PUBLIC EMPLOYEES FOR ENVIRONMENTAL RESPONSIBILITY
962 Wayne Ave • Suite 610 • Silver Spring, MD 20910

Via email to miranda.nichols@state.mn.us

Miranda Nichols
Impaired Waters List Coordinator
Minnesota Pollution Control Agency
520 Lafayette Road N
St. Paul, MN 55155-4194

January 7, 2022

Dear Ms. Nichols:

The Minnesota Pollution Control Agency (MPCA) is proposing to add 15 water bodies as impaired for perfluorooctanesulfonic acid (PFOS), one of the 12,039[1] per-and polyfluoroalkyl substances (PFAS), due to high levels of PFOS in fish tissue. With the addition of these 15 waters, a total of 26 waters in Minnesota would be impaired due to PFOS. While PEER applauds Minnesota's decision to list waters as impaired due to PFOS, we urge the MPCA to consider expanding both the type of PFAS that would result in impaired waters, and to consider listing waters as impaired for PFAS levels in the surface waters themselves. Our specific comments are set forth below.

I. Background.

As MPCA is aware, PFAS are hazardous to human health and the environment. PFAS, as a class, should be presumed potentially hazardous due to their high persistence alone. The high persistence of PFAS means that there is a higher probability for widespread and long-lasting adverse effects.[2] Highly persistent chemicals, with a consistent rate of emission, will attain higher concentrations in the environment, necessarily leading to "widespread, long-lasting, and increasing contamination."[3]

Aside from persistence, PFAS present additional hazards to human health and the environment. Well-studied PFAS are associated with cancer and have been linked to growth, learning, and behavioral problems in infants and children; fertility and pregnancy problems, including pre-eclampsia; interference with natural human hormones; increased cholesterol; and immune

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[1] EPA CompTox Chemicals Dashboard, PFAS Master List of PFAS Substances https://comptox.epa.gov/dashboard/chemical-lists/pfasmaster (last visited Jan. 6, 2022).
[2] Ian T. Cousins, et.al., *Why is high persistence alone a major cause of concern?*, DOI: 10.1039/C8EM00515J (Perspective) 21 ENVIRON. SCI.: PROCESSES IMPACTS 781-792 (2019), https://pubs.rsc.org/en/content/articlehtml/2019/em/c8em00515j.
[3] *Id.*, *see also* Carol F. Kwiatkowski et. al., *Scientific Basis for Managing PFAS as a Chemical Class*, ACS PUBLICATIONS, (June 30, 2020) https://pubs.acs.org/doi/10.1021/acs.estlett.0c00255.

system problems.[4] Specifically, links between PFOA and high cholesterol, thyroid disease, pregnancy-induced hypertension, ulcerative colitis, and kidney and testicular cancer are well established.[5]

Minnesota's testing of state waters and fish for PFAS since 2004[6] makes it a national leader in this area. Only 19 states regularly test water for PFAS, and even fewer test fish tissue. However, the MCPA has identified only 26 water bodies that are impaired due to PFOS, and given the ubiquity of PFAS in Minnesota and around the country,[7] it is almost certain that many more waters are also impaired.[8]

II. Routes of human exposure from PFAS include inhalation, dermal absorption, and ingestion.

MPCA states that, "PFOS can accumulate to levels of concern in fish, and is transferred to humans when the fish is consumed, potentially causing adverse health effects."[9] While it is true that PFOS is the most common PFAS found in fish fillets,[10] despite the fact that most production of PFOS in

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[4] U.S. DEPT. OF HEALTH AND HUMAN SERVICES, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY, TOXICOLOGICAL PROFILE FOR PERFLUOROALKYLS (May 2021), https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf.

[5] Elsie M. Sunderland et. al., *A Review of the Pathways of Human Exposure to Poly- and Perfluoroalkyl Substances (PFASs) and Present Understanding of Health Effects*, 29 J. OF EXPOSURE SCIENCE AND ENVT'L EPIDEMIOLOGY no. 2, (2018), https://pubmed.ncbi.nlm.nih.gov/30470793/.

[6] MPCA, GUIDANCE MANUAL FOR ASSESSING THE QUALITY OF MINNESOTA SURFACE WATERS FOR DETERMINATION OF IMPAIRMENT: 305(B) REPORT AND 303(D) LIST 29 (Nov. 2021), https://www.pca.state.mn.us/sites/default/files/wq-iw1-04l.pdf.

[7] According to data released by the Environmental Protection Agency, there are more than 120,000 facilities across the country that "may be handling PFAS." Tim Whitehouse, *Revealed EPA Data on Potential PFAS Sites* (Oct. 17, 2021), https://peer.org/blog-revealed-epa-data-on-potential-pfas-sites/.

[8] For example, in 2021 Wisconsin regulators found high enough levels of PFAS in Lake Superior smelt to issue an advisory on limiting smelt consumption—a caution adopted by the Minnesota Department of Health after Wisconsin acted. *See* John Myers, *Word of warning: Advisory issued for Lake Superior smelt due to PFAS 'forever chemicals'*, Duluth News Tribune, Feb. 27, 2021, https://www.duluthnewstribune.com/northland-outdoors/6902799-Wisconsin-Minnesota-share-advisory-on-eating-Lake-Superior-smelt. But the MPCA does not propose to include Lake Superior in its list of waters impaired for PFOS or PFAS as a larger class. *See* MPCA Draft 2022 Impaired Waters List, https://www.pca.state.mn.us/sites/default/files/wq-iw1-73.xlsx (last visited Jan. 6, 2022).

[9] MPCA, PFOS impairments, https://www.pca.state.mn.us/water/pfos-impairments (last visited Jan. 5. 2022).

[10] Augustsson, A., et al., *Consumption of freshwater fish: A variable but significant risk factor for PFOS exposure*, ENVIRONMENTAL RESEARCH 192 (2021): 110284, https://pubmed.ncbi.nlm.nih.gov/33022218/.

the United States has been halted,[11] there are many more PFAS of concern. Moreover, if freshwater fish are laden with PFOS, it is highly likely that the water and sediment also contain PFOS and other PFAS, meaning that humans and wildlife can be exposed during the use of and recreation in these waters. Although dermal absorption of PFAS is currently poorly understood, we do know that it is a factor in blood serum contamination.[12] Therefore, MCPA should consider other routes of exposure when determining whether a water is impaired by PFAS. While reducing consumption of PFAS-contaminated fish is important, other routes of exposure must be considered and limited.

III. Other PFAS aside from PFOS should be included in the impaired waters determinations, preferably regulating PFAS as a class.

Minnesota Department of Health (MDH) has developed health-based limits for five PFAS (PFOA, PFOS, PFHxS, PFBA and PFBS) and is currently considering a sixth (PFHxA).[13] Therefore, it is puzzling as to why MCPA is limiting its impaired water determinations to PFOS.

As MPCA itself says, "Where are PFAS? Everywhere…What do we know about PFAS? Not enough."[14] Although our knowledge regarding the toxicity of most PFAS is non-existent, we do know that all that have been studied are toxic,[15] and ***all*** are persistent.[16] Given this, it is critical that we invoke the precautionary principle and regulate as many PFAS as possible. This would be in keeping with the MPCA's PFAS blueprint, which is not limited to a small number of legacy PFAS chemicals for which the toxicity is absolutely certain.[17]

Treating these chemicals as a class that merits scrutiny and regulation is not just good science and good logic, it is also good state policy. Regulators in California[18] have chosen to regulate PFAS as a class, explaining that:

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[11] Brian Bienkowski, *Fish Still Contaminated with Phased-Out Chemical*, SCIENTIFIC AMERICAN, Sept. 24, 2016, https://www.scientificamerican.com/article/fish-still-contaminated-with-phased-out-chemical/.

[12] Poothong, S, et al., *Multiple pathways of human exposure to poly- and perfluoroalkyl substances (PFASs): From external exposure to human blood*, 134 ENVIRONMENT INTERNATIONAL 105244 (2020), https://pubmed.ncbi.nlm.nih.gov/31711019/.

[13] MPCA, Minnesota's PFAS Blueprint, https://www.pca.state.mn.us/waste/minnesotas-pfas-blueprint (last visited Jan. 5, 2022).

[14] *Id.*

[15] PFAS-Tox Database, https://pfastoxdatabase.org/ (last visited Jan. 5, 2022).

[16] Ian T. Cousins, et. al., *The high persistence of PFAS is sufficient for their management as a chemical class*, DOI: 10.1039/D0EM00355G (PERSPECTIVE) ENVIRON. SCI.: PROCESSES IMPACTS, 2020, 22, 2307-2312, https://pubs.rsc.org/en/content/articlehtml/2020/em/d0em00355g.

[17] *See generally*, MPCA, MINNESOTA'S PFAS BLUEPRINT (Feb. 2021) https://www.pca.state.mn.us/sites/default/files/p-gen1-22.pdf (announcing "A plan to protect our communities and our environment from per- and polyfluorinated alkyl substances" and discussing PFAS as a group).

[18] Note that other states, such as Maine and Massachusetts, are also starting to regulate PFAS as a class.

> *a*) all PFAS, or their degradation, reaction, or metabolism products, display at least one common hazard trait according to the California Code of Regulations, namely environmental persistence; and *b*) certain key PFAS that are the degradation, reaction or metabolism products, or impurities of nearly all other PFAS display additional hazard traits, including toxicity; are widespread in the environment, humans, and biota; and will continue to cause adverse impacts for as long as any PFAS continue to be used. Regulating PFAS as a class is thus logical, necessary, and forward-thinking.[19]

These regulators explicitly foresaw that their position would encourage MPCA to take a similar approach, stating: "This technical position may be helpful to other regulatory agencies in comprehensively addressing this large class of chemicals with common hazard traits."[20] The MPCA has sufficient data and experience with PFAS to take up this mantle, proffered by another state's expert agency. As an interim step, the MPCA should at least include all PFAS that have been assessed by MDH in its analysis of which waters are impaired by PFAS pollution.

IV. MCPA should move away from site specific water quality criteria and toward water quality standards for all PFAS.

MCPA's proposed guidelines address PFOS using concentrations in fish tissue that corresponds to meal frequency recommendations. Specifically, waters listed as impaired for PFOS after 2017 were based on a threshold of 0.05 mg/kg (50 ppb).[21] MCPA is moving away from MDH fish consumption guidelines for impaired water assessments. However, the proposal is to develop site-specific water quality criteria, as opposed to water quality standards. Water quality criteria, or WQC, are typically used when a pollutant is identified in surface water that is of local or regional concern.

While PEER understands that there are certain waterbodies where there is known PFOS contamination, it is likely that many more waters also have PFAS contamination. Indeed, data collected by the Environmental Protection Agency, and laid out by PEER in a GIS map, demonstrate that there are hundreds of potential PFAS sites in the state, meriting a far broader assessment of the impacts on Minnesota waters.[22]

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[19] Simona Andreea Bălan, Vivek Chander Mathrani, Dennis Fengmao Guo, and André Maurice Algazi, *Regulating PFAS as a Chemical Class under the California Safer Consumer Products Program*, Envt'l. Health Perspectives, https://ehp.niehs.nih.gov/doi/10.1289/EHP7431.

[20] *Id.*

[21] MPCA, GUIDANCE MANUAL FOR ASSESSING THE QUALITY OF MINNESOTA SURFACE WATERS FOR DETERMINATION OF IMPAIRMENT: 305(B) REPORT AND 303(D) LIST 29 (Nov. 2021), https://www.pca.state.mn.us/sites/default/files/wq-iw1-04l.pdf.

[22] For a tailored map of all EPA-identified sites in Minnesota that may be handling PFAS see PEER, Facilities that "May be Handling PFAS", https://public.tableau.com/shared/QWSPPGSCG?:display_count=y&:origin=viz_share_link&:embed=y. *See also* PEER, PFAS Map, https://peer.org/areas-of-work/public-health/pfas/pfas-map/ (presenting the same map with all of EPA's data in all U.S. locations).

PEER believes that it would be more protective of both human health and the environment if MCPA were to ultimately develop numeric water quality standards for a number of PFAS chemicals. Another more protective approach would be to develop water quality standards based on total organic fluorine (TOF), which would enable MCPA to avoid the limited targeted analyses of PFAS (currently private labs can detect 70 different PFAS) and look for the entire class of chemicals. States have latitude in adding waters to the impaired waters list, and it is possible to base a water quality standard on narrative criteria (e.g., no PFAS in toxic amounts), or with numeric criteria. Minnesota must endeavor to set a protective standard, which may first mean adopting a narrative criteria for the class of PFAS while developing numeric criteria appropriate for the class or a subset thereof.

V. PFOS in fish tissue may not be the best indicator of impaired waters.

Longer chain PFAS tend to settle in fish tissue and sediment, but shorter chain PFAS predominate in surface water[23] and are harder to remove with filtration.[24] In addition, older and larger fish likely bioaccumulate higher levels of PFAS.[25] Moreover, there are often higher levels of PFAS found in fish that eat insects.[26] Although MCPA is linking its impairment determinations with fish consumption, PFAS in fish is indicative of PFAS in water and sediment, suggesting impairment for reasons other than just fish consumption. PFAS levels in whole fish are often two to three times higher than the PFAS in fish filets, and differences of PFAS found in fish differ depending on capture location.[27]

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[23] Goodrow, S.M., *Investigation of levels of perfluoroalkyl substances in surface water, sediment and fish tissue in New Jersey, USA*, 729 SCIENCE OF THE TOTAL ENVIRONMENT (2020), 138839, https://pubmed.ncbi.nlm.nih.gov/32387771/.

[24] EPA, *Reducing PFAS in Drinking Water with Treatment Technologies*, Aug. 23, 2018, https://www.epa.gov/sciencematters/reducing-pfas-drinking-water-treatment-technologies.

[25] HARRY BEHZADI, THE NEXT FRONTIER ON PFAS CONTAMINATION IN SEDIMENT, SURFACE WATER AND FISH TISSUE, https://www.ideals.illinois.edu/bitstream/handle/2142/103963/Behzadi_Harry_ECEC19.pdf?sequence=2. *But see* Myers, *supra* note 8 (noting that Wisconsin DNR could not determine why there was a higher concentration of PFAS in smelt than in the larger fish that ate smelt).

[26] Presentation by Dr. Greg Cope, North Carolina Testing Network Seminar, October 23, 2020. *See also* Penland, T. N., W. G. Cope, T. J. Kwak, M. J. Strynar, C. A. Grieshaber, R. J. Heise, and F. W. Sessions, *Trophodynamics of per- and polyfluoroalkyl substances in the food web of a large Atlantic slope river*, ENVT'L SCI. & TECHNOLOGY (2020) 54(11):6800-6811, https://wwww.unboundmedicine.com/medline/citation/32345015/Trophodynamics_of_Per__and_Polyfluoroalkyl_Substances_in_the_Food_Web_of_a_Large_Atlantic_Slope_River_ ("The food web compartment with the most detections and greatest concentrations of PFASs was aquatic insects").

[27] Fair, P.A., et al. *Perfluoroalkyl substances (PFASs) in edible fish species from Charleston Harbor and tributaries, South Carolina, United States: Exposure and risk assessment*, 171 ENVT'L RESEARCH (2019), https://repository.library.noaa.gov/view/noaa/22155/noaa_22155_DS1.pdf.

While fish consumption is certainly an important source of human exposure to PFAS, it is not the only exposure. As such, MCPA should consider broadening its impaired waters list to include PFAS in the water column, not just in certain fish tissue.

VI. Conclusion.

PEER supports MCPA's proposal to add 15 water bodies as impaired for PFOS. However, we urge MCPA to expand both the types of PFAS—ideally to a TOF standard rather than a targeted analysis—and to also test surface water levels rather than just fish tissue. To the extent that these changes cannot be fully implemented in the 2022 impaired waters list, they should be implemented in the 2024 listing process.

Hudson B. Kingston
Litigation and Policy Attorney
Public Employees for Environmental Responsibility (PEER)
962 Wayne Ave., Suite 610, Silver Spring, MD 20910
Tel: (202) 265-7337
hkingston@peer.org