use class]

This Section of the SONAR contains proposed changes to the parts of Minn. R. 7050 that deal with the beneficial use classifications, Minn. R. 7050.0400 to 7050.0470. The next two major sections will deal with the update of the list of trout waters (Class 2A), the proposed new limited resource value waters, and two other classification issues. All the changes discussed in this Section are non-substantive; i.e., the meaning and intent of the rule will not be changed as a result of the proposed revision.

The Agency recently adopted Minn. R. 7050.0405 as part of requirements of Minn. Laws 2003 ch. 128 § 156 (see SONAR Book I, Section I.B and Exhibit A-4). No changes are being proposed to Minn. R. 7050.0405 as part of this rulemaking, but this part will appear as new to most readers.

It may be helpful to briefly review Minnesota's beneficial use classification system for surface waters as outlined in SONAR Book I, Section II.B.1. Minnesota has identified seven beneficial uses associated with surface waters, designated as Class 1 through Class 7 (Minn. R. 7050.0140). The use classes are listed below. The numbers 1 – 7 do not imply a priority rank to the use classes.

Use Class	Beneficial Use
Class 1	Drinking water
Class 2	Aquatic life and recreation
Class 3	Industrial use and cooling
Class 4A	Agricultural use, irrigation
Class 4B	Agricultural use, livestock and wildlife watering
Class 5	Aesthetics and navigation
Class 6	Other uses
Class 7	Limited resource value waters (not fully protected for aquatic life due to lack of water, lack of habitat or extensive physical alterations)

While all surface waters are protected for multiple beneficial uses, it is useful to think of all surface waters as falling into one of two categories: a) those protected for aquatic life and recreation (Class 2), and b) those designated as limited resource value waters (Class 7). The vast majority of Minnesota surface waters are Class 2, fully protected for aquatic life and recreation. All Class 7 waters started out as Class 2 but each has been individually assessed and reclassified through rulemaking as a limited resource value water. Class 7 waters support a very limited aquatic community and offer limited opportunities for water-related recreation. As noted, all surface waters are assigned multiple uses. Both Class 2 and 7 waters (i.e., all surface waters of the state) are also designated as Class 3, 4A, 4B, 5 and 6, and are protected for the associated beneficial uses listed above.

Minnesota R. 7050.0470 is the section of the rule that specifically lists certain surface waters of the state under one of nine major surface water drainage basins. The waters specifically listed in Minn. R. 7050.0470, while numerous, makeup only a fraction of the total number of waters in Minnesota. Examples of waters that are specifically listed include trout waters, surface waters protected for drinking, outstanding resource value waters, and limited resource value waters. Most surface waters in the state are classified under the "unlisted waters" provisions of the rule, Minn. R. 7050.0425 and 7050.0430. All waters **not listed** in Minn. R. 7050.0470 are protected for aquatic life and recreation (Class 2), plus Classes 3, 4A, 4B, 5 and 6.

B. NEED FOR AND REASONABLENESS OF NON-SUBSTANTIVE CHANGES TO USE CLASSIFICATION LANGUAGE [IX. use class]

1. Minn. R. 7050.0400, Change in Heading and References [IX.B. need and reasonableness, use class]

Minnesota R. 7050.0400 introduces the parts of the rule that deal with the beneficial use classifications. The Agency proposes to add a more descriptive heading to Minn. R. 7050.0400 to make it more informative. Also, two citations to other rule parts are being changed. The first removes Minn. R. 7050.0400 from the range of parts cited because it is unnecessary to cite the part of the rule one is in. This change will make it consistent with how ranges of rule parts are cited in other introductory parts of Minn. R. ch. 7050. The second citation change is to the consolidated descriptions of the use classes in the revised Minn. R. ch. 7050.

> *7050.0400. ~~PURPOSE~~. BENEFICIAL USE CLASSIFICATIONS FOR SURFACE WATERS; SCOPE.*
>
> *Parts ~~7050.0400~~ 7050.0410 to 7050.0470 classify all surface waters within or bordering Minnesota and designate appropriate beneficial uses for these waters. The use classifications are defined in part ~~7050.0200~~ 7050.0140.*

2. Minn. R. 7050.0420, Removal of Class 3C [IX.B. need and reasonableness, use class]

The Agency is proposing to remove the references to Class 3C waters in Minn. R. 7050.0420. This part of the rule specifies the use classifications applicable to trout waters. The current rule says that: "*All* [trout] *waters listed in part 7050.0470 as Class 1B, 2A and **3B** are also classified as Class **3C**, 4A, 4B, 5 and 6 waters.*" (emphasis added). The reference to Class 3C is not needed since these waters are already classified as 3B. The 3B classification, being a "higher" class, supersedes the Class 3C classification and standards. This change is being proposed as an off-shoot of the Agency's proposal to change the "default" industrial use classification from 3B to 3C, but it is independent of this more substantive change (Section VIII). The Agency is not proposing to change the current 3B classification that all trout waters currently have, as listed in Minn. R. 7050.0470. A search of Minn. R. 7050.0470 found no Class 2A (trout) waters that were not also specifically classified as 3B.

The proposal, to remove "3C" from Minn. R. 7050.0420 is needed because it is redundant and superfluous. This change will have no impact on the protection of trout waters. It is independent of the larger proposed change to the industrial use classifications.

3. Minn. R. 7050.0450, Clarification of Multi-classifications [IX.B. need and reasonableness, use class]

The Agency is proposing to reword the first sentence in Minn. R. 7050.0450 that deals with multi-classifications. The need is to make it clear that it is not "**if**" a surface water is classified in more than one use class, but to clearly state that, in fact, all surface waters of the state are classified in more than one class. The concept of multiple classifications is commonly misunderstood, and this change will replace wording that tends to reinforce the misunderstanding with wording that is clear on this point. Minnesota R. 7050.0450 is quoted below showing the proposed change.

7050.0450 MULTICLASSIFICATIONS.

~~If a water~~ All surface waters of the state are ~~is~~ classified in more than one class~~,~~ and all the water quality standards for each of the classes apply. If the water quality standards for particular parameters for the various classes are different, the more restrictive of the standards apply.

4. Minn. R. 7050.0460, Clarification of the List of Waters Specifically Classified and the Abbreviations Used [IX.B. need and reasonableness, use class]

The Agency is proposing several changes to Minn. R. 7050.0460. The first is the addition of "*in part 7050.0470*" to the heading of this part and the division of the part into three subparts (see wording below). These changes help define the content of the part and separate the different provisions for ease of citation.

The second proposed change is the addition of a sentence reminding people that most waters are **not** specifically listed in Minn. R. 7050.0470, and that they need to look at Minn. R. 7050.0425 and 7050.0430 for the beneficial uses assigned to waters not listed. This addition should reduce the number of people that become confused about applicable uses when they cannot find their waterbody of interest in Minn. R. 7050.0470. Confusion about the use classes assigned to unlisted waters is one of the most common pitfalls associated with the current rule.

The third proposed change is to change "waterbody" to "water body". While the Agency prefers one word in its written documents, two words for this term is the convention throughout Minn. R. ch. 7050.

The fourth proposed change is a new listing of all the abbreviations and symbols used in Minn. R. 7050.0470 to a more "bullet-like" format, and to have them all in one place and easier to read. The abbreviations for township, range and section" are being moved as part of this change so they are listed with the others in the proposed new listing of all the abbreviations used in Minn. R. 7050.0470. Also, as part of this proposed change, some of the existing paragraphs are moved within Minn. R. 7050.0460. No new abbreviations are proposed to be added and no existing ones are proposed for removal. All the proposed changes in Minn. R. 7050.0460 are shown below.

7050.0460. WATERS SPECIFICALLY CLASSIFIED *IN PART 7050.0470.*

Subpart 1. Explanation of listings. The waters of the state listed in part 7050.0470 are classified as specified. The specific stretch of watercourse or the location of a ~~waterbody~~ water body is described by township, range, and section.~~,~~ ~~abbreviated as T., R., S., respectively~~. Any community listed in part 7050.0470 is the community nearest the water classified, and is included solely to assist in identifying the water. Most waters of the state are not specifically listed in part 7050.0470. See parts 7050.0425 and 7050.0430 for the classifications of waters not listed.

~~Outstanding resource value waters are listed in part 7050.0470 and are denoted by an asterisk (*) preceding the name of the water resource. Following the name is the effective date the water resource was designated as an outstanding resource value water and a letter code that corresponds to the applicable discharge restrictions in part 7050.0180, subpart 3 or 6. The letter code P corresponds to the prohibited discharges provision in part 7050.0180, subpart 3. The letter code R corresponds to the restricted discharges provision in part 7050.0180, subpart 6.~~

Subp. 2. Outstanding international waters. The waters listed in part 7050.0470, subpart 1, that are not designated as outstanding resource value waters or classified as Class 7 waters are designated as outstanding international resource waters under part 7052.0300, subpart 3. Unlisted waters classified in part 7050.0430 and unlisted wetlands classified in part 7050.0425 that are located in the Lake Superior Basin are also designated as outstanding international resource waters under part 7052.0300, subpart 3.

~~Waters listed in part 7050.0470 that are classified as Class 2Bd are Class 2B waters also classified for domestic consumption purposes. Applicable standards for Class 2Bd waters are listed in part 7050.0222, subpart 3.~~

~~Waters designated as wild rice waters in part 7050.0470, subpart 1, are identified by the letters WR appearing in brackets following the name of the water.~~

Subp. 3. Abbreviations and symbols. The listings in part 7050.0470 include the following abbreviations and symbols:

T., R., S. means township, range and section, respectively.

An asterisk (*) preceding the name of the water body means the water body is an outstanding resource value water.

[month/day/year/letter code] following the name of the outstanding resource value water in brackets is the effective date the water resource was designated as an outstanding resource value water. The letter code (P or R) indicates the applicable discharge restrictions in part 7050.0180, subpart 3 or 6. The letter code P corresponds

<u>to the prohibited discharges provision in part 7050.0180, subpart 3. The letter code R corresponds to the restricted discharges provision in part 7050.0180, subpart 6.</u>

<u>[WR] following the name of the water body means the water body is designated as a wild rice water in part 7050.0470, subpart 1.</u>

<u>Class 2Bd waters are Class 2B waters also protected for domestic consumption purposes (Class 1). Applicable standards for Class 2Bd waters are listed in part 7050.0222, subparts 3 and 3a.</u>

5. <u>Minn. R. 7050.0470, subp. 1 to 9, Additions to the Introductory Paragraphs</u> [IX.B. need and reasonableness, use class]

The Agency proposes to reword the heading for Minn. R. 7050.0470, and to add a sentence to the introductory paragraphs in each of the nine subparts in Minn. R. 7050.0470. The heading needs to be reworded to clarify the language and make it more straightforward. The proposed new sentence to be added to each subpart reminds readers again to look at Minn. R. 7050.0425 and 7050.0430 for applicable use classes, if they cannot find the waterbody of interest in Minn. R. 7005.0470. The addition to Minn. R. 7050.0470, subp.1 is shown below as an example.

7050.0470 CLASSIFICATIONS FOR <u>SURFACE</u> WATERS IN MAJOR ~~SURFACE WATER~~ DRAINAGE BASINS.

*Subpart 1. **Lake Superior Basin.** The water use classifications for the listed waters in the Lake Superior Basin are as identified in items A to ~~, B, and~~ D. <u>See parts 7050.0425 and 7050.0430 for the classifications of waters not listed</u>.*

6. <u>Minn. R. 7050.0470, subp. 1 to 9, Corrections and Housekeeping Changes</u> [IX.B. need, and reasonableness, use class]

Since the original adoption of the water use classification system, formerly codified in rules WPC 24 and WPC 25, there have been occasional corrections or modifications of names and legal description listings of various waters specifically listed in what is now Minn. R. 7050.0470, subparts 1 through 9. As part of the effort to clarify and correct errors in the rule, this rulemaking includes a substantial number of proposed modifications and changes to the listings in Minn. R. 7050.0470. For the most part, the scope of these changes can best be described as "housekeeping." Included among these changes are:

1. Assignment of unique lake identification numbers to lakes specifically listed in the rule;
2. Additions of alternate names for certain listed waterbodies; and
3. Additions/deletions to certain legal descriptions identifying the locations of the listed waters.

The Agency is proposing to add the Minnesota Department of Natural Resources lake identification numbers to the listings for all lakes listed in Minn. R. 7050.0470. The lake ID numbers are unique numbers assigned to each lake or reservoir in Minnesota by the MDNR. They were published in 1968 as part of an inventory of all lakes in Minnesota larger than 10 acres (15,291 in 1968).[101] The ID numbers have a broad range of applications, both in and outside the Agency. For example the Agency uses them to identify the lakes monitored for transparency in the Citizens Lake Monitoring Program. The MDNR uses them to identify specific lakes in their "lake finder" Web page that provides fisheries, water quality and other information to the public on Minnesota's lake resources (http://www.dnr.state.mn.us/lakefind/index.html).

Many lakes have the same or similar names. Some lakes have more than one name or there may be variations in spelling. The lake ID numbers will eliminate any question as to which lake it is.

The majority of the proposed changes to waterbody names and locations appearing in Minn. R. 7050.0470 (nos. 2 and 3 in list above) are a byproduct of the Agency's contributions to EPA's efforts to develop a national water quality standards database. The goal of this database is to improve public access to information about the nation's surface waters. In Minnesota there has been an ongoing effort to produce computerized mappings of the assigned water use classifications for the surface waters of the state. These in-house generated mapping products are then sent off to be incorporated into the National Hydrography Database, a component of the national WQS data base. When completed, this database will allow access to maps and data for the approximately two million surface waters across the nation.

In the mid-1960s, state of Minnesota county highway maps (½ inch to a mile, 1:126,720 scale) were generally the primary references used in naming and locating information for the waters originally listed in what is now Minn. R. 7050.0470. In proofing the mapping products to be incorporated into the National Hydrography Database, the base reference maps being used are U.S. Geological Survey 7.5 minute topographical quadrangle maps (1:24,000 scale). In comparison to the county highway maps, these topographical maps provide a much greater level of detail on the locations of these waters. The use of the USGS map resources, coupled with ready-access to aerial photographs for most areas of the state, has resulted in a number of changes and corrections to the legal descriptions for the waters specifically listed in Minn. R. 7050.0470. The additions and corrections to these waters are shown by either underscored (new) or over-struck (deleted) entries in Minn. R. 7050.0470 (Exhibit A-15a). These changes are in addition to the more substantive changes associated with the trout water listing updates described in Section X.C.

Included in the third category of changes are four lakes in the Lake Superior Basin that are situated along the border of the Boundary Waters Canoe Area Wilderness (BWCAW). These lakes include, Ptarmigan Lake (lake ID no.16-0183-00), Unnamed Lake (16-0237-00), Pellet Lake (16-0592-00), and another Unnamed Lake (16-0598-00). These lakes are split by the border defining the BWCAW; i.e., portions of these lakes are within the BWCAW and portions of these lakes are outside the current border. For these four lakes, all individually less than 15 acres in size, it was concluded that the majority of the surface areas of all four are within the BWCAW. As a result of this evaluation, the Agency proposes to list:

[101] Minnesota Department of Natural Resources. 1968. An inventory of Minnesota lakes. Bulletin No. 25. Division of Waters, Soils and Minerals, MDNR. 499 p.

- Ptarmigan Lake and Unnamed Lake (16-0237-00) in Minn. R. 7050.0470, subp. 1, item B, and
- Pellet Lake and Unnamed Lake 16-0598-00 in Minn. R. 7050.0470, subp. 2, item B.

These waters will be classified as Class 1B, 2Bd, 3B, 4A, 4B, 5, and 6 waters. Also, they will be flagged with an asterisk (*) designating them as outstanding resource value waters (ORVW) in the "prohibited discharge category." The assigned listing date will be November 5, 1984, [11/5/84P] to coincide with the original listing date of all of the other waters within the BWCAW.

Also included in the third category cited above are modifications to the legal descriptions for three lakes in the Lake of the Woods Basin, as noted below.

- Kabetogama Lake (69-0845-00), add range 19;
- Knife Lake (38-0404-00), add range 6; and
- Sand Point Lake (69-0617-00), add township 67.

These legal description modifications were identified from lake maps and USGS quadrangle map evaluations showing that portions of these lakes extend into sections not previously covered by the township and range public land survey listings for these three lakes in Minn. R. 7050.0470, subp. 2, item B. Kabetogama, Knife, and Sand Point Lakes are presently listed as ORVWs.

The four individual lake listings in the rule, and the modifications to the legal descriptions of the other three lakes referenced above, are considered "housekeeping" changes since the proposed amendments are intended to clarify the assigned use classifications for these waters. Their status as ORVWs, where applicable, will not change as a result of these additions, and no new ORVWs are being proposed.

7 <u>Conclusions</u> [IX.B. need and reasonableness, use class]

The proposed non-substantive changes are both needed and reasonable. They will make the rule clearer, easier to use and;

- Help prevent a common error users make in identifying all the multiple beneficial uses assigned to waters of the state;
- Remove a redundant use class listing (3C from Minn. R. 7050.0420);
- Help identify lakes and reservoirs with the addition of the MDNR lake ID numbers; and
- Correct or make more accurate the names and locations of certain waterbodies.

C. REASONABLENESS OF PROPOSED CHANGES TO USE CLASSIFICATION LANGUAGE, REQUIRED INFORMATION [IX. use class]

1. Introduction [IX.C. reasonableness, use class]

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed changes to Minn. R. 7050.0400 to 7050.0470 covered in Section IX.

2. Classes of Persons Affected by the Proposed Rule Amendments, Including those Classes that Will Bear the Costs and Those that Will Benefit [IX.C. reasonableness, use class]

The proposed changes to Minn. R. 7050.0400 to 7050.0470 are non-substantive and serve only to make the rule clearer, more accurate and easier to read. It is the Agency's intent that the only effect of these changes on the public will be an improved understanding of rule content. There will be no costs associated with these changes (see Section IX.D).

3. Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues [IX.C. reasonableness, use class]

There are no anticipated added costs to the Agency or any other Agency as a result of these proposed changes. For example, the cooperative work between the Agency and EPA on the national water quality standards database and the National Hydrography Database is ongoing independent of these proposed amendments.

4. Determination of Whether There Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose [IX.C. reasonableness, use class]

The proposed changes are not intrusive. The Agency's proposed clarifications represent a reasonable approach to the goal of improving the rule language.

5. Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments [IX.C. reasonableness, use class]

The Agency has not considered alternatives to what is being proposed.

6. Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [IX.C. reasonableness, use class]

There are no added costs to any party as a result of these proposed changes

7. Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [IX.C. reasonableness, use class]

There will be no added costs to any party if the proposed changes are not adopted.

8. Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference [IX.C. reasonableness, use class]

To our knowledge, the proposed changes are entirely consistent with any relevant federal regulations.

9. Consideration and Implementation of the Legislative Policy Under Minn. Stat. §§ 14.002 and 14.131 [IX.C. reasonableness, use class]

Minnesota Stats. §§ 14.002 and 14.131 require state agencies, whenever feasible, to develop rules and that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

Clarification of the rule language would seem to be consistent with the spirit of this statute. The general concepts of how prescriptive or flexible a water quality rule should be are discussed in SONAR Book I, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [IX.C. reasonableness, use class]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

These specific notification requirements are discussed in Section IV.C.10 and will not be repeated here. The Agency outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I.

11. Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local Governments [IX.C. reasonableness, use class]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

12. Agency Determination Regarding Whether Cost of Complying with Proposed Rule in the First Year after the Rule Takes Effects will Exceed $25,000 [IX.C. reasonableness, use class]

Minnesota Stat. § 14.127, subd. 1 and 2 requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees

The Agency has determined that there will be no added costs to the parties covered by this Statute.

D. ECONOMIC IMPACT OF PROPOSED NON-SUBSTNATIVE CLASSIFICATION CHANGES, MINN. R. 7050.0400 TO 7050.0470 [IX. economics, use class]

The proposed changes discussed in Section IX are considered non-substantive and administrative in nature in the context of this rulemaking, but are nonetheless important to the overall work effort to provide a clear and understandable rule and the most accurate set of use classification listings in Minn. R. 7050.0470 as possible for the state and national databases. The Agency believes there will be no added costs to any party associated with the adoption of these amendments. Any unforeseen costs would be minimal.

X. ADDITION OF NEW CLASS 1 WATERS AND UPDATE LIST OF CLASS 2A TROUT WATERS

A. INTRODUCTION [X.B. introduction, class 1 and 2A]

The Class 1 use classification is assigned to waters of the state that serve as source water for drinking, culinary or food processing or other domestic purposes. All ground waters are Class 1; ground waters are not part of the changes discussed in this Section. Unlike ground waters, the relatively small subset of surface waters that are protected for drinking (Class 1 and Class 2Bd) are all individually listed in Minn. R. 7050.0470. However, the six waterbodies shown in Table III-33 are either directly or indirectly used as source waters for public water systems but they are not specifically listed and have not been assigned the domestic consumption use classification. The Agency proposes to add the Class 1C Domestic Consumption use classification to these waters. If adopted into rule, these six waters will be assigned the following use classifications: Class 1C, 2Bd, 3C, 4A, 4B, 5, and 6.

The Agency also proposes to change the drinking water use classification for a seventh waterbody from Class 1B to 1C. The waterbody is St. James Mine Pit Lake in St. Louis County, which is currently classified as a Class 1B, 2A, 3B, 3C, 4A, 4B, 5, and 6 water by virtue of its existing listing in the rule as a trout water. Based on changes to the Minnesota Department of Natural Resources (MDNR) designated stream trout lake listings, St. James Mine Pit Lake is no longer a designated trout lake and is being proposed for reclassification to the cool and warm water use classification. Given the fact that this lake is still used by the city of Aurora as a source of water for its public water system, St. James Mine Pit Lake is proposed to be reclassified as a Class 1C, 2Bd, 3C, 4A, 4B, 5, and 6 water. This change will have no impact on the quality of Aurora's drinking water supply.

The Class 2A use classification is a subgroup of the Class 2 aquatic life and recreational use assigned to some waters of the state so as to "*permit the propagation and maintenance of a healthy community of cold water sport and commercial fish and associated aquatic life and their habitats*" (Minn. R. 7050.0222, subp. 2). Class 2A waters are managed to support a trout or salmon sport fishery. The Agency relies on the MDNR to determine which streams and lakes are suitable for the management of coldwater fisheries. The Class 2A waters referenced in Minn. R. 7050.0420 are based on the latest list adopted into rule by the MDNR (Minn. R. 6264.0050). The Agency proposes to update the reference in Minn. R. 7050.0420 and to make the necessary changes to the individual listings in Minn. R. 7050.0470 needed to bring the list up to date.

Ten **lake trout** lakes within the Boundary Waters Canoe Area Wilderness (BWCAW) that do not appear in Minn. R. 6264.0050 as designated trout waters are also being proposed for Class 2A water use classification. These lakes will be specifically listed in Minn. R. 7050.0470 and will be identified as Outstanding Resource Value Waters (ORVW), consistent with the provisions of Minn. R. 7050.0180, subp. 3.

These changes will not impact the protection Minn. R. ch. 7050 provides to Class 1 surface waters and to Class 2A trout waters; nor will the addition of the 10 lake trout lakes to Minn. R. 7050.0470 impact their protection because they are already located within the BWCAW and are considered ORVWs.

It is worth noting here that all trout waters are protected for domestic consumption (Class 1) regardless of whether or not they are actually used as a community drinking water supply. Thus, the EPA drinking water standards apply to all Class 2A waters (Minn. R 7050.0420 and 7050.0470) even if the waterbody is not used for drinking. Generally, the Agency believes the beneficial uses assigned to a waterbody should reflect the actual or potential uses made of that waterbody. The Agency is considering removing the Class 1 use designation for those trout waters not actually used as a drinking water supply in a future rulemaking.

B. NEED AND REASONABLENESS OF DRINKING WATER RECLASSIFICATIONS CLASS 1 WATERS [X.B. introduction, class 1]

The list of waterbodies for which the drinking water use classification is proposed is shown in Table III-33.

Table III-33. Waterbodies Proposed to be Classified for Domestic Consumption, Class 1C.

Waterbody	Basin	County	Lake ID No.	Minn. R. 7050.0470,
Community Water Systems				
Wright Lake	Red River	Otter Tail	56-0783-00	Subp. 3
Hoot Lake	Red River	Otter Tail	56-0782-00	Subp. 3
Ottertail River Diversion Channel	Red River	Otter Tail	Na	Subp. 3
St. James Mine Pit Lake	Lake Superior	St. Louis	69-0428-00	Subp. 1
Non-community Water Systems				
Bow Lake	Lake Superior	Cook	16-0211-00	Subp. 1
Gull Lake	Rainy River	Cook	16-0632-00	Subp. 2
Fenske Lake	Rainy River	St. Louis	69-0085-00	Subp. 2

The definition of public (drinking) water systems, as specified in 40 CFR 141.2 and incorporated by reference in Minn. R. 4720.5100, is as follows:

> ***Public water system means a system for the provision to the public of water for human consumption through pipes or, after August 5, 1998, other constructed conveyances, if such system has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year.*** *Such term includes: any collection, treatment, storage, and distribution facilities under control of the operator of such system and used primarily in connection with such system; and any collection or pretreatment storage facilities not under such control which are used*

> *primarily in connection with such system. Such term does not include any "special irrigation district."* ***A public water system is either a "community water system" or a "noncommunity water system."*** (emphasis added)

Thus a community water system is one that serves at least 15 service connections or regularly serves an average of 25 or more individuals on a daily basis for at least 60 days out of the year. A non-community water system is either a "transient non-community water system" or a "non-transient non-community water system," which are described as:

- Transient non-community water system means a system that does not regularly serve at least 25 of the same persons over six months per year; and
- Non-transient non-community water system means a system that regularly serves at least 25 of the same persons over 6 months per year.

The Fergus Falls and Aurora, Minnesota water supply sources are part of community water systems whereas Bow Lake, Gull Lake, and Fenske Lake are source supplies for transient non-community water systems.

The need to reclassify the seven waterbodies listed in Table III-33 as Class 1C waters is demonstrated by their current use as public water system supply sources. The use classification should reflect the actual use being made of the waterbody. The Agency proposes to list these specific waterbodies with the Class 1C domestic consumption use classification in Minn. R. 7050.0470. Specific information regarding each of the proposed Class 1C reclassifications is provided below.

<u>Wright Lake, Hoot Lake, and the Otter Tail River Diversion Channel.</u> The primary source of water used for domestic consumption purposes at Fergus Falls, Minnesota comes from a withdrawal point on the west end of Wright Lake. Wright Lake is connected to Hoot Lake which in turn is connected to the Otter Tail River via a constructed diversion channel and aqueduct approximately two miles north, northeast of the Fergus Falls water treatment plant intake. A diversion dam on the Otter Tail River at this location diverts a portion of the Otter Tail River through the diversion channel down through these two lakes in order to meet the appropriation demands of the city as well as to maintain lake water elevation levels. Exhibit UC-18 is a 2003 aerial photograph of this area showing the waterbodies proposed for Class 1C classification.

The Otter Tail River is classified Class 1C from the outlet of Height-of-Land Lake in Becker County to its confluence with the Bois de Sioux River in Breckenridge, Minnesota. Historically, Agency staff has treated the diversion channel, Hoot Lake and Wright Lake as being "part of the Otter Tail River system" and have considered these waters as having the same domestic consumption water use as the Otter Tail River. In order to be clear that this has been and continues to be staff's intent, it is reasonable to specifically list these three waterbodies in the rule and classify them as Class 1C waters to reflect their actual use as community water system supply sources.

<u>Bow Lake, Fenske Lake, and Gull Lake.</u> Bow Lake, Fenske Lake, and Gull Lake are transient non-community water systems that supply drinking water to three separate camping/resort type

facilities on the outskirts of the Boundary Waters Canoe Area Wilderness in northern Minnesota. These commercial facilities were identified as surface water users in updated information provided by the Minnesota Department of Health on non-community water systems. The incorporation of these three lakes as Class 1C waters into Minn. R. 7050.0470 is reasonable in order to reflect their use for drinking water and other domestic consumption purposes.

St. James Mine Pit Lake. St. James Mine Pit Lake in St. Louis County is a water supply source for the city of Aurora. Revisions to Minn R. 6264.0050, subp. 2 (the MDNR listing of designated trout lakes) have resulted in the "de-listing" of this mine pit lake from the list of designated stream trout lakes. As such, it is reasonable to remove the Class 1B, 2A, 3B classifications assigned to trout waters and replace them with the uses assigned to non-trout waters used as a source of drinking water, Class 1C, 2Bd, 3C, 4A, 4B, 5, and 6. The Agency proposes to make this change in Minn. R. 7050.0470, subp. 1, item B, subitem (110) to reflect this trout listing change and to acknowledge the continued use of this mine pit lake for domestic consumption purposes. Again, this change does not impact Aurora's water supply.

C. NEED FOR AND REASOANBLENESS OF UPDATING THE TROUT WATER LIST [X. need and reasonableness, 2A]

The MDNR periodically revises the official list of designated trout waters (Minn. R. 6264.0050, subparts 2 and 4) through a rulemaking process that incorporates information obtained from MDNR fisheries surveys, fishery management goals and objectives, public comments, and riparian land owner comments solicited in accordance with the provisions of Minn. Stat. § 97C.005. The current list of trout waters cited in Minn. R. 7050.0420 is dated September 14, 1999. The most recent amended version of Minn. R. 6264.0050 was adopted by the MDNR on June 14, 2004. The Agency typically updates the list of trout waters (Class 2A waters) in Minn. R. 7050.0470 as needed at each triennial review. In the rule as proposed, the Class 2A waters listed in Minn. R. 7050.0470 have been updated to reflect the additions and deletions of the trout water listings contained in the June 14, 2004, version of Minn. R. 6264.0050. The Agency has used this list of trout waters as the basis to make the necessary changes to Minn. R. 7050.0470 with the intent that the two lists are in agreement. Therefore it is reasonable to update the list of Class 2A trout waters in Minn. R. 7050.0470 based on the latest list from the MDNR.

In addition to the stream trout lakes designated in Minn. R. 6264.0050, there are other lakes where lake trout are the primary species of management interest. Stream trout lakes are managed for one or more stream trout species (brook trout, brown trout, rainbow trout, and/or splake). While some designated stream trout lakes will have a combination of stream trout species and lake trout present, the majority of lake trout lakes are not specifically listed in Minn. R. 6264.0050. However, most of the existing and potential lake trout lakes **are** listed in Minn. R. 7050 as Class 2A waters as a result of past revisions of Minn. R. ch. 7050 based on information provided by MDNR. The proposed listing of the additional ten lake trout lakes within the BWCAW during this rulemaking proceeding will update the Minn. R. 7050 listings to coincide with MDNR's ongoing management objectives for these lakes.

All the proposed trout water listing changes in Minn. R. 7050.0470 are summarized below:

1. Eight new trout stream listings are being added in the following counties – Cass (1), Chisago (2), Fillmore (3), Lake (1), Pine (1);
2. One new stream trout lake listing in Lake County is being added;
3. Ten lake trout lakes within the Boundary Waters Canoe Area Wilderness are being added to the list – Cook County (7), Lake County (2), St. Louis County (1);
4. Three trout streams currently on the list are being removed – Fillmore County (2), Houston County (1);
5. Two St. Louis County mine pit lakes currently on the list are being removed;
6. The designated trout portion of 13 streams are being extended in the following counties – Cass (4), Dakota (1), Fillmore (3), Houston (2), Lake (1), Morrison (1), Pine (1);
7. The designated trout segments of 21 trout streams are being shortened in the following counties, Blue Earth (1), Carlton (2), Cass (3), Cook (4), Houston (1), Itasca (3), Lake (3), Morrison (1), Pine (2), Roseau (1); and
8. Modifications to the names of eleven trout streams are being made.

As with other waters specifically listed in Minn. R. 7050.0470, the legal descriptions detailing the geographic locations of trout waters were proof-checked using 7.5 minute USGS topographic quadrangle maps and aerial photographs as part of a mapping effort to digitize the locations of all the waters specifically listed in Minn. R. 7050.0470 (see Section IX.B.6). This work effort has yielded a number of recommended changes to the legal descriptions of waters specifically listed in Minn. R. 7050.0470, including some that are also listed in Minn. R. 6264.0050, subparts 2 and 4. These suggested listing changes have been forwarded to MDNR staff for their consideration and potential incorporation into the next revision of Minn. R. 6264.0050. Following the adoption of the revised MDNR rule, the Agency will propose the adopted legal description changes into Minn. R. 7050.0470 during a future triennial review of Minn. R. ch. 7050.

In conclusion, the proposed cold water fishery classification changes are needed and reasonable to appropriately assign the Class 2A water use to waters designated by the MDNR as trout waters. These changes will bring Minn. R. ch. 7050 into agreement with the latest list of trout waters from the MDNR.

D. REASONABLENESS OF ADDITION OF NEW CLASS 1 WATERS AND UPDATE OF TROUT WATER LIST, REQUIRED INFORMATION [X. reasonableness, class 1 and 2A waters]

1. <u>Introduction</u> [X.D. reasonableness, class 1 and 2A]

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed Class 1 classification changes and to the updating of the list of trout (Class 2A) waters.

2. Classes of Persons Affected by the Proposed Rule Amendments, Including Those Classes that Will Bear the Costs and Those that Will Benefit [X.D. reasonableness, class 1 and 2A]

The proposed addition of new Class 1 surface waters will bring the rule into line with the actual uses provided by these waters (Table III-33). The additions will go largely unnoticed because it does not change the fact that these waters are already used as a drinking water supply, nor do they alter the protection provided these waterbodies as sources of drinking water. No party will incur added costs due these changes (see Section X.E.1).

It is unlikely, but conceivable that some party might incur added costs due the updating of the trout waters list in Minn. R. 7050.0470. Streams and lakes designated as trout waters do not have to be named in Minn. R. 7050.0470 to be protected by the MDNR. Potential economic impacts are discussed in Section X.E.2.

3. Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues [X.D. reasonableness, class 1 and 2A]

Any costs to the Agency as a result of the Class 1 and Class 2A amendments, which are not likely, would be very small. Any added costs will be absorbed into current staffing levels and budgets. There should be no costs at all to other agencies.

4. Determination of Whether There Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose [X.D. reasonableness, class 1 and 2A]

These proposed amendments are not intrusive.

5. Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments [X.D. reasonableness, class 1 and 2A]

The Agency has not considered alternatives to what is being proposed.

6. Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [X.D. reasonableness, class 1 and 2A]

The Agency does not anticipate added costs for any party as a result of these proposed changes, however, there is some possibility of cost due the updating of the trout water list (see Section X.E.2).

7. Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [X.D. reasonableness, class 1 and 2A]

There will be no added costs to any party if the proposed changes are not adopted.

8. Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference [IX.D. reasonableness, class 1 and 2A]

The proposed addition of the Class 1 designation to six waterbodies is independent of the federal drinking water standards, which are incorporated by reference in Minn. R. 7050.0221; there is nothing inconsistent with this action and federal regulations. Updating of the trout waters list is consistent with federal regulations that say beneficial uses assigned to waters should reflect the actual uses attained.

9. Consideration and Implementation of the Legislative Policy Under Minn. Stat. §§ 14.002 and 14.131 [IX.D. reasonableness, class 1 and 2A]

Minnesota Stats. §§ 14.002 and 14.131 require state agencies, whenever feasible, to develop rules and that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

The proposed Class 1 and Class 2A amendments are by necessity prescriptive; it is the nature of specific classification listings. The Agency does not believe that this fact makes the proposed changes inconsistent with the intent of this statute. The general concepts of how prescriptive or flexible a water quality rule should be are discussed in SONAR Book I, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [IX.D. reasonableness, class 1 and 2A]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

These specific notification requirements are discussed in Section IV.C.10 and will not be repeated here. The Agency outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I.

11. Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local Governments [IX.D. reasonableness, class 1 and 2A]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

12. Agency Determination Regarding Whether Cost of Complying with Proposed Rule in the First Year after the Rule Takes Effects will Exceed $25,000 [IX.D. reasonableness, class 1 and 2A waters]

Minnesota Stat. § 14.127, subd. 1 and 2 requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees

The Agency has determined that there will be no added costs to the parties covered by this Statute.

E. ECONOMIC IMPACT OF ADDING NEW CLASS 1 WATERS AND UPDATING LIST OF TROUT WATERS [X. economics, class 1 and 2A]

1. New Class 1 Waters [X.E. economics, class 1]

The proposal to classify the waterbodies listed in Table III-33 as Class 1C waters will not result in additional treatment costs for any current NPDES/SDS permit holders. A Voluntary Investigation Cleanup program site is located south of Wright Lake adjacent to the banks of the Otter Tail River in Fergus Falls, Minnesota. As noted earlier, the Otter Tail River is currently classified as a Class 1C water. On-going remediation activities at this site are managing several coal ash disposal areas at the Otter Tail Power Company's Hoot Lake Plant location. Surface water impacts from these areas are to the Otter Tail River downstream of the Fergus Falls water works intake point in Wright Lake. Additional costs to this program's remediation activities are not anticipated as a result of the proposed Class 1C water use classifications of Hoot and Wright Lakes and the Otter Tail Diversion Channel.

2. Update of Trout Water List [X.E. economics, class 2A]

A review of the proposed new trout water listings indicates that one municipal wastewater treatment plant (WWTP) is affected by the proposed update of the trout stream list in Minn. R. 7050.0470. This facility, the Empire WWTP in Dakota County, is operated by Metropolitan Council Environmental Services (MCES) and it currently discharges to a segment of the Vermillion River that was designated by MDNR as a trout stream in 2002. Subsequently the MDNR extended the portions of the Vermillion River and its tributaries designated as trout waters. Based on the current listing in Minn. R. 6264.0050, subp. 4, item Q, subitem (7), the trout waters reach of the Vermillion River extends from just west of Cedar Avenue on the south side of the city of Lakeville, to a point just east of U. S. Highway 52. The segment of the Vermillion River and its tributaries east of the city of Farmington is proposed to be added during this rulemaking to Minn. R. 7050.0470 as a Class 1B, 2A, 3B, 4A, 4B, 5 and 6 water. The Empire WWTP is located within this reach, about two miles east of the city of Farmington.

An expansion underway at the Empire WWTP will ultimately double the permitted wastewater discharge from this facility from its current 14 million gallons per day average wet weather design flow to 28.61 million gallons per day. During the planning phase of evaluating how wastewater services would be delivered to this rapidly growing south-metro area, issues were raised regarding the potential impacts this discharge would have on both the quality and quantity of stream flows on the Vermillion River. Among the concerns were the impacts on the trout fishery resulting from potential stream bank erosion and flooding resulting from a flow increase of this magnitude. These issues, coupled with the instream thermal impacts from the WWTP discharge, were factors that led the MCES and its stakeholder groups to the decision to divert the treated wastewater effluent from the Vermillion River and pipe it directly to the main channel area of the Mississippi River near river mile 823.2. The expansion and upgrades underway at the Empire WWTP are intended to provide wastewater services to the area through the year 2050. Construction costs associated with the overall project are estimated to be in excess of $84.4 million. Of this, $69.6 million are associated with the project costs for the construction of the 12.5 mile-long outfall line. The planned removal of the Empire WWTP effluent from the Vermillion River is a proactive attempt to help insure the continued maintenance and protection of this metropolitan area trout stream resource.

Aside from the costs associated with the Empire WWTP, no significant additional costs are anticipated as a result of the proposed listing of additional water segments as Class 2A waters in Minn. R. 7050.0470 associated with the update of the trout water list. Trout lakes and trout streams designated in Minn. R. 6264.0050 are among the list of special waters under the Agency's storm water rules requiring additional best management practices and enhanced runoff controls for discharges to these waters (Minn. R. 7090.1010 and Exhibit UC-19). As such, future additional costs associated with the implementation of storm water best management practices may be incurred by the state, local units of government, and private land developers that have storm water runoff discharging to waters that have been assigned this "special waters" designation. By virtue of the fact that they are designated trout waters in Minn. R. 6264.0050, additional best management practices and enhanced runoff controls are currently required for discharges to these waters. The application of these requirements, however, is independent of whether or not the proposed Class 2A use classification is assigned to these waters.

In the case of the ten lake trout lakes proposed for specific listing in Minn. R. 7050.0470, even though they are not “designated” in Minn. R. 6264.0050, no additional costs are anticipated due to the assignment of the Class 2A use classification. They are already protected under the “prohibited discharge” category of ORVW waters due to the fact they are within the boundaries of the BWCAW (Minn. R. 7050.0180, subp. 3).

XI. CLASSIFICATION CHANGES, PROPOSED LIMITED RESOURCE VALUE WATERS (CLASS 7)

A. INTRODUCTION [XI. introduction, class 7]

Section XI of this SONAR discusses the:

1. Proposed reclassification of twelve surface water reaches from Class 2 to Class 7 limited resource value waters;
2. Proposed reclassification of the lower reaches of an existing Class 7 water in Renville County back to a Class 2B use classification; and
3. Recommendation that the Class 2B use classification is retained for a watercourse in Isanti County originally assessed for potential Class 7 reclassification.

As noted elsewhere in this SONAR (see Section IX.A. above and SONAR Book I, Section II.B.1), waterbodies or specific reaches of waterbodies in Minnesota, are assigned certain water uses either by being specifically listed in Minn. R. 7050.0470, "listed waters," or by being assigned use classifications under the "unlisted waters" provisions in Minn. R. 7050.0430 and 7050.0425. The vast majority of waters in Minnesota are assigned use classifications by the latter. In essence, watercourses in the unlisted waters category are designated as Class 2B aquatic life and recreation waters and are presumed to be "fishable/swimmable" waters until such time that their attainable uses are evaluated on an individual basis. Since all surface waters are assigned multiple uses, water quality standards specific to each of the assigned use classes apply. If more than one use class has standards for the same pollutant, the most stringent standard is used.

Class 7 waters are protected so as to allow secondary body contact, to preserve the groundwater for use as a potable water supply, and to protect the aesthetic qualities of the water. Aquatic life and recreational uses in and on Class 7 waters are limited due to instream channelization and/or the lack of instream flows. As part of the multiple use classification system, Class 7 waters are also protected for industrial consumption use (Class 3C), agriculture and livestock uses (Class 4A and 4B), aesthetic enjoyment and navigation (Class 5) and Class 6, other uses.

Effluent limits assigned to discharges to Class 7 waters are often less restrictive than those assigned to a Class 2 water of comparable size. To protect the Class 7 uses, advanced secondary treatment limits are normally assigned to continuous discharges to these waters. There are instances where either the wastewater discharge flow rates are high and/or the length of the Class 7 watercourse segment is so short that more restrictive limits are needed in order to be protective of the downstream Class 2 water uses (Minn. R. 7053.0245, subp. 3). In other words, while Class 2 chronic water quality standards are not applied to Class 7 reaches, these standards must be met in the downstream Class 2 water, and the discharge of toxic pollutants to a Class 7 reach cannot be in concentrations acutely toxic to aquatic life. This holds true regardless of the size of the discharge and the length of the Class 7 water reach.

The watercourses assessed for potential reclassification, the existing or proposed discharger to these waters, and the Agency staff recommended use classification changes are show in Table III-34.

Table III-34. Waterbodies Assessed for Potential Class 7 Designation and Agency Recommended Action.

No.	Assessed Watercourse	Existing or Potential Discharger	Present Use Class	Proposed Use Class
1	County Ditch No. 45 (Branch Lateral 3)	Golden Oval Eggs at Renville, MN Renville County	Class 2B	Class 7
2	County Ditch No. 45	Southern Minnesota Beet Sugar Cooperative at Renville, MN Renville County	Class 2B	Class 7
3 4	Lateral Judicial Ditch No. 29 Judicial Ditch No. 29	Evan, MN Brown County	Class 2B Class 2C	Class 7 Class 7
	Unnamed Creek to Cedar Creek	Isanti Estates (mobile home park) Isanti County	Class 2B	Class 2B (no change)
5	Judicial Ditch No. 4	Lac Qui Parle Oil at Dawson, MN Lac Qui Parle County	Class 2B	Class 7
6 7	Unnamed Ditch to Sater's Creek	Agri-Energy at Luverne, MN Rock County	Class 2B Class 2B	Class 7 Class 7
8	Unnamed Ditch to County Ditch No. 42	Winthrop, MN Sibley County	Class 2B	Class 7
9 10 11	Unnamed Ditch to Unnamed Ditch to Deer Creek (Co. Ditch No. 71)	Myrtle, MN Freeborn County	Class 2B Class 2B Class 2C	Class 7 Class 7 Class 7
12	County Ditch No. 11	Manchester, MN Freeborn County	Class 2B	Class 7
1	County Ditch No. 45	Renville, MN Renville County	Class 7	Class 2B

B. NEED FOR CLASS 7 AND CLASS 2B RECLASSIFICATIONS [XI. need, class 7]

The need to address the potential Class 7 reclassifications of ten of the above listed waters is based on the Agency's need to respond to petition requests from existing or potential dischargers who have requested an individual evaluation of the water uses assigned to these selected watercourse. Two additional proposed Class 7 waters listed above (the unnamed lateral ditch to Sibley County Ditch No. 42 and an easterly lateral segment of County Ditch No. 45) were independently assessed by the Agency to address a re-location of the wastewater treatment facility at Winthrop, Minnesota and to address an Agency recommended re-location of the Southern Minnesota Beet Sugar Cooperative's process and non-contact cooling water discharge. The need for the proposed Class 2B reclassification of the lower reaches of Renville County Ditch No. 45, south of the city of Renville was prompted by new information gathered on this segment of watercourse during the assessment of the other segments of the County Ditch No. 45 system mentioned above. Lastly, the unnamed creek tributary to Cedar Creek in Isanti County was assessed for potential Class 7 reclassification in response to a petition, but the Agency is recommending that this creek retain its current Class 2B use classification.

In addition to the need associated with outside petition requests outlined above, Minn. Stat. § 115.44 establishes a need to appropriately classify waters of the state in order to reflect their existing or potential water uses. Over the last 29 years an assessment process has been in place which has been used to determine whether or not the Class 2 aquatic life and recreational uses are attainable. For those assessed waters where these uses are considered un-attainable, Agency staff has proposed reclassification of these water segments as Class 7 limited resource value waters.

C. REASONABLENESS OF CLASS 7 AND CLASS 2 CLASSIFICATION CHANGES, REQUIRED INFORMATION [XI. reasonableness, class 7 and 2]

1. Introduction [XI.C. reasonableness, class 7 and 2]

Minnesota Stat. § 14.131 requires that this SONAR, as part of demonstrating the reasonableness of the proposed amendments, include information about affected parties, costs and other topics that are covered in the following 11 sections. The discussion in these sections pertains only to the proposed reclassification of 12 waterbodies from Class 2 to Class 7 (limited resource value waters) and the single proposed change from Class 7 back to Class 2 changes covered in Section XI.

2. Classes of Persons Affected by the Proposed Rule Amendments, Including those Classes that Will Bear the Costs and Those that Will Benefit [XI.C. reasonableness, class 7 and 2]

The persons most directly impacted by the proposed new Class 7 and Class 2 classifications are the five municipalities and the four industries listed in Table III-34. The proposed Class 7 reclassifications, if adopted, potentially could save the four industries and three municipalities wastewater treatment costs. This is because more lenient point source effluent limits are applicable to discharges to Class 7 receiving waters (Minn. R. 7053.0245). Savings could extend beyond just savings in treatment costs if the reclassifications allow the impacted discharges to obtain NPDES/SDS permits without having to request a variance, and other administrative cost saving may follow as well. Clearly these seven dischargers stand to gain the most economically if the proposed reclassifications are adopted.

No cost saving are attributed to the proposed Class 7 at Winthrop, Minnesota, if adopted, because they operate a stabilization pond wastewater treatment facility (see Section XI.F). The effluent limits for a pond discharge are essentially the same regardless of the classification of the receiving stream.

The reclassification of the lower reaches of Renville County Ditch No. 45 from Class 7 to Class 2B is not likely to result in additional treatment costs to the parties potentially impacted by this change.

Other potentially impacted parties are the citizens that live in these communities or others that have an interest in the area. For example, some might benefit if the changes are adopted and the changes contribute to the economic vitality of the industries so they remain sources of employment and tax revenues. Others may be concerned about environmental consequences of the proposed changes. These impacts are impossible to quantify. However, the Agency believes that the on-site use attainability analysis is a reliable indicator of existing and attainable uses and that the use classification changes are not a threat to the environment. Any environmental harm should be negligible.

3. <u>Estimate of the Probable Costs to the Agency and Other Agencies of Implementing and Enforcing the Rule Amendments, and Any Anticipated Effect on State Revenues</u> [XI.C. reasonableness, class 7 and 2]

For the most part the costs to the Agency as a result of the proposed Class 7 and Class 2A changes have already been incurred. We estimate that the costs for staff time alone for the use attainability survey and preparation time for rulemaking for each proposed Class 7 waterbody is approximately $1,500. This does not include other expenses associated with rulemaking (e.g., Attorney General's time, Administrative Law Judge, court reporter, etc.). Thus 12 use attainability analyses would cost approximately $18,000. These costs to the Agency are part of current staffing levels, workloads and budgets. In the future, the Agency could potentially see cost savings, if the changes are adopted, because staff may not need to evaluate and process as many variance requests, and permit issuance for the affected dischargers may be streamlined.

There should be no costs to other agencies.

4. <u>Determination of Whether There Are Less Costly or Less Intrusive Methods of Achieving the Rule Amendments' Purpose</u> [XI.C. reasonableness, class 7 and 2]

The Agency believes that there are no practical or realistic less costly or intrusive methods to achieve the same result.

5. <u>Describe Any Alternative Methods for Achieving the Purpose of the Proposed Rule Amendments that the Agency Seriously Considered and the Reasons Why They Were Rejected in Favor of the Proposed Amendments</u> [XI.C. reasonableness, class 1 and 2]

The Agency has not considered alternatives to what is being proposed.

6. Estimate of the Probable Costs of Complying with the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [XI.C. reasonableness, class 7 and 2]

These costs and the affected parties are discussed in Sections XI.C.2 and 3 above, and in Section XI.F.

7. Estimate of the Probable Costs of Not Adopting the Proposed Rule Amendments, Including Costs Borne by Categories of Affected Parties [XI.C. reasonableness, class 7 and 2]

The possibility that there will be added costs to the parties listed in Table III-34 if the proposed changes are not adopted is real. For example, the projected savings in capital costs alone for one party (the city of Evan, Minnesota) associated with the Class 7 reclassification of the proposed receiving waters is approximately $100,000 (Section XI.F).

8. Differences Between the Proposed Rule and Existing Federal Regulations and the Need for and Reasonableness of Each Difference [XI.C. reasonableness, class 7 and 2]

The UAA process and the adoption of waterbody-specific use classification, based on the results of the UAA, that recognizes a very limited aquatic community and very limited opportunities for recreation is consistent with federal regulations (40 CFR 131.3, see Section XI.D.1 below).

9. Consideration and Implementation of the Legislative Policy Under Minn. Stat. §§ 14.002 and 14.131 [XI.C. reasonableness, class 7 and 2]

Minnesota Stats. §§ 14.002 and 14.131 require state agencies, whenever feasible, to develop rules and that are not overly prescriptive and inflexible, and rules that emphasize achievement of the Agency's regulatory objectives while allowing maximum flexibility to regulated parties and to the Agency in meeting those goals.

As noted previously, classification designations are by necessity prescriptive. This holds true for changes to a limited resource value water. The general concepts of how prescriptive or flexible a water quality rule should be are discussed in SONAR Book I, Section VIII.I.

10. Additional Notification of the Public Under Minn. Stat. §§ 14.131 and 14.23 [XI.C. reasonableness, class 7 and 2]

Minnesota Stat. §§ 14.131 and 14.23 require the Agency to include in its SONAR a description of its efforts to provide additional notification to persons or classes of persons who may be affected by the proposed rule, or the Agency must explain why these efforts were not made.

These specific notification requirements are discussed in Section IV.C.10 and will not be repeated here. The Agency outlined its efforts to inform and involve interested and affected parties and the public in general in Section III of SONAR Book I.

11. Consultation with the Commissioner of Finance Regarding Fiscal Impacts on Local Governments [XI.C. reasonableness, class 7 and 2]

Minnesota Stat. § 14.131 requires the Agency to consult with the Department of Finance to help evaluate the fiscal impact and benefits of proposed rules on local governments. In accordance with the interim process established by the Department of Finance on June 21, 2004, the Agency provided the Department of Finance with a copy of the proposed rule and SONAR at the same time as these items were sent to the Governor's Office. This timing allows the fiscal impacts and fiscal benefits of the proposed rule to be reviewed by the Department of Finance concurrent with the Governor's Office review.

12. Agency Determination Regarding Whether Cost of Complying with Proposed Rule in the First Year after the Rule Takes Effects will Exceed $25,000 [XI.C. reasonableness, class 7 and 2]

Minnesota Stat. § 14.127, subd. 1 and 2 requires the Agency to determine if the cost of complying with a proposed rule in the first year after the rule takes effect will exceed $25,000 for:

- Any one business that has less than 50 full-time employees, or
- Any one statutory or home rule charter city that has less than ten full-time employees

There will be no added costs to the parties named in this statute as a result of these proposed changes.

D. REASONABLENESS OF PROPOSED CLASS 7 AND CLASS 2B RECLASSIFICATIONS [XI. reasonableness, class 7]

1. Use Attainability Analysis [XI.D. reasonableness, class 7]

When Minnesota first adopted water quality standards in the late-1960s all surface waters were classified for multiple uses including Class 2, fisheries and recreation. This use was assigned to all surface waters whether or not these uses were actually attainable. As time progressed, it became apparent that there were certain waters of the State that could not meet the national "fishable/swimmable" goal of the Clean Water Act. In recognition of the disparities between the designated uses and the attainable uses for certain waters, in the late-1970s the Agency developed an assessment procedure that evaluated whether the designated uses were consistent with the uses that appeared to be attainable for a given waterbody. This use assessment procedure (now called a use attainability analysis or UAA), was developed using EPA guidance. It was used to individually evaluate the attainable uses of the assessed waters. The concept of the limited resource value use classification is consistent with Section 101(a)(2) of the Clean Water Act and with the EPA guidance used to develop the assessment procedure. Therefore, the Agency maintains that the assignment of a use classification that reflects a water's existing or attainable uses is a reasonable approach in the establishment of water quality standards.

As noted, waters classified under the "unlisted waters" provisions of the rule are presumed to be suitable for aquatic life and recreational uses. These waters retain the Class 2 classification unless and until:

- A UAA has been performed which demonstrates that the water qualifies for Class 7 limited resource value water reclassification;
- The proposed Class 7 reclassification is adopted as a rule amendment in accordance with Minnesota's rulemaking procedures; and
- The Class 7 water use reclassification is approved by the EPA.

A "use attainability analysis" is the name applied to the assessment process that evaluates whether or not a given waterbody supports certain beneficial water uses. In a regulatory sense, a UAA is defined in the federal Water Quality Standards Regulation (40 CFR 131.3) as:

> *"…a structured scientific assessment of the factors affecting the attainment of a use which may include physical, chemical, biological and economic factors as described in section 131.10(g)."*

Title 40 of CFR § 131.10(g) specifies that:

> *"States may remove a designated use which is not an existing use, as defined in Sec. 131.3, or establish sub-categories of a use if the State can demonstrate that attaining the designated use is not feasible because:*
> *(1) Naturally occurring pollutant concentrations prevent the attainment of the use; or*
> *(2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or*
> *(3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or*
> *(4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or*
> *(5) Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or*
> *(6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.*

Historically, Agency has considered factors outlined in 40 CFR 131.10(g)(1) through (5) as being part of the use attainability analysis. The economic and social issues referenced in section 131.10(g)(6) are generally addressed as part of the Minnesota's variance provisions specified in Minn. R. 7050.0190 and 7000.7000.

Parallel state criteria comparable to the factors, outlined in (1) through (5) above, are contained in existing Minn. R. 7050.0200, subp.8. This rule states that use attainability analysis information shall be used to:

> *"… determine the extent to which the waters of the state demonstrate:*
> *A. the existing and potential faunal and flora communities are severely limited by natural conditions as exhibited by poor water quality characteristics, lack of habitat, or lack of water; or*
> *B. the quality of the resource has been significantly altered by human activity and the effect is essentially irreversible; and*
> *C. there are limited recreational opportunities (such as fishing, swimming, wading, or boating) in and on the water resource."*

The conditions in items A and C or B and C must be established by the use attainability analysis before the waters can be classified as limited resource value waters." Another provision in Minn. R. 7050.0200, subp. 8 specifies that the flows of Class 7 waters must be intermittent in nature or less than one cubic foot per second at the once in ten year, seven-day low flow ($7Q_{10}$).

Over the past 29 years, Agency personnel have used a stream assessment survey procedure to conduct UAAs of waters proposed for potential Class 7 reclassification. These stream surveys gather data on the physical, chemical, and biological factors affecting the capacity of these waters to sustain Class 2 uses or meet the "fishable/swimmable" goal. While the detail and complexity of the surveys may vary depending on the type of waterbody assessed, each survey serves to document whether or not the Class 7 criteria listed above have been met. The evaluation of the information gathered through the UAA, taken as a whole, allows one to conclude whether or not the designated use class is appropriate for that particular waterbody. Therefore, the basis for whether or not it is reasonable to reclassify a given waterbody as Class 7 rests with the physical, chemical, and biological factors exhibited by the waterbody being evaluated.

In the sections that follow, the reasons supporting each of the recommended reclassifications for the proposed Class 7 waters is summarized. Survey information, photographs of the assessed waters, and site maps are part of the assessment surveys and are contained in the cited exhibits for the individual water courses proposed for Class 7 reclassification.

1. <u>County Ditch No. 45 (Branch Lateral 3), Renville County, Golden Oval Eggs</u> [XI.D. reasonableness, class 7]

The June 2003 reclassification request for County Ditch No. 45, Branch Lateral 3 was made by a consultant representing Golden Oval Eggs Cooperative (Exhibit UC-1). Golden Oval Eggs is an egg laying and breaking facility located on the eastern side of the city of Renville. Golden Oval has a sequencing batch reactor wastewater treatment facility on their property that currently serves to pre-treat the wastewater prior to it being sent to the city of Renville's mechanical WWTP. Golden Oval is considered a significant industrial user, which means they contribute wastewater to the Renville WWTP under an agreement covered by the city's NPDES/SDS permit (no. MN0020737).

In 2004 Golden Oval took over operation and maintenance of the batch reactor treatment facility, and facility upgrades were added for the intended purpose of independently treating their process wastewaters and discharging the effluent to Branch Lateral 3 of County Ditch No. 45. If this proposal ultimately happens, Golden Oval would no longer be a significant industrial user discharging to the Renville municipal WWTP. The Golden Oval proposed point of discharge to Branch Lateral 3 would be approximately 1.6 miles upstream of the existing Renville WWTP outfall to this same ditch.

The main stem County Ditch No. 45 was originally adopted as a Class 7 water in 1981. If Branch Lateral 3 of County Ditch No. 45 is reclassified as Class 7, it would be an upstream extension of an existing Class 7 water segment. In a related action, in 2004 Southern Minnesota Beet Sugar Cooperative attempted to obtain ditch access permission to relocate their effluent and non-contact cooling water discharges to this same branch lateral ditch segment. Ditch access permission was denied for the Branch Lateral 3 discharge relocation, but access permission was obtained by So. MN Beet Sugar for a new discharge location to an alternate County Ditch No. 45 segment located south and east of the Branch Later 3 reach. The proposed reclassification of the receiving water for So. MN Beet Sugar's discharge is discussed in the next Section.

Branch Lateral 3 County Ditch No. 45 is proposed for Class 7 reclassification due to the amount of channelization and the lack of water in this ditch system. The proposed Golden Oval effluent outfall location is near the headwater of Branch Lateral 3 and there is less than one square mile of contributing watershed above this point. The estimated $7Q_{10}$ low flow for this ditch segment is zero cubic feet per second (cfs). The aquatic life and recreational use potential of this ditch is severely limited by the lack of water and lack of suitable habitat due to the degree of channelization. Therefore both Class 7 criteria conditions A and C, and B and C are documented for this ditch segment (Exhibit UC-2).

3. <u>County Ditch No. 45, Renville County, Southern Minnesota Beet Sugar Cooperative</u> [XI.D. reasonableness, class 7]

Southern Minnesota Beet Sugar Cooperative is a major industrial facility on the eastern side of the city of Renville. Southern MN Beet Sugar processes sugar beets into refined, white granulated sugar, molasses, dried beet pulp, as well as several other sugar beet related byproducts. Prior to the end of December 2004, So. MN Beet Sugar had a seasonal discharge of both treated process and non-contact cooling wastewaters discharging to Renville County Ditch No. 37, a tributary to West Branch Beaver Creek. At the recommendation of the Agency, So. MN Beet Sugar initially attempted to relocate their discharge to Branch Lateral 3 of County Ditch No. 45 at a point less than one-half mile upstream of the proposed Golden Oval outfall location discussed above. In the summer of 2004, So. MN Beet Sugar failed to obtain ditch access authorization from the Renville County Commissioners to relocate their discharge outfall to Branch Lateral 3. Again, at the recommendation of Agency staff, So. MN Beet Sugar pursued and successfully obtained ditch access permission to relocate to an alternate lateral ditch segment of County Ditch No. 45. This ditch segment joins with the main stem County Ditch No. 45 approximately two miles downstream of the Renville municipal WWTP outfall.

In December 2004 a permit was issued to So. MN Beet Sugar allowing for a seasonal discharge (September through March) to County Ditch No. 45 at a point directly south and across Highway 212 from their factory location. This permit contains variances from water quality standards for certain salinity related parameters and also contains references to certain county imposed conditions relating to quality and quantity aspects of the relocated discharge. Agency staff believe that there are limited aquatic life and recreational uses along this ditch segment and that a Class 7 reclassification of this segment of County Ditch No. 45 is justified given the degree of channelization and lack of water along this watercourse. Class 7 criteria conditions A and C, and B and C are documented for this ditch segment (Exhibit UC-3).

4. <u>Judicial Ditch No. 29, Brown County at Evan, Minnesota</u> [XI.D. reasonableness, class 7]

Evan, Minnesota, population 91 (2000 census), is located in northwestern Brown County approximately 20 miles west of New Ulm, Minnesota. In August 2001, a consulting engineering firm, acting on behalf of the city of Evan, submitted a dual request to the Agency: first for a variance from certain water quality standards relating to a proposed new recirculating sand filter WWTP for the city, and second, for a Class 7 reclassification for the proposed receiving waters, a lateral ditch and the main stem of Judicial Ditch No. 29 (Exhibit UC-4). Judicial Ditch No. 29 in part forms the headwaters of Hindeman Creek (Spring Creek), which contains a designated trout stream reach, upstream of its confluence with the Minnesota River.

The Agency conducted a UAA of these watercourses in October 2002. Conclusions drawn from this assessment led staff to recommend potential Class 7 reclassification for a reach extending approximately nine miles downstream of the proposed Evan outfall. This was based on the amount of channelization along the lateral and main stem judicial ditches and the lack of water (zero cfs) at the projected $7Q_{10}$ low flow conditions. The downstream end point of the proposed Class 7 reach is approximately one mile upstream of the beginning of the designated trout stream segment. Class 7 criteria conditions A and C, and B and C are documented for Judicial Ditch No. 29 and its lateral ditch (Exhibit UC-5).

A NPDES/SDS permit with variances to instream water quality standards for dissolved oxygen and un-ionized ammonia nitrogen was approved and issued by the Agency Board in April 2003 (Exhibit UC-6). Since that time, representatives with the city of Evan considered the possibility of entering into agreements with two nearby cities, Cobden or Morgan for wastewater treatment services. Neither of these communities is able to allow for this option so Evan appears to be back to the original recirculating sand filter WWTP proposed treatment alternative.

5. Judicial Ditch No. 4, Lac Qui Parle County, Lac Qui Parle Oil at Dawson, MN [XI.D. reasonableness, class 7]

The request for possible Class 7 reclassification of Judicial Ditch No. 4 was received in April 2003 from a consultant on behalf of the Lac Qui Parle Oil Coop (also formerly known as Dawson Ag Services). This facility is located along U.S. Highway 212 on the northwestern side of Dawson, Minnesota (Exhibit UC-7).

Past spills or leaks of agricultural fertilizers and petroleum products have resulted in soil and groundwater contamination in the area of the former Dawson Ag Services facility (Agency Site ID No. Leak 00012622). Groundwater monitoring studies jointly required by the Agency and the Minnesota Department of Agriculture have shown contaminated groundwater plumes extending to Judicial Ditch No. 4 which flows through the facility. Excavation of contaminated soils from the area of impact has occurred. Based on the data and information provided in the monitoring reports, Lac Qui Parle Oil Coop has been instructed to proceed with the preparation and submission of a corrective action design in order to remediate the groundwater to surface water quality standards.

Less than 1,000 feet downstream of the Lac Qui Parle Oil Coop facility, Judicial Ditch No. 4 enters into a storm sewer system that conveys the flows underground through the city of Dawson in an east/southeasterly direction. The storm sewer then discharges to an open channel on the eastern side of Dawson near the city park and the city's wastewater treatment plant. Water within this open channel ultimately flows to the West Branch Lac Qui Parle River.

The proposed Class 7 reclassification of Judicial Ditch No. 4 is somewhat unique. Agency is proposing to reclassify the upper portion of Judicial Ditch No. 4 as a Class 7 water due to the degree of channelization and limited watershed area above the Lac Qui Parle Oil Coop facility (Exhibit UC-8). In other words, Class 7 criteria conditions A and C, and B and C are met along the headwaters of Judicial Ditch No. 4 down to the point where the ditch enters into the Dawson storm water system, just south of Highway 212. Agency staff recommends, however, that the open channel on the eastern side of Dawson down to the West Branch Lac Qui Parle retain its Class 2B water use classification based on observations of numerous fish in the open water channel during the 2004 stream assessment survey. Also, a reported fish kill of northern pike in this channel, which was the result of an apparent sodium hydroxide release from another industrial facility in Dawson in mid-April, 1992, indicates the presence of game fish (Exhibit UC-9).

6. Unnamed Ditch and Sater's Creek, Rock County, Agri-Energy LLC at Luverne, Minnesota [XI.D. reasonableness, class 7]

Agri-Energy LLC is an ethanol production facility utilizing a dry mill corn processing, fermentation, and distillation process to produce nearly 22 million gallons of ethanol per year. The Class 7 assessment was conducted on the unnamed ditch and Sater's Creek in response to a chloride variance request application submitted by the facility in February 2002 (Exhibit UC-10).

The water supplied to Agri-Energy LLC for its operations is potable water from the city of Luverne. Depending on the demands for water in the city, water supplied to Agri-Energy comes from one of two, or a combination of both, city-run water treatment plants for potable water. Chloride concentrations in the city water vary depending on the wells being used at any given time. The chloride concentrations in the water from Water Plant No. 1 generally run around 40 mg/L. The chloride levels in the well water from Water Plant No. 2 are about twice this concentration. Agri-Energy treats the city water through a reverse osmosis system at a flow rate of 226 gallons per minute. Of this amount, 61 gallons per minute becomes reverse osmosis reject water with chloride concentrations running on the order of 170 – 300 mg/L. Up to 90,000 gallons per day of reverse osmosis reject water is discharged to the unnamed ditch which flows to Sater's Creek, a tributary of the Rock River.

The upper portions of the unnamed ditch north of the Agri-Energy facility are largely undefined in the sense that the ditch is no more than a swale through an agricultural field. In the vicinity of the Agri-Energy facility the unnamed ditch, and the reverse osmosis reject water, flow underground for about a quarter mile before out-letting just north of U.S. Interstate Highway 90. The ditch then flows to the east and crosses underneath I-90 before joining with Sater's Creek which flows along the south side of I-90. Sater's Creek in-turn flows through a commercial area before it passes under Highway 75 on its way to its confluence with the Rock River.

Those surface portions of the unnamed ditch south of the Agri-Energy facility as well as Sater's Creek are 100 percent channelized with thick, emergent vegetative growth through-out the reaches. At the time of the UAA, the unnamed ditch channel upstream of the facility was dry. Downstream of the outfall discharge, and in the upper reaches of Sater's Creek, only stagnant water conditions were present. At the last downstream station on Sater's Creek, stream flow was estimated to be about 0.1 cubic foot per second. Instream channelization and the lack of water are the factors supporting the Class 7 reclassification of these two watercourses (see Exhibit UC-11).

7. <u>Unnamed Ditch to County Ditch No. 42, Sibley County at Winthrop, Minnesota</u> [XI.D. reasonableness, class 7]

County Ditch No. 42 was originally classified as a Class 7 water in 1981. At that time, the city of Winthrop operated a mechanical WWTP with an outfall discharge directly to County Ditch No. 42. In the mid-1980's the city constructed a waste stabilization pond system on the eastern side of town, which resulted in the re-location of their effluent discharge outfall to an unnamed ditch that runs parallel to the south side of the stabilization ponds and joins with County Ditch No. 42 a short distance downstream of the city's former WWTP.

The pond discharges on a seasonal basis to the head-end of the unnamed ditch. At the time of the UAA, the only flowing water in the ditch was the treated effluent being discharged from the pond's secondary treatment cell. The overall lack of water, coupled with the high degree of channelization along this reach, are the bases for proposing a Class 7 reclassification of this unnamed ditch (Exhibit UC-41).

8 Two Unnamed Ditches and Deer Creek (County Ditch No. 71), Freeborn County at Myrtle, Minnesota [XI.D. reasonableness, class 7]

The city of Myrtle, population 63 (2002), is located in southeastern Freeborn County about four miles north of the Minnesota/Iowa border. The reclassification request was submitted to the Agency in the form of a December 2003 dual request for both a Class 7 reclassification and a variance request from standards (Exhibit UC-12). Individual on-site wastewater septic systems in Myrtle reportedly discharge to a field tile drainage system that conveys the partially treated wastewaters to the ditches that drain to Deer Creek. Deer Creek is also known as County Ditch No. 71.

At the time of the reclassification request, the city was exploring a re-circulating sand filter wastewater treatment system with a surface water discharge to the assessed unnamed ditches. At the time of this writing (October 2006), the city is in the process of re-examining wastewater treatment alternatives, some of which would still have a surface discharge to the unnamed ditches.

The Class 7 criteria conditions A and C, and B and C are documented in Exhibit UC-13 for the unnamed ditches and portions of Deer Creek. Habitat limitations due to the lack of water and extensive channelization indicate that these segments would more appropriately be classified as Class 7 limited resource value waters. The downstream end for the proposed Class 7 reach on Deer Creek (Co. Dt. 71) is at the confluence of the creek and a lateral ditch system flowing in from the west. While Deer Creek at, and downstream of, the confluence of these two ditch systems is still highly channelized, there is a marked change in the channel substrate, from the mud/sand mix noted at upstream stations to a stony mix with sand and silt downstream. There also appears to be some opportunities for fishing and recreational use in this area. At the next accessed stream station downstream (Observation point C), fishing and recreational use potentials were judged to be even greater (Exhibit UC-13).

9. County Ditch No. 11, Freeborn County at Manchester, Minnesota [XI.D. reasonableness, class 7]

Manchester, Minnesota (population 81), located about five miles northwest of Albert Lea, is another unsewered community in Freeborn County. Manchester currently has no sewage collection system or centralized wastewater treatment plant. On-site septic systems reportedly discharge to a series of drain tiles in the area.

County Ditch No. 11 originates just north of town and flows in a south/southeasterly direction for about six miles before entering the northwest end of Fountain Lake. Like the city of Myrtle, a dual request for Class 7 reclassification and a variance from standards was received in December 2003 (Exhibit UC-14). Also like the city of Myrtle, a re-circulating sand filter facility was the wastewater treatment system being proposed at the time. If constructed, this proposed facility will have an effluent discharge of approximately 15,000 gallons per day.

County Ditch No. 11 flows primarily through agricultural lands. Numerous field tile line outfalls were noted and all were discharging water to the ditch at the time of the UAA survey. This ditch is 100 percent channelized throughout most of its upper reaches. It begins to take-on more of a natural channel characteristic downstream of the U.S. Interstate Highway 90 overpass on the north side of School Section Lake. Fisheries and recreational uses in the proposed Class 7 reach of County Ditch No. 11 are considered to be very limited due to the lack of habitat caused by the extensive channelization and the lack of sustaining stream flows due to the ditch's limited watershed size. Therefore Class 7 criteria conditions A and C, and B and C are cited in support of the proposed reclassification of the upper 5.7 miles of County Ditch No. 11 (Exhibit UC-15).

10. Conclusion [XI.D. reasonableness, class 7]

The beneficial uses assigned to certain waters of the state, including Class 7 waters, are specifically listed in Minn. R. 7050.0470. However, most waters of the state are not listed and are classified under the "unlisted waters" provisions of Minn. R. 7050.0425 and 7050.0430. All watercourses in the "unlisted waters" category are designated as Class 2B waters and are assumed to be fishable/swimmable until it can be demonstrated otherwise. If a use attainability analysis of a waterbody shows that aquatic life and recreation uses are severely limited, then a reclassification of a specific reach may be appropriate. Reclassification is usually initiated by a request from an existing or potential discharger. Each use classification change requires amending Minn. R. ch. 7050.

Such is the case with the twelve watercourses being proposed for Class 7 reclassification in this rulemaking. Each of the waters has been individually assessed using the stream assessment survey worksheets. These survey findings are included in Exhibits UC-1 through UC-16 and UC-41 along with related correspondence. The proposed Class 7 reclassifications are needed and reasonable.

E. REASONABLENESS OF PROPOSED RECLASSIFICATION OF CLASS 7 WATER TO CLASS 2B, AND RETENTION OF EXISTING CLASS 2B USE CLASSIFICATION [XI. reasonableness, class 2]

1. Reclassification of Class 7 to Class 2, Lower Reaches of County Ditch No. 45, Renville County, downstream of Renville, Minnesota [XI.E. reasonableness, class 2]

Stream assessment surveys conducted in 1977 and 1978 on County Ditch No. 45 downstream of the city of Renville were used to recommend the 1981 Class 7 reclassification of County Ditch No. 45 from the city of Renville downstream to a point where the ditch flows into Sacred Heart Creek, approximately three-quarters of a mile upstream of the Minnesota River. In 2004 the County Ditch No. 45 ditch system was re-assessed in part to address the recommended re-location of the Southern Minnesota Beet Sugar Cooperative's wastewater and non-contact cooling water discharges and in part to address the potential independent discharge into Branch Lateral 3 of County Ditch No. 45 from the Golden Oval Eggs Cooperative.

The portion of County Ditch No. 45 that is proposed for reclassification back to a Class 2B water use classification extends from the ditch's confluence with Sacred Heart Creek upstream to 770th Ave. (a Flora Township section line road between Sections 6 and 7, T.114N, R.36W). This is a distance of just under three river miles. At the 770th Ave. culvert crossing and continuing downstream, County Ditch No. 45 is a high gradient natural stream channel with a predominant stony, sand/silt stream bottom. At this location, the watercourse flows primarily through riparian wooded areas as it makes its way from higher elevations towards the Minnesota River valley below (Exhibit UC-16).

Biological sampling of both County Ditch No. 45 and Sacred Heart Creek was included as a condition in the So. MN Beet Sugar Cooperative NPDES/SDS permit in order to gather baseline data prior to the re-location and commencement of their discharge into the County Ditch No. 45 watershed and as a follow up to assess the discharge's possible impact. The sampling results indicate that there is a diverse assemblage of aquatic organisms in the lower portions of County Ditch No. 45. These data are reflected in the results obtained from sample station CD45ALT in the March 2006 Biological Monitoring Report for CD45 and Sacred Heart Creek (Exhibit UC-17). While actual fishing and recreational use of this segment of County Ditch No. 45 may be limited, the limitations are driven more by the inaccessibility to this watercourse than by any inherent or human-induced physical or chemical limitations of this segment of watercourse. Therefore it is reasonable to reclassify this lower portion of this watercourse as a Class 2B aquatic life and recreational use water.

2. <u>Retention of Class 2 designation for Unnamed Creek at Isanti Estates Mobile Home Park, Isanti County, Minnesota</u> [XI.E. reasonableness, class 2]

Isanti Estates is a mobile home community located on U. S. Highway 65 approximately two miles south of the city of Isanti. Wastewater from Isanti Estates is treated on-site with an extended aeration package plant that is designed to treat an average wet weather flow of 23,000 gallons per day. The effluent from this facility is discharged to an unnamed creek that runs along the north side of the property. This unnamed creek flows from a 160 acre wetland complex on the west side of Highway 65, situated within the Athens State Wildlife Management Area, and flows in an east/southeasterly direction approximately two river miles to its confluence with Cedar Creek. Cedar Creek is a tributary of the Rum River.

Except for a midpoint segment where the unnamed creek is channelized through a wetland area, the creek retains much of its natural channel characteristics as it flows through wooded and other largely undeveloped rural lands. While low stream flow events can be expected along this watercourse given the limited upstream watershed size (about 2.5 square miles), the fact that the creek is fed by outflows from the wetland in the wildlife management area would tend to moderate instream water levels more than what would normally be expected if the headwaters area were simply an upstream extension of the stream channel. Spring-time flow inundations of the surrounding riparian lands adjacent to this creek also appear to make these areas well suited for northern pike spawning.

An equally important consideration in the assessment of existing or potential uses of this watercourse is the fact that the unnamed creek flows through a portion of the northern boundaries of the Cedar Creek Natural History Area near its confluence with Cedar Creek. The Cedar Creek Natural History Area is a 5,400 acre ecological research site owned by the University of Minnesota. This natural history area is uniquely situated in an area where the North American continent's three major ecosystems overlap. This convergence of 1) the northern conifer forest, 2) the eastern deciduous forest, and 3) the western tallgrass prairies makes the area an ideal site for a diverse mix of long-term ecological studies.

Based on the information gathered during the use attainability stream assessment survey (Exhibit UC- 42) the Agency believes that it is reasonable to recommend that the unnamed creek at Isanti Estates retain its current Class 2B water use classification.

3. Conclusions [XI.E. reasonableness, class 2]

The Agency is proposing to reclassify the lower reach of Renville County Ditch No. 45 from Class 7 back to Class 2. New survey information led the Agency to conclude that this reach has a fisheries and recreational potential and would more appropriately be classified as a Class 2B water.

Based on the results of the stream assessment survey conducted on the unnamed creek at Isanti Estates, along with the comments obtained from the local MDNR fisheries office, the Agency recommends the current Class 2B water use classification be retained for this watercourse.

F. ECONOMIC IMPACT OF PROPOSED CLASS 7 AND CLASS 2B RECLASSIFICATIONS [XI.F. economics, class 7 and 2]

1. Class 7 Reclassifications [XI.F. economics, class 7]

Wastewater treatment plant discharges to Class 7 limited resource value waters, in general, are assigned less stringent effluent limits than would otherwise be assigned if the receiving water remained classified for Class 2 aquatic life and recreational water use. This is generally the case, but factors such as: 1) the size of the discharge, 2) the length of the Class 7 receiving water, and 3) the use classification of the downstream waterbody, come into play in the effluent setting process. The result may be the assignment of effluent limits that closely match limits assigned to discharges to a Class 2 waterbody irrespective of the use classification of the immediate receiving water.

If the proposed Class 7 reclassifications are adopted into rule, cost savings relating to capital expenditures and/or yearly operation and maintenance costs may be realized by the four industrial facilities and three of the four municipalities listed in Table III-34. The proposed reclassification at Winthrop, Minnesota is considered to be cost neutral since this community operates a stabilization pond wastewater treatment facility and any cost savings as a result of the proposed reclassification are thought to be minimal.

For the remaining three municipalities (Evan, Manchester, and Myrtle, Minnesota), cost savings that may result from a Class 7 reclassification will vary depending on the type of facilities that are ultimately chosen to treat the communities' wastewater. Shown below is an example of the potential cost savings resulting from the assignment of less restrictive effluent limits for the city of Evan should the proposed receiving waters be reclassified as a Class 7 waters.. These cost estimates were taken from a 2000 preliminary engineering report developed for the city which examined three wastewater alternatives. These cost projections do not include the estimated $315,000 cost to re-build the sanitary sewer collection system.

The first alternative explored was a regional consolidation with a near-by community's proposed wastewater treatment facility. The projected capital cost of this proposal was approximately $724,000. This alternative was later rejected in part due to the costs associated with pumping the sewage the four-mile distance between the two towns. The second alternative considered the construction of a sequencing batch reactor WWTP at Evan with a projected cost of $283,900. This treatment facility could reportedly meet the Class 2B effluent receiving water discharge limits. The third alternative was a recirculating sand filter treatment facility, which was projected to cost $183,400. The recirculating sand filter would produce an effluent quality that would meet the Class 7 discharge limits but would not consistently produce an effluent quality needed to meet Class 2B receiving water requirements.

The projected capital cost savings associated with the Class 7 reclassification of the proposed receiving waters at Evan would therefore be approximately $100,000. A $6,000 reduction in the annual operation and maintenance costs ($20,000 vs. $26,000) would also be realized if these waters were reclassified as Class 7 waters. An NPDES/SDS discharge permit has been issued for the city of Evan which contains variances to the dissolved oxygen and instream ammonia water quality standards. The resulting effluent limits assigned in this permit parallel those that would be assigned for a Class 7 discharge receiving water.

While the preceding discussion speaks to the issue of potential cost savings associated with the proposed Class 7 reclassifications there is another important factor that deserves recognition. With populations of less than 100 people, debt retirement for any type of centralized WWTP and collection system for these towns will be costly. As such, Agency staff anticipates both Myrtle and Manchester to pursue their variance requests, in accordance with the provisions contained in Minn. R. 7000.7000 and 7050.0190, if adoptions of the proposed Class 7 reclassifications fail to make their way through this rulemaking process, and if these communities choose a wastewater system designed with a continuous surface water discharge.

2. <u>Class 7 to Class 2B Reclassification</u> [XI.F. economics, class 2]

If adopted, the proposed reclassification of the lower reaches of Renville County Ditch No. 45 from its existing Class 7 to Class 2B use will effectively shorten the Class 7 reach of this watercourse by 2.7 river miles. The downstream end of the Class 7 reach would then be 7.6 river miles below the city of Renville's WWTP outfall. In addition to the domestic wastewaters from the residents in town, the Renville WWTP currently treats wastewater from three industrial facilities: Golden Oval Eggs, MinAqua Fisheries (an aquaculture facility in Renville), and the domestic wastewaters generated at the Southern Minnesota Beet Sugar Cooperative facility. Golden Oval and MinAqua both have pre-treatment systems that pre-treat their wastewaters before discharging the effluent to the Renville WWTP. Past discussions have indicated that one or both of these operations may in the future decide to withdraw from the city's WWTP and discharge on their own into the upstream portions of County Ditch No. 45 if ditch access permission is granted by Renville County and necessary NPDES/SDS permits can be obtained. This potential new point of discharge would be approximately 1.5 river miles above the Renville WWTP outfall.

Based on the current and potential discharge scenarios outlined above, coupled with the seasonal (September through March) discharge to another lateral ditch of County Ditch No. 45 from the So. MN Beet Sugar facility, additional treatment costs to the city are not anticipated at this time as a result of the proposed Class 2B reclassification of the lower 2.7 miles of County Ditch No. 45. Ammonia nitrogen levels in the treated effluent from Golden Oval and MinAqua will be evaluated if and when these facilities seek a discharge permit for independent discharges to Branch Lateral 3 of County Ditch No. 45 and appropriate ammonia effluent limits will be established as necessary.

3. Summary [XI.F. economics, class 7 and class 2]

In conclusion, the proposed Class 7 reclassifications, if adopted, potentially could save the four industrial facilities and three of the four municipalities wastewater treatment costs (see Table III-34) due to the generally more lenient point source effluent limits applicable to Class 7 receiving waters (Minn. R. 7053.0245). The proposed reclassification at Winthrop, Minnesota is considered to be cost neutral because they operate a stabilization pond wastewater treatment facility. For Evan, Manchester and Myrtle, cost savings that may result from a Class 7 reclassification will vary depending on the type of facilities that are ultimately chosen to treat the communities' wastewater.

The reclassification of the lower reaches of Renville County Ditch No. 45 from Class 7 to Class 2B is not likely to result in additional treatment costs to the parties potentially impacted by this change.

XII. IMPACT ON AGRICULTURE

Minnesota Stat. § 14.111 requires agencies to send a copy of any proposed rule that affect farming operations to the Commissioner of Agriculture no latter than 30 days prior to publication of the proposed rule in the *State Register*.

The Agency believes that the proposed addition of Class 2 numeric standards for acetochlor and metolachlor to Minn. R. ch. 7050 could impact farming operations. These standards were developed at the request of the Department of Agriculture. The potential for these standards to impact farming operations is discussed detail in Sections V.C and V.L.

The Agency believes that the other proposed amendments discussed in Book III of the SONAR should not have a direct impact on farming operations.

On April 18, 2007, the Agency sent a letter, together with a draft copy of the proposed rule amendments, to the Commissioner of Agriculture well in advance of the targeted *State Register* publication date. The letter, which highlighted the proposed water quality standards for acetochlor and metolachlor discussed in Section V, will be introduced as an exhibit at the beginning of the public hearings. Copies of this letter were also sent to the Minnesota Departments of Health and Natural Resources.

XIII. NOTICE TO THE COMMISSIONER OF TRANSPORTATION

Minnesota Stat. § 174.05, subd. 1 requires the Agency to inform the Commissioner of Transportation of all activities which relate to the adoption, revision or repeal of any standard or rule concerning transportation. A representative of the Minnesota Department of Transportation (MDOT) is on the Agency's interested party mailing list and received all the mailings discussed in Section III of SONAR Book I. The Agency believes that the proposed revisions discussed in this Book may indirectly impact the Department of Transportation, but we do not anticipate any direct impact or direst cost implications.

The change discussed in this Book of the SONAR with the most potential to impact Department of Transportation activities in controlling construction site runoff is the proposal to change the default industrial use classification from 3B to3C. In a related exchange of letters, the Agency informed MDOT that we would not be revising the Class 2 standard for chloride as they had requested (see Section III.F in SONAR Book I, and Exhibits A-14j and A-22).

On April 18, 2007, the MPCA sent a letter, together with a draft copy of the proposed rule amendments, to the Commissioner of MDOT. The letter will be introduced as an exhibit at the beginning of the public hearings.

XIV. LIST OF WITNESSES AND EXHIBITS

A. WITNESSES

The Agency plans to have the following staff available to testify at the public hearings on issues relevant to Book III of the SONAR.

David Maschwitz – Proposed amendments in general, history of their development, preparation of the proposed rule and author of portions of SONAR Book III. Proposed chronic standards for acetochlor and metolachlor, and proposed mercury and *E. coli* standards.
Mark Tomasek – Supervisor of Standards Unit.
Gerald Blaha – Proposed rule language. Proposed Class 3B to 3C change in default classification, update list of trout waters (Class 2A), addition of new Class 1 waters, changes to language associated with use classifications, and proposed new limited resource value waters (Class7) and author of portions of SONAR Book III
Angela Preimesberger – Proposed standards for mercury, acetochlor, metolachlor, benzene, and naphthalene and author of portions of SONAR Book III. Preparation of exhibit list.
Dann White - Proposed acute standards for acetochlor, metolachlor.
Joseph Zachmann, Minnesota Department of Agriculture (MDA) - Proposed standards for acetochlor and metolachlor, implementation of best management practices and costs.
Dan Stoddard, Minnesota Department of Agriculture - Proposed standards for acetochlor and metolachlor. MDA pesticide programs.

B. EXHIBITS

The list of all exhibits is attached.

XV. CONCLUSION

Based on the foregoing, the proposed rule amendments described in SONAR Books III are both needed and reasonable.

Dated: 7/16/07

Brad Moore
Commissioner

Exhibit List: Statement of Need and Reasonableness, Books I-III

A-1 **Statement of Need and Reasonableness, Book I of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
July 2007 Book I of III

A-2 **Statement of Need and Reasonableness, Book II of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
July 2007 Book II of III

A-3 **Statement of Need and Reasonableness, Book III of III, In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; the Proposed Addition of a New Rule, Minnesota Rules Chapter 7053, Relating to Point and Nonpoint Source Treatment Requirements; and the Repeal of Minn. R. Chapters 7056 and 7065**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
Book III of III

A-4 **Statement of Need and Reasonableness (SONAR): In the Matter of Proposed Additions To Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State; Proposed Additions Required By Minnesota Session Law 2003, Chapter 128, Article 1, Section 156 As Amended By Minnesota Session Law 2005, First Special Session, Chapter 1, Article 2, Section 156**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
May 2006 http://www.pca.state.mn.us

A-5 **Exhibit List for Statement of Need and Reasonableness, Books I-III**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
July 2007

A-6 **2006 303(d) List. (Final 2004 MPCA Clean Water Act Section 2004 303(d) Total Maximum Daily Load (TMDL) List of Impaired Waters)**

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Publication MPCA St. Paul
June 1, 2006 http://www.pca.state.mn.us
The List identifies impaired streams and lakes in ten major River Basins.

A-7 **Guidance Manual For Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) Report and 303(d) List**

Author: Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Guidance MPCA St. Paul
October 2005 pp1-106 & Appendices http://www.pca.state.mn.us/water/tmdl/index

URL: See first document under "publications"

A-8a **Subject: Triennial Review -Revised**

From Larry C. Salmela, Department Manager - Environmental, United States Steel Corporation (USS)
Comment Letter Mount Iron
September 22, 2003
To Mr. Marvin Hora, Environmental Outcomes Division, MPCA

A-8b

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter

October 31, 2003

To David Maschwitz and Greg Gross, Environmental Outcomes Division, MPCA

Follow-up to Meeting on October 24, 2003 in New Ulm, Minnesota

A-9 Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

Author: Minnesota Pollution Control Agency (MPCA)

Public Notice State Register (SR) St. Paul

November 10, 2003 Vol 28 (19), pp.614-5

A-10

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter MPCA St. Paul

November 6, 2003 http://www.pca.state.mn.us

To Interested Parties for 7050, 7052 and 7055 Water Quality Rules

1st Notice to mailing list. MPCA Cover Letter with State Register Notice to Interested Parties for 7050, 7052 and 7055.

A-11a Subject: State Register of November 10, 2003 - Possible Amendments to Rules Governing State Water Quality Standards

From Larry C. Salmela, Department Manager - Environmental, United States Steel Corporation (USS)

Comment Letter Mount Iron

December 12, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11b Subject: Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB), Christopher M. Hood, Flaherty & Hood, P.A.

Comment Letter

December 31, 2003

To David Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11c Subject: Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Rebecca J. Flood, Manager - Environmental Compliance Section, Environmental Services Division, Metropolitan Council

Comment Letter St. Paul

December 31, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11d Subject: Proposed Water Quality Standards Rules Revision Invitation to Comment

From Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy (MCEA)

Comment Letter St. Paul

January 9, 2004

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11e Subject: Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Keith E. Hanson, Minnesota Chamber of Commerce Water Quality Subcommittee - Chair

Comment Letter St. Paul

December 31, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11f **Subject: Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052**

From Steven Colvin, Environmental Management Unit Supervisor, Division of Ecological Services, Minnesota Department of Natural Resources (MDNR)

Comment Letter St. Paul

December 31, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice.

A-11g **Subject: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process… (Importance: High)**

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

September 29, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-11h **Subject: RE: MPCA WQ Standards Rule Revision…**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

September 29, 2003

To David Flakne, Syngenta

Comment Letter from 1st Notice.

A-11i **Subject: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process… (Importance: High)**

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

December 19, 2003

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice. 3 Attachments:
EPA DWLOC Values iRED.ppt; EPA LOC CASM Screening Values…; US EPA Atrazine Aquatic Life Water Quality (see Exhibit H-59)

A-11j **Subject: RE: Syngenta Comments & Input to MPCA WQ Standards Rule Revision Process…**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

December 22, 2003

To David Flakne, Syngenta

Comment Letter from 1st Notice. Attachment: Atrazine U.S. EPA.doc

A-11k **Subject: Syngenta Comments/Questions on MPCA Proposed Revisions to WQ Standards 7050 and 7052… (Importance: High)**

From David Flakne, State Government Relations Manager, Syngenta Crop Protection

e-mail Madison

May 25, 2004

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Comment Letter from 1st Notice. Comment Letter from 1st Notice. 3 Attachments:
EPA DWLOC Values iRED.ppt; EPA LOC CASM Screening Values…; US EPA Atrazine Aquatic Life Water Quality

A-11l **Subject: RE: Syngenta Comments/Questions on MPCA Proposed Revisions to WQ Standards 7050 and 7052…**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

May 25, 2004

To David Flakne, State Government Relations Manager, Syngenta Crop Protection

Comment Letter from 1st Notice.

A-12 **Request for Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052**

Minnesota Pollution Control Agency (MPCA)

Public Notice State Register (SR) St. Paul

May 17, 2004 Vol 28(46); pp.1464-7

Notice to solicit in SR, May 17, 2004

A-13

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Letter
May 11, 2004
To Interested Party
Cover Letter & Mailing List - 2nd Notice

A-14a **Subject: Water Quality Rule Revisions**
From Paula West, Executive Director, Minnesota Lakes Association (MLA)
e-mail Brainerd
May 13, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14b **Subject: Proposed Extension of 1 mg/L Phosphorous Effluent Limit to New or Expanding Discharges**
From Steven Colvin, Environmental Management Unit Supervisor, Division of Ecological Services, Minnesota Department of Natural Resources (MDNR)
Letter St. Paul
May 14, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14c **Subject: RE: Syngenta Comments/Questions on MPCA Proposed Revision to WQ Standards Chapter 7050 and 7052… (Importance: High)**
From David Flakne, State Government Relations Manager, Syngenta Crop Protection
e-mail Madison
May 25, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14d

From Crosby-Ironton Presbyterian Church
Letter Crosby
June 11, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
Re: Upholding Strict Standards to Protect Water Quality in Our State

A-14e **Subject: Clean Water/Public Input**
From Tine Thevenin, Author/Speaker
e-mail Lake City
June 18, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14f **Subject: Request for Development of Water Quality Standards**
From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)
Letter St. Paul
June 23, 2004
To Greg Gross, Environmental Outcomes Division, MPCA

A-14g **Subject: Mercury Comments**
From Donald Barron
Comment Letter Thief River Falls
Received June 24, 2004
To Environmental Protection Agency Administrator, Ariel Rios Building (Washington, D.C.)
Copy Mailed To: David E. Maschwitz, Environmental Outcomes Division, MPCA, St. Paul, MN

A-14h **Subject: Comments - Proposed Changes to MS Ch. 7050**
From Terry Noonan, Project Manager - Water Resources, Ramsey County Public Works
e-mail Shoreview
June 25, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-14i Subject: Comments on Possible Amendments to Rules Governing State Water Quality Standards, Minnesota Rules Chapters 7050 and 7052

From Al Christopherson, President, Minnesota Farm Bureau Federation (MFBF)
Comment Letter
June 28, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
with Cover Letter (e-mail from Jackie Gauger sent on June 29, 2004)

A-14j Subject: Mn/DOT Comments on Water Quality Standards Revision

From Richard Elasky, Chief Environmental Officer, Minnesota Department of Transportation (MNDoT)
Comment Letter St.Paul
June 29, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA
3 Attachments: Derivation of Acute and Chronic Toxicity Criteria for Chloride (January, 2000) prepared by: Jim Schmidt -WDNR; Chronic Data - Chlorides spread sheet provided by Jim Schmidt -WDNR; Ambient Aquatic Life Criteria For Chloride -Chloride Issue Paper (2003) provided by Connie Due - Iowa DNR, Environmental Services Division, Water Quality Bureau

A-14k Subject: MESERB/CGMC Data Practices Act Request Relative to Proposed Amendments to the Phosphorus Rule, Minn. R. 7050.0211, subp. 1a

From Chistopher M. Hood, Flaherty & Hood, P.A.
Letter St. Paul
June 30, 2004
To Commissioner Sheryl Corrigan
Included an Attached Memo (Exhibit A-14l)

A-14l Subject: Supplemental Data Practices Act Request

From Christopher M. Hood, Flaherty & Hood, P.A. for Coalition of Greater Minnesota Cities (CGMC)
Letter St. Paul
July 16, 2004
To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

A-14m Subject: Proposed Water Quality Standards Rule Revision Invitation to Comment

From Sol Simon, President - Mississippi River Revival (MRR)
Comment Letter Winona
June 30, 2004
To David E. Maschwitz, Environmental Outcomes Division, MPCA

A-15a Proposed Amendments to Minnesota Rules Chapter 7050 [RULES AS PROPOSED]

Author: Minnesota Pollution Control Agency (MPCA)
Rule MPCA St. Paul
July 16, 2007 wq-rule1-02

A-15b Proposed New Minnesota Rules Chapter 7053 [RULES AS PROPOSED]

Author: Minnesota Pollution Control Agency (MPCA)
Rule MPCA St. Paul
July 16, 2007 wq-rule1-03

A-16 NEWS RELEASE: MPCA Seeks Input on Proposed Changes to State Water-Quality Standards

Author: Minnesota Pollution Control Agency (MPCA)
MPCA Publication MPCA St. Paul
For Release: June 4, 2004 http://www.pca.state.mn.us
News Release for the public meetings

A-17 Subject: Plans for Additions and Revisions to Water Quality Standards in Minn. R. chs. 7050 and 7052

From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo St. Paul

September 23, 2003

To MPCA's Citizens' Board

with cover letter to interested parties from David Maschwitz dated September 12, 2003, and list of 59 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on September 23, 2003)

A-18 Triennial Review of Water Quality Standards, Minn. R. ch. 7050 & 7052

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation St. Paul

September 23, 2003

For MPCA's Citizens' Board

PowerPoint presentation

A-19 Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards

From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo St. Paul

August 13, 2004

To MPCA's Citizens' Board

with cover letter to interested parties dated August 16, 2004, and list of 72 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on August 24, 2004)

A-20 Update of Plans to Revise MN Water Quality Standards

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation St. Paul

August 24, 2004

To MPCA's Citizens' Board

PowerPoint presentation

A-21 Health Risk Limits for Groundwater Water Intake and Cancer Potency Adjustment Factors

Author: Helen Goeden, Ph.D., Minnesota Department of Health (MDH)

Presentation St. Paul

August 24, 2004

To MPCA's Citizens' Board

PowerPoint presentation - New MDH Slides

A-22 Subject: Request for Change to the Class 2 Standard for Chloride

From Marvin E. Hora, Manager, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

September 24, 2004

To Mr. Richard Elasky, Chief Environmental Officer, Minnesota Department of Transportation (MNDoT)

A-23 Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo St. Paul

September 21, 2004

To MPCA's Citizens' Board

Cover letter to interested parties; 2 Attachments; Agency Board Meeting was on September 28, 2004.

A-24 Update of Plans to Revise MN Water Quality Standards

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Presentation St.Paul

September 28, 2004

To MPCA's Citizens' Board

PowerPoint presentation

A-25 2003 Administrative Rule Preliminary Proposal Form

Author: David E. Maschwitz, Environmental Outcomes Division, MPCA

Form MPCA St. Paul

October 27, 2003

with cover memorandum To: Scott Wiggins, Legislative Coordinator; From: Kevin Molloy, Water Quality Rule Coordinator; 1st of three forms to the Governor's Office

A-26 2007 Admistrative Rule Proposed Rule and SONAR form: Minnesota's Water Quality Standards, Proposed Revision of Minnesota Rules Chapter (Minn. R. Ch.) 7050, Proposed Addition of a New Rule, Minn. R. Ch. 7053, Proposed Repeal of Out-dated Rules, Minn. R. Ch. 7056 and 7065

Author: David E. Maschwitz (Rule/SONAR Content) and Kevin Molloy (Rulemaking Coordinator), Minnesota Pollution Control Agency (MPCA)

Form MPCA

April 9, 2007 Adm. Rule Tracking #: AR081(B)

Attached to Memo: Letters to Commissioner Tom Hanson, Department of Finance, Commissioner Gene Hugoson, Minnesota Department of Agriculture, and Commissioner Carol Molnau, Minnesota Department of Transportation

A-27 No Exhibit

A-28 Petition for Rulemaking to the Minnesota Pollution Control Agency -Pursuant to Minnesota Statutes § 14.09 et seq.

From Chistopher M. Hood, Flaherty & Hood, P.A.

Petition St. Paul

December 15, 2003

To Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Includes cover letter to Commissioner Sheryl Corrigan Re: Petition to amend Minn. R. 7050.0211, subp. 1a (the "phosphorus rule")

A-29 Subject: Response to Petition to Amend Minn. R. 7050.0211, subp. 1a (the "phosphorus rule")

From Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

January 13, 2004

To Christopher M. Hood, Flaherty & Hood, P.A.

A-30 Phosphorus Rulemaking Petition

From Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy

Petition Minnesota Center for Environmental Advocacy (MCEA) St. Paul

July 27, 2004

To Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Includes cover letter (Re: Petition to Amend Minn. R. 7050.0211)

A-31 Subject: Petition to Amend Minn. R. 7050.0211

From Commissioner Sheryl Corrigan, Minnesota Pollution Control Agency (MPCA)

Letter St. Paul

August 18, 2004

To Janette K. Brimmer, Kris Sigford of the Minnesota Center for Environmental Advocacy

(Response to MCEA's July 27, 2004 Petition)

A-32a Subject: MPCA Proposed Phosphorous Rule and Phosphorous Strategy Amendments

From Christopher M. Hood, Flaherty & Hood, P.A.

Letter St. Paul

June 30, 2004

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Attached Technical Memo from MESERB (see Exhibit A-32b)

A-32b **Subject: MPCA Approach to Phosphorus Effluent Limits in NPDES Permitting**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Memo — Alexandria

June 30, 2004

To Commissioner Sheryl Corrigan

Attachment to Exhibit A-14k

A-33

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

August 5, 2004

To Christopher M. Hood, Flaherty & Hood, P.A.

Response to Christopher Hood on the Minnesota Data Practices Act Request of June 30, 2004, and the Follow-up Request of July 16, 2004.

A-34 **Subject: Amendments to Phosphorus Rule, Minn. R. 7050.0211, subp. 1a**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter — Alexandria

February 11, 2005

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Additional Contact: Steve Nyhus, Flaherty & Hood, P.A.

A-35 **Subject: MPCA Proposed Water Quality Assessment Rules Revisions and Ecoregion-Based Eutrophication Standards**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter — Alexandria

March 18, 2005

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Additional Contact: Steve Nyhus, Flaherty & Hood, P.A.

A-36 **Subject: Response to MESERB February 11, 2005 Letter, Comments on Amendments to Phosphorus Rule; and March 18, 2005 Letter, Comments on Proposed Eutrophication Standards**

From Greg Gross, Supervisor, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

May 12, 2005 — pp.1-13 and pp.1-6

To Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Attachment: Draft Amendments to Minnesota Rules Chapter 7050; Excerpt of Planned Revision of Water Quality Standards

A-37a **Minn. Session Law 2003, ch. 128, art. 1, § 156, subdivisions 1 and 2 Water Quality Assessment Process**

Law — Minnesota Office of Revisor of Statutes — St. Paul

2003 — http://www.revisor.leg.State.mn.us

(Original Law)

A-37b **Minn. Special Session Law 2005 ch. 1, art. 2, § 151, subdivisions 1, 2 and 3 Water Quality Assessment Process**

Law

2005 — http://www.revisor.leg.State.mn.us

(Amendment to: Minn. Session Law 2003, ch. 128, art. 1, § 156, subdivisions 1 and 2)

A-38 **No Exhibit**

A-39 **No Exhibit**

A-40a **Subject: Critical Concerns Regarding Draft Nutrient Standards and Phosphorous Rule**

From Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

Comment Letter — Alexandria

June 16, 2005 — pp.1-4

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

A-40b **Water Quality Standards: A Review with an Emphasis on Numeric Nutrient Criteria**

Author: Walt Poole, Ph.D., America's Clean Water Foundation (ACWF)

Report — ACWF

March 2005 — pp.6-31

In Cooperation with the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA)

A-41 **Subject: MESERB's Concerns Regarding Nutrient Standards and Phosphorous Rule**

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

June 29, 2005 — pp.1-3

To Bruce A. Nelson, Executive Director, Alexandria Lake Area Sanitary District, Minnesota Environmental Science and Economic Review Board (MESERB)

A-42a **Changes to Proposed Amendments to Minn. Rules, ch. 7050**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

March 9, 1990 — pp.1-6

A-42b **Revised Changes to Proposed Amendments to Minn. Rules pts. 7050.0218, subp. 2 and 7050.0220, subp. 4**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

March 16, 1990

A-43 **No Exhibit**

A-44a **Sensitivity of Mussels to Ammonia Toxicity, Implications for a Revised Minnesota Ammonia Standard Considering the Biology and Distribution of Mussels in Minnesota**

Author: Minnesota Pollution Control Agency (MPCA)

Agenda — MPCA — St. Paul

March 25, 2004

Contact List on back

A-44b **Subject: Meeting at MPCA, 1:00-4:30p.m., March 25, 2004**
Sensitivity of Mussels to Ammonia Toxicity, Implications for a Revised Minnesota Ammonia Standard Considering the Biology and Distributions of Mussels in Minnesota

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter — St. Paul

March 15, 2004

To Ammonia Toxicity Experts (see exhibit A-44c for list)

A-44c

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — St. Paul

2004

List of Attendees (for March 25, 2004 Mtg.: exhibit A-44b)

A-45 **Notice of Intent To Re-Evaluate the Aquatic Life Ambient Water Quality Criteria for Ammonia**

Author: Geoffrey H. Grubbs, Director, Office of Science and Technology, Environmental Protection Agency (EPA)

Public Notice — Federal Register - Online via GPO Access — Washington, D.C.

July 8, 2004 — Vol 69(130); pp.41262-4 — http://www.gpoaccess.gov/fr/index.html

A-46a **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

December 3, 2004 http://www.pca.state.mn.us

Included excerpts from Minn. Rule ch 7050 revisions (See Exhibit A-46b).

A-46b **Excerpts of Planned Revision of Water Quality Standards: Preliminary Draft Amendments to Minn. R. 7050.0150 and 7050.0222 - Relevant Definitions and Eutrophication Standards for Lakes, Reservoirs and Shallow Lakes [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule Minnesota Office of Revisor of Statutes St. Paul

November 1, 2004 http://www.pca.state.mn.us

Attachment to December 3, 2004 website, "Proposed Water Quality Standards Rule Revisions".

A-47 **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: June 16, 2005 http://www.pca.state.mn.us

A-48a **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: August 9, 2005 http://www.pca.state.mn.us

Includes complete versions of Minn. Rules ch 7050 & 7055 [Drafts]. (See Exhibit A-48b & A-48c)

A-48b **Proposed Amendments to Minnesota Rules Chapter 7050 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

July 28, 2005 http://www.pca.state.mn.us

A-48c **Proposed Amendments to Minnesota Rules Chapter 7055 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule Office of Revisor of Statutes, State of Minnesota St. Paul

July 28, 2005

Attached to August 9, 2005 Rule Revision Website

A-49a **Proposed Water Quality Standards Rule Revisions**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised: January 26, 2006 http://www.pca.state.mn.us

Includes complete versions of Minn. Rules ch 7050 & 7055 [Drafts] (Updated January 1, 2006; See Exhibit A-49b & A-49c) and Derivation of acetochlor and metolachlor standards (See Exhibit A-49d)

A-49b **Proposed Amendments to Minnesota Rules Chapter 7050 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

Revised January 1, 2006 http://www.pca.state.mn.us

A-49c **Proposed New Minnesota Rule Chapter 7055 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Rule MPCA St. Paul

Revised January 1, 2006 http://www.pca.state.mn.us

A-49d **Outline of Basis for Draft Proposed Acetochlor and Metolachlor Class 2 Water Quality Standards**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

January 17, 2006 http://www.pca.state.mn.us

A-50 Water Quality Standards Handbook: 2nd Ed.

Author: Office of Water, Environmental Protection Agency (EPA)

Guide EPA Washington

August 1994 EPA-823-B-94-005a; pp.5-11, 5-12 http://www.epa.gov

[5.3] Variances From Water Quality Standards

A-51 National Recommended Water Quality Criteria: 2002

Author: Office of Water and Office of Science and Technolgy, Environmental Protection Agency (EPA)

EPA Report Washington, D. C.

November 2002 http://www.epa.gov

A-52 Announcement: Health Risk Limits Expert Advisory Panel

From Patricia Bloomgren, Director, Division of Environmental Health, Minnesota Department of Health (MDH)

Letter St. Paul

2005 http://www.health.state.mn.us

(General Posting on MDH website)

A-53 Subject: Exclusions/Inclusions for DWS in 7050

From Richard D. Clark

e-mail St. Paul

May 20, 2005

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Includes Attachment: SONAR excerpt on Drinking Water Standards

A-54 40 CFR parts 141 and 143

Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access

Rule Code of Federal Regulations (CFR) Washington, D.C

Revised July 1, 2004 Vol 21 http://www.gpoaccess.gov/fr/index.html

Title 40 "Protection of Environment"; Part 141 "National Primary Drinking Water Regulations" and Part 143 "National Secondary Drinking Water Regulations"

A-55a Statement of Need and Reasonableness [Excerpt]

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document St. Paul

1979; 1980 Rule Revision PCA-004-80-AK, pp.1, 37-8

Excerpt on Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55b Report of the Hearing Examiner [Excerpt]

Hearing Examiner

Report Stat e of Minnesota Office of Hearing Examiners St. Paul

1980 PCA-80-004-AK, pp.1, 78-81

Excerpt related to Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55c Proposed Findings of Fact and Conclusions [Excerpt]

Minnesota Pollution Control Agency (MPCA)

MPCA Document St. Paul

October 28, 1980 Cover sheet, pp.20

Cover Sheet: Agenda Item Control Sheet; Excerpt on Proposed Amendments for WPC 14 C.9. and 15 C.9.- 5 mg/L TSS Limit & Pretreatment

A-55d Order Adopting Rules

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document St. Paul

1980 PCA-80-004-AK, p. 3, no. 4

In the Matter of the Proposed Amendments to MPCA Rules WPC 14, 15, 24 and 25 and the Proposed Repeal of WPC 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17,18, 19, 20, 21, 23, 26, 29, 31 and 32.

A-56 Minn. R. ch. 7056
Author: Minnesota Pollution Control Agency (MPCA)
Rule Minnesota Office of Revisor of Statutes St. Paul
November 3, 1998 http://www.revisor.leg.state.mn.us/
Mississippi River and Tributaries

A-57 Minn. R. ch. 7065
Author: Minnesota Pollution Control Agency (MPCA)
Rule Minnesota Office of Revisor of Statutes St. Paul
November 3, 1998 http://www.revisor.leg.state.mn.us/
http://www.revisor.leg.state.mn.us/
Effluent Standards for Disposal Systems

A-58 No Exhibit

A-59 No Exhibit

A-60 40 CFR 131.10 (a) Designation of Uses
Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access
Rule Code of Federal Regulations (CFR) Washington, D.C.
Revised July 1, 2004 pp.370-1 http://www.gpoaccess.gov/fr/index.html
(Waste Assimilation Not a Beneficial Use).

A-61 Water Quality Standards Handbook: 2nd Ed.
Author: Office of Water, Environmental Protection Agency (EPA)
Guide EPA Washington, D.C.
August 1994 EPA-823-B-94-005a; pp.2-1, 2-2 http://www.epa.gov
[2.1] Use Classification - 40 CFR 131.10(a) in Chapter 2, "Designation of Uses"

A-62 40 CFR 131.12 Antidegradation Policy
Author: Environmental Protection Agency (EPA) -From the US Gov. Print. Office via GPO Access
Rule Code of Federal Regulations (CFR) Washington, D.C.
Revised July 1, 2005 pp.390-1 http://www.gpoaccess.gov/fr/index.html
Title 40 "Protection of Environment"; Part 131 "Water Quality Standards"

A-63 Water Quality Standards Handbook: 2nd Ed.
Author: Office of Water, Environmental Protection Agency (EPA)
Guide EPA Washington, D.C.
August 1994 EPA-823-B-94-005a; pp.4-1 to 4-14 http://www.epa.gov
Chapter 4 - Antidegradation

A-64a Subject: Update on Proposed Revisions and Additions to Minnesota Water Quality Standards
From David E. Maschwitz, Greg Gross - Supervisor, and Marvin E. Hora, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Memo MPCA St. Paul
January 13, 2006 http://www.dnr.state.mn.us
To MPCA Citizens' Board
with cover letter to interested parties dated January 13, 2006, and list of 72 interested parties that received a copy of the memo to the Agency Board. (Agency Board meeting was on January 24, 2006)

A-64b Triennial Review of Water Quality Standards: Update on Revisions of Minn. R. ch. 7050
Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Presentation St. Paul
January 24, 2006
To MPCA's Citizens' Board

A-65a **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

Revised July 28, 2006 http://www.pca.state.mn.us

Included Draft Minn. R. chs. 7050 and 7053 and Outline of Acetochlor and Metolachlor Standards

A-65b **Proposed Water Quality Standards Rule Revisions (Update)**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Website MPCA St, Paul

June 6, 2007 http://www.pca.state.mn.us

Includes Proposed Minn. R. chs. 7050 (Exhibit A-15a) and 7053 (Exhibit A-15b) and Outline of Acetochlor and Metolachlor Standards; Attached email to Interested Parties

A-66 **Subject:**

From Tom Poleck, Water Quality Branch, Environmental Protection Agency (EPA)

Letter Chicago

December 19, 2005

To Dave Maschwitz, Environmental Outcomes Division, MPCA

"…initial response to changes that the Minnesota Pollution Control Agency (MPCA) is considering making to certain aspects of Minn. R. ch. 7050, including proposed rule revisions that MPCA posted on its website on August 9, 2005."

A-67a **Subject: Water Quality Standards for Mercury**

From Char Brooker

e-mail Maplewood

February 3, 2006

To David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Example of emails received after January 24, 2006 presentation at the MPCA's Citizen Board Meeting

A-67b **Subject: FW: FW: Act to Reduce Mercury in Minnesota Fish!**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

e-mail St. Paul

March 2, 2006

To Interested Party

EC-1 **Ambient Water Quality Criteria for Bacteria-1986**

Author: Environmental Protection Agency's (EPA's) Office of Research and Development Microbiology and Toxicology Div., Cincinnati, OH and Office of Water Regulations and Standards, Criteria and Standards Div., Washington, D.C.

EPA Report EPA Washington, D.C

January 1986 EPA440/5-84-002; pp.i-iv, 1-18 http://www.epa.gov

Bacteriological Ambient Water Quality Criteria for Marine and Fresh Recreational Waters

EC-2 **Implementation Guidance for Ambient Water Quality Criteria for Bacteria**

Primary Authors: Jim Keating, Jennifer Wigal, and Lars Wilcut, Office of Water (4305T), Environmental Protection Agency (EPA)

Guidance EPA Washington, D.C.

March 2004 EPA-823-B-04-002; pp.i-x, 1-89 http://www.epa.gov

EC-3 **Fecal Contamination of Surface and Recreational Waters: Disease Transmission and Public Health Protection [DRAFT]**

Prepared by Tetra Tech EM Inc. for Minnesota Pollution Control Agency (MPCA);

Report MPCA St. Paul

September 30, 1997 pp. i- ii, 1-28 http://www.pca.state.mn.us

EC-4 **Microbial Indicators of Faecal Contamination In Water: A Current Perspective**

Author: Pam Tallon, Brenda Magajna, Cassandra Lofranco and Kam Tin Leung, Department of Biology, Lakehead University, and Ontario Ministry of the Environment, Standards Development Branch, Etobicoke

Journal Water, Air and Soil Pollution Ontario -Canada

2005 Vol 166; pp.139-166 http://springerlink.metapress.com/content/1573-2932/

EC-5 **Do U.S. Environmental Protection Agency Water Quality Guidelines for Recreational Waters Prevent Gastrointestinal Illness? A Systematic Review and Meta-Analysis**

Author: Timothy J. Wade, N. Pai, Joseph N.S. Eisenberg, and J. Colford, Jr., Epidemiology and Biomarkers Branch, Environmental Protection Agency (EPA), Research Triangle Park, NC; School of Public Health, Div. of Epidemiology, Univ. of California

Review — Environmental Health Perspectives (EHP) — Berkley

June 2003 — Vol 111; pp.1102-8 — http://www.ehponline.org

EC-6a **Method 1603: Escherichia coli (E. coli) in Water by Membrane Filtration Using Modified membrane-Thermotolerant Escherichia coli Agar (Modified mTEC)**

Author: Office of Water (4303T) Environmental Protection Agency (EPA)

EPA Report — EPA — Washington, E.C.

September 2002 — EPA-821-R-02-023 — http://www.epa.gov

EC-6b **40 CFR Part 136.**
Part III. Guidelines Establishing Test Procedures for the Analysis of Pollutants; Analytical Methods for Biological Pollutants in Ambient Water [Final Rule]

Author: Environmental Protection Agency (EPA)

Rule — Federal Register (FR)

July 21, 2003 — Vol 68(139); pp.43271-83 — http://www.epa.gov/fedrgstr

EC-6c **Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Notice of Data Availability**

Author: Environmental Protection Agency (EPA) -from Online via GPO Access

Public Notice — Federal Register (FR)

April 11, 2006 — Vol 71(69); pp.18329-31 — http://www.epa.gov/fedrgstr/

EC-7 **Rapidly Measured Indicators of Recreational Water Quality are Predictive of Swimming Associated Gastrointestinal Illness**

Author: Timothy J. Wade, Rebecca L. Calderon, Elizabeth Sams, Michael Beach, Kristen P. Brenner, Ann H. Williams, and Alfred P. Dufour, The National Institute of Environmental Health Sciences, U.S. Department of Health and Human Services

Journal — Environmental Health Perspectives (EHP)

Online: September 1, 2005 — Vol 114 (1); pp.24-8 — http://www.ehponline.org

EC-8 **South Zumbro River in Rochester Fecal Coliform and E. coli Monitoring (2001) [DRAFT]**

Author: Norman Senjem and Lee Ganske, Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

April 2003 — http://www.pca.state.mn.us

EC-9 **Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota**

Submitted by: Norman Senjem, Lee Ganske, Gregory Johnson, David Morrison, and Bill Thompson, Regional Environmental Management Division, Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

October 2002 — http://www.pca.state.mn.us

For Submission To: Region 5, U.S. Environmental Protection Agency (EPA), Chicago, Illinois

EC-10 **Water-Resources Investigations.**
Escherichia coli and Fecal-coliform Bacteria as Indicators of Recreational Water Quality

Author: Donna S. Francy, Donna N. Myers, and Kevin D. Metzker, U.S. Geological Survey

Report — U.S. Geological Survey — Columbus

1993 — Report# 93-4083 — http://www.usgs.gov

EC-11 **Surface Water Pathogen Study**

Prepared by Wenck Associates, Inc.

Study — Minnehaha Creek Watershed District

Study Completion: July 2003 — pp.i-vii, 2-1 to 6-3, Appendix A & B

Prepared for the Minnehaha Creek Watershed District

EC-12 **1984 Mississippi River Bacteria Study**

Author: Gary L. Fandrei, Minnesota Pollution Control Agency (MPCA)

Study — MPCA — Roseville

April 1985 — pp.i-vii, 1-29 — http://www.pca.state.mn.us

EC-13 **Health Effects Criteria for Fresh Recreational Waters**

Author: Alfred P. Dufour, Toxicology and Microbiology Division, Environmental Protection Agency (EPA)

EPA Report | EPA | Cincinnati

August 1984 | EPA-600/1-84-004 | http://www.epa.gov

EC-14 **Fecal Coliform vs. E. coli Water Quality Standards**

Author: Dave Christopherson, Minnesota Pollution Control Agency (MPCA)

MPCA Document | MPCA | St. Paul

May 2003

EC-15 **Water Pollution Control Act of 1972 Amendment to Section 303(i) Beaches Environmental Assessment and Coastal Health Act of 2000 .**

106th Congress

Law | U.S. Code | Washington, D.C.

October 10, 2000 | Public Law 106-284; 114 STAT.870 | http://www.gpoaccess.gov/uscode/index.html

BEACH Act Amendment to the Clean Water Act

EC-16a **Subject: Reminder of Deadline and Advisement of EPA's Plans to Comply with Requirements of Section 303(i) of the Clean Water Act, Also Known As the BEACH Act**

From Benjamin H. Grumbles, Office of Water, Environmental Protection Agency (EPA)

Letter | EPA | Washington, D.C.

April 19, 2004

To Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

with Attachment - Outline/Requirements: "General Background of the BEACH Act"

EC-16b **Subject: Federal Promulgation of Water Quality Criteria for Bacteria**

From Sheryl A. Corrigan, Commissioner, Minnesota Pollution Control Agency (MPCA)

Letter | MPCA | St. Paul

May 7, 2004

To Benjamin H. Grumbles, Office of Water Environmental Protection Agency (EPA)

Response to EPA

EC-17 **40 CFR Part 131**
Part II. Water Quality Standards for Coastal and Great Lakes Recreation Waters; Final Rule

Author: Environmental Protection Agency (EPA)

Public Notice | Federal Register (FR) | Washington, D.C.

November 16, 2004 | Vol 69(220); pp.67218-67243 | http://www.epa.gov/fedrgstr

Rules and Regulations. (EPA Promulgation of Standards for States Not Meeting Deadline)

EC-18 **Minnesota Lake Superior Beach Program**

Author: Minnesota Pollution Control Agency (MPCA)

Website | MPCA | St. Paul

June 24, 2004; Accessed: March 3, 2005 | http://www.pca.state.mn.us/water/beaches/index.html

EC-19 **Draft Matrix of Protocols and Criteria Used in Beach Closing Decisions [DRAFT]**

Prepared by the Metro Area Beach Monitoring Group, Minnesota Pollution Control Agency (MPCA)

MPCA Document | MPCA | St. Paul

September 2005

Headings: Sampling and Analysis Methods; ods; Thresholds; Actions; Other Items

EC-20 **Subject: Comments on the May 2002 Draft "Implementation Guidance for Ambient Water Quality Criteria for Bacteria"**

From Marvin E. Hora, Manager, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Letter | MPCA | St. Paul

August 2002

To Mr. William Morrow, Assistant Branch Chief, Water Quality Standards Branch, U.S. Environmental Protection Agency (EPA)

EC-21 **Microbiological Quality of Puget Sound Basin Streams and Identification of Contaminant Sources**

Author: Sandra S. Embrey, Hydrologist, U.S. Geological Survey

Journal — J. of the American Water Resources Assoc. (JAWRA) — Tacoma

April 2001 — Vol 37(2); pp.407-21 — http://www.awra.org/publicationindex.html

EC-22 **Accommodating Change of Bacterial Indicators In Long Term Water Quality Datasets**

Author: Curtis G. Cude, Natural Resource Specialist, Oregon Department of Environmental Quality, MSD/BSD

Journal — J. of the American Water Resources Assoc. (JAWRA) — Portland

February 2005 — Vol 41(1); pp.47-54 — http://www.awra.org/publicationindex.html

EC-23 **Bacterial Water Quality Standards for Recreational Waters (Freshwater and Marine Waters)**

Author: Office of Water (4305T), Environmental Protection Agency (EPA)

Report — EPA — Washington, D.C.

June 2003 — EPA-823-R-03-008; pp.i-iii, 1-9+ — http://www.epa.gov/waterscience/beaches

Status Report

EC-24 **Environmental Sampling and Analytical Contract Valid from July 1, 2004 Through June 30, 2006**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

June 30, 2006

Showing Costs for Bacteriological Sample Analysis at Eight Labs

EU-1 **Minnesota Lake Water Quality Assessment Report: Developing Nutrient Criteria, Third Edition**

Prepared by Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and C. Bruce Wilson Watershed Section, Regional Division, Minnesota Pollution Control Agency (MPCA)

Report — MPCA — St. Paul

September 2005 — http://www.pca.state.mn.us/water

EU-2 **The Changing Lake Regions of Minnesota**

Author: Minnesota Lakes (MLA) Reporter

Newspaper — Minnesota Lakes Association Reporter

July 2003 — Vol 7 (2); pp.1 & 6 — http://www.mnlakes.org

David E. Maschwitz, Environmental Outcomes Division, MPCA

EU-3a **Ecological Disaster. The State We're In. One of a Series of Articles About Conservation, Chapter 3: Clearing the Shorelines**

Author: Dennis Anderson, Star Tribune Staff Writer

Newspaper — Minneapolis Star Tribune -Metro Edition — Minneapolis

December 18, 2001 — pp.A-1, A-10 & A-11 — #http://www.startribune.com#

EU-3b **State of the Lakes. Minnesota is Known as the State of 10,000 Lakes and the Land of Sky Blue Waters. But Who's Looking After Our Trademark Waters?**

Author: Greg Breining, Minnesota Department of Natural Resources (MDNR)

Journal — Minnesota Conservation Volunteer — St. Paul

July-August, 2003 — http://www.dnr.state.mn.us/volunteer

EU-3c **'Dog Days' of Summer Bring the Greening of Minnesota's Lakes. The Solution to Lake Water Degradation May Be in Our Own Backyards**

Author: Forrest Peterson, Minnesota Pollution Control Agency (MPCA)

MPCA Publication — Minnesota Environment — St. Paul

Fall 2001 — Vol 2 (1); pp.1-6 — www.pca.state.mn.us

EU-4 **Minnesota Sea Grant: Why Love Lakes? and Summary Report: Public Perceptions, Use, and Future of Minnesota Lakes. Results of the 1998 Minnesota Lakes Survey (1999)**

Author: Keith A. Anderson, University of Minnesota Sea Grant Program

Newsletter — The Seiche Newsletter

December 1998; Accessed: February 23, 2006 — pp.1-4 — http://www.seagrant.umn.edu/seiche

EU-5 **Limnology. Ontogeny and Evolution of Lake Ecosystems**

Author: Robert G. Wetzel, Professor of Botany, Kellogg Biological Station, Michigan State University

Book Section W. B. Saunders Company Philadelphia

1975 p.640 of 743

EU-6 **Detailed Assessment of Phosphorus Sources to MN Watershed: Under TMDL Master Contract [Executive Summary]**

Prepared by Barr Engineering

Report MPCA St. Paul

February 2004 pp.1, 2, ii-xxxiv http://www.pca.state.mn.us

EU-7 **Rules and Standards Development for Nonpoint Source Controls**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Publication MPCA St. Paul

January 7, 1986 http://www.pca.state.mn.us

EU-8 **Subject: Lake Eutrophication Standards Development**

From Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, Minnesota Pollution Control Agency (MPCA)

Memo MPCA

January 26, 1995

To Duane L. Anderson, Manager, Monitoring & Assessment Section, Water Quality Division, MPCA

EU-9 **Phosphorus Strategy Task Force**

Author: Water Quality Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

June 1996 http://www.pca.state.mn.us

EU-10 **National Strategy for the Development of Regional Nutrient Criteria**

Author: Office of Water, Environmental Protection Agency (EPA)

EPA Report EPA Washington,

June 1998 EPA 822-R-98-002 http://www.epa.gov

EU-11 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VI**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA 822-B-00-008; pp.i-x, 1-27, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northern Glaciated Plains and Western Corn-belt Plains Ecoregions

EU-12 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VII**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA-822-B-00-009; pp.i-xii, 1-28, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northcentral Hardwood Forests Ecoregion

EU-13 **Ambient Water Quality Criteria Recommendations. Information Supporting the Development of State and Tribal Nutrient Criteria. Lakes and Reservoirs in Nutrient Ecoregion VIII**

Author: Office of Water, Office of Science & Technology, Health & Ecological Criteria Division, Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

December 2000 EPA-822-B-00-010; pp.i-x, 1-26, Appendix A, B, C, ii-iii, 1-20, A-1 - 7, B-1 - 3, & C-1 http://www.epa.gov/OST/standards/nutrient.html

Northern Lakes and Forests Ecoregions

EU-14 **Ecoregional Nutrient Criteria**
Author: Office of Water, Environmental Protection Agency (EPA)
Fact Sheet EPA
October 2002 EPA-822-F-02-008 http://www.epa.gov/OST/standards/nutrient.html

EU-15 **Nutrient Criteria Development; Notice of Ecological Nutrient Criteria (66 FR 1671)**
Author: Environmental Protection Agency (EPA)
Public Notice Federal Register (FR)
January 9, 2001 Vol 66(6); pp.1671-4 http://www.epa.gov/fedrgstr/

EU-16 **Nutrient Criteria Technical Guidance Manual. Lakes and Reservoirs - First Edition**
Author: George Gibson, et al., Office of Water, Office of Science and TechnologyEnvironmental Protection Agency (EPA)
Guidance EPA Washington,
April 2000 EPA-822-B00-001 http://www.epa.gov

EU-17 **Subject: Development and Adoption of Nutrient Criteria into Water Quality Standards**
From/Signed by Geoffrey Grubbs, Director, Office of Science & Technology, Environmental Protection Agency (EPA)
Memo EPA
November 14, 2001 http://www.epa.gov/OST/standards/nutrient.html
To Water Directors, Regions I - X; Directors, State Water Programs; Directors, Great Water Body Programs; Directors, Authorized Tribal Water Quality Standards Programs; State & Interstate Water Pollution Control Administrators

EU-18 **Subject: EPA Policy as it Relates to the Phosphorus Objectives for the Nation's Receiving Waters**
From Francis T. Mayo, Regional Administrator, Environmental Protection Agency (EPA)
Letter EPA Region V Chicago
April 20, 1973
To Clarence A. Johannes, Director, Division of Water Quality, MPCA

EU-19a **Minnesota's Plan for Development of Nutrient Criteria**
Author: Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Plan MPCA
April 2003
To U. S. Environmental Protection Agency (EPA), Region V, Chicago, IL
(Including: Schematic, Summary, Timeline & Narrative)

EU-19b **Minnesota's Plan for Development of Nutrient Criteria**
From Environmental Outcomes and Analysis Division, Minnesota Pollution Control Agency (MPCA)
Plan MPCA St. Paul
September 2006
To U. S. Environmental Protection Agency (EPA), Region V, Chicago, IL
(Including: Schematic, Summary, Timeline & Narrative)

EU-20 **Subject: Minnesota's Nutrient Criteria Development Plan**
From Michael J. Sandusky, Division Director, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
Letter St. Paul
April 2003
To Mr. David Pfeifer, U.S. Environmental Protection Agency (EPA), Region V
Cover Letter to April 2003 Nutrient Plan (Exhibit EU-19a)

EU-21
From Jo Lynn Traub, Director Water Division, Environmental Protection Agency (EPA), Region V
Letter EPA Region V Chicago
May 5, 2003
To Michael Sandusky, Director, Environmental Outcomes Division, MPCA
EPA Approval of 2003 Nutrient Plan (Exhibit EU-19a)

EU-22a **Subject: Minnesota Nutrient Criteria Plan Update: 2004**

From Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, MPCA

Memo MPCA St. Paul

April 7, 2004

To Dave Pfeifer, U. S. Environmental Protection Agency (EPA), Region V

EU-22b **Subject: Cover Letter - Response to a Request for Progress on Minnesota's Nutrient Criteria Development Plan**

From Leo Raudys, Division Director, Regional Division, Minnesota Pollution Control Agency (MPCA)

Letter MPCA St. Paul

December 1, 2004 http://www.pca.state.mn.us

To Jodi Lynn Traub, U. S. Environmental Protection Agency (EPA), Region V

Response to Exhibit EU-21

EU-23 **Minnesota Ecoregions**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

1993

MPCA Map & Ecoregion Descriptions

EU-24 **Analysis of Regional Patterns in Lake Water Quality: Using Ecoregions for Lake Management in Minnesota**

Author: Steven A. Heiskary, C. Bruce Wilson, Division of Water Quality, Minnesota Pollution Control Agency (MPCA) and David P. Larsen, Environmental Research Lab, Environmental Protection Agency (EPA), Corvallis, Oregon

Journal Lake & Reservoir Management (LRM) -Intnt'l

1987 Vol III; pp.337-44 http://www.nalms.org/journal/lrm.htm

EU-25 **Developing Eutrophication Standards for Lakes and Reservoirs**

Prepared by the Lake Standards Subcommittee, North American Lake Management Society (NALMS)

Report NALMS Alachua

May 1992 http://www.nalms.org

Chair: Steve Heiskary, MPCA

EU-26 **No Exhibit**

EU-27 **The Regional Nature of Lake Water Quality Across Minnesota: An Analysis for Improving Resource Management**

Author: Steven Heiskary and Bruce Wilson, Research Scientists, Program Development Section, Water Quality Division, Minnesota Pollution Control Agency (MPCA)

Journal Journal of the Minnesota Academy of Science (JMAS) St. Paul

1989 Vol 55(1); pp.71-7

EU-28 **Minnesota Lake Water Quality Assessment Report, Second Edition**
A Practical Guide for Lake Managers

Author: Steven A. Heiskary and C. Bruce Wilson, Program Development Section Division of Water Quality, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

May 1990 http://www.pca.state.mn.us

EU-29 **Lake Assessment Program: A Cooperative Lake Study Program**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Journal Lake and Reservoir Management (LRM)

1989 Vol 5(1); pp.85-94 http://www.nalms.org/journal/lrm.htm

EU-30 **Developing Phosphorus Criteria for Minnesota Lakes**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA), and W. W. Walker, Jr., Environmental Engineer, Concord, Massachusetts

Journal Lake and Reservoir Management (LRM)

1988 Vol 4(1); pp.1-9 http://www.nalms.org/journal/lrm.htm

EU-31 **No Exhibit**

EU-32 **A Chlorophyll a Trophic Status Classification System for South African Impoundments**

Author: R. D. Walmsley

Journal Journal of Environmental Quality

1984 Vol 13(1); pp.97-104 http://jeq.scijournals.org

EU-33 **Analysis and Application of Lake User Survey Data**

Author: Eric Smeltzer, Vermont Department of Environmental Conservation and S. A. Heiskary, Environmental Outcomes & Analysis, Minnesota Pollution Control Agency (MPCA)

Journal Lake and Reservoir Management (LRM)

1990 Vol 6(1); pp. 109-18 http://www.nalms.org/journal/lrm.htm

EU-34 **Citizen Lake-Monitoring Program - 2001 Secchi Data Sheet**

From Minnesota Pollution Control Agency (MPCA)

Form MPCA

November 17, 2001 http://www.pca.state.mn.us

Includes choices for perceptions of physical condition and suitability for recreation.

EU-35 **Reconstructing Historical Water Quality in Minnesota Lakes from Fossil Diatoms**

Author: Steven A. Heiskary, Edward B. Swain, Minnesota Pollution Control Agency (MPCA), and Mark B. Edlund, Science Museum of Minnesota, St. Croix Watershed Research Station

MPCA Publication Environmental Bulletin St. Paul

September 2004 No. 4 http://www.pca.state.mn.us

EU-36 **Water Quality Reconstruction from Fossil Diatoms: Applications for Trend Assessment, Model Verification, and Development of Nutrient Criteria for Lakes in Minnesota, USA**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information and Edward B. Swain, Ph.D., Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

September 2002 http://www.pca.state.mn.us/water/lakequality.html reports

Part of a Series on Minnesota Lake Water Quality Assessment

EU-37 **Shallow Lakes of Southeastern Minnesota: Status and Trend Summary for Selected Lakes**

Author: Steven A. Heiskary, Howard Markus, and Matt Lindon, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

July 2003 http://www.pca.state.mn.us

Part of a Series on Minnesota Lake Water Quality Assessment
www.pca.state.mn.us/publications/reports/lakes-shallowlake-swmn.pdf

EU-38 **Interrelationships Among Water Quality, Lake Morphometry, Rooted Plants and Related Factors for Selected Shallow Lakes of West-Central Minnesota**

Author: Steven A. Heiskary and Matt Lindon, Environmental Analysis & Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

March 2005 http://www.pca.state.mn.us

Part of a Series on Minnesota Lake Water Quality Assessment

EU-39 **Lakeshore Property Values and Water Quality: Evidence from Property Sales in the Mississippi Headwaters Region**

Author/Submitted by: Charles Krysel, Elizabeth Marsh Boyer, Charles Parson, Ph.D., and Patrick Welle, Ph.D., Mississippi Headwaters Board & Bemidji State University

Report Mississippi Headwaters Board Bemidji

June 2003 http://www.mississippiheadwaters.org

Submitted To the Legislative Commission on Minnesota Resources

EU-40 **Economic Value of Protecting Minnesota's Lakes**

Author: Harold E. Dziuk, Ph.D., Board Member for the Itasca Coalition of Lake Associations (CLA)

Newspaper — Minnesota Lakes Association Reporter

November 2005 — Vol 9(4); pp.1, 6-7 — http://www.mnlakes.org

EU-41 **Importance of Lakes to Minnesota's Economy**

Author: Hank Todd, Minnesota Office of Tourism

Report — Minnesota Lake Management Conference

October 1989 — http://www.mnlakes.org

EU-42 **No Exhibit**

EU-43 **Economic Values of Lakes**

A publication of the North American Lake Management Society (NALMS)

Journal — LakeLine — Bloomington

Fall 2003 — Vol 23(3); pp.1-48 — http://www.nalms.org/lakeline/lakeline.htm

EU-44 **Shallow Lakes**

A publication of the North American Lake Management Society (NALMS)

Journal — LakeLine — Bloomington

Spring 2003 — Vol 23(1); pp.11-36 — http://www.nalms.org/lakeline/lakeline.htm

Special Issue of Lake Line

EU-45 **Developing Environmental Indicators for Minnesota. Lakes. The Environmental Indicators Initiative**

Author: State of Minnesota, Funded by the Minnesota Legislature on Recommendation of the Legislative Commission on Minnesota Resources (LCMR), Sponsored by The Environmental Quality Board (EQB)

Report — Legislative Commission on Minnesota Resources (LCMR)

1998 — http://www.commissions.leg.state.mn.us/lcmr/lcmr.htm

EU-46a **Statement of Need and Reasonableness: In the Matter of Proposed Revisions of Minnesota Rules Chapter 7050, Relating to the Classification and Standards for Waters of the State**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

April 2002

Assessment Factors Rule Revision

EU-46b **Staff Post-hearing Response to Public Comments**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

July 8, 2002

Assessment Factor Rule Revision *[Attachments not part of the exhibit]*

EU-46c **Staff Final Response to Public Comments**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document — MPCA — St. Paul

July 15, 2002

Assessment Factor Rule Revision

EU-47 **Measuring the Economic Value of Water Quality: The Case of Lakeshore Land**

Author Donald N. Steinnes, Department of Economics, University of Minnesota Duluth

Journal — The Annals of Regional Science

1992 — Vol 26; pp.171-6

EU-48 Protecting Aesthetics and the Visual Resource Quality of Lakes
Author: Eric J. Macbeth, Minnesota-Wisconsin Boundary Area Commission
Journal Proceedings of a National Conference on Enhancing the States' Lake Management Program Chicago
April 1992 1991; pp.17-23

EU-49 Subject: Nutrient Pollution and Numeric Water Quality Standards
From Benjamin H. Grumbles, Assistant Administrator, Office of Water Environmental Protection Agency (EPA)
Memo EPA Washington, D.C.
May 25, 2007
To Director, State Water Programs

H-1 Subject: Request for Development of Water Quality Standards
From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)
Letter St. Paul
February 27, 2002
To Greg Gross, Environmental Outcomes Division, MPCA

H-2a Subject: Water Quality Criterion for the Wrogge Spill
Author: Dann D. White, Monitoring and Assessment, Water Quality Division, Min esota Pollution Control Agency (MPCA)
Letter St. Paul
June 10, 1996
To Ms. Michelle Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture (MDA)

H-2b Aquatic Life Criteria (Summary Sheet): Acetochlor
Author: Minnesota Pollution Control Agency (MPCA)
Summary MPCA St. Paul
January 29, 1998
Includes Cover Letter
To Ms. Michele Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture. From Dann D. White

H-3 Subject: Interim Water Quality Guideline Value for Metolachlor
From Dann D. White, Monitoring and Assessment, Water Quality Division, Minnesota Pollution Control Agency (MPCA)
Letter St. Paul
February 23, 1998
To Ms. Michelle Puchalski, Agronomy Services Division, Incident Response Section, Minnesota Department of Agriculture (MDA)

H-4 Acetochlor Supplement: Supplementary Information on Acetochlor and Metolachlor
Author: Angela L. H. Preimesberger and David E. Maschwitz, Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
November 7, 2005
Developed by the Water Quality Standards Unit, MPCA, in Cooperation with the Minnesota Department of Agriculture, Agronomy and Plant Protection Division

H-5 Metolachlor Supplement: Supplementary Information on Acetochlor and Metolachlor
Author: Angela L. H. Preimesberger and David E. Maschwitz, Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA St. Paul
November 8, 2005
Developed by the Water Quality Standards Unit, MPCA, in Cooperation with the Minnesota Department of Agriculture, Agronomy and Plant Protection Division

H-6 Subject: Request for Development of Water Quality Standards
From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)
Letter St. Paul
April 11, 2003
To Greg Gross, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

H-7 **Subject: Request for Development of Water Quality Standards**

From Dan Stoddard, Manager, Agricultural Chemical Environmental Section, Minnesota Department of Agriculture (MDA)

Letter — St. Paul

June 23, 2004

To Greg Gross, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

H-8 **Water Quality Best Management Practices for Agricultural Herbicides**

Author: Minnesota Department of Agriculture (MDA)

Guide — St. Paul

February 2004 — http://www.mda.sate.mn.us

H-9 **Aquatic Life Criteria: Acetochlor [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary — MPCA — St. Paul

March 14, 2006

Summary Sheet (5pgs) & Tables 1-5

H-10a **Aquatic Life Criteria: Metolachlor (50:50 Formula) [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary — MPCA — St. Paul

March 15, 2006

Summary Sheets (4pgs) & Tables 1-5

H-10b **Aquatic Life Criteria: Metolachlor (88:12) formula [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary — MPCA — St. Paul

February 7, 2006

Summary Sheets (4pgs) & Tables 1-5

H-11 **Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses**

Author: Charles E. Stephan, Donald I. Mount, David J. Hansen, John H. Gentile, Gary A. Chapman, and William A. Brungs, Office of Research and Development, U.S. EPA, Environmental Research Laboratories -Duluth, MN, Narragansett, RI, Corvallis, OR

Guide — EPA — Duluth

July 30, 1985 — pp.i-vi, 1-98 — http://www.epa.gov

H-12a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Acute Toxicity to Rainbow Trout (Salmo gairdneri). Prepared by ICI Group Environmental Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation — EPA

Reviewed: November 18, 1991 — OPP# (MRID No.) 419633-06; Registrant Report# BL3960/B — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-12b **Acetochlor: Acute Toxicity to Rainbow Trout (Salmo gairdneri). Prepared by ICI Group Environmental Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, P. A. Johnson and D. S. Adams

Study — Monsanto

1991 — Registrant Report# BL3960/B; OPP# (MRID No.) 419633-06

Attachment: MPCA Reference Review Form by D. White (Exhibit H-12a)

H-13a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acute Toxicity of MON-097 (AB-81-181) to Bluegill Sunfish (Lepomis macrochirus). Unpublished Study prepared by Analytical Bio-Chemistry Laboratories, Inc. on 23 Sept. 1981 for Monsanto Company Submitted 10-27-81 Under Accession (SIC) No. 246128**

Reviewed by J. Tice, Fish & Wildlife Biologist; HED/EEB

Evaluation — EPA

Reviewed: November 5, 1981 — OPP# 85993 and OPP# ACC246128 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-13b **Acute Toxicity of MON-097 (AB-81-181) to Bluegill Sunfish (Lepomis macrochirus). Unpublished Study prepared by Analytical Bio-Chemistry Laboratories, Inc. on 23 Sept. 1981 for Monsanto Company Submitted 10-27-81 Under Accession (SIC) No. 246128**

Author: J. Griffin and C. M. Thompson

Study Monsanto

1981 OPP# 85993 and OPP# ACC246128

For Monsanto Company

Attachment: MPCA Reference Review Form by D. White (Exhibit 13a)

H-14a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Determination of Acute Toxicity to Bluegill Sunfish (Lepomis macrochirus). Brixham Study No. R1072/B. Study performed by Imperial Chemical PLC, Brixham Laboratory, Freshwater Quarry, Brixham, Devon, U.K. Submitted by ICI Americas, Inc.**

Reviewed by Rosemary Graham Mora, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: September 20, 1991 OPP# (MRID No.) 41565133 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-14b **Acetochlor: Determination of Acute Toxicity to Bluegill Sunfish (Lepomis macrochirus). Brixham Study No. R1072/B. Study performed by Imperial Chemical PLC, Brixham Laboratory, Freshwater Quarry, Brixham, Devon, U.K. Submitted by ICI Americas, Inc. EPA**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, and B. J. Harland

Study Monsanto

1989 OPP# (MRID No.) 415651-33

Attachment: MPCA Reference Review Form by D. White (Exhibit H-14a)

H-15 **Acetochlor Fish Studies - Acetochlor: Determination of Acute Toxicity to Mirror Carp (Cyprinus carpio), Submitted by ICI Brixham Environmental Laboratory**

Author: J. F. Tapp, S. A. Sankey, J. E. Caunter, and H. M. Miller

Study Monsanto

1989 Report# BL/B/3554,

Attachment: MPCA Reference Review Form by D. White

H-16a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: An Investigation of the Toxicity of Technical Material and Formulation WF2061 to First Instar Daphnia magna. Laboratory Report No. RJ 0744B. Study performed by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, U.K. Submitted by ICI Americas, Inc.**

Reviewed by Rosemary Graham Mora, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 3, 1991 OPP# (MRID No.) 415651-34 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-16b **Acetochlor: An Investigation of the Toxicity of Technical Material and Formulation WF2061 to First Instar Daphnia magna. Study performed by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, U.K. Submitted by ICI Americas, Inc.**

Author: E. Farrelly, M. J. Hamer

Study Monsanto

1989 Registrant Report# RJ 0744B, OPP# (MRID No.) 415651-34

Attachment: MPCA Reference Review Form by D. White (Exhibit H-16a)

H-17 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acute Toxicity to Daphnids (Daphnia magna) Under Static Conditions, Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC**

Reviewed by Rosemary Graham Mora, M.S., Environmental Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 14, 1996 OPP# (MRID No.) 439289-12 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-18a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102 - Acute Toxicity to Rainbow Trout (Oncorhynchus mykiss) Under Static Conditions. Springborn Laboratories, Inc, Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation EPA

Reviewed: May 20, 1996 OPP# (MRID No.) 439289-11 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-18b **Final Report:**
CGA 77102 - Acute Toxicity to Rainbow Trout (Oncorhynchus mykiss) Under Static Conditions. Springborn Laboratories, Inc, Wareham, MA

Author: Maura K. Collins, Study Director, Springborn Laboratories Inc.

Study Syngenta (Ciba-Geigy Corporation)

December 12, 1995 Registrant Report# CGA-77102; OPP# (MRID No.) 439289-11

Submitted To: Ciba-Geigy Corporation (Greensboro, NC)

Attachment: MPCA Reference Review Form by D. White

H-19a **Data Evaluation Record (Validation Sheet) - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acute Toxicity of CGA-24705 to Rainbow Trout (Salmo gairdneri) Report# BW-78-6-186

Author: R. Balcomb

Evaluation EPA

Reviewed: July 20, 1978 OPP# (MRID No.) 18722 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-19b **Acute Toxicity of CGA-24705 to Rainbow Trout (Salmo gairdneri)**

Prepared by Robert J. Buccafusco, EG & G, Bionomics, Aquatic Toxicology Laboratory

Study Syngenta (Ciba-Geigy Corporation)

June 1978 Report# CGA-24705; OPP# (MRID No.) 18722

Attachment: MPCA Reference Review Form by D. White

H-20 **Manual of Acute Toxicity: Interpretation and Data Base for 410 Chemicals and 66 Species of Freshwater Animals**

Author: Foster L. Mayer and Mark R. Ellersieck

Manual United States Department of the Interior -Fish & Wildlife Service Washington, D.C.

1986 Resource Publication 160; cover,pp.3,4 & 313 http://www.fws.gov

H-21a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
(Acetochlor: Daphnia magna Life-Cycle Study. Prepared by ICI Agrochemicals, Jealott's Hill Research Station, Bracknell, Berkshire, UK. Submitted by ICI Americas, Inc. Wilmington, DE)

Reviewed by Louis M. Rifici, M.S., Associate Scientist, KPN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 4, 1991 OPP# (MRID No.) 415651-38 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-21b **Acetochlor Aquatic Invertebrate Studies - Acetochlor: Daphnia magna Life-Cycle Study**

Prepared by ICI Agrochemicals

Study Monsanto

1990 Report# RJ0785B; OPP# (MRID No.) 415651-38

Attachment: MPCA Reference Review Forms by D. White

H-22a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acetochlor: Determination of Chronic Toxicity to Fathead Minnow (Pimphales promelas) Embryos and Larvae. Prepared by ICI PLC, Brixham Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc.

Reviewed by Louis M. Rifici, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: October 4, 1991 OPP# (MRID No.) 415920-11 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-22b **Acetochlor: Determination of Chronic Toxicity to Fathead Minnow (Pimphales promelas) Embryos and Larvae. Prepared by ICI PLC, Brixham Laboratory, Brixham, Devon, UK.; Submitted by ICI Americas, Inc.**

Author: J. F. Tapp, J. E. Caunter and R. D. Stanley

Study — Monsanto

1989 — Report# BL/B/3669; OPP# (MRID No.) 415920-11

Attachment: MPCA Reference Review Form by D. White (Exhibit H-22a)

H-23 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Chronic Toxicity of Acetochlor to Daphnia magna Under Flow-Through Test Conditions. Study conducted by Analytical Bio-Chemistry Laboratories, Inc., Columbia, MO. Submitted by Acetochlor Registration Partnership, c/o Monsanto Agricultural Company, St. Louis, MO**

Reviewed by William S. Rabert, Biologist, Ecological Effects Branch, Environmental Fate and Effects Division (7507C), Environmental Protection Agency (EPA)

Evaluation — EPA

Reviewed: November 2, 1993 — OPP# (MRID No.) 427131-05 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-24a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: S-Metolachlor (CGA-77102): Early Life-Stage Toxicity Test with Fathead Minnow (Pimephales promelas). Springborn Laboratories, Inc, Wareham, MA. Novartis Crop Protection Inc., Greensboro, NC**

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.

Evaluation — EPA

Reviewed: May 2, 2000 — OPP# (MRID No.) 449959-03 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-24b **s-Metolachlor (CGA-77102): Final Report s-Metolachlor (CGA-77102) - Early Life-Stage Toxicity Test with Fathead Minnow (Pimephales promelas)**

Author: J. V. Sousa, Study Director, Springborn Laboratories Inc.

Study — Syngenta (Novartis Crop Protection, Inc.)

Study Completion: November 30, 1999 — Registrant Report# CGA-77102; OPP# (MRID No.) 449959-03

Attachment: MPCA Reference Review Form by D. White

H-25a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Determination of Toxicity to the Green Alga Selenastrum capricornutum. Laboratory ID No. R1072/I. Conducted by Imperial Chemical Industries PLC, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation — EPA

Reviewed: January 17, 1992 — OPP# (MRID No.) 415651-41 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-25b **Acetochlor: Determination of Toxicity to the Green Alga Selenastrum Capricornutum. Laboratory ID No. R1072/I. Conducted by Imperial Chemical Industries PLC, Brixham, Devon, UK. Submitted by ICI Americas, Inc.**

Author: D. V. Smyth, J. F. Tapp, S. A. Sankey and R. D. Stanley

Study — Monsanto

1989 — OPP# (MRID No.) 415651-41

H-26a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor Toxicity to the Duckweed (Lemna gibba). Laboratory ID No. W556/D (FT21/92). Conducted by ZENECA Agrochemicals, Surrey, UK**

Reviewed by William S. Rabert, Biologist, Ecological Effects Branch, Environmental Fate and Effects Division (7507C)

Evaluation — EPA

Reviewed: November 4, 1993 — OPP# (MRID No.) 427131-07 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-26b **Acetochlor Toxicity to the Duckweed (Lemna gibba). Laboratory ID No. W556/D (FT21/92). Conducted by ZENECA Agrochemicals, Surrey, UK**

Author: D. V. Smyth, S. A. Sankey, and A. J. Penwell

Study — Monsanto

1993 — OPP# (MRID No.) 427131-07

Attachment: MPCA Reference Review Form by D. White (Exhibit H-26a)

H-27 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Toxicity to the Freshwater Diatom Navicula pelliculosa. Laboratory ID No. W566/C (FT20/92). Conducted by Imperial Chemical Industries PLC, Devon, UK. Submitted by ICI Agrochemicals, Surrey, UK

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: May 24, 1993 OPP# (MRID No.) 427131-08 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-28 Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Acetochlor: Toxicity to Blue-green Alga Anabaena flos-aqua. Laboratory ID. No. W566/A (FT18/92). Conducted by Imperial Chemical Industries PLC, Devon, UK. Submitted by ICI Agrochemicals, Surrey, UK

Reviewed by Mark A. Mossler, M.S., Associate Scientist, KBN Engineering and Applied Sciences, Inc.

Evaluation EPA

Reviewed: June 1, 1993 OPP# (MRID No.) 427131-09 http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-29 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of One Day Exposure to Technical Acetochlor on Elodea canadensis Acquired from an Outdoor Pond

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2003-149

Attachment: MPCA Reference Review Form by D. White

H-30 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of a Single Application of Technical Acetochlor in a Static Test on Elodea canadensis Acquired from an Outdoor Pond

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2004-009

Attachment: MPCA Reference Review Form by D. White

H-31 Acetochlor Laboratory Aquatic Macrophyte Tests - Determination of the Effect of a Single Application of Technical Acetochlor in a Static Test on Elodea canadensis Acquired from a Commercial Supplier

Author: E. M. Foekema, M. T. Collombon, G. Hoornsman

Study Monsanto

2004 Registrant Report# TN-2004-010

Attachment: MPCA Reference Review Form by D. White

H-32 Acetochlor Outdoor Microcosm/Mesocosm Studies - The Determination of the Biological Effects of a Single Pulse of Technical Acetochlor in Outdoor Ponds

Author: E. M. Foekema

Study Monsanto

2005 Registrant Report# TN-2005-076

Attachment: MPCA Reference Review Form by D. White

H-33 Acetochlor Algae Studies - Acetochlor Technical-Toxicity Test and Recovery Period with Freshwater Green Alga, Psudokchneriella subcapitata

Author: J. R. Hoberg

Study Monsanto

2003 Registrant Report# SE-2003-097

Attachment: MPCA Reference Review Form by D. White

H-34 Acetochlor Algae Studies - Acetochlor Technical-Toxicity Test and Recovery Period with Marine diatom, Skeletonema costatum

Author: J. R. Hoberg

Study Monsanto

2003 Registrant Report# SE-2003-098

Attachment: MPCA Reference Review Form by D. White

H-35 **Acetochlor Outdoor Microcosm/Mesocosm Studies - An Assessment of Toxicity of Technical Acetochlor to the Aquatic Macrophytes Glyceria maxima, Myriophyllum spicatum, and Lagarosiphon major.**

Author: P. Kaur, B. Caswell, J. Newman, and S. J. Powers

Study Monsanto (Dow Agrosciences)

2003 Registrant Report# DAS 011246

Attachment: MPCA Reference Review Form by D. White

H-36 **Acetochlor Laboratory Aquatic Macrophyte Tests - Acetochlor Technical-Toxicity Test and Period with Duckweed, Lemna gibba**

Author: A. E. Putt

Study Monsanto

2003 Registrant Report# SE-2003-095

Attachment: MPCA Reference Review Form by D. White

H-37 **Factors Determining the Bioaccumulation Potential of Pesticides in the Individual Compartments of Aquatic Food Chains**

Author: H. Ellgehausen, J. A. Guth, and H. O. Esser, Agricultural Division, CIBA-GEIGY Ltd., Basel, Switzerland

Journal Ecotoxicology and Environmental Safety

1980 Vol 4 (2); pp.134-157; ECOTOX# 6458 http://www.elsevier.com/wps/find/journaldescription.cws_home/622819/description#description#

Attachment: MPCA Reference Review Form by D. White

H-38 **Short-Term Effects of Herbicides on Primary Productivity of Periphyton in Lotic Environments**

Author: K. E. Day

Journal Ecotoxicology

1993 Vol 2 (2); pp.123138; ECOTOX# 13325 http://www.springerlink.com/content/1573-3017

Attachment: MPCA Reference Review Form by D. White

H-39 **Metolachlor and 2,4-Dichlorophenoxyacetic Acid Sensitivity of Salvinia natans**

Author: A. M. Goncz, and L. Sencic

Journal Bulletin of Environmental Contamination and Toxicology

1994 Vol 53 (6); pp.852-5; ECOTOX# 13738

Attachment: MPCA Reference Review Form by D. White

H-40 **Aquatic Phyto-Toxicity of 23 Pesticides Applied at Expected Environmental Concentrations**

Author: H. G. Peterson, C. Boutin, P. A. Martin, K. E. Freemark, N. J. Ruecker, and M. J. Moody

Journal Aquatic Toxicology

1994 Vol 28 (3/4); pp.275-92; ECOTOX# 13800 http://www.elsevier.com/wps/find/journaldescription.cws_home/505509/description#description#

Attachment: MPCA Reference Review Form by D. White

H-41 **Comparative Sensitivity of Selenastrum capricornutum and Lemna minor to Sixteen Herbicides**

Author: J. F. Fairchild, D. S. Ruessler, P. S. Haverland, and A. R. Carlson

Journal Archives of Environmental Contamination and Toxicology

1997 Vol 32; pp.353-57; ECOTOX# 18093

Attachment: MPCA Reference Review Form by D. White

H-42 **Comparative Sensitivity of Five Species of Macrophytes and Six Species of Algae to Atrazine, Metribuzin, Alachlor, and Metolachlor**

Author: J. F. Fairchild, D. S. Ruessler, and A. R. Carlson

Journal Environmental Toxicology and Chemistry

1998 Vol 17 (9); pp.1830-4; ECOTOX# 19461 http://etc.allenpress.com/entconline/?request=index-html

Attachment: MPCA Reference Review Form by D. White

H-43 **Comparative Assessment of Herbicide Phytotoxicity to Selenastrum capricornutum Using Microplate and Flask Bioassay Procedures**

Author: D. St. Laurant, and C. Blaise

Journal — Environmental Toxicology and Water Quality: An International Journal

1992 — Vol 7; pp.35-48 (OECDG Data File); ECOTOX# 56387 — http://www3.interscience.wiley.com/cgi-bin/jhome/10008541

Attachment: MPCA Reference Review Form by D. White

H-44 **An Aquatic Risk Assessment of Four Herbicides Using Six Species of Algae and Five Species of Aquatic Macrophytes**

Author: J. F. Fairchild, S. D. Ruessler, M. K. Nelson, and A. R. Carlson

Journal — Society of Environmental Toxicology and Chemistry (SETAC)

1994 — Conference Proceeding; ECOTOX# 61707 — http://www.setac.org

Presented at the 1994 SETAC Meeting, Oct. 30-Nov. 3, 1994, Denver, CO
Attachment: MPCA Reference Review Form by D. White

H-45 **The Toxicity of the Herbicide Metolachlor, Some Transformation Products and a Commercial Safener to an Alga (Selenastrum capricornutum), a Cyanophyte (Anabaena cylindrica) and a Macrophyte (Lemna gibba)**

Author: K. E. Day, and V. Hodge

Journal — Water Quality Research Journal -Canada

1996 — Vol 31 (1); pp.197-214 — http://www.cciw.ca/wqrjc/wqrjce.htm

Attachment: MPCA Reference Review Form by D. White

H-46 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor-technical-5 Day Toxicity to Freshwater Green Alga, Anabaena flos-aqua. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-04 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-47a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical -Toxicity to Duckweed (Lemna gibba). Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-05 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-47b **Metolachlor technical - Toxicity to Duckweed (Lemna gibba)**

Author: James R. Hoberg

Study — Syngenta (Ciba-Geigy Corporation)

January 9, 1995 — SLI Registrant Report# 94-8-5404; OPP# (MRID No.) 43487105

Attachment: MPCA Reference Review Form by D. White

H-48 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical-Toxicity to the Marine diatom, Skeletonema costatum. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: January 26, 1995 — OPP# (MRID No.) 434871-06 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-49 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: Metolachlor technical-5-Day Toxicity to the Freshwater Green Alga, Selenastrum capricornutum, Using Acetone as a Carrier Solvent. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC**

Reviewed by William Erickson, Biologist, EEB/EFED

Evaluation — EPA

Reviewed: March 1, 1995 — OPP# (MRID No.) 435413-01 — http://www.epa.gov

Attachment: MPCA Reference Review Form by D. White

H-50 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Metolachlor technical-5-Day Toxicity to the Freshwater diatom, Navicula pelliculosa, Using Acetone as a Carrier Solvent. Springborn Laboratories, Inc., Wareham, MA. Ciba Crop Protection, Greensboro, NC

Reviewed by William Erickson, Biologist, EEB/EFED
Evaluation EPA
Reviewed: March 1, 1995 OPP# (MRID No.) 435413-01 http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-51 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Acute Toxicity of CGA-51202 to the Duckweed, Lemna gibba G3

Reviewed by Karl Bullock, M.S. Environmental Scientist, Golder Associates, Inc.
Evaluation EPA Marblehead
Reviewed:November 10, 1999 OPP# (MRID No.) 449295-14 http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-52 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Report on the Growth Inhibition Test of CGA-51202 to Green Algae (Scenedesmus subspicatus). Ciba-Geigy Ltd, Crop Protection Division, Basle, Switzerland. Novartis Crop Protection, Inc., Greensboro, NC

Reviewed by Karl Bullock, M.S. Environmental Scientist, Golder Associates, Inc.
Evaluation EPA
Reviewed: November 10, 1999 OPP# (MRID No.) 449295-15 http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-53 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
Toxicity of CGA-354743 to Duckweed, Lemna gibba G3. T.R. Wibury Laboratories, Inc., Marblehead, MA. Novartis Crop Protection, Inc., Greensboro, NC

Reviewed by Mark Mossler, M.S., Environmental Toxicologist, Golder Associates Inc.
Evaluation EPA
Reviewed: April 13, 2000 OPP# (MRID No.) 449317-20 http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-54 **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102: 5-Day Toxicity to the Marine Diatom Skeletonema costatum. Springborn Laboratories, Inc, Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.
Evaluation EPA
Reviewed: May 16, 1996 OPP# (MRID No.) 439289-30 http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-55a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation:**
CGA 77102: 5-Day Toxicity to the Fresh Water Green Alga Selenastrum capricornutum. Springborn Laboratories, Inc, Wareham, MA

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.
Evaluation EPA
Reviewed: May 16, 1996 OPP# (MRID No.) 439289-29 http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-55b **Final Report:**
CGA 77102: 5-Day Toxicity to the Fresh Water Green Alga Selenastrum capricornutum. Springborn Laboratories, Inc Wareham, MA

Author: James R. Hoberg
Study Syngenta (Cib-Geigy Corporation)
September 20, 1995 Registrant Report# 95-8-6031; OPP# (MRID No.) 439289-29
Submitted To: Ciba-Geigy Corporation, Crop Protection Division (Greensboro, NC)
Attachment: MPCA Reference Review Form by D. White

H-56a **Data Evaluation Record - EPA, Office of Pesticide Programs (OPP) Database - Citation: CGA 77102: Toxicity to Duckweed Lemna gibba. Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC**

Reviewed by Max Feken, M.S., Environmental Toxicologist, KBN Engineering and Applied Sciences, Inc.
Evaluation EPA
Reviewed: May 16, 1996 OPP# (MRID No.) 439289-31 http://www.epa.gov
Attachment: MPCA Reference Review Form by D. White

H-56b **Final Report: CGA 77102: Toxicity to Duckweed Lemna gibba. Springborn Laboratories, Inc., Wareham, MA. Ciba-Geigy Corporation, Greensboro, NC**

Author: James R. Hoberg
Study Syngenta (Ciba-Geigy Corporation)
Study Completion: September 28, 1995 Registrant Report# 95-8-6068; OPP# (MRID No.) 439289-31
Attachment: MPCA Reference Review Form by D. White

H-57 **Acetochlor Plant Toxicity Data from Table 4a, Proposed Water Quality Standard**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA
January 19, 2006
Spreadsheets: Species Chronic Value (SCV), and Ranked Toxicity Values (January 20, 2006)

H-58 **Metolachlor Plant Toxicity Data from Table 4a, Proposed Water Quality Standard**

Author: David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA
January 19, 2006
Spreadsheets: Species Chronic Value (SCV), and Ranked Toxicity Values (January 20, 2006)

H-59 **Ambient Aquatic Life Water Quality Criteria for Atrazine [REVISED DRAFT]**

Author: Office of Water, Environmental Protection Agency (EPA)
EPA Report EPA Washington, D.C.
October 2003 EPA-822-R-03-23 http://www.epa.gov

H-60 **New York State-Aquatic Fact Sheet: Ambient Water Quality Value for Protection of Aquatic Life [DRAFT]**

From New York State
Fact Sheet
August 10, 2005

H-61 **Health Risk Limits for Groundwater Chemical: Acetochlor, CAS# 34256-82-1 [DRAFT]**

Author: Minnesota Department of Health (MDH)
Summary MDH St. Paul
December 28, 2006 http://www.health.state.mn.us
Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

H-62 **Subject: Health Based Values for Acetochlor ESA & Acetochlor OXA**

From Helen Goeden, Health Risk Assessment Unit, Environmental Health Division, Minnesota Department of Health (MDH)
Memo St. Paul
February 13, 2006
To Dan Stoddard, Joseph Zachmann, Minnesota Department of Agriculture (MDA)
Includes Attachment: Data for Derivation of Ground Water Health Based Value (HBV)

H-63 **Acetochlor Fish Studies - Acetochlor: An Investigation of Accumulation and Elimination in Bluegill Sunfish in a Flow-Through System (ICI Americas Report# RJ0846B) and Calculation of Bioconcentration Factors in Bluegill Sunfish (Addendum to RJ0846B)**

Author: M. J. Hamer, E. Farrelly, J. Litzen, and I. R. Hill; M. J. Hamer, S. J. Crook, and I. R. Hill; K. H. Carr
Study Monsanto
1990; Addendum Dates: 1991, 2003 Registrant Report# MSL-18896
Attachment: MPCA Reference Review Form by D. White (BCF Studies)

H-64 **Health Risk Limits for Groundwater Chemical: Metolachlor, CAS# 51218-45-2 (and s-Metolachlor) [DRAFT]**
Author: Minnesota Department of Health (MDH)
Summary MDH St. Paul
July 26, 2004 http://www.health.state.mn.us
Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

H-65 **Subject: Health Based Value for Metolachlor OA and Metolachlor ESA**
From Anne Kukowski, Health Risk Assessment Unit, Minnesota Department of Health (MDH)
Memo St. Paul
July 7, 2004
To Joseph Zachmann, Dan Stoddard, Minnesota Department of Agriculture (MDA)

H-66 **Metabolism of [14C] Metolachlor in Bluegill Sunfish**
Author: Sean M. Cruz, Margaret N. Scott, and Andrew K. Merrit, Metabolism Department, Agricultural Division, Ciba-Geigy Corporation
Journal Journal of Agricultural Food Chemistry
1993 Vol 41; pp.662-8 http://www.health.state.mn.us
Attachment: MPCA Reference Review Form by D. White

H-67 **CORN - Minnesota Agriculture in the Classroom Program**
Author: Minnesota Department of Agriculture (MDA)
Fact Sheet MDA St. Paul
2004 http:/www.mda.state.mn.us/maitc
Commodity Card: Corn (Field)

H-68a **S-Metolachlor; Pesticide Tolerance**
Author: Environmental Protection Agency (EPA)- From the Federal Register Online via GPO Access
Public Notice Federal Register (FR) Washington, D.C
August 30, 2006 Vol 71(168); pp.51505-10 http://www.epa.gov/fedrgstr/

H-68b **Subject: Transmittal Memo for the Ecological Risk Assessment for the Use of S-Metolachlor on Pumpkins and Winter Squash (IR-4, DP 324973) and on Pumpkins in New York State (S18, DP 327861)**
From Paige Doelling Brown, Ph.D., Fisheries Biologist, James Hetrick, Ph.D., Senior Chemist, and Nancy Andrews, Ph.D. Branch Chief Environmental Risk Branch 1, Environmental Fate and Effects Division
Memo EPA Washington, D.C,
May 31, 2006
To Joanne Miller, Product Manager, Herbicide Branch, Barbara Madden, Risk Integration, Minor Use, Emergency Response Branch, and Daniel Rosenblatt, Team Leader, Emergency Response Team, Registration Division

H-68c **Ecological Risk Assessment for Use of S-Metolachlor (PC 108800) on Pumpkins and Winter Squash (DP324973, DP327861)**
Author Environmental Fate and Effects, Environmental Protection Agency (EPA)
EPA Document EPA Washington, D.C.
May 2006 http://www.epa.gov
Referenced in Memo (Exhibit H-68b)

H-68d **Subject: S-metolachlor Human Health Risk Assessment for Proposed Section 18 Uses on Cilantro, Collards, Kale, and Mustard Greens; Section 3 Use on Pumpkins; and Tolerance on Winter Squash without a US Registration. PC Code: 108800 S-metolachlor & 108801 Metolachlor, ID#: 06OH05 & PP#5E7015, DP Numbers: 329117 & 326011. [Executive Summary]**
From W. Cutchin, Chemist, ARIA Team, Technical Review Branch, Registration Division
Memo EPA Washington, D.C.
July 13, 2006 pp.1-11
To Barbara Madden and A. Ertman PM-5, Risk Integration Minor Use and Emergency Response Branch, Registration Division; Through Christina Swartz, Chief Registration Action Branch, Health Effects Division

H-69 Toxicity to Daphni magna, Hyalella azteca, Oncorhynchus kisutch, Oncorhynchus mykiss, Oncorhynchus tshawytscha, and Rana catesbeiana of Atrazine, Metolachlor, Simazine, and Their Formulated Products

Author: M. T. Wan, C. Buday, G. Schroeder, J. Kuo, and J. Pasternak

Journal Environmental Contamination and Toxicology

2006 Vol 76; pp.52-58

Attachments: Journal article and report providing details on test methods (Environmental Toxicology and Chemistry, Vol 24(5);pp.1146-54, 2005; Environmental Protection, Conservation and Protection, Environment Canada, Report EPS 1/RM/11, 1990)

HH-1 Current Drinking Water Standards: List of Drinking Water Contaminants and MCLs

Author: Ground Water and Drinking Water, Environmental Protection Agency (EPA)

Website EPA Washington, D.C.

July 2002, Accessed: July 14, 2005 EPA 816-F-02-013 http:/www.epa.gov/safewater/mcl.html

HH-2 2006 Edition of the Drinking Water Standards and Health Advisories

Author: Environmental Protection Agency (EPA)

EPA Report EPA Washington, D.C.

August 2006 EPA 822-R-06-013 http:/www.epa.gov/waterscience

HH-3 Guidelines for the Development of Surface Water Quality Standards. For Protection of Aquatic Life, Including Human Health and Wildlife [DRAFT]

Author: David E. Maschwitz, Environmental Outcomes Division, Environmental Standards and Analysis Section, Minnesota Pollution Control Agency (MPCA)

Guide MPCA St. Paul

August 28, 2000 pp.1-40, and Appendix A - G1. http:/www.pca.state.mn.us

1st Version: January 1990

HH-4 Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health

Author: Office of Water, Office of Science and Technology, Environmental Protection Agency (EPA)

Guide EPA Washington, D.C.

October 2000 EPA-822-B-00-004; pp.i-xvii, 1-1 through 5-67 http:/www.epa.gov

FINAL

HH-5 Health Risk Limits for Groundwater Chemical Summary: Benzene, CAS# 71-43-2 [DRAFT]

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

November 24, 2004 http:/www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

HH-6 Health Risk Limits for Groundwater Chemical Summary: Naphthalene, CAS# 91-20-3 [DRAFT]

Author: Minnesota Department of Health (MDH)

Summary MDH St. Paul

February 17, 2004 http:/www.health.state.mn.us

Part of Groundwater HRL Rule, Minnesota Rule ch. [Draft]

HH-7 Aquatic Life Criteria: Benzene, CAS# 71432

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

January 1990, Revised February 1993

Summary Sheets (3pgs) and Tables 1-5a

HH-8 Aquatic Life Criteria: Benzene, CAS# 71-43-2 [PROPOSED]

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

February 1993, Revised January 2006

Summary Sheets (5pgs) and Tables 1-5a

HH-9 **Aquatic Life Criteria: Naphthalene, CAS# 91203**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

April 1991

Summary Sheets (4pgs) and Tables 1-5b

HH-10 **Aquatic Life Criteria: Naphthalene, CAS# 91-20-3 [PROPOSED]**

Author: Minnesota Pollution Control Agency (MPCA)

Summary MPCA St. Paul

April 1991, Revised January 2006

Summary Sheets

HH-11 **Fact Sheet for the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit Program General Permit No. MN G790000 [DRAFT]**

Author: Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

April 20, 2006 http://www.pca.state.mn.us

with Attachments (pp.1-21)

M-1 **Water Quality Criterion for the Protection of Human Health: Methylmercury**

Author: Office of Science and Technology, Office of Water, Environmental Protection Agency (EPA)

Report EPA Washington, D.C.

January 2001 EPA-823-R-01-001; pp.i-xvii, 1-1 through 7-2, R-1-29, A, A1-33; http://www.epa.gov

M-2 **Minnesota's Total Maximum Daily Load Study of Mercury [DRAFT]***

Prepared by Minnesota Pollution Control Agency (MPCA)

Study MPCA St. Paul

June 1, 2006 Study# wq-iw4-01b; pp.i-xiii, 1-57, Appd.A and B www.pca.state.mn.us

**Draft Report Until Approved by U.S. EPA*

M-3 **Sources of Mercury Pollution and the Methylmercury Contamination of Fish in Minnesota**

Author: Environmental Analysis and Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

August 2005 #4-06 http://www.pca.state.mn.us

Pollution Prevention & Sustainability Fact Sheet

M-4 **Eat Fish Often?**

Author: Minnesota Department of Health (MDH)

Pamphlet MDH St. Paul

May 2004 IC# 141-0378 http://www.health.state.mn.us

A Minnesota Guide to Eating Fish

M-5 **Water Quality Criteria: Notice of Availability of Water Quality Protection of Human Health: Methylmercury**

Author: Environmental Protection Agency (EPA) -From the Federal Register Online via GPO Access

Public Notice Federal Register (FR)

January 8, 2001 Vol 66(5); pp.1344-59; [DOCID:fr08ja01-55] http://www.epa.gov/fedrgstr/

M-6 **Subject: Bioaccumulation Factors (BAF) for Mercury in Northern Pike and Walleye: Rivers**

Author: Dennis Wasley (update by Bruce Monson), Minnesota Pollution Control Agency (MPCA)

Memo MPCA St. Paul

September 30, 2005 (Updated: August 5, 2003)

To David E. Maschwitz, Environmental Outcomes Division, MPCA

Includes Tables

M-7 **Subject: Bioaccumulation Factors (BAF) for Mercury in Northern Pike and Walleye: Lakes [DRAFT]**

From Bruce Monson, Minnesota Pollution Control Agency, (MPCA)

Memo MPCA St. Paul

July 30, 2003

To David E. Maschwitz, Environmental Outcomes Division, Dennis Wasley, Gary Kimball, MPCA

M-8 **Notice of Draft Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion**

Author: Environmental Protection Agency

Public Notice Federal Register (FR) Washington, DC

August 9, 2006 Vol 71(153); pp.45560-4 http://www.epa.gov/fedrgstr/

PL-1a **MPCA Phosphorus Strategy Web Page**

Author: Minnesota Pollution Control Agency (MPCA)

Website MPCA St. Paul

July 14, 2006 http://www.pca.state.mn.us/water/phosphorus.html

PL-1b **Phosphorus Strategy: NPDES Permits (000306) - Strategy for Addressing Phosphorus in National Pollutant Discharge Elimination System (NPDES) Permitting**

Author: Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA St. Paul

March 2000 (000306) http://www.pca.state.mn.us

PL-1c **MPCA Phosphorus (P) Strategy: NPDES Permits [Information Packet]**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA St. Paul

March 2000 (000306) http://www.pca.state.mn.us

Referenced in fact sheet (Exhibit PL-1b)

PL-2a **St. Croix Basin Phosphorus-Based Water-Quality Goals - Report on the Recommended Water-Quality Goals of the St. Croix Basin Water Resources Planning Team and the 5th Annual Conference "Protecting the St. Croix: Reducing and Managing Nutrients and Sediments"**

Prepared by Pamela J. Davis, Coordinator, St. Croix Basin Water Resources Planning Team

Report St. Croix Basin Water Resources Planning Team

August 2004 Report# wq-b6-01 http://www.pca.state.mn.us

PL-2b **Wisconsin Department of Natural Resources and Minnesota Pollution Control Agency: Agreement on Nutrient and Sediment Reduction in the St. Croix River Basin**

Signed: Sheryl Corrigan, Commissioner Minnesota Pollution Control Agency and Scott Hassett, Secretary Wisconsin Department of Natural Resources

Agreement

Signed: April 6, 2006

Includes Strategy-Based Subcommittee Structure [Draft] June 15, 2006

PL-3 **Subject: Cost Estimates for Phosphorus Removal**

From Randy Thorson, Municipal Division, Minnesota Pollution Control Agency (MPCA)

Memo

August 17, 2005 http://www.pca.state.mn.us

To David E. Maschwitz, Environmental Analysis and Outcomes Division, MPCA

PL-4 **Wastewater Phosphorus Control and Reduction Initiative**

Author: Hydroqual, Inc. in Association with H. David Stensel, Ph.D., P.E., University of Washington

Study Minnesota Environmental Science and Economic Review Board (MESERB) Seattle

Study Completion Date: April 2005 Project #MESE0001; ppES1-14

Bio-P Study (Executive Summary)

PL-5 **Joint LMC/MPCA Survey of Bio-P Costs**

Survey

PL-6 **Economic Evaluation of Aesthetic Amenities: A Case Study of River View**

S. N. Kulshreshtha and J. A. Gillies, University of Saskatchewan

Journal Water Resources Bulletin

April 1993 Vol 29(2); pp.257-66

PL-7 **Establishing Relationships Among Nutrient Concentrations, Phytoplankton Abundance, and Biochemical Oxygen Demand in Minnesota, USA, Rivers**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and Howard Markus, Monitoring & Assessment, Minnesota Pollution Control Agency (MPCA)

Journal Lake and Reservoir Management (LRM) St. Paul

2001 Vol 17(4); pp.251-62 http://www.nalms.org/journal/lrm.htm

PL-8 **Establishing Relationships Among In-Stream Nutrient Concentrations, Phytoplankton and Periphyton Abundance and Composition, Fish and Macroinvertebrate Indices, and Biochemical Oxygen Demand in Minnesota USA Rivers - Final Report**

Author: Steven A. Heiskary, Environmental Analysis & Outcomes Division, Water Assessment & Environmental Information, and Howard Markus, Monitoring & Assessment, Minnesota Pollution Control Agency (MPCA)

Report MPCA St. Paul

July 2003 pp.i-iv, 1-100

To USEPA Region V

PL-9 **Subject: Proposed Extension of 1mg/L Phosphorus Effluent Limit to New or Expanding Discharges**

From David E. Maschwitz, Environmental Outcomes Division, Minnesota Pollution Control Agency (MPCA)

Memo St. Paul

March 18, 2004

To Michael Sandusky, Director, Environmental Outcomes Division, MPCA

(without attachments)

PL-10 **Municipalities Given 1 mg/L Total Phosphorus Effluent Limits Since Phosphorus Strategy Was Approved, March 2000**

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document

September 2005

PL-11 **Industries Given 1 mg/L Total Phosphorus Effluent Limits Since Phosphorus Strategy Was Approved, March 2000 [Working DRAFT]**

Author: David E. Maschwitz, Environmental Outcomes Division, MPCA

MPCA Document St. Paul

September 2005

PL-12 **Evaluation of Membrane Bioreactor Process Capabilities to Meet Stringent Effluent Nutrient Discharge Requirements**

Author: Edwin J. Fleischer, Thomas A. Broderick, Glen T. Daigger, Anabela D. Fonseca, R. David Holbrook, Sudhir N. Murthy

Journal Water Environment Research (WER)

2005 Vol 77(2); pp.162-78 http://www.wef.org/ScienceTechnologyResources/Publications/WER/

PL-13 **Chapter NR 217-Effluent Standards and Limitations**

Wisconsin Department of Natural Resources

Rule

November 1992 http://www.legis.state.wi.us/rsb/index.html

PL-14 **Implementation Guidance for Chapter NR 217: Phosphorus Effluent Standards and Limitations [Final Document]**

Author: Wisconsin Department of Natural Resources and Bureau of Watershed Management

Guidance WI DNR

June 1999 http://www.dnr.state.wi.us/

PL-15 **Notice of Adopted Amendment**

Illinois Pollution Control Board

Public Notice Illinois Register

February 17, 2006 Vol 30(7); pp.2365-72

UC-1 **Subject: Stream Reclassification Request of Renville County Ditch No. 45, (Branch Lateral 3)**
From Craig R.Olson (Yaggy Colby Associates) on behalf of Midwest Investors of Renville, Inc., dba Golden Oval Eggs Cooperative
Letter
June 13, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-2 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45 (Branch Lateral 3)**
Golden Oval Eggs Cooperative
Form — Renville
November 8, 2004

UC-3 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45 (Branch Lateral 3)**
Southern Minnesota Beet Sugar Cooperative
Form — Renville
November 8, 2004

UC-4 **Subject: Requesting Discharge Variance and Reclassification of Judicial Ditch No. 29, Evan, Minnesota**
From Sylvia Schwarz, Arden Environmental Engineering, Inc. on behalf of the City of Evan, Minnesota
Letter — Evan
August 14, 2001
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-5 **Stream Assessment Worksheet Use Attainability Analysis, Lateral Judicial Ditch No. 29 and Judicial Ditch No. 29**
City of Evan, Minnesota
Form — Evan
October 24, 2002

UC-6 **MPCA Board Item and Attachments Re: Evan NPDES/SDS Permit Issuance and Variance Request, Brown County – Request for Variance from the Dissolved Oxygen, Un-ionized Ammonia Nitrogen and Fecal Coliform Bacteria Water Quality Standards for Judicial Ditch No. 29**
Author: Minnesota Pollution Control Agency (MPCA)
MPCA Document MPCA — Evan
April 22, 2003 — http://www.pca.state.mn.us

UC-7 **Subject: Requesting Reclassification of Judicial Ditch No. 4**
From Scott A. Johnson, Terracon on behalf of Lac Qui Parle Oil Cooperative
Letter — Dawson
April 28, 2003
To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-8 **Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 4**
Lac Qui Parle Oil Cooperative
Form — Dawson
November 4, 2004

UC-9 **Subject: Dawson Ditch**
From Chris Domeier, Minnesota Department of Natural Resources (MDNR) Fisheries, Ortonville, MN
e-mail — Ortonville
January 26, 2006
To Gerald Blaha, Environmental Outcomes Division, MPCA
Referencing April 1982 sodium hydroxide spill to Jud. Dt. No. 4 at Dawson, MN Spill File No. 10403

UC-10 **Subject: Requesting a Total Chloride Variance Request for Discharge to an Unnamed Ditch to Sater's Creek**
From Rick Serie, Agri-Energy, LLC
Letter — Luverne
February 27, 2002
To Becky Olson, MPCA

UC-11 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditch and Sater's Creek

Agri-Energy, LLC

Form Luverne

November 4, 2004

UC-12 Subject: Requesting Stream Reclassifications for Unnamed Ditches and Freeborn County Ditch No. 71 and Discharge Variances, Myrtle, Minnesota

From Dan Bigalke (Arden Environmental Engineering, Inc.), on behalf of the City of Myrtle

Letter Myrtle

December 23, 2003

To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-13 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditches and County Ditch No. 71

City of Myrtle, MN

Form Myrtle

November 3, 2004

UC-14 Subject: Requesting Stream Reclassification for Freeborn County Ditch No. 11 and Discharge Variances, Manchester, Minnesota

From Dan Bigalke (Arden Environmental Engineering, Inc.) on behalf of the City of Manchester

Letter Manchester

December 23, 2003

To Marvin E. Hora, Manager, Environmental Outcomes Division, MPCA

UC-15 Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 11

City of Manchester, MN

Form Manchester

November 3, 2004

UC-16 Stream Assessment Worksheet Use Attainability Analysis, County Ditch No. 45:
Class 7 Reclassification back to a Class 2B Water Use Classification

Form

November 8, 2004

UC-17 Biological Monitoring Report for CD45 and Sacred Heart Creek

Author: Barr Engineering

Report Renville

March 2006

UC-18 2003 Aerial Photograph of the Wright Lake, Hoot Lake Area at Fergus Falls, Minnesota Showing the Locations of Waters Proposed for Class 1C Classification

U. S. Department of Agriculture, Farm Service Agency

Map(s)

2003

UC-19 Overview of Minnesota's NPDES/SDS Construction Stormwater Permit

Author: Minnesota Pollution Control Agency (MPCA)

Fact Sheet MPCA

November 2005 Water Quality/Stormwater #2-05 http://www.pca.state.mn.us

UC-20 Summary Comparison of Chloride Water Quality Standards for EPA Region V States, North Dakota, South Dakota, and Iowa

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

Not Given

UC-21 Minnesota Subregional Hydrologic Unit Code Chloride Data Summary retrieved from the EPA STORET National Environmental Data System

Author: Environmental Protection Agency (EPA)

Summary EPA

Accessed: May 2006 http://www.epa.gov/storet/

STORET (short for STOrage and RETrieval)

UC-22 Figure 5. – Mean Hardness of Calcium Carbonate at NASQAN (National Stream Quality Accounting Network) Stations During 1975 Water Year from Quality of Rivers in the United States

J.C. Briggs and J. F. Fricke

Report U.S Geological Survey

1977 Open-file Report 78-200

UC-23 Total Hardness of Minnesota's Ground Water 1992 - 1996 from Minnesota Pollution Control Agency's Baseline Water Quality of Minnesota's Principal Aquifers, 1992 - 1996.

Author: Minnesota Pollution Control Agency (MPCA)

MPCA Document MPCA

Not Given

UC-24 Minnesota Subregional Hydrologic Unit Code Total Hardness Data Summary retrieved from the EPA STORET National Environmental Data System

Author: Environmental Protection Agency (EPA)

Summary EPA

Accessed: May 2006

STORET (short for STOrage and RETrieval)

UC-25 Water Quality Criteria, Second Edition

Editors: Jack E. McKee and Harold W. Wolf

Report California State Water Resources Board

Revised 1963 Publication No. 3 – A

UC-26 Manual on Industrial Water and Industrial Waste Water, Second Edition [Excerpt pp. 24 and 25, Table III: Water Quality Tolerances for Industrial Applications]

Author: American Society for Testing and Materials

Manual ASTM Philadelphia

1959 ASTM Special Technical Publication No. 148-D

UC-27 Guidelines for Establishing Water Quality Standards for Interstate Waters, (Under the Water Quality Act of 1965, Public Law 89-234)

Author: U.S. Department of Interior, Federal Water Pollution Control Administration.

Guidance

May 1966

UC-28 Water Quality Criteria, Report of the National Technical Advisory Committee to the Secretary of the Interior [Excerpt]

Author: U.S. Department of the Interior, Federal Water Pollution Control Administration

Report

April 1, 1968 pp.185-215

[a.k.a Green Book]

UC-29 Categorization of Surface Waters for Industrial Consumption for WPC-15

Author: George R. Koonce, Chief - Section of Industrial and Other Wastes, Division of Water Quality, Minnesota Pollution Control Agency

MPCA Document MPCA

1973

Rulemaking exhibit from the 1973 revisions to WPC-15 (PCA Exhibit 41, 5-31-73)

UC-30 Water Quality Criteria 1972 [Excerpt]
A Report of the Committee on Water Quality Criteria, Environmental Studies Board, National Academy of Sciences, National Academy of Engineering,
EPA Report EPA
March 1973 EPA.R3.73.033; pp.368-96 http://www.epa.gov
[a.k.a. Blue Book]

UC-31 Quality Criteria for Water 1986 [Excerpt page entries regarding Hardness]
Author: Office of Water Regulations and Standards, Environmental Protection Agency (EPA)
EPA Report EPA
May 1, 1986 EPA 440/5-86-001; Unnumbered http://www.epa.gov
[a.k.a. Gold Book]

UC-32 Non-irrigation Surface Water Permit Locations Retrieved from Minnesota Department of Natural Resources Water Appropriation Permits Database
Author: Minnesota Department of Natural Resources (MDNR)
Summary DNR
Accessed: May 2006

UC-33 Closed-cycle Cooling Systems for Steam-electric Power Plants: A State-of-the-art Manual, Interagency Energy/Environment R&D Program Report [Excerpt]
Author: Industrial Environmental Research Laboratory, Environmental Protection Agency (EPA)
Manual EPA
Not Given EPA-600/7-79-001; pp.237-61

UC-34 Subject: Soliciting Comments on the MPCA Proposed Class 3B to Class 3C Changes as Outlined in a May 26, 2004 Email Message from David Maschwitz (MPCA) to Keith Hanson
From Keith Hanson, Minnesota Power
e-mail
May 27, 2004
To Minnesota Chamber of Commerce Environment and Water Quality Committee

UC-35 Subject: Response to Comments on the Proposed Class 3B to Class 3C Changes
From David E. Maschwitz, Environmental Outcomes Division, MPCA
e-mail
March 4, 2005
To Kevin Kangas, Sappi Paper Cloquet, LLC,

UC-36 Cluster Rule Impact on Recovery Boiler Operations: Chloride and potassium Concentrations in the Kraft Liquor Cycle
Author: J. M. Jordan and P.S. Bryant
Journal TAPPI
December 12,1996 Vol 79(12); pp.108-16

UC-37 Dynamic Modeling of Potassium and Chloride in the Recovery Area
Author: B. Malmberg, L. Edwards, et al.
Journal TAPPI
June 2002 Vol 1(4); pp.3-6

UC-38 Selective Removal of Chloride and Potassium in Kraft Mills.
Author: L. Manuel, G.A. Ferreira, et al.
Journal TAPPI
April 2003 Vol 2(4); pp.21-5

UC-39 Mineral Scale Management, Part I. Case Studies
Author: P.W. Hart and A.W. Rudie
Journal TAPPI
June 2006 Vol 5(6); pp.22-7

UC-40 Mineral Scale Management. Part II. Fundamental Chemistry
Author: A.W. Rudie and P.W. Hart
Journal TAPPI
July 2006 Vol 5(7); pp.17-23

UC-41 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Ditch to County Ditch No. 42

Form Winthrop
November 4, 2004

UC-42 Stream Assessment Worksheet Use Attainability Analysis, Unnamed Creek to Cedar Creek
Author: Isanti Estates Mobile Home Park
Form Isanti
November 9, 2004