

State of Minnesota
Minnesota Pollution Control Agency

In the Matter of Proposed Amendment to Minnesota Rules Chapters 7050 and 7053, Relating to Minnesota Rules 7050.0130, 7050.0220, 7050.0224, 7050.0470, 7050.0471, 7053.0135, 7053.0205, and 7053.0406,	MPCA Post-Hearing Response to Public Comments
OAH Docket # 80-9003-34519	
Revisor ID 4324	November 22, 2017

MPCA Response to Public Comments Submitted During the Pre-Hearing Public Comment Period and at Public Hearings.

I. Introduction

A. Notice and public hearing

The Minnesota Pollution Control Agency (MPCA or Agency) published notice of its intent to hold public hearings regarding the above referenced proposed amendments. The MPCA published this notice (Notice) in the *State Register* on August 21, 2017.

The Notice provided for the submission of comments from August 21, 2017, through the public hearings to be held on October 23, 24, 25, 26, 30 and November 2, 2017, and also provided for a post-hearing comment of at least 5 working days after the public hearing. The comment period was extended until 4:30 p.m. on November 22, 2017 by order of Administrative Law Judge Schlatter at the October 23, 2017 hearing.

This rulemaking is limited in scope to amendments to Minn. R. chapters 7050 and 7053 governing the sulfate water quality standard to protect wild rice and identification of wild rice waters. The amendments are proposed under the authority of Minn. Stat. §§ 115.03 and 115.44, in addition to the specific legislative authority under Minnesota Laws, 2011 First Special Session, chapter 2, article 4, section 32 which requires the MPCA to initiate a process to amend the state water quality standards in Minn. R. ch. 7050.

The MPCA presented information demonstrating that the proposed amendments are needed and reasonable as required by Minn. Stat. §§ 14.131 and 14.14, subd. 2, through an affirmative presentation of facts at the hearing, and in the Statement of Need and Reasonableness (SONAR) and the supporting exhibits to the SONAR.

B. MPCA review of comments and organization of MPCA's response to comments

The MPCA received many comments on the wild rice rulemaking, including oral comments at hearings by more than 100 testifiers and many written comments. We appreciate the extensive engagement on this issue, particularly the long-term engagement of the tribes and many stakeholders; engagement throughout the process has made the rule better.

The MPCA reviewed and considered every comment. This Cover Memorandum and Attachments, hereinafter called the Response, contain the MPCA's detailed responses to comments submitted during the pre-hearing public comment period, at the hearings and after the hearings through November 17, 2017. This Response is considered a supplement to the information in the SONAR.

This response consists of multiple parts and addresses the comments received and available for MPCA review by the end of the day on Friday, November 17, 2017.¹ The MPCA participated in the hearings and reviewed the hearing transcripts and the comments submitted to the Office of Administrative Hearings up to that time.

In this Cover Memorandum, the MPCA provides its response to common themes and topic areas that were frequently identified in the comments and describes the MPCA's proposed revisions to the rules as proposed. This Cover Memorandum also identifies the additional information the MPCA is submitting into the rule record at this time in support of its responses to the comments and the changes it is proposing.

Attachment 1 provides the MPCA's detailed response to comments about specific concerns or addressing technical details not addressed in the Cover Memorandum. Attachment 1 is organized according to major topic areas, in some cases providing multiple subtopic discussions. The discussions in Attachment 1 correspond to the order of topic areas identified in Attachment 3.

Attachment 2 is a spreadsheet compilation of the comments received through Friday, November 17, 2017. Attachment 2 provides separate worksheets for: the comments presented at each public hearing (both oral and written); comments typed into the OAH e-comment system; and specific individual comments either mailed, faxed or uploaded to the OAH comment site. Comment letters and oral testimony usually include multiple statements or topics and the MPCA has addressed each topic on a separate line of the worksheet. Where possible the line contains both a summary or paraphrase of the comment and excerpts or provides the location of the actual comment.

In the "MPCA Response" column of Attachment 2, the MPCA provides a short response to the comment or identifies where it has addressed the topic elsewhere, such as a reference to the response in this Cover Memorandum, Attachment 1, the SONAR, the Technical Support Document (TSD), or the part of the hearing testimony where the MPCA has addressed the topic. For many of the issues identified by commenters, the MPCA has already provided a response in sufficient detail to establish the need and reasonableness of the proposed rule part that is the object of the comment.

Attachment 3 provides a list of the topic areas of comments. The MPCA developed this list to facilitate the review of comments and organize the response.

Attachment 4 are recurring comments that were submitted by multiple commenters. The MPCA has identified the content of the recurring letters and responded to those comments in a separate sheet of Attachment 2.

Attachment 5 are the documents and reference materials the MPCA has identified in Part of this Cover Memorandum in support of this Response. Where a Response Exhibit is available online, it is not being submitted in Attachment 5.

II. Overview – MPCA's Goals for the Rulemaking

The MPCA's proposed rule revisions can be summarized as an effort to clarify the wild rice sulfate standard so that the standard can be successfully implemented and achieve the protection of wild rice that was envisioned when the standard was adopted in 1973. Page 12 of the SONAR more specifically identifies the three main goals for the revisions as: 1) revise the numeric standard to incorporate the latest scientific understanding of the impacts of sulfate; 2) clarify the beneficial use and which waters support the beneficial use; and 3) clarify what it means to meet or exceed the standard. This context is important. There is an existing sulfate water quality standard on the books in Minnesota to protect wild rice that was approved by the U.S. Environmental Protection Agency (EPA).

¹ In order to meet the deadline for submitting comments, the MPCA is responding to comments available for review through November 17, 2017. Comments submitted after that time will be addressed in the MPCA's Rebuttal Response to Comments.

As described in the SONAR, the MPCA is not proposing to change the wild rice beneficial use. The rule revisions the Agency has proposed aim to continue to protect the beneficial use consistent with the existing standard, but with more clarity and in a more refined way that reflects new scientific findings. The identification of Class 4D wild rice waters is intended to specifically identify those waters for which the wild rice beneficial use is an existing use in a more comprehensive rulemaking action rather than via the case-by-case determination that is the current process.

Many rulemaking comments seem to suggest that the choice here is between the MPCA's proposed standard and no sulfate standard at all. There is ample evidence presented in the SONAR, TSD and Exhibits that sulfate does negatively affect wild rice – the new scientific learning surround the mechanism of this impact and the fact that it is an indirect impact rather than a direct one.

As clarified by EPA in a May 2011 letter (Response Exhibit N.30) written in reference to a bill introduced by the Minnesota Legislature to modify the existing wild rice sulfate standard:

"federal regulations require that criteria be protective of a state's designated uses and EPA's approval is based, among other factors, on demonstrating that there is a scientifically defensible basis for finding that the criteria are sufficient to protect designated uses ... Absent such a showing, EPA would be unable to approve a revised criterion ..."

Therefore, if the proposed revision is not adopted, the existing standard of 10 mg/L will continue in force. It is not scientifically defensible to conclude that simply eliminating the existing sulfate standard would protect the designated beneficial use.

Comments were made throughout the process that the MPCA has presented "a solution in search of a problem" as wild rice is thriving in Minnesota. Some of these commenters went on to ask how many acres of wild rice will be protected or restored by the proposed rule revisions, suggesting that the necessity of the rule should be measured based on quantification of the acreage of wild rice. It is a flaw in reasoning to conclude that a standard is not needed or should not apply because in some areas the beneficial use is not impaired. A primary goal of water quality standards is to *protect* water quality and keep it from degrading to the point where a beneficial use is diminished or lost. For example, drinking water is a beneficial use that applies to specific waters in Minnesota, and the state has established drinking water standards to protect that use. It would be unreasonable to state that because the quality of some lakes and streams protected for drinking water is high or pristine, standards to protect drinking water are not needed. The fact that wild rice in some areas is not impaired by sulfate does not mean that the sulfate standard is not needed and reasonable to protect the beneficial use and ensure an impact from sulfate does not occur in those areas in the future.

It is MPCA's intention that the standard be protective of *all* the wild rice waters in Minnesota where the beneficial use is an existing use. MPCA does not have a reliable estimate of the total acres of wild rice that this represents, both because the extent of wild rice acreage can vary from year to year and also because we do not currently have sufficient information to evaluate all Minnesota waters for the existence (since 1975) of the Class 4D wild rice beneficial use. However, MPCA's intent to protect this beneficial use where it is determined to be an existing use is clear in the SONAR and in rule language regarding identifying additional wild rice waters in the future. Further, the goal of the rule is not to assure a particular yield of wild rice from any given wild rice water, rather is to protect and preserve the wild rice beneficial use in those waters.

MPCA also fully acknowledges in the SONAR and the TSD that there are additional factors besides sulfate that can negatively affect wild rice. The fact that other factors than sulfate – many of which are not recognized as "pollutants" under the federal Clean Water Act – also affect wild rice does not by itself negate the need for or reasonableness of a revised sulfate standard to protect wild rice from *sulfate* impacts.

III. Major themes of comments received.

A number of comments involve similar broad, high-level, themes. These broad or common comments are addressed here, in a general discussion. Where additional nuance or details are needed to fully respond, those are provided in Attachment 1.

A. Scientific Demonstration of Sulfate/Sulfide Impacts on Wild Rice. A number of commenters objected to the proposed revisions of the sulfate standard by articulating concerns about the research and data analysis that form the basis of the revision, particularly in relation to what the research showed to be the impact of sulfate or sulfide on wild rice.

The objections to the scientific basis for the proposed revisions ranged from vague accusations that the MPCA did not use “sound science” to specific objections to aspects of the research and data analysis. Additionally, commenters stated that there was insufficient evidence to support the MPCA’s conclusions about the impact of sulfate/sulfide on wild rice. Those specific comments are discussed in more detail in Attachment 1. However, the Agency believes it is important to provide a clarification of what constitutes “sound science” and the role of peer review in the development of the proposed standard revisions.

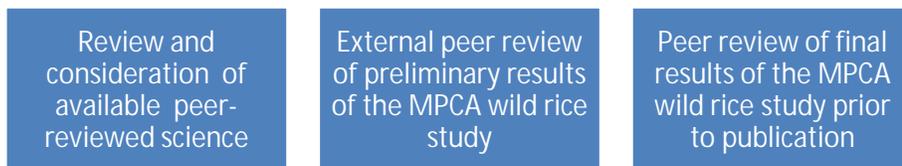
In 1999, the Society of Environmental Toxicology and Chemistry (SETAC) published a Technical Issue Paper entitled “Sound Science” (Response Exhibit N. 40). SETAC is the pre-eminent international ecotoxicology society that “promotes the advancement and application of scientific research related to contaminants and other stressors in the environment, education in the environmental sciences, and the use of science in environmental policy and decision-making.”² According to the SETAC web site, society membership exceeds 6,000 from more than 100 countries. SETAC publishes the peer-reviewed *Journal of Toxicology and Chemistry*. In their technical issue paper, SETAC describes sound science as “...organized investigations and observations conducted by qualified personnel using documented methods and leading to verifiable results and conclusions.” The paper goes on to note in a later paragraph that “Perhaps the most common means of verification used today is peer review of experimental results in manuscripts submitted to professional journals for publication.”³

As described in the section 1.2.1 of EPA’s Peer Review Handbook (4th Edition, published October 2015),

“Peer review is a documented process for enhancing a scientific or technical work product so that the decision or position taken by the Agency, based on that product, has a sound, credible basis...Peer review is an in-depth assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodology, acceptance criteria and conclusions pertaining to the scientific or technical work product”.

It is important to note that peer review is for the underlying science and technical work, not a review to check for “agreement” on final decisions.

On page 216-218 of the SONAR, the MPCA provides a discussion of our reliance on peer review in developing the technical basis of the proposed revisions. The MPCA implemented the concept of peer review at several points in the rule development process.



² <http://www.setac.org/?page=Mission>

³ p. 2, top of second column.)

The entire process of designing the research and developing the proposed revisions to the sulfate standard was informed by a larger scientific understanding available through review of published research. Throughout the process, the MPCA relied on peer-reviewed scientific literature to guide our work, from the development of the research hypothesis, to design of the research projects, to analysis of data. The MPCA identifies 68 reference documents in the SONAR and 163 reference documents in the TSD in support of the proposed revision to the standard.

The second area where the MPCA relied on the input of the peer-review process was via the convening of a peer-review panel to evaluate and comment on specific aspects of the MPCA-sponsored research and preliminary analysis of the data (see SONAR Exhibit 5 for the preliminary analysis and SONAR Exhibit 7 for the questions posed to the peer review panel). The resulting peer-review report (SONAR Exhibit 9) completed in September 2014 informed the MPCA's subsequent revisions to the preliminary analysis, which ultimately led to the development and completion of the TSD and rulemaking proposal.

Finally, the MPCA-sponsored research has generated four peer-reviewed papers that document the relationships between wild rice, sulfate, sulfide, iron, and organic carbon. The review process for these papers involved submitting the papers to peer-reviewed scientific journals for consideration and revising them in response to comments received. Only then were the papers published. At the time the SONAR was completed, publication of the papers was not yet completed; it is therefore not mentioned in the SONAR discussion. However, at the time of this Response to Comments, all four papers have been published in peer-reviewed scientific journals (Response Exhibits N.2, N.3, N.4, and N.5).

In addition to scientific peer review, there was an extensive process of public review. Throughout this effort, the MPCA invited and considered feedback from the Wild Rice Sulfate Standard Advisory Committee, Tribal governments and staff, and interested stakeholders, many of whom had scientific or technical expertise, practical experience, or traditional ecological knowledge that allowed for further critique and enhancement of the scientific work products that underlie the proposed rule revisions.

Beyond a general concern about sound science, commenters raised concerns about some specific aspects of the MPCA's research and the findings that underlie the proposed revisions to the standard.

- a. **Lack of Sulfate Impact on Wild Rice; Unreasonable Focus on Sulfide.** Many commenters suggested that the MPCA, through the research conducted, determined that sulfate did not impact wild rice. These commenters tended to argue for the removal of any sulfate standard to protect wild rice, and characterized both the existing sulfate standard and the MPCA proposal as "a solution looking for a problem." Commenters indicated that in many areas, wild rice is abundant, despite the presence of high levels of sulfate and the lack of enforcement of the existing sulfate standard. Commenters further contended that the MPCA has not documented the need for the proposed standard by identifying a statewide loss of wild rice, either in acreage or yield. Additionally, commenters asserted that the benefit of the standard, if any, will be very limited relative to the costs incurred.

In this rulemaking, the MPCA has documented the need for the proposed rules by presenting scientific evidence of the negative effect of sulfate on wild rice. The scientific evidence shows that the effect is indirect – via conversion of sulfate in the surface water to sulfide in the sediment porewater, the efficiency of which is affected by iron and carbon in the sediment – and occurs over multiple growing seasons rather than in the short-term. Nevertheless, the negative effect is evident.

While commenters have described the Agency's conclusion that sulfate has an indirect impact on wild rice as a new idea or theory motivated by an unreasonable move to regulate sulfate or mining discharges, the Agency has long known that the impact of sulfate on wild rice was likely not a direct one. As shown in MPCA Hearing Exhibit L.8., MPCA staff member Carri Lohse-Hanson noted in 1987 that "it appears that sulfate does play a role in limiting wild rice, but there is an associated

parameter or parameters that has not been quantified.” MPCA Hearing Exhibit L.8 includes Ms. Lohse-Hanson’s 1987 memo and a 1975 document from John B. Moyle stating that “the sulfate ion can be reduced by bacteria to hydrogen sulfide...hydrogen sulfide has recently been found to be toxic for domestic rice...when concentrations are about 0.1 ppm in paddy soils.” Dr. Moyle was referring to a 1972 paper (Pitts et al., 1972, Response Exhibit N.33) published in the journal *Science* by scientists studying white rice. White rice is a grass like wild rice and, like all wetland plants, can encounter elevated sulfide in porewater. Pitts et al. cited peer-reviewed publications that found that sulfide is toxic to white rice at concentrations exceeding 0.1 ppm (100 ppb), which is generally consistent with MPCA’s conclusions regarding the toxicity of sulfide to wild rice. The toxicity is expressed as decreased production of rice seeds, an effect that was also found in the mesocosm experiments sponsored by the MPCA and published by Pastor et al. (Response Exhibit N.5). It is clear that the MPCA-sponsored research conclusions concerning the effect of sulfide on plants are neither new nor scientifically surprising.

This role of sulfide in the sulfate-wild rice dynamic was a key hypothesis articulated in the research protocol the MPCA developed and finalized in 2011 with input from the scientific community, as further described on page 3 of the TSD, and the Wild Rice Advisory Committee as noted in Attachment 3 to the SONAR. That research has further elucidated this interesting and important relationship – from sulfate, to sulfide, to an adverse impact on wild rice. The fact that the relationship of sulfate to wild rice is indirect does not make it less important. To protect the beneficial use as envisioned when the standard was adopted elevated sulfate needs to be limited. The MPCA’s proposed rule establishes the protective level of sulfide – the direct actor – and adopts an equation to establish the numeric sulfate standard in a way that accounts for naturally variable environmental conditions that determine how efficiently sulfate is converted to porewater sulfide.

- b. **Error Rate of Proposed Equation.** Many commenters raised concerns about the error rate of the MPCA’s equation. Some suggested that an error rate of 16 to 20 percent is evidence that the proposed rule revision is not scientifically sound. Others put forth an alternate equation with a lower error rate, which the MPCA had previously evaluated. All water quality standards have some degree of imprecision (or “error”) associated with them – that is one of the inherent challenges of establishing water quality standards in light of natural environmental variability. That is also why both the Clean Water Act and state rules allow for the development of site-specific standards; this recognizes that there are individual cases where the more generally applicable standard can be improved upon by considering site-specific conditions. In the case of this rulemaking, MPCA is reducing (but not eliminating) the likelihood of site-specific standards being needed in the future by increasing the precision of the sulfate standard over the existing fixed standard approach. MPCA provides significant detail on the concept of “error rates” in the context of establishing or revising water quality standards in general, and the development of this specific rulemaking proposal, in the TSD (see pp. 48-66). The TSD and this Response explain in depth how the proposed equation is more precise than the current standard while still protecting the wild rice beneficial use, and how the alternate equation put forth by some commenters is not as protective of the wild rice beneficial use.

B. Overall Effect of Proposal on Wild Rice.

- a. **Wild rice is/is not in decline.** Many commenters made statements about wild rice and its general health across Minnesota, using this to argue against the MPCA’s proposal. Some commenters stated that wild rice has already declined and is continuing to decline across Minnesota, that this shows that wild rice needs additional protection, and therefore the MPCA should keep and enforce the existing 10 mg/L standard or develop a more stringent sulfate standard. Any decline in wild rice is particularly important to the tribes, who also note that the decline of rice is environmental racism

because of its disproportionate impact on Native people. Commenters noted that, based on traditional harvest patterns and needs, there is insufficient rice in Minnesota to support tribal members. As noted in paragraph A (a) above, other commenters stated that wild rice is not in decline – in fact, that the 2017 harvest was a strong one – and therefore no standard is needed.

The purpose of the proposed rule is not to determine the “right” amount of wild rice that should be present in Minnesota, either by allowing losses to a certain level or by re-establishing the range of wild rice to pre- industrial levels. The purpose of the proposed rule is to protect the wild rice beneficial use where it exists or has existed on or after November 28, 1975. The development of the proposed rule did not require the MPCA to attempt to determine how much wild rice exists in Minnesota, the state of its health, or how the current wild rice population compares to past populations of wild rice. MPCA acknowledges that additional work to understand the status of and limitations on wild rice in Minnesota would be beneficial, and would welcome an opportunity to contribute to that effort. Such an effort is beyond the scope of this rulemaking and was not necessary to developments of a standard that is protective of the beneficial use.

- b. **Skepticism that the proposed standard will improve wild rice.** Many commenters stated that the MPCA did not have evidence that the standard will improve wild rice, either in distribution, density, or yield. This statement was used to both support removal of any standard and advocate for maintaining the existing standard or adopting a more stringent standard. As noted above, a primary goal of water quality standards is to protect water quality and keep it from degrading to the point where a beneficial use is not maintained. Maintaining wild rice is an important goal. The MPCA cannot estimate how much more wild rice there may be if the proposed revisions are implemented, because of the variable nature of wild rice and because we do not currently know how many wild rice waters are being impacted by elevated sulfate levels or need sulfate levels less than 10 mg/L. Again, sulfide is a factor in limiting wild rice. The Agency’s proposal is designed to protect wild rice from this adverse impact.
- c. **Other stressors.** Many commenters noted that sulfate is one of many stressors to wild rice and may not be a primary reason for a persistent or temporary decline of wild rice. Some commenters asserted that the existence of multiple factors that impact wild rice means no sulfate standard is necessary, while others argued for standards that address more than sulfate.

The MPCA agrees, and noted at length in the TSD, that water level fluctuations, turbidity, invasive species, loss of habitat, climate change, and many other factors also adversely affect wild rice. In Chapter 1, Part B (p. 23) of the TSD, the MPCA refutes the argument that it is not necessary to protect wild rice from elevated sulfate given that there are other environmental stressors affecting wild rice. Sulfate impacts wild rice independently of other known stressors. The MPCA has established that sulfate can be detrimental to the wild rice beneficial use. It is not reasonable to make the application of a water quality standard to address a single stressor dependent upon resolution of all other potential stressors or issues affecting that beneficial use. Water quality standards, by their nature, stand alone and do not depend on the resolution of all other issues to justify their relevance to the protection of the beneficial use.

With respect to the comments that the MPCA should propose additional standards to protect wild rice, the MPCA is not proposing to expand the application of the existing narrative standard or to adopt additional numeric standards for the wild rice beneficial use at this time. In some cases, the stressor of concern raised by a comment is not considered a pollutant within the current context of the Clean Water Act (e.g. water level fluctuations; shoreland development). In other cases, Minnesota already has standards in place to protect other beneficial uses (e.g. eutrophication

standards, mercury standard) and MPCA does not have scientific evidence to suggest that a more restrictive standard is needed to protect the wild rice beneficial use.

C. **Economic Effects.** A major theme of the comments and the testimony at the hearings was the cost of sulfate treatment and its potential effect on industry and municipalities, and whether the MPCA had considered those costs or was rushing the proposed revisions forward without adequate consideration. Many commenters claimed that implementing either the proposed rules or the existing sulfate standard would result in widespread economic hardship. Comments identified concerns about the impact on the taconite mining industry and its employees, northern Minnesota communities where taconite mining is a significant component of the local economy, and the affordability of municipal wastewater treatment systems. In contrast, other commenters identified a concern that failure to implement a rule that protects wild rice from elevated sulfate would negatively affect Native Americans economically, culturally, and spiritually.

a. **Cost of Treatment Technology.** A major concern is the potential cost of treatment to reduce sulfate. Several commenters stated that the only technology currently available is reverse osmosis, which has high monetary costs for initial installation and for long-term operation and maintenance – both for the technology itself and to pay for the energy needs to operate the technology and to dispose of the waste. Reverse osmosis also has important environmental impacts unrelated to water quality to consider, such as increased energy use and the need to manage difficult waste streams. The MPCA is aware of these issues, and documented them and related costs in the SONAR on pages 176-186.

The MPCA fully acknowledges the concerns about the cost of existing sulfate treatment technology and the subsequent economic impact. Those concerns exist for both the existing standard of 10 mg/L and the proposed revision. The proposed revision mitigates some of these concerns by revising the standard to address the way in which naturally variable environmental conditions – namely total organic carbon and total extractable iron in sediment – affect the degree to which sulfate in the surface water impacts wild rice. This avoids or reduces the amount of treatment needed to protect wild rice waters that can tolerate sulfate levels higher than 10 mg/L and still be protective of the wild rice beneficial use. Pages 189-190 of the SONAR address this reality in the discussion of the costs associated with not adopting the proposed revision. This addresses the MPCA's goal of protecting the wild rice beneficial use from sulfate impacts while avoiding unnecessary treatment costs.

Commenters are correct in stating that the options for treatment of sulfate are currently limited and it is costly to achieve low levels of sulfate in wastewater. However, without yet knowing the precise sulfate levels that will need to be reached at a given facility, let alone if treatment will be needed, it is premature to assume that reverse osmosis will be the only treatment option. As noted on page 185 of the SONAR (Table 18), there may be other options – including source isolation or other kinds of membrane treatment – that may work where a higher level of sulfate can remain in the discharge and still be protective of the wild rice beneficial use. In addition, technologies will likely be developed as it becomes clearer what level of sulfate removal will generally be needed. Finally, as MPCA indicated in the SONAR and in oral responses at the hearings, one of the criteria for granting a variance under both state and federal regulations is widespread economic and social impacts (see Minn. R. 7050.0190, Subp. 4 and 40 CFR 131.10.). MPCA would consider those impacts in evaluating variance requests.

A number of commenters stated that the rule proposal is unreasonable given the potential costs of reverse osmosis treatment. Under the federal Clean Water Act (CWA), cost considerations cannot be a basis for establishing or modifying a water quality standard. As noted above and in Response Exhibit N. 30, under the Code of Federal Regulations EPA's approval is based on determining, among

other things, if the proposed standards (“criteria” in EPA’s lexicon) are based on scientifically defensible evidence that the standards are sufficient to protect the beneficial use(s).

In addition, EPA has provided the states with the *Interim Economic Guidance for Water Quality Standards* (March 1995).⁴ That guidance explains that although economics can be considered at various points in the process of setting or revising water quality standards, for example in the designation of uses or in reviewing variance requests, economic factors are not allowable determinants in establishing a water quality criterion. Further, a caveat on using costs in designating uses is that the designated use cannot reflect lower water quality than the existing use.

The relationship of a standard to the costs of achieving that standard in a waterbody can be explained in terms of the goal and the process of getting to the goal. The standard is the goal that must be met to protect the beneficial use (in this case use of wild rice as food for humans and wildlife). This goal has been determined by best available scientific practices and research. Technological limitations, treatment costs, and social and economic consequences may certainly be obstacles and complications to achieving that goal. These are therefore considered during the implementation process, particularly the permitting process.

The MPCA does not expect that by adopting the standard all obstacles to achieving the standard in every wild rice water will be resolved. However, the presence of obstacles is not a basis for modifying or invalidating a scientifically developed standard. Furthermore, the pattern has been repeated again and again that when a goal has been identified, pollution prevention opportunities have been discovered and treatment technology has advanced such that permit requirements (i.e. limits) based on a goal (i.e. standard) that were once seen as impossible to achieve are either routinely met (example: ammonia limits), or almost within our grasp (example: mercury limits in the Lake Superior Basin).

- b. **Timing of Amendments and Study on Municipal Treatment Costs.** Many comments stated that the MPCA had not done sufficient analysis of the costs of the proposed rule revisions. Commenters suggested that only the results of a pending report on treatment options would provide sufficient information about the economic impact, and that the proposed amendments were being “rushed” despite the change in a legislative deadline that would allow the MPCA to consider the results of the pending report. The referenced report is an MPCA-proposed study funded by the Legislative Citizen Commission on Minnesota Resources (LCCMR), entitled “Analyzing Alternatives for Municipal Wastewater Treatment”.

The state Administrative Procedures Act (APA, M.S. Chapter 14) at Section 14.131 directs state agencies in rulemaking processes to “prepare, review, and make available for public review a statement of the need for and reasonableness of the rule. The statement of need and reasonableness...include the following to the extent the agency, **through reasonable effort**, can ascertain this information:...(5) the probable costs of complying with the proposed rule, including the portion of the total costs that will be borne by identifiable categories of affected parties, such as separate classes of governmental units, businesses, or individuals” [emphasis added].

The MPCA included in Part 10D of the SONAR, beginning on page 165, the required description of the probable costs associated with the proposed rules and the probable costs of compliance, which the MPCA compiled through a reasonable effort. On page 207 of the SONAR, the MPCA provides an enhanced economic analysis and discussion of considerations for cost-effective implementation of the standard. The MPCA shared a draft of this enhanced economic analysis with one of the

⁴ <https://www.epa.gov/sites/production/files/2016-03/.../econworkbook-complete.pdf>

professional engineers working on the “Part 1 Feasibility Alternative Review” (MPCA Hearing Exhibit L.1) component of the LCCMR study to provide an opportunity to review and provide input on the preliminary sulfate treatment costs. Once the Part 1 Feasibility Analysis was complete, MPCA posted the document on the MPCA web site and notified parties interested in the rulemaking that it was available. MPCA also reviewed and considered the Part 1 Feasibility Analysis to see if any changes to the rule proposal or SONAR were needed. In this way, the MPCA made use of the information available from the LCCMR study to help inform development of the rulemaking proposal.

The goal of the LCCMR funded project is to:

“...analyze alternatives for improved treatment of sulfate and salty parameters at municipal wastewater plants. This analysis will inform implementation of the wild rice, sulfate and other water quality standards...The proposed study will allow affected communities to better understand sulfate and salty parameter treatment alternatives and their costs before beginning pilot testing and design work .” (Response Exhibit N.45)

The project will provide additional information about treatment options and costs for municipal wastewater treatment plants – beyond the reasonable effort required by the APA for rulemaking – to support rule implementation including the development and evaluation of variance requests. It is also intended to compile information that municipalities can use to support variance applications, thereby lowering their costs.

If the MPCA were to wait until the LCCMR study is complete, given the time required for administrative rulemaking, the revised legislative deadline for completing the rule revision in all likelihood would be missed.

Finally, even if the LCCMR study were available today – or prior to the SONAR completion – it would not provide any scientific basis for development of the proposed standards revision.

- D. Lack of Staffing Resources to Collect Necessary Field Data.** Another theme among the comments is concern about the time it will take to implement the proposed revised standard, and skepticism that the MPCA will have sufficient resources to collect the necessary data. Pages 153-155 of the SONAR detail the expected costs and general process the MPCA will follow to collect the necessary data, including how the MPCA will prioritize data gathering. The MPCA’s current Intensive Watershed Monitoring plan includes intensive data collection across the state following a 10-year cycle. The MPCA is working with field staff to incorporate data collection needs for the proposed sulfate wild rice standard into that effort. In most cases, the MPCA will integrate the collection of sediment data in wild rice waters into our regular monitoring work around the state. The agency will prioritize data collection for wild rice waters most likely to be affected by discharges, and some work may be prioritized outside the regular monitoring schedule.

As further noted on the top of page 3 of Hearing Exhibit 1013 (*Protecting wild rice from excess sulfide: Frequently asked questions and concerns*), implementation will take time; this is not unique. With any standard, resources are required to collect a sufficient amount of data for implementation. In fact, the MPCA is not convinced that the resources needed to implement the proposed standard revision exceed those needed to implement the existing 10 mg/L sulfate standard if this rulemaking were not to proceed.

The current process requires a case-by-case evaluation of whether or not a downstream water is a “water used for production of wild rice” (in other words, if the beneficial use is or has been an existing use since November 28, 1975). This is a staff-intensive effort that requires extensive review of collected information and development of a supportable case-specific determination. The information gathered to support this rulemaking should speed up this process if the rulemaking does not proceed, but case-by-case determinations would still be necessary.

In addition, if the standard remained as is, the MPCA would still need to devote resources to collect and analyze sulfate samples in wild rice waters to determine if the 10 mg/L standard is being met and to evaluate discharges for potential impacts. In this scenario, the initial work of collecting samples may be somewhat reduced (since only surface water sulfate samples would be needed and not sediment iron and carbon samples), but the lack of clarity and imprecision of the current 10 mg/L standard would result in additional work after the initial sampling. For example, the existing standard has no specified averaging time or exceedance frequency, meaning the MPCA would have to invest staff time to develop an interpretation of the data.

In terms of precision, we already know there are places where surface water sulfate is greater than 10 mg/L but extensive stands of wild rice exist (see the "false positive" discussion on pp. 60-61 of the TSD, particularly Table 1-13). If the 10 mg/L standard is maintained, these sites may be misidentified as impaired and require a restoration study (i.e. a total maximum daily load study, TMDL). MPCA would then need to complete a TMDL study, which would be a wasted effort if the beneficial use is not actually impaired, or develop a site-specific standard (SSS) establishing that the current conditions are protective of the wild rice beneficial use. Either of those activities would require staff resources that may exceed those needed to collect sediment data and calculate the numeric sulfate standard as proposed by this rulemaking.

Furthermore, the MPCA anticipates that if the proposed rule revision is not adopted, the agency will receive increased SSS requests based on the scientific information presented in the rulemaking proposal. Acting on such requests would require data collection by either the MPCA or proposers, as well as significant MPCA staff time to evaluate the data, develop a SSS if warranted, and go through the administrative process of adopting a SSS, which includes a public notice and comment period, response to comments, and submittal to EPA for their review and approval.

In summary, the current 10 mg/L standard requires initially less work to collect sulfate samples but involves greater resources later. Conversely, the proposed revised standard will initially require more effort, but the clarity and precision will result in less strain on resources later.

- E. Alternate proposal to protect and restore wild rice.** A number of commenters, both verbally and in writing, advocated for an alternate approach to protecting wild rice in the form of a task force or nonprofit made up of tribes, cities, mining interests, environmental groups, and state government. The stated intent was for this group to develop an approach for promoting and funding wild rice protection and restoration in a manner that would be more cost-effective than requiring reverse osmosis treatment to meet permit limits needed to be protective of the beneficial use and to comply with the wild rice sulfate standard (current or proposed revision).

As noted above, the MPCA contends that the conclusions made by some commenters regarding the extensive costs of implementing the proposed standard are premature, and that unreasonable costs can be avoided using available implementation tools. The MPCA fully acknowledges the concerns, however, and intends to make use of available tools and pursue creative strategies to avoid impacts to municipalities and industries that would affect jobs, affordability of municipal services, and economic vitality. Economic and environmental health are not mutually exclusive, and we are committed to achieving both.

The MPCA does recognize the limitations of the proposal, however, in that it addresses only one component of wild rice protection (namely the adverse impacts of elevated sulfate leading to elevated sulfide). The MPCA is very interested in the idea of working together among various interests to develop more comprehensive and cost-effective strategies to protect wild rice that go beyond the limitations of water quality standards and their implementation. This interest was expressed by MPCA Commissioner John Stine in a letter (Response Exhibit N. 25) responding to concerns about the rule revisions raised by the Minnesota

Indian Affairs Council during the summer of 2017 (Commissioner Stine's 2017 letter was also provided as an attachment to Hearing Exhibit 1020).

We do not believe that under the Clean Water Act the MPCA could substitute a broader effort like that suggested by some commenters as a replacement for the existing sulfate standard or the proposed revised standard; and we do not think it would be an approvable standards action by EPA. However, we do think such an approach might provide an opportunity for additional implementation flexibility, particularly until additional treatment options become available to address elevated sulfate discharges. We would welcome an opportunity to explore this idea and any other implementation strategies with cities, tribes, industries, hand harvesters, environmental groups, elected officials and other involved parties (including EPA).

- F. Comments out of scope.** Commenters identified a number of issues that are beyond the authority of the MPCA to address in the proposed rules. These comments identified concerns with pipeline construction, Native American tribal rights, the environmental effects of mining, the MPCA's past enforcement of standards, and many others. In Attachment 2, the MPCA has identified those comments that it considers to be out of scope of this rulemaking and therefore not necessary to address specifically in this Response. The MPCA acknowledges the importance of the expressed concerns, even though they are out of scope.

IV. MPCA's proposed changes to rule amendments as published

After review and careful consideration of comments, the MPCA proposes several changes to the rule as published in the *Minnesota State Register* on August 21, 2017. The MPCA has established the need and reasonableness of each proposed rule in the SONAR. Any additional statements of need and reasonableness for the proposed changes are included below and are considered a supplement to the SONAR.

Minnesota Stat. § 14.05, subd. 2, establishes the standard to assess if a change is substantially different than the proposed rule. The changes proposed below are not substantially different from the rule as published because:

- The changes are within the scope of the matter announced in the notice of hearing;
- The changes are a logical outgrowth of comments submitted in response to the notice of hearing;
- The notice of hearing provided fair warning to persons interested in and affected by the rule amendments that the additional changes could be part of the rule in question;
- The additional changes do not change in any way the group of persons who will be affected by the rule;
- The subject matter of the additional changes is the same as the subject matter contained in the notice of hearing; and
- The additional changes do not alter the effects of the rule proposed in the hearing notice.

Proposed change to the rule amendments as published (line numbers identify the rule language in the Revisor's certified copy dated 7/24/17. MPCA Hearing Exhibit C)	Statement of Need and Reasonableness supporting the proposed change
<p>7050.0471, subp.3 Line 13.2 Cuffs Lake 16-0006-00 Line 13.23 Mount Maud Wetland 16-0914-00 Line 14.15 Teal Lake 16-0003-00 Line 14.21 Unnamed stream (Grand Portage) 04010101-757 Line 15.9 Bang Lake 09-0046-00 Line 15.14 Cedar Lake 09-0031-00 Line 15.17 Dead Fish Lake 09-0051-00 Line 16.2 Hardwood Lake 09-0030-00 Line 16.9 Jaskari Lake 09-0050-00 Line 16.14 Martin Lake 69-0768-00 Line 16.15 Miller Lake 09-0053-00 Line 16.25 Perch Lake 09-0036-00 Line 16.27 Rice Portage Lake 09-0037-00 Line 17.7 Simian Lake 69-0619-00 Line 17.8 Unnamed (FDL1) 09-0178-00 Line 17.6 Side Lake 69-0699-00 Line 17.17 Twin Lake 69-0695-00 Line 17.19 Unnamed (FDL2) Lake 69-1454-00 7050.0471, subp.8 Line 63.5 Wild Rice Lake 09-0023-00</p>	<p>Comments from the Fond du Lac and Grand Portage Bands requested the MPCA to remove from the list of wild rice waters, all waters wholly within the reservation boundaries. The MPCA agrees with this request and proposes to amend the list of wild rice waters in part 7050.0471 to remove the identified waters.</p> <p>The proposed change is reasonable because it recognizes the tribal authority to establish water standards within the reservation boundaries. Before proposing the list of wild rice waters, the MPCA acknowledged a similar request from the Leech Lake Band to remove all waters wholly within the Leech Lake reservation from the list of wild rice waters in part 7050.0471</p>

<p>Line 41.26 7050.0471, sub.6, C, subitem (40) Moose River Aitkin County</p> <ul style="list-style-type: none"> WID 07010103-524 <u>07010103-749</u>. <p>Line 43.7 7050.0471, sub.6, C. subitem (76) Swan River Itasca County</p> <ul style="list-style-type: none"> WID 07010103-506 <u>07010103-753</u>. <p>Line 43.9 C. New subitem (78) Tamarack River Aitkin County</p> <ul style="list-style-type: none"> WID 07010103-521; <u>07010103-758</u> <p>Line 43.9 7050.0471, sub.6, C. subitem (78-79) Tamarack River Aitkin, Carlton Counties</p> <ul style="list-style-type: none"> WID 07010103-521 <u>07010103-757</u>. <p>Subitems following this change will be renumbered accordingly.</p>	<p>The MPCA is developing a supplementary mapping tool that provides additional information on beginning and ending points associated with the stream reach WIDs (water identification numbers) for proposed wild rice waters. This WID location tool is intended to be supplementary to the Tableau interactive mapping tool presently available on the MPCA wild rice web page http://www.pca.state.mn.us/water/protecting-wild-rice-waters.</p> <p>In the course of developing this supplementary mapping tool, the MPCA found that the boundaries of several WIDs had changed as a result of subdivision of stream reaches previously identified as a single WID. When these streams WIDs were subdivided, each WID was replaced with two new WID numbers. As a result, the MPCA is proposing the following changes to the rule:</p> <p>The Moose River in Aitkin County WID 07010103-524 was split into two WIDs 07010103-749 and 07010103-750. Wild rice was identified in WID 07010103-749, which is proposed as a Class 4D wild rice water.</p> <p>The Swan River in Itasca County WID 07010103-506 was split into two WIDs 07010103-753 and 07010103-754. Wild rice was identified in WID 07010103-753, which is proposed as a Class 4D wild rice water.</p> <p>Tamarack River in Aitkin and Carlton counties WID 07010103-521 was split into two WIDs 07010103-757 and 07010103-758. Wild rice was identified in both of these WIDs, which are proposed as Class 4D wild rice waters.</p> <p>A new subitem is being added (new subitem 78) to reflect the splitting of former WID 07010103-521 into two new WID (07010103-757 and 07010103-758).</p>
<p>Lines 67.6 -67.10 7053.0406, subpart 1. No effluent limit required based on site specific conditions. If the commissioner</p>	<p>The MPCA is removing the proposed provision based on conversations with EPA staff, who indicated that they would view such a</p>

<p>determines that, based on the location of the discharge in the wild rice water or site-specific hydraulic or substrate conditions, the effluent will not affect the class 4D wild rice beneficial use in the wild rice water, the commissioner must not establish a water quality based effluent limitation for the class 4D sulfate in that discharge.</p>	<p>determination as a change to the standard that requires EPA approval.</p>
<p>Line 67.13 7053.0406, subpart 2.1. Variances. A. A permit applicant may apply for a variance from the sulfate standard for wild rice and associated water quality based effluent limit (WOBEL), as specified in parts 7000.7000, 7050.0190, 7052.0280, and 7053.0195, as applicable.</p>	<p>The MPCA is removing the reference to a water quality-based-effluent limit at the suggestion of EPA to clarify that MPCA is specifically referencing the process for requesting, evaluating and approving a variances from the water quality standard. As noted in Minn. R. 7050.0190, a variance from a water quality standard includes a variance for a related water quality-based effluent limit.</p>
<p>Lines 67.15 -67.20 7053.0406, subpart 2.1. Variances. B. The commissioner must base the determination of widespread economic and social effect on the procedures established in Interim Economic Guidance for Water Quality Standards, EPA 823-B-95-002 (March, 1995) and as subsequently amended), which is incorporated by reference, is not subject to frequent change, and is available at https://www.epa.gov/wqs-tech/economic-guidance-water-quality-standards. D. <u>B.</u> Publicly owned wastewater treatment plants are exempt from the variance fee requirement under part 7002.0253.</p>	<p>The MPCA received comments critical of its planned incorporation by reference of an EPA guidance document regarding reviewing variance requests. The MPCA proposed incorporating this document by reference to provide additional clarity about the MPCA's evaluation of variance requests. However, commenters identified concerns that the incorporated 1995 document has interim status and is more than 20 years old, and therefore that more up-to-date information may also be available to inform MPCA's review in addition to this guidance. MPCA agrees that it should have the flexibility to consider additional information so long as the information considered conforms to the requirements of Minnesota Rules and federal regulations regarding variance evaluations. Since MPCA variance-related rules are already referenced in paragraph A of this subpart and those rules have been recently revised to be consistent with federal regulations, the MPCA agrees to remove 7054.0406 subp. 2.B.</p>

V. Conclusion

After thorough consideration of comments made on the proposed rule, and as required by Minn. Stat. §§ 14.131, 14.14, subd. 2, and 14.15, subd.4, and Minn. Rules § 1400.2100, the Agency has shown the rules as proposed, with the additional changes detailed in Section IV of this document, are needed and reasonable as demonstrated by and affirmatively shown by facts presented to the Agency on the hearing record.

VI. List of Exhibits supporting the MPCA's Response to Comments

N.1 MPCA's Memorandum describing its Post-Hearing Response to Comments

- N.1 Response Attachment 1- MPCA Detailed Responses to Comments
- N.1 Response Attachment 2- MPCA Spreadsheet of Comments
- N.1 Response Attachment 3-List of Topic Areas
- N.1 Response Attachment 4 - Tabulation of the comments submitted in the form of identical letters.
- N.1 Response Attachment 5- Materials provided as Response Exhibits

N.2 Myrbo, A., E.B. Swain, D.R. Engstrom, J. Coleman Wasik, J. Brenner, M. Dykhuizen Shore, E.B. Peters, and G. Blaha. 2017. Sulfide generated by sulfate reduction is a primary controller of the occurrence of wild rice (*Zizania palustris*) in shallow aquatic ecosystems. *Journal of Geophysical Research: Biogeosciences*. <https://doi.org/10.10022017JG003787>

Available at: <http://onlinelibrary.wiley.com/doi/10.1002/2017JG003787/epdf>

N.3 Myrbo, A., E.B. Swain, N.W. Johnson, D.R. Engstrom, J. Pastor, B. Dewey, P. Monson, J. Brenner, M. Dykhuizen Shore, and E.B. Peters. 2017. Increase in nutrients, mercury, and methylmercury as a consequence of elevated sulfate reduction to sulfide in experimental wetland mesocosms. *Journal of Geophysical Research: Biogeosciences*. <https://doi.org/10.10022017JG003788>

Available at: <http://onlinelibrary.wiley.com/doi/10.1002/2017JG003788/epdf>

N.4 Pollman, C.D., E.B. Swain, D. Bael, A. Myrbo, P. Monson, and M. Dykhuizen Shore. 2017. The evolution of sulfide in shallow aquatic ecosystem sediments – an analysis of the roles of sulfate, organic carbon, iron, and feedback constraints using structural equation modeling. *Journal of Geophysical Research: Biogeosciences*. 122. <https://doi.org/10.1002/2017JG003785>

Available at: <http://onlinelibrary.wiley.com/doi/10.1002/2017JG003785/epdf>

N.5 Pastor, J., B. Dewey, N. W. Johnson, E. B. Swain, P. Monson, E. B. Peters, and A. Myrbo. 2017. Effects of sulfate and sulfide on the life cycle of *Zizania palustris* in hydroponic and mesocosm experiments, *Ecological Applications*, 27, 321-336.

Available at: <http://onlinelibrary.wiley.com/doi/10.1002/eap.1452/epdf>

N.6 Berndt, M., J. Jeremiason, and B. Von Korff. 2014. Hydrologic and Geochemical Controls on St. Louis River Chemistry with Implications for regulating Sulfate to Control Methylmercury Concentrations. Minnesota DNR. November 3, 2014. 33 p.

N.7 Berndt, M.E. and Bavin, T.K., 2012. Methylmercury and dissolved organic carbon relationships in a wetland-rich watershed impacted by elevated sulfate from mining. *Environmental Pollution*, 161, pp.321-327.

- N.8 Jeremiason, J.D., Reiser, T.K., Weitz, R.A., Berndt, M.E. and Aiken, G.R., 2016. Aeshnid dragonfly larvae as bioindicators of methylmercury contamination in aquatic systems impacted by elevated sulfate loading. *Ecotoxicology*, 25(3), pp.456-468.
- N.9 Bailey, L.T., Mitchell, C.P., Engstrom, D.R., Berndt, M.E., Wasik, J.K.C. and Johnson, N.W., 2017. Influence of porewater sulfide on methylmercury production and partitioning in sulfate-impacted lake sediments. *Science of The Total Environment*, 580, pp.1197-1204.
- N.10 Berndt, M.E., Rutelonis, W. and Regan, C.P., 2016. A comparison of results from a hydrologic transport model (HSPF) with distributions of sulfate and mercury in a mine-impacted watershed in northeastern Minnesota. *Journal of environmental management*, 181, pp.74-79.
- N.11 Johnson, N.W., Mitchell, C.P., Engstrom, D.R., Bailey, L.T., Wasik, J.K.C. and Berndt, M.E., 2016. Methylmercury production in a chronically sulfate-impacted sub-boreal wetland. *Environmental Science: Processes & Impacts*, 18(6), pp.725-734.
- N.12 Paranjape, A.R. and Hall, B.D., 2017. Recent advances in the study of mercury methylation in aquatic systems. *FACETS*, 2(1), pp. 85-119.
- N.13 King, J.K., Kostka, J.E., Frischer, M.E. and Saunders, F.M., 2000. Sulfate-reducing bacteria methylate mercury at variable rates in pure culture and in marine sediments. *Applied and Environmental Microbiology*, 66(6), pp.2430-2437.
- N.14 MPCA. 2013. Wild rice sulfate standard hydroponic experiment on response of wild rice to sulfide--Quality Assurance Project Plan. 506 pp.
Available at: <https://www.pca.state.mn.us/sites/default/files/tdr-qapp1-03.pdf>
- N.15 MPCA 2013 Wild rice sulfate standard mesocosm studies--Quality Assurance Project Plan. 527 pp
Available at: <https://www.pca.state.mn.us/sites/default/files/tdr-qapp1-02.pdf>
- N.16 MPCA 2013 Minnesota wild rice sulfate standard 2013 field survey--Quality Assurance Project Plan. 603 pp.
Available at: <https://www.pca.state.mn.us/sites/default/files/tdr-qapp1-04.pdf>
- N.17 Winter, T.C., 2007. The role of ground water in generating streamflow in headwater areas and in maintaining base flow. *JAWRA Journal of the American Water Resources Association*, 43(1), pp.15-25.
- N.18 Winter, T.C., 1978. Numerical simulation of steady state three-dimensional groundwater flow near lakes. *Water Resources Research*, 14(2), pp.245-254.
- N.19 Winter, T.C., 1976. *Numerical simulation analysis of the interaction of lakes and ground water*. United States Geological Survey Professional Paper 1001, 1-45.
- N.20 E-mail from Darren Vogt to Gerald Blaha dated February 17, 2017
- N.21 1854 Treaty Authority List of Wild Rice Waters dated March 29, 2017
- N.22 Information and photos of Dark Lake from U of M/MPCA field surveys

- N.23 Cooperative Agreement between Grand Portage Band of Chippewa and the Minnesota Pollution Control Agency. July 16, 1996.
- N.24 Lamers, L.P., Govers, L.L., Janssen, I.C., Geurts, J.J., Van der Welle, M.E., Van Katwijk, M.M., Van der Heide, T., Roelofs, J.G. and Smolders, A.J., 2013. Sulfide as a soil phytotoxin—a review. *Frontiers in plant science*, 4. doi:10.3389/fpls.2013.00268
- N.25 Letter from Commissioner John Stine to Robert Larsen, Chair of Minnesota Indian Affairs Council, dated July 7, 2017 and in response to letter of May 25, 2017.
- N.26 Letter from Commissioner John Stine to Robert Larsen, Chair of Minnesota Indian Affairs Council, dated September 1, 2017 and attached Summary of How Rulemaking Proposal Reflects Tribal Consultation and Formal/Informal Feedback.
- N.27 Variances Granted in Minnesota
- N.28 December 6, 2010 e-mail from Ray Norrgard (DNR) to Gerald Blaha (MPCA) explaining how Minnesota Wild Rice Management Workgroup developed its List of 350 Important Wild Rice Waters (SONAR Exhibit 23).
- N.29 February 21, 2017 e-mail from Darren Vogt (1854 Treaty Authority) to Gerald Blaha (MPCA) providing information on several wild rice waters including supplemental photo sheet from MPCA on Dark Lake.
- N.30 May 13, 2011 Letter from Tinka Hyda, Director, Water Division, EPA Region 5 to Senator Thomas Bakk and Representative David Dill.
- N.31 EPA. 1985. Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. BP85-227049. 59 pp.
- Available at: <https://www.epa.gov/sites/production/files/2016-02/documents/guidelines-water-quality-criteria.pdf>
- N.32 MPCA. 2011. The Sulfate Standard to Protect Wild Rice. Study Protocol. Minnesota Pollution Control Agency. November 8, 2011. 34 pp.
- Available at: <https://www.pca.state.mn.us/sites/default/files/wq-s6-42b.pdf>
- N.33 Pitts, G., A.I. Allam, and J.P. Hollis. 1972. *Beggiatoa*: Occurrence in the rice rhizosphere. *Science*. 178:900-992.
- N.34 Pastor, J. 2017. Progress Report on Experiments on Effects of Sulfate and Sulfide on Wild Rice. June 28, 2017. Report to the Fond du Lac Band of Lake Superior Chippewa, Cloquet, Minnesota. 4 pp.
- N.35 Fisheries Research Investigational Report No. 40 February 15, 1942. *The 1941 Minnesota Wild Rice Crop*. John B. Moyle.
- N.36 List of 350 Significant Wild Rice Waters 5/4/2010 (uncropped version).

- N.37 *Sandy Lake and Little Sandy Lake Monitoring (2010-2016), Technical Report 16-06*. December 2016. 1854 Treaty Authority.
- N.38 MPCA. 2017. Data Management Protocol for the Minnesota Pollution Control Agency's Ambient Groundwater Monitoring Network. wq-am1-08. 17 pp.
- N.39 July 21, 1987 and December 7, 1987 MDNR memoranda regarding wild rice on Sandy and Little Sandy Lakes.
- N. 40 Sound Science Technical Issue Paper. 1999. Society of Environmental Toxicology and Chemistry (SETAC).
- N.41 Cook, R.B. and Schindler, D.W., 1983. The biogeochemistry of sulfur in an experimentally acidified lake. *Ecological Bulletins*, pp.115-127.
- N.42 Urban, N.R., Brezonik, P.L., Baker, L.A. and Sherman, L.A., 1994. Sulfate reduction and diffusion in sediments of Little Rock Lake, Wisconsin. *Limnology and Oceanography*, 39(4), pp.797-815.
- N.43 Bailey, L.T., Mitchell, C.P., Engstrom, D.R., Berndt, M.E., Wasik, J.K.C. and Johnson, N.W., 2017. Influence of porewater sulfide on methylmercury production and partitioning in sulfate-impacted lake sediments. *Science of The Total Environment*, 580, pp.1197-1204.
- N.44 Johnson, N.W., Mitchell, C.P., Engstrom, D.R., Bailey, L.T., Wasik, J.K.C. and Berndt, M.E., 2016. Methylmercury production in a chronically sulfate-impacted sub-boreal wetland. *Environmental Science: Processes & Impacts*, 18(6), pp.725-734.
- N.45 Environment and Natural Resources Trust Fund (ENRTF): Analyzing Alternatives for Municipal Wastewater Treatment. May 29, 2016. https://www.lccmr.leg.mn/projects/2016/work_plans_may/_2016_04m.pdf