Exhibits

3M's Comments to
Draft NPDES/SDS Permit No. MN0001449 for
3M Operations LLC Cottage Grove Facility
Cottage Grove, Washington County, Minnesota
August 30, 2024

Volume 2

Exhibit F-6 to Exhibit L

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RE: DRAFT NPDES/SDS PERMIT MN0001449

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[1] *Note: 3M hereby incorporates the final version of the 2023 IPC Study by reference due to size limitations. The study was provided to MPCA in draft on April 28, 2023 and in final on June 29, 2023.*

EXHIBIT F-6

March 18, 2024 MPCA response 3M's 2/15/24 comments

Due to size restrictions a full copy of the letter was not included in the electronic version. The full copy was included in the hard copy of the Exhibits filed with MPCA.

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March 18, 2024

Keith Schmuck, CSP
Sr. Environmental Manager
3M Chemical Operations LLC
3M Cottage Grove Center
10746 Innovation Rd
Cottage Grove, Minnesota 55016-4600
Sent Electronically

RE: ***Pre-Public Notice Draft Permit – Response to Pre-PN Comments***
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Keith Schmuck:

The Minnesota Pollution Control Agency (MPCA) has reviewed your pre-public notice comments and notes on the draft National Pollutant Discharge Elimination System/State Discharge System (NPDES/SDS) permit for 3M Chemical Operations LLC in Cottage Grove, MN Permit No. MN0001449 and corresponding fact sheet, which were submitted to the MPCA on February 15, 2024. The following are responses to your comments in the order in which they appear in your letter. Due to length, the comments made by the Permittee are only included in this letter as headings with specific excerpts included as needed for clarification. Please refer to the pre-public notice comments letter dated February 15, 2024, for the complete comments.

Comment 1: *Intervention Limits*

Response 1: MPCA understands based on a conversation after the written comment below was received, that only "WS 001 through WS 007" were meant to be grouped together, not "WS 001 through WS 009."

Internal Waste Stream (WS) station requirements in the pre-public draft permit were developed from 3M's PFAS Treatability Alternative Identification Plan, the PFAS Treatability Study, the Design Basis Reports and the 3M plans & specifications. Statements/information in these documents included "…The GAC will generally target the removal of C4+ PFAS compounds (PFAS compounds containing carbon chains of four or more carbon atoms), while the IX will target removal of C3- PFAS compounds (PFAS compounds with carbon chains of three or less carbon atoms)." 3M did not notify and/or provide information to the MPCA of its intent to utilize AIX for the adsorption of C4+ compounds. Had 3M notified and/or provided information regarding this change from previous submittals, the current language in the pre-public draft permit for the Internal Waste Streams (WS) stations would not have been developed.

Elise M. Doucette

This document has been electronically signed.

Elise M. Doucette
Supervisor
Water Quality Permits
Industrial Division

Enclosures: SONAR referenced in Responses 9.8 and 9.14

CC: Richard Allen Chasteen, Vice President, 3M
Alma Allen-Webb, Senior Environmental Specialist, 3M
Eric Funk, Site Director, 3M
Shane Symmank, WWT Process Engineer, 3M
Darren Schwankl, Civil Engineer-3M Facilities Engineering, 3M
Christopher Bryan, Global Water Resource Specialist, 3M
Matthew Garrison, Environmental Specialist, 3M
Andy Schulz, Operations Director, 3M
Nicholas Nelson, Vice President, Barr Engineering Co
Abby Morrissette, Vice President – Senior Environment Engineer, Barr Engineering Co

EXHIBIT F-7

March 26, 2024 3M comments re: Compliance Schedule

3M Cottage Grove Center
10746 Innovation Road
Cottage Grove MN 55016-4600

March 26, 2024

ELECTRONIC MAIL

Elise Doucette
Supervisor of Water Quality Permits Unit
Industrial Division
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Subject: Pre-Public Notice Draft Permit – Additional Compliance Schedule Comments
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Ms. Doucette:

This letter is in response to the Minnesota Pollution Control Agency's (MPCA) March 18, 2024 letter to 3M Company (3M) and specifically pertains to the compliance schedules proposed for inclusion in the revised draft NPDES permit.

3M appreciates MPCA's adoption of the compliance schedule language proposed in 3M's comment letter on February 15, 2024. MPCA is proposing to add the following language to the revised draft permit in addition to the language 3M provided in its comment letter, which read as follows:

> "The permittee shall attain compliance with Phase 2 for six PFAS compounds, antimony, mercury, and bis(ethylhexyl) phthalate final limits by July 1, 2025."

MPCA and 3M discussed potential revisions to this addition during the March 21, 2024 meeting. MPCA requested that 3M submit its requested revisions in writing. This letter contains that submittal.

As discussed with MPCA, the advanced wastewater treatment system is designed specifically for PFAS removal. As such, it is not designed to remove metals. The compliance schedule requirements for PFAS compounds should be developed and considered separately from the compliance schedule for other compounds. These two compliance schedules are separately addressed in this letter.

During the March 21, 2024 meeting, 3M raised with MPCA the necessity of including both compliance schedules and interim effluent limitations in the pre-public notice draft permit. As 3M stated, given the current limitations of its existing system to remove PFAS, any final limitations should take effect only after 3M has completed the construction, start-up and optimization of the advanced wastewater treatment system. Accordingly, 3M respectfully requests that any revised draft NPDES permit include both appropriate PFAS interim effluent limitations for the time period that pre-dates the above-described process for bringing the advanced wastewater treatment plant on-line and optimizing its performance, as well as a compliance schedule for meeting the final PFAS effluent limitations. Separately, as we discussed, 3M needs to identify and implement additional measures to ensure that it is able to meet final effluent limitations for antimony, cadmium, mercury, selenium and bis(ethylhexyl) phthalate. For that reason, 3M respectfully requests that the draft NPDES permit include proposed interim effluent limitations and an associated compliance schedule that affords 3M sufficient time to

3M Cottage Grove Center
10746 Innovation Road
Cottage Grove MN 55016-4600

take action to ensure that it is able to meet any final discharge limitations for these parameters. These additions would clarify 3M's compliance requirements prior to the end of these compliance schedules.

Compliance Schedule for PFAS Parameters

Based on 3M's experience with constructing, optimizing and operating advanced wastewater treatment systems designed for the removal of PFAS at other facilities, MPCA's proposed three month start-up period from April 1 to July 1, 2025[1] will be insufficient to reliably achieve compliance with the final effluent limits. Based on 3M's experience, 3M respectfully proposes the following:

> The permittee shall demonstrate compliance with final effluent limitations for PFBS, PFBA, PFHxS, PFHxA, and PFOA at SD001 and SD002 as prescribed by the conditions in this permit by no later than thirty-six months from the effective date of the permit;
>
> The permittee shall demonstrate compliance with final effluent limitations for PFOS at SD001 and SD002 by no later than thirty-six months from the effective date of the permit, as prescribed by the conditions in this permit, unless the permittee requests, by December 31, 2025, a modification of this compliance schedule or other appropriate provisions of the permit (with supporting documentation), based on its determination that the limits and associated compliance demonstration for PFOS are not consistently attainable with the advanced wastewater treatment system.

3M welcomes discussion with MPCA regarding the above-proposed compliance schedule and the compliance dates contained therein.

Compliance Schedule for Other Parameters

3M proposes that the following language be added to the compliance schedule section of the draft NPDES permit, pertaining to compliance with final antimony, cadmium, mercury, selenium and bis(ethylhexyl) phthalate effluent discharge limits.

1. Twelve months from the effective date of this permit, and annually thereafter, the permittee shall report progress made in attaining compliance with the final effluent limitations at SD001 and SD002 for antimony, cadmium, mercury, selenium and bis(ethylhexyl) phthalate.

2. Within 24 months from the effective date of this permit, the permittee shall submit a report that describes wastewater treatment technology upgrades, operation and management practices, or source control measures for attaining compliance with the final antimony, cadmium, mercury, selenium and bis(ethylhexyl) phthalate effluent limitations for SD001 and SD002. The report should include a description of the measure(s) determined to meet the final effluent limitations at SD001 and SD002 for antimony, cadmium, mercury, selenium and bis(ethylhexyl) phthalate.

3. Within five years from the effective date of this permit, the permittee shall complete the construction or implementation of the selected treatment system or other method and attain compliance with the final limits.

[1] 3M currently estimates that it will complete the construction of the Cottage Grove advanced wastewater treatment plant on or about March 31, 2025.

3M Cottage Grove Center
10746 Innovation Road
Cottage Grove MN 55016-4600

If you have any questions regarding the comments outlined above or the additional information, please feel free to contact me by phone at [redacted] or email at [redacted].

Sincerely,

[redacted]

Keith Schmuck, CSP
Sr. Environmental Manager
3M Global Chemical Operations

cc: Sarah Starr
Environmental Specialist
Water Quality Permits
Industrial Division
520 Lafayette Road | St. Paul, MN | 55155

EXHIBIT F-8

March 28, 2024 3M letter to Commissioner Kessler

3M Company
3M Center
St. Paul, MN 55144-1000

March 28, 2024

Commissioner Katrina Kessler
Minnesota Pollution Control Agency
520 Lafayette Rd North
St. Paul, MN 55155-4194

ELECTRONIC CORRESPONDENCE - katrina.kessler@state.mn.us

Re: Pre-Public Notice Draft Permit Comments
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Commissioner Kessler:

We write to bring to your attention an issue of vital interest to both the Minnesota Pollution Control Agency (MPCA) and 3M Company (3M) -- the proposed effluent limits for perfluorooctanesulfonic acid (PFOS) in the pre-publication version of the draft National Pollutant Discharge Elimination System (NPDES) permit for 3M's Cottage Grove facility. We believe these proposed limits are improperly derived, technologically infeasible to achieve even using the most advanced wastewater pollution control technology, and may require the re-opening of remedial measures at multiple sites.

We seek your attention to this issue for two reasons. First, the manner in which MPCA derived the proposed "site-specific" effluent limits for PFOS is flawed, and the resulting effluent limit numeric value is incorrect. Second, finalizing the PFOS limit in the draft permit likely will require a reopening of the long-standing approach to PFAS-related remedial actions for the Woodbury Disposal Site and Cottage Grove. Fortunately, as outlined below, there are solutions that should be acceptable to MPCA.

In developing the site-specific effluent limits for PFOS in the draft permit for Cottage Grove, MPCA should have used the available site-specific data as required by law.[1]

[1] MPCA regulations provide that "site-specific numeric criteria for toxic pollutants shall be derived by the commissioner using the procedures in this part." Minn. R. 7050.0218, subpart 2. Within that part, the regulations then define the BAF as "the concentration of a pollutant in one or more tissues of an aquatic organism, exposed from any source of a pollutant but primarily from the water

Minnesota law expressly states that site-specific limits must be based upon, to the extent practicable, site-specific conditions. Here, MPCA relied upon data gathered from 2016 to 2018 from water bodies unconnected to Pool 2 of the Mississippi River rather than data from the two-year Mississippi River instream study that MPCA required 3M to carry out specifically of Pool 2.[2] These data were submitted to MPCA in a comprehensive report dated June 30, 2023 (*Instream Characterization Study Final Report Mississippi River Cottage Grove, Minnesota*). The study spanned approximately 41 river miles (RM) of the Mississippi River from Pool 2 to Pool 4. The purpose of the study was to analyze for the presence of 40 PFAS at various trophic levels. As part of the study, 3M collected and analyzed 56 sediment samples, 56 surface water samples, 49 porewater samples, 14 benthic macroinvertebrate samples, 779 fish samples from 10 species, and six surface microlayer samples.

These Pool 2 data provide the site-specific inputs necessary for calculating a "bioaccumulation factor" (BAF) for Pool 2 that Minnesota regulations require for the derivation of water quality criteria. Minn. R. 7050.0218, subpart 3. The BAF is critical because MPCA has established a specific health-based limit for PFOS in fish.[3] The BAF is a central factor in relating the concentrations of a chemical in fish flesh to water, which is the basis for setting a site-specific discharge limit. MPCA has established by regulation the algorithms to be used in the derivation of BAFs as well as its use in setting water quality criteria. Id., 7050.0218-0219. If the BAF is wrong, the mathematically-derived water quality criterion will be too high or too low.

The BAF used in the development of the site-specific limit for PFOS is demonstrably wrong, resulting in unsupported and unsupportable effluent limits for PFOS. BAFs calculated from Pool 2 data show significant declines over time, especially from 2013 to 2021. And the calculated BAFs from these data since 2011 are far below MPCA's "interim statewide BAF" that was used to derive the limit for Cottage Grove. Thus, the true site-

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column, diet, and bottom sediments, divided by the average concentration in the *solution in which the organism had been living*, under steady state conditions." Minn. R. 7050.0218, subpart 3.G. (emphasis added).

[2] See *Notice of Violation, 3M Company - Cottage Grove Center, Cottage Grove, Washington County*, dated January 21, 2021, Corrective Action ¶ 21 and Attachment 1 – PFAS Characterization Study.

[3] 3M is not here raising issues regarding MPCA's determination of health-based values for the consumption of fish. While 3M may choose to contest those values at some point, for purposes of this letter we are accepting those values as settled.

specific PFOS BAF for Pool 2 results in a chronic water quality criterion much higher than the value used to derive the Cottage Grove PFOS effluent limits.

3M shares MPCA's interest and commitment to protect human health and the environment through the establishment of properly derived effluent limits for the Cottage Grove facility. As you know, 3M has invested approximately $300 million to construct an advanced water treatment system designed specifically to remove PFAS from its wastewater.[4] This state-of-the-science system is expected to be capable of routinely removing PFOS to levels below the ability of any method currently approved by MPCA to measure pollutant concentrations (the limit of quantitation or (LOQ)).

Discharge concentrations routinely below the LOQ, however, will not be sufficient to meet the PFOS limits in the draft permit. This is especially true with respect to the proposed 30-day-average limit of 0.07 ng/L, or 70 parts per quadrillion (ppq). At this level, even if only one of the eight daily composite samples required per month reports a PFOS concentration of 2.2 ng/L (slightly above MPCA's recently proposed LOQ), the 30-day average will be exceeded, exposing 3M to a Clean Water Act statutory maximum civil penalty of up to $2 million. This is even more problematic considering that analytical measurements at the boundary of the LOQ necessarily mean that the value derived is not an absolute value, but rather a value that is within a range of the actual concentrations. For the currently approved EPA Method 537, an analytical result near the minimum reporting level (i.e., LOQ) can have uncertainties as high as ±50 percent of the actual concentration. This means that values very near the LOQ have an irreducible probability of being wrong – of overstating the actual concentration of the target analyte. With the proposed 30-day limit, this means that analytical acceptance criteria creates significant regulatory uncertainty. While MPCA might be inclined to exercise prosecutorial discretion, these limits are also enforceable by both the United States Environmental Protection Agency and third-parties through citizen suits.

It is also important to consider the follow-on implications of the PFOS limits. Since 2019, 3M has captured all PFAS-containing water from its PFAS manufacturing- and research and development-related processes, and 3M ceased operation of the Cottage Grove

[4] The magnitude of 3M's investment in its advanced wastewater treatment system is testament to MPCA's observation as to why it has not gone through the formal process to adopt state-wide water quality standards for PFOS: "effective, feasible methods to manage PFAS-contaminated water, biosolids, and other media are not yet available and are needed to broadly implement a WQS." *See* Public Comments Received During the 2020-2021 Triennial Standards Review and MPCA's General Response."

incinerator in December 2022. Thus, the source of the PFAS in the Cottage Grove wastewater discharge is predominantly from contaminated groundwater or associated with legacy contamination attributable to historic operations; a significant percentage of the contaminated groundwater is received from the offsite remedial action selected by MPCA for the Woodbury Disposal Site (Woodbury) site that 3M is obligated to implement under a 2007 Administrative Order on Consent (Order on Consent) between MPCA and 3M. In view of the foregoing, the new advanced wastewater treatment system, therefore, is essentially a remedial system, not a system necessary to control discharges from ongoing manufacturing operations.

The groundwater 3M is obligated to treat contains PFOS concentrations that are up to five orders of magnitude above the PFOS limits in the draft permit. Unless the obligations under the 2007 Order on Consent are modified, 3M will be required to treat the PFOS-containing groundwater from Woodbury and Cottage Grove regardless of whether 3M continues to operate the Cottage Grove manufacturing facility. Consequently, 3M does not have any ability, without modification of the Order on Consent and the remedial actions conducted thereunder, to meet the proposed effluent limits for PFOS. The Order on Consent expressly provides, however, that "[t]his Agreement is based upon the expectation that the terms and conditions of any necessary permits will be issued consistent with the response actions required by this Agreement." 3M respectfully submits that a permit containing limits that pose a genuine risk of non-compliance and extreme penalty exposure is not consistent with the remedial decisions that direct contaminated groundwater to Cottage Grove for treatment; such a permit also casts serious doubt about 3M's ability to agree to increase groundwater extraction and treatment at Cottage Grove as recently requested by MPCA. While 3M does not want to reopen the 2007 Order on Consent and is otherwise interested in treating as much groundwater as the new system can handle, 3M is not willing to accept the risk of significant penalties to do so.

Proposed Path Forward

3M respectfully suggests that there are several paths to address the issues discussed above. First, is a discussion focused on the data that underlie the selection of site-specific effluent limits for PFOS. 3M seeks an open discussion of the facts and applicable law, which 3M is convinced will result in the development of site-specific limits that are fully consistent with Minnesota regulations. MPCA regulations explicitly recognize the likely

need for an evidentiary hearing on the site-specific effluent limitations.[5] 3M submits that it would be far more efficient to meet and talk than to address this issue through a formal hearing process.

If MPCA will commit to such discussions, 3M is prepared to provide MPCA with a full explanation for the data that drive the correct BAF calculation, as well as 3M's concerns with other parameters used in the calculation of the water quality criterion. Our internal and external experts are also ready to work with MPCA's experts to ensure that the Agency makes a fully informed final decision on the appropriate water quality criterion from which to derive the site-specific effluent limits for PFOS at the Cottage Grove facility. We do not believe this review process needs to take more than a few weeks if personnel are directed to make it a priority, and we respectfully submit that this issue is sufficiently important to warrant the time and high level of effort by both 3M and MPCA. 3M pledges to commit the necessary resources for this engagement.

An alternative path to address the PFOS limits is using the procedure provided in State law for considering a site-specific "adjustment" of limits. Minn. S. 115.03, Subdivision 1(a)(5)(viii). This provision first requires the Commissioner to hold a public hearing and determine whether MPCA's effluent limitations can be implemented with available technology given the wastewater and groundwater to be treated.[6] It then provides an affected discharger the opportunity to demonstrate at that hearing that the economic and social benefits associated with meeting the limits are outweighed by the costs. If that demonstration is made, the effluent limitation cannot be applied to the discharger unless it is adjusted.

There is no evidence to suggest that any known treatment system can achieve the proposed PFOS effluent discharge limits in the draft permit for the volume of wastewater required to be treated at Cottage Grove facility at the concentrations of PFOS at issue. As MPCA's Fact Sheet for the draft permit demonstrates, the upstream concentration of PFOS in the Mississippi River is considerably higher than MPCA's proposed effluent limitations would allow in the Cottage Grove discharge, and will remain so unless and until MPCA believes cost-effective treatment technology is available to address the other

[5] "Any effluent limitation derived from a site-specific criterion under this subpart shall only be required after the discharger has been given notice of the specific proposed effluent limitations and an opportunity to request a hearing as provided in part 7000.1800." MN Reg 7050.0218, Subpart 2.

[6] The hearing is required before MPCA finalizes the Cottage Grove permit, and we encourage you to schedule it sufficiently in advance of the close of the public comment period to enable commenters to provide their views regarding the evidence presented at the hearing.

known significant sources of PFOS. Simple logic demonstrates that no amount of discharge from Cottage Grove at the proposed effluent limits could dilute the upstream contributions of PFOS to the currently proposed water quality criterion level. This is the demonstration 3M would plan to make at the public hearing, allowing the Commissioner to exercise her authority to adjust the proposed PFOS effluent limits to a value that this $300 million system can meet.

As stated, 3M shares MPCA's interest in and commitment to protecting human health and the environment through the establishment of properly derived effluent limits for the Cottage Grove facility, 3M is committed to working closely with MPCA to establish limits that provide necessary protection, are scientifically and statutorily valid, and are achievable via best available control technology. We remain committed to scaling and optimizing our state-of-the-science advanced water treatment system according to an appropriate compliance schedule and committing appropriate resources to support the MPCA in the revision of the proposed draft permit.

We appreciate your consideration of the items outlined above and look forward to discussing them in more detail during our meeting to be scheduled in early April.

Sincerely,

Dr. Rebecca Teeters
SVP, Global Chemical Operations

cc: Elise Doucette (elise.doucette@state.mn.us)

EXHIBIT F-9

April 3, 2024 MPCA ltr re: Phase 3 wastewater treatment system

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April 3, 2024

Keith Schmuck, CSP
Sr. Environmental Manager
3M Chemical Operations LLC
3M Cottage Grove Center
10746 Innovation Rd
Cottage Grove, Minnesota 55016-4600
Sent Electronically

RE: ***Pre-Public Notice Draft Permit – Phase 3 Notice and Responses to Additional Pre-PN Comments***
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Keith Schmuck:

As communicated during the 3-28-2024 meeting between 3M and the Minnesota Pollution Control Agency (MPCA), below is the notice in writing regarding the Incinerator WW/Phase 3.

Incinerator WW/Phase 3 Notice
After July 1, 2025, the Permittee no longer has approval or authorization to discharge treated wastewater and stormwater from Phase 3 unless it first receives comparable PFAS treatment efficacy as that found in Buildings 150 and 151. The Permittee may address the Phase 3 GAC treatment system discharge in one of three ways:

1. Discharge to the new advanced wastewater treatment system; or
2. Install a new advanced PFAS treatment system specifically for this discharge (discharge from this waste stream would be treated as a separate discharge with its own SD station and limits/monitoring requirements); or
3. Transport Phase 3 wastewater to a hazardous waste treatment, storage, and disposal (HW TSD) facility.

In addition, the MPCA has reviewed your additional pre-public notice comments and notes on the draft National Pollutant Discharge Elimination System/State Discharge System (NPDES/SDS) for 3M Chemical Operations LLC in Cottage Grove, MN Permit No. MN0001449, some of which were submitted to the MPCA via email and others discussed during weekly meetings.

In response to the additional comments received/discussed via email and weekly meetings, the MPCA has the following remarks:

Comment 1: *2233 No. 101 PFAS parameter that is retained for salts – discuss why this was retained along with No. 111 HFP*

Response 1: No. 101 2233-TFPA will be retained as it is the acid form of the analyte, not a salt. In 3M's Pre-PN Comments Letter dated 2-15-2024, this analyte was listed as no. 38 in Table 2: 3M Recommended PFAS analyte list. 3M listed the CAS# 756-09-2 8. MPCA believes this to be a typo and will update the CAS# to 756-09-2 which is the acid form of the analyte.

No. 111 HFP has been removed from the draft permit due to its volatility property. It was mistakenly included on the list of PFAS compounds clarified in the MPCA's response letter. It was intended to be included on the list of PFAS compounds to remove.

Comment 2: *Underground piping integrity plan – how will priority and risk be determined?*

Response 2: Requirements 5.72.84 and 6.61.16 will be edited to read as follows for additional clarification:

"Underground Piping Integrity Plan
The Permittee shall submit an implementation plan within 90 days after permit issuance detailing the following:
A. Timeline (maximum of three years for high priority/high risk pipes and maximum of ten years for all other pipes) for assessing condition of all underground piping conveying water at the facility;
B. Timeline (maximum of one year) for restoring integrity of any underground piping found to have defects allowing either infiltration or exfiltration of water; and
C. Maps, drawings, and diagrams along with methods for both pipe assessment and restoration of integrity.

High priority/high risk pipes include but are not limited to (Reference: Cottage Grove Sewer Operations and Maintenance Manual dated July 28, 2023 Revision 0):

- Chem Sewer Phase 1 Group 3
- Sanitary Sewer Group 1
- Sanitary Sewer Group 2
- Sanitary Sewer Group 3
- Chem Sewer Phase 1 Group 2
- Storm Sewer Group 2
- Storm Sewer Group 3
- Chem Sewer Phase 2 Group 3

The Permittee shall submit a plan : Due by 90 days after permit issuance."

Comment 3: *Building 92 effluent – discuss the meaning/intention of the HBV restriction (Response 1.1, 1.2, and 1.3)*

Response 3: The HBV restriction language was added to WS 006 and WS 007 in lieu of the intervention limits proposed in the draft pre-pn permit that 3M requested be removed. MPCA is aware that the Potable BLD 92 effluent has consistently lower PFAS concentrations than the Non-Potable BLD 92 effluent; however, PFOA has been present in the BLD 92 Potable effluent at concentrations up to 70

ng/L (June 16, 2022) and PFOS present at concentrations up to 20.2 ng/L (December 16, 2021). Both of the aforementioned concentrations are above existing HBVs.

Comment 4: *What we do not understand is the method for determination of the monthly average limit because there is no language like what is provided for demonstration of compliance with the daily maximum. Do you intend that a monthly average analytical result that is below the monthly average LOQ be considered to be in compliance with the monthly average discharge limits? One of the issues discussed with MPCA that we have not seen addressed is the potential for much higher than typical LOQ. For example, if one sample had an LOQ of 20 ng/L, the monthly average reporting limit would not be less than 4 ng/L and would not be in compliance per the language proposed for Section 5.72.66.*

Response 4: The MPCA has changed the reporting limit condition from 4 ng/L as a monthly average to 4 ng/L as a calendar year average (see response 6 below).
The following language has been added to the to the draft permit: "A violation of the annual average RL condition is not a WQBEL limit violation but is a permit violation at the specified station."

The MPCA has edited requirement 5.72.66 to read as follows:

"DMR Requirements

An individual sample result that is below its reporting limit is considered to be in compliance with the associated daily maximum limit. [Minn. R. 7001]

Use the following instructions to determine a reportable value where sample values are less than the RL and the permit requires reporting of an average.
A. If some values are less than (<) the RL, substitute zero for all non-detectable values to report the average or summed concentration.
Example: The values for the month are: 5.0 ng/L, 4.0 ng/L, 3.0 ng/L and <2.0 ng/L. Report the monthly average or sum as (5.0 + 4.0 + 3.0 + 0.0) = 12.0 ÷ 4 = 3.0 ng/L
B. If all values are less than (<) the RL, use the RL for all non-detectable values to calculate the average or sum and report as < the RL calculated average or summed concentration.
Example: The values for the month are <0.2 ng/L, <0.4 ng/L, <0.2 ng/L, <2.0 ng/L. Report the monthly average or sum as (0.2 + 0.4 + 0.2 + 2.0) = 2.8 ÷ 4 = < 0.7 ng/L.
C. For calculating the average reporting limit: Average the numeric reporting limit for each PFOS or PFOA sample over the calendar year. If the average reporting limit is less than 4 ng/L, then the reporting limit is in compliance for that year.
Example: The reporting limits for four PFOS samples for a given year are: 1.8 ng/L, 3.2 ng/L, 4.0 ng/L, and 5.0 ng/L. This averages out to 3.5 ng/L as a yearly average and would be in compliance with the 4 ng/L value.

Comment 5: *Concerns Regarding Sampling Turn-Around-Time and Average Reporting Limit*

Response 5: The MPCA has edited requirement 5.72.62 to read as follows:

"The Permittee shall analyze per- and polyfluoroalkyl substances (PFAS) at all monitoring locations in accordance with the following:

A. The Permittee must sample and analyze PFAS compounds using methodology capable of detecting

PFAS to the minimum reporting levels available and specifically below a 4 ng/L reporting limit for PFOS and PFOA, such as EPA method 1633 using an LC-MS/MS.
Note – Reporting limit compliance will be assessed by averaging all reporting limits at each individual monitoring station within a calendar year period and comparing against the 4 ng/L limit. The annual average of the reporting limit shall be included in the comments cell of the respective DMRs for all stations with the exception of WS 005 on the December reporting requirement. A violation of the annual average RL condition is not a WQBEL limit violation but is a permit violation at the specified station.
Note – Due to the variable stormwater characteristics, stormwater SD and WS stations may use all results from all stormwater stations when assessing compliance with the 4 ng/L reporting limit.

B. The Permittee shall analyze for all PFAS believed to be present (including but not limited to the compounds identified in this permit) in all water required to be monitored at all locations in this permit.
Note - Non-targeted PFAS analysis shall be conducted at a minimum frequency of once per year of the water required to be monitored at all locations in this permit. PFAS compounds detected during the non-targeted analysis that are not identified in this permit must be added to the PFAS analysis list for the applicable station immediately upon receipt of the non-targeted analysis results.
C. The Permittee shall analyze other PFAS compounds upon request of the MPCA should future research or environmental study determine a need for added parameters.
D. The Permittee may request a change or reduction in monitoring frequency for PFAS analysis after 12 months if monitoring data over a 12-month period of time proves that the pollutants(s) are not present at a particular monitoring location.
E. If the MPCA approves of the requested reduction in monitoring, the Permittee shall sample for the approved parameter(s) at a minimum of 1x/year to verify that they remain absent from the discharge.
F. All targeted PFAS analysis results shall have results finalized for potential submission to the MPCA as soon as possible and a maximum of 51 days after sample collection."

Comment 6: *Request for Reduction in Sampling Frequencies*

Response 6: The proposed reductions in monitoring frequencies described in Table 1 are contingent upon MPCA receiving a LIMS spreadsheet of all of 3M's Process Control Sampling data (e.g. inclusive of "early operations and stable operations") on a reoccurring basis for the duration of this permit coverage.
The following language would be added to requirement 5.72.62 in the Pre-PN Draft Permit:
"…
*Note – Process control sampling does not have to meet the reporting limits established in item "A" above or any other quality assurance requirements otherwise required of the monitoring required in the Limits and Monitoring Requirement table of this permit.
…
G. Process control sampling (see March 12, 2024 "Cottage Grove Advanced Water Treatment Proposed Draft Sampling Plan") PFAS results shall be submitted to the MPCA quarterly by 21 days after the calendar quarter as a Microsoft Excel spreadsheet output from the LIMS system attached to the DMR submittal."

Table 1. Proposed Revisions to Monitoring Frequencies in the Draft Permit

Stations	PFAS Parameters w/ Limits at SD 001 & SD 002 (6 total)	PFAS Parameters w/out Limits at SD 001 & SD 002	All Parameters
SD 001 & SD 002	1 x week (currently 2 x week)	1 x month (currently 2 x week)	-
WS 001 & WS 002	1 x week (currently 1 x week)	1 x month (currently 1 x week)	-
WS 003	1 x week (currently 2 x week)	1 x month (currently 2 x week)	-
WS 004	1 x week (currently 1 x week)	1 x month (currently 1 x week)	-
SW 001 – SW 004	-	-	1 x quarter (currently 1 x month)

Please let the MPCA know if 3M is able to comply with the proposed language to be added to requirement 5.72.62.

Comment 7: *Compliance Schedules*

Response 7: Potential compliance schedules related to final PFAS compound effluent limits, final effluent limits for additional parameters of concern (antimony, bis(2-ethylhexyl) phthalate, cadmium, mercury, and selenium), and Incinerator WW/Phase 3 will be addressed in a separate communication.

Thank you for taking the opportunity to provide input into the permitting process.

Please provide a response to the Phase 3 information above and to Response 6 by April 11, 2024.

If you have any questions regarding any of the contents of this letter, please contact Sarah Starr at 651-757- 2335 or by email at sarah.starr@state.mn.us.

Sincerely,

Elise M. Doucette
This document has been electronically signed.

Elise M. Doucette
Supervisor
Effluent Limits Unit
Environmental Assessment and Outcomes Division

CC: Richard Allen Chasteen, Vice President, 3M
Alma Allen-Webb, Senior Environmental Specialist, 3M
Eric Funk, Site Director, 3M

Shane Symmank, WWT Process Engineer, 3M
Darren Schwankl, Civil Engineer-3M Facilities Engineering, 3M
Christopher Bryan, Global Water Resource Specialist, 3M
Matthew Garrison, Environmental Specialist, 3M
Andy Schulz, Operations Director, 3M
Nicholas Nelson, Vice President, Barr Engineering Co
Abby Morrissette, Vice President – Senior Environment Engineer, Barr Engineering Co

EXHIBIT F-10

April 11, 2024 3M response to 4/3/24 letter

3M Cottage Grove Center
10746 Innovation Road
Cottage Grove MN 55016-4600

April 11, 2024

ELECTRONIC MAIL

Ms. Elise Doucette
Supervisor of Water Quality Permits Unit
Industrial Division
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Subject: Pre-Public Notice Draft Permit – Phase 3 Notice and Responses to Additional Pre-PN Comments
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Ms. Doucette:

I write on behalf of 3M Chemical Operations LLC (3M) in response to the Minnesota Pollution Control Agency's (MPCA) April 3 letter, wherein MPCA requests that 3M respond to the sections of that letter titled *Incinerator WW/Phase 3 Notice and Comment 6: Request for Reduction in Sampling Frequencies* by no later than April 11, 2024. 3M's responses appear below.

Incinerator WW/Phase 3 Notice

The approach to the treatment of phase 3 wastewater outlined by MPCA in the April 3 letter raises important regulatory issues arising under both the Clean Water Act and under Minnesota and federal hazardous waste laws related to Resource Conservation and Recovery Act (RCRA) closure activities associated with the decommissioning of the Cottage Grove Corporate Incinerator (CGCI).

First, in its April 3 letter, MPCA states:

> After July 1, 2025, the Permittee ***no longer has approval or authorization to discharge treated wastewater and stormwater from phase 3*** unless it first receives comparable PFAS treatment efficacy as that found in Buildings 150 and 151.

(emphasis supplied). As you know, since at least 2003, 3M has been authorized by *National Pollutant Discharge Elimination System (NPDES and State Disposal Permit (SDS) MN0001449*

(February 1, 2003) to treat (and discharge) wastewater generated by the CGCI and classified as hazardous waste in the Cottage Grove phase 3 wastewater treatment system (WWTS). Since at least 2003, 3M has been treating water in the WWTS by operation of the wastewater treatment unit (WWTU) exemption found in both the Minnesota hazardous waste rules at Minn. R. 7045.0450, Subp. 1(G) and the regulations promulgated under RCRA found at 40 C.F.R. § 264.1(g)(6). Similarly, 3M is authorized to treat and discharge wastewater generated from CGCI decommissioning activities under the WWTU exemption.

The above-quoted language from MPCA's April 3 letter is ambiguous insofar as it relates to the application of the WWTU exemption. Due to the critical nature of the ongoing CGCI decommissioning activities, 3M respectfully requests that MPCA expressly affirm that the WWTU exemption applies to the phase 3 WWTS. 3M seeks further affirmation that the WWTU exemption will continue to apply to the phase 3 WWTS until such as time the RCRA closure-related decommissioning activity is complete, and the phase 3 wastewater is determined to no longer be hazardous waste. For these reasons, 3M wants to ensure, and respectfully requests, that MPCA retains the language in the *Permitted facility description* section of the draft proposed NPDES permit that describes the phase 3 WWTS system and identifies it as part of the permitted treatment process. Such an approach is consistent with Cottage Grove's 2003 NPDES permit and the 2012 CGCI Hazardous Waste Storage and Treatment final permit (2012 CGCI HW Permit).

Second, in its April 3 letter, MPCA states: "The Permittee may address the phase 3 GAC treatment system discharge in one of three ways: "Discharge to the new advanced wastewater treatment system . . . .". 3M agrees that if the phase 3 wastewater did not contain listed hazardous waste it would be suitable for treatment in the Building 150/151 (B-150/151) advanced wastewater treatment system. However, the phase 3 wastewater is considered a RCRA "listed hazardous waste" by virtue of the "Derived-From Rule" (40 CFR 261.3(c-d) and (g)) and "Mixture Rule" (40 CFR 261.3(a-b) and (g)) until discharged to surface water through an NPDES permitted outfall, at which point the RCRA NPDES Discharge Exclusion (40 CFR 261.4(a)(2)) takes effect. Further, as long as the water is deemed a listed hazardous waste all equipment and media that come in contact with the phase 3 water become RCRA regulated. For this reason, any decision to reroute Building 185 GAC phase 3 effluent to B-150/151 is inextricably related to the ongoing CGCI RCRA closure process.

If MPCA agrees that the measures outlined below result in a determination that the phase 3 wastewater is no longer considered a listed hazardous waste, 3M can reroute the phase 3 wastewater to the advanced wastewater treatment system. Per Section 1003(b) of RCRA, 3M is required to minimize the generation of hazardous waste wherever feasible. Consequently, 3M is compelled to carefully consider the potential regulatory implications of introducing listed hazardous wastewater to the treatment system located in B-150/151. In our analysis, as

noted above, the introduction of hazardous wastewater to the B-150/151 advanced wastewater treatment system would cause any wastewater filter media (e.g., granulated activated carbon (GAC))[1] to also be considered hazardous waste subject to any RCRA-related treatment, storage and disposal requirements. Examples of such media include:

- Spent media upon removal for disposal;
- Inactivated media, precluded from reactivation due to RCRA listed hazardous waste concerns, upon removal for disposal;
- Spills and spill cleanup residues;
- Equipment removed for disposal; and
- Future decontamination waste from decommissioned equipment and buildings.

Accordingly, 3M respectfully requests that MPCA provide written approval of the measures 3M must take to: 1) demonstrate that phase 3 wastewater will no longer be considered a listed hazardous waste; and 2) decontaminate the phase 3 WWTS for reuse as a WWTS for treatment of non-hazardous waste. 3M outlines the measures it understands to be necessary and appropriate to decontaminate the phase 3 system for reuse as a non-hazardous WWTS in Section 4.12.2 of 3M's RCRA Closure Work Plan (submitted to MPCA on April 7, 2022). Section 4.12.2 describes decontamination, verification by rinsate sampling, and waste management measures that 3M understands is fully consistent with the 2012 CGCI HW Permit. Providing clarity on these measures is necessary before 3M can determine how best to manage wastewater from the phase 3 system on an ongoing basis. Once 3M and MPCA are able to resolve potential hazardous waste listing concerns, 3M can plan for the discharge of the Building 185 GAC Phase 3 effluent to the B-150/151 treatment system. We suggest that reaching an understanding on the measures outlined above can best be done in the context of the RCRA closure process.

Third, 3M requests that the date for changing the current method of disposition of the phase 3 wastewater be tied to the final advanced treatment system compliance schedule date rather than the July 1, 2025 date set forth in MPCA's April 3 letter. 3M will need this additional time to demonstrate that phase 3 wastewater does not contain listed hazardous waste or to install additional treatment technology solely for phase 3 water. This additional time would allow 3M to receive the necessary approvals and consider the downstream regulatory implications of the three options outlined by MPCA.

As MPCA acknowledges in its April 3 letter, the compliance schedule for the advanced PFAS treatment system is currently under discussion.

[1] The introduction of phase 3 wastewater to the B-150/151 advanced wastewater treatment system would require 3M to shift from the planned regeneration (i.e., reuse) of GAC to its treatment or disposal consistent with hazardous waste regulatory requirements. Planned annual GAC usage is estimated to be approximately one million pounds per year, based on current design and average flow rates.

Considering all of our above comments, 3M proposes revising the MPCA language as follows:

> By no later than the later of 1) the date set forth in [insert permit line reference to advanced treatment system compliance schedule end date], or 2) the date of completion of a RCRA decontamination/reuse plan approved by MPCA for the phase 3 system, discharge of phase 3 wastewater to SD001 must be routed for treatment to either the advanced treatment system or additional treatment technology approved in writing by MPCA.

3M proposes to monitor phase 3 effluent at a location immediately downstream of the Building 185 GAC and prior to commingling with any other wastewater. The above-described monitoring location would be designated as WS029.

Comment and Response 6

3M agrees with the approach proposed by MPCA and appreciates MPCA's flexibility.

If you have any questions regarding the comments outlined above or the additional information, please feel free to contact me by phone at [redacted] or email at [redacted].

Sincerely,

[redacted]

Keith Schmuck, CSP
Sr. Environmental Manager
3M Global Chemical Operations

cc: Sarah Starr (MPCA Environmental Specialist)
John Chikkala (MPCA Senior Engineer)

EXHIBIT F-11

April 23, 2024 MPCA request for additional maps and diagrams

[EXTERNAL] Updated Maps and diagrams for 3M Cottage Grove's NPDES/SDS Permit MN0001449

Starr, Sarah (MPCA) <Sarah.Starr@state.mn.us>

Tue 4/23/2024 3:11 PM

To:Keith Schmuck [redacted];Alma Allen-Webb [redacted]
Cc:Doucette, Elise (MPCA) <elise.doucette@state.mn.us>;Schnick, Emily (MPCA) <emily.schnick@state.mn.us>;Knowles, Scott (MPCA) <scott.knowles@state.mn.us>

Keith and Alma,

I am checking in on the status/availability of the additional updated maps and diagrams that 3M was planning to submit for inclusion in the Draft Permit and Fact Sheet for the Cottage Grove Facility as stated in the 2-15-2024 Pre-Public Notice Draft Permit Comments Letter (comment 13).

The only one I am aware of that was sent was the “Cottage Grove_PFD_Water Flow_Future_rv6.pdf” that Keith sent on 3-20-2024.

Are there any updated maps, particularly for the stormwater locations? Or any additional updated maps/figures to send my way?

Thank you,

Sarah Starr
Environmental Specialist
Water Quality Permits
Industrial Division
520 Lafayette Road | St. Paul, MN | 55155
Phone: 651.757.2335
sarah.starr@state.mn.us | www.pca.state.mn.us

MINNESOTA POLLUTION CONTROL AGENCY

Our mission is to protect and improve the environment and human health.

EXHIBIT F-12

April 26, 2024 3M response to 4/23 MPCA request

This figure includes all permitted discharge locations included in the permit, and all receiving waters. This is an updated version of the figure included in the 2021 renewal application.

- Figure 3: Water Flow Diagram
  - This is the flow figure previously submitted to MPCA.
- Figure 4: SSTS System Location
  - This figure includes all SSTS systems. This is an updated version of the figure included in the 2021 renewal application.

I wanted to specifically address your question about stormwater. The proposed Figure 2 listed above includes all of the stormwater outfalls in the draft permit. It is 3M's understanding that stormwater routing and management practices are typically shown and described in the SWPPP (Part 5.80.279 of the January draft permit). As MPCA is aware, 3M is continually evaluating and improving its stormwater management practices. 3M would prefer to retain stormwater figures and information in the SWPPP so that the figures can be updated without engaging in a permit modification. It is our understanding that this is consistent with other permits in the state as well.

Please let us know if you have any questions, or if a discussion would be helpful.

Sincerely,

Keith Schmuck, CSP
Sr. Manager, Environment | Global Chemical Operations
Enterprise Supply Chain
[redacted]
3M Science. Applied to Life.™
3M.com

From: Starr, Sarah (MPCA) <Sarah.Starr@state.mn.us>
Sent: Wednesday, April 24, 2024 12:01 PM
To: Keith Schmuck [redacted] Alma Allen-Webb [redacted]
Cc: Doucette, Elise (MPCA) <elise.doucette@state.mn.us>; Schnick, Emily (MPCA) <emily.schnick@state.mn.us>; Knowles, Scott (MPCA) <scott.knowles@state.mn.us>
Subject: [EXTERNAL] RE: Updated Maps and diagrams for 3M Cottage Grove's NPDES/SDS Permit MN0001449

Keith and Alma,

For reference, please see the attached MPCA communication regarding maps and diagrams from 12-

20-2023.

Thank you,

Sarah Starr

From: Starr, Sarah (MPCA)
Sent: Tuesday, April 23, 2024 3:11 PM
To: Keith Schmuck [redacted] Alma Allen-Webb [redacted]
Cc: Doucette, Elise (MPCA) <elise.doucette@state.mn.us>; Schnick, Emily (MPCA) <emily.schnick@state.mn.us>; Knowles, Scott (MPCA) <scott.knowles@state.mn.us>
Subject: Updated Maps and diagrams for 3M Cottage Grove's NPDES/SDS Permit MN0001449

Keith and Alma,

I am checking in on the status/availability of the additional updated maps and diagrams that 3M was planning to submit for inclusion in the Draft Permit and Fact Sheet for the Cottage Grove Facility as stated in the 2-15-2024 Pre-Public Notice Draft Permit Comments Letter (comment 13).

The only one I am aware of that was sent was the "Cottage Grove_PFD_Water Flow_Future_rv6.pdf" that Keith sent on 3-20-2024.

Are there any updated maps, particularly for the stormwater locations? Or any additional updated maps/figures to send my way?

Thank you,

Sarah Starr
Environmental Specialist
Water Quality Permits
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520 Lafayette Road | St. Paul, MN | 55155
Phone: 651.757.2335
sarah.starr@state.mn.us | www.pca.state.mn.us

MINNESOTA POLLUTION CONTROL AGENCY

Our mission is to protect and improve the environment and human health.

EXHIBIT F-13

April 30, 2024 3M response to MPCA re: proposal for changes to Draft Permit

3M Chemical Operations
Cottage Grove Center
10746 Innovation Road
Cottage Grove MN 55016-4600

April 30, 2024

ELECTRONIC MAIL

Ms. Sarah Starr
MPCA Permit Writer
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Subject: Pre-Public Notice Draft Permit – Additional Comments
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Ms. Starr:

We previously sent a letter to Commissioner Kessler dated March 28, 2024, in which we expressed some of our views regarding the water quality criteria that we understand serve as the basis for the proposed water quality-based effluent limits (WQBELs) in the pre-publication version of the draft National Pollutant Discharge Elimination System (NPDES) permit for 3M's Cottage Grove facility (Draft Permit). We understand MPCA is still considering that letter. The purpose of this letter is not to reiterate those points, but rather to suggest a way to ensure that the discharge from Cottage Grove has the lowest level of PFOS that can feasibly be achieved without curtailing 3M's groundwater remediation activities at the site.[1] The proposed permit language is set out in an attachment to this letter (Attachment 1).

The proposed permit language and the suggestions below are heavily influenced by the attached United States Environmental Protection Agency's (EPA) "Guidance on Water Quality Based Effluent Limits Set Below Analytical Detection/Quantitation Limits" (April 25, 2005) (EPA Guidance). Memorandum: Region 10 Guidance on Water Quality-Based Effluent Limits Set Below Analytical Detection/Quantitation Limits | US EPA. To the extent our suggested

[1] Please note that the information shared in this letter reflects 3M's good-faith effort to propose a feasible approach to the PFOS limit in the Draft Permit. By making this submission, and in seeking to reach an accommodation of our respective interests, 3M does not concede that the imposition of a PFOS WQBEL is authorized or that the water quality criterion developed by MPCA complies with statutory and regulatory requirements or is supported by the best available data. 3M's proposal does not constitute waiver of any comments or arguments to be raised during the public participation portion of the permitting process or any subsequent administrative or judicial process that may ensue.

course of action does not strictly follow the EPA Guidance, we believe we can demonstrate that those deviations are appropriate in this context.

3M's proposal on the PFOS limit is largely driven by a few observations that we share to assist in understanding our perspective. First, we understand Minnesota law to require, among other things, that when MPCA seeks to impose a WQBEL, the Agency must consider whether such limit is feasible using available technology. Minn. Stat. 116.07, subd. 6 and Minn. Stat. 115.03, Subd. 1(a)(5)(viii). Second, the PFAS that are subject to the proposed WQBEL are present in 3M's wastewater primarily as a result of 3M's ongoing obligation to treat both onsite groundwater as well as groundwater from other remedial sites (e.g., Woodbury) as required by the 2007 administrative settlement between 3M and MPCA.[2] Third, 3M has invested approximately $300 million to build a state-of-the-science advanced water treatment system that is capable of removing a very large percentage of a broad spectrum of PFAS, not just the PFAS for which MPCA will set numerical effluent limits. Fourth, 3M is unaware of any demonstrated technology that can treat the volume of groundwater 3M is required to manage to consistently achieve the proposed PFOS WQBEL of 0.12 ng/L as a daily maximum limit or 0.07 ng/L as a monthly average limit.[3] Finally, as acknowledged in the Draft Permit, the WQBEL daily maximum and monthly average discharge limits are so low that they cannot be measured with currently a validated analytical test method.[4] Moreover, these limits are well below the ability of any EPA approved analytical method to detect.

The Minnesota regulations do not fully address how to implement the PFOS limits selected by MPCA. As MPCA considers how best to balance the factors noted above, the EPA Guidance and MPCA precedent provide useful examples for how to address some permitting issues for a WQBEL that is below the limits of detection and/or quantitation.

The EPA Guidance recommends establishing a numerical value for determination of compliance, which the guidance labels the "minimum level" or "ML." The definition of ML in

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[2] 3M has been capturing PFAS process waters for offsite disposal since 2020. 3M is on course to discontinue all manufacturing of PFAS by the end of 2025. There is some contribution of PFAS from residual material in the chemical sewers at the facility and the Draft Permit contains a schedule for the cleaning of these sewers.

[3] The only known "alternative control strategy" available for reducing PFOS in effluent is taking action to limit PFOS in the influent, which here would mean curtailing the treatment of groundwater for purposes of remediation. For many reasons, this is not a preferred approach to controlling effluent quality.

[4] The draft Fact Sheet prepared by MPCA to accompany the Draft Permit states at page 68:

> Any reported effluent value below the detection limit will be considered to be in compliance with effluent limits. The Permittee must sample PFAS using a methodology capable of detecting PFAS to below a 2 ng/L reporting limit, such as the draft EPA method 1633 using an LC-MS/MS. All PFAS samples shall be analyzed to the minimum reporting levels available.

the EPA Guidance is essentially the same as the usual definitions of "reporting limit" or "limit of quantitation." The EPA Guidance at p. 3 defines the term "Minimum Level" as follows:

> Minimum Level means the concentration at which the entire analytical system must give a recognizable signal and an acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard by a specific analytical procedure, assuming that all of the method-specified sample weights, volumes and processing steps have been followed.[5]

MPCA used an approach somewhat like that recommended by the EPA Guidance in the current Groundwater Pump-Out General Permit effective through April 30, 2027. MNG790000 Groundwater Pump-Out General Permit (state.mn.us). In that permit, MPCA set a discharge limit for polycyclic aromatic hydrocarbons (PAH) below the limits of detection and set the "ML" as the value for determination of compliance. General Permit at page 17, ¶ 5.7.102.

Following the EPA Guidance for the Cottage Grove treated effluent, we propose that an ML for the purpose of determining compliance be established using Cottage Grove historical discharge data that demonstrate the reporting limits of the EPA analytical method preferred by MPCA, Method 1633. We recommend this approach because, as MPCA knows, the reporting limit of the EPA methods for wastewater are influenced by the chemical composition of the wastewater being analyzed and the technical capability of the analyzing laboratory. The ML would remain the value against which the compliance is assessed unless and until MPCA modifies or reissues the permit with a different compliance level.

To develop a fact-based ML for the Cottage Grove-specific discharge, 3M will present for MPCA's review a statistical analysis of reporting limits achieved by independent laboratories using EPA Method 1633 for samples from Cottage Grove's sampling locations SD 001 and SD 002. This water has been treated by granular activated carbon and will have less variation in reporting limits than untreated water.[6] The analysis demonstrates that a reporting limit is 2.2 ng/L best represents the data. We propose that this value set the enforceable numerical limits for the daily maximum and monthly average PFOS at SD 001 and SD 002, which will control discharge to the same limits.

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[5] See also, Minn. R. 7052.0250, subp. 30 (Lake Superior Basin Water Standards). This regulation is not applicable to permitting at Cottage Grove, which does not discharge into the Lake Superior Basin, but it does provide some useful guidance.

[6] As we have previously discussed, matrix interference and the need for dilution of samples by the laboratory increases the reporting limit. 3M's statistical analysis excluded all results from diluted samples, eliminating values that would bias results high. By eliminating the diluted samples and their corresponding higher reporting limits we believe the analysis provides a conservative estimate of the reporting limit that can be achieved by good laboratories using EPA Method 1633.

If MPCA adopts a compliance schedule that allows for sufficient time to optimize performance of the advanced water treatment system currently under construction at Cottage Grove, 3M believes that a daily maximum and monthly average discharge limit at the proposed ML is achievable. 3M believes that the law requires a single numerical value for evaluating compliance and that this is essential for developing and operating the complex water treatment system currently under construction. A discharge limit of 2.2 ng/L is at the edge of current analytical capabilities. This limit is also well below the drinking water standards EPA just issued and well below the levels that EPA determined many approved laboratories could even reliably measure.

In addition, other enforceable provisions in the draft permit will ensure that PFOS discharges are consistently below the ML and that other PFAS parameters remain below their respective limits. Specifically, these provisions require 3M to develop and submit for MPCA approval manuals for operation and maintenance of the granular activated carbon (GAC), reverse osmosis (RO) and ion exchange (IX) elements of the advanced water treatment system (collectively O&M Manuals). The purpose of these O&M Manuals is to achieve the maximum, consistent performance of the system, and adherence to the procedures in the O&M Manuals is enforceable under the permit.

We have previously discussed interim limits for certain PFAS until the final compliance date and applicability of the new limits. 3M has reviewed its discharge data for PFOS, PFBS, PFBA, PFHxS, PFHxA, and PFOA at SD001 and SD002 and is prepared to discuss appropriate interim limits.

We would appreciate an opportunity to discuss all of the proposed modifications of permit language set forth in Attachment 1. We believe our suggestions meet MPCA goals and comply with applicable law.

Sincerely,

[redacted]

Keith Schmuck, CSP
Sr. Environmental Manager
3M Global Chemical Operations

Enclosure: Attachment 1

cc w/enclosure: Tanya Maurice
Elise Doucette

ATTACHMENT 1

Proposed Permit Language

Definitions

Reporting Limit (RL) shall mean: The lowest concentration of a contaminant that can be reported with a high level of confidence as being accurately quantified for a specific sample. The RL is provided by the laboratory conducting the analysis along with the corresponding analytical results.

Minimum Level (ML) shall mean: The value deemed as compliance with the Daily Maximum and Monthly Average PFOS limits. The monthly average and daily max PFOS WQBELs are below the reporting limits (limits of quantitation) achievable when analyzing treated effluent at Cottage Grove. A statistical analysis of the actual reporting limit wastewater at Cottage Grove sampling stations SD 001 and 002 is 2.2 ng/L. For PFOS only, (A) any effluent value less than or equal to 2.2 ng/L will be considered to be in compliance with the daily maximum limit and (B) any monthly average effluent value equal to or below 2.2 ng/L will be considered to be in compliance with monthly average limits.

Special Conditions

A. The Permittee shall analyze per- and polyfluoroalkyl substances (PFAS) at all monitoring locations in accordance with the following. The Permittee must sample and analyze PFAS compounds using a methodology adopted through rulemaking by the U.S. Environmental Protection Agency that is capable of detecting and quantifying PFAS at low levels (e.g. EPA Method 537 or Method 1633).

B. For analysis of PFOS and PFOA at sampling locations SD 001 and SD 002, the annual average RL must be less than or equal to 4 ng/L using an LC-MS/MS. RL compliance for analytical results for SD 001 and 002 for PFOS and PFOA will be assessed by averaging all RL values provided by the laboratory conducting the analysis of samples from SD 001 and 002 within a calendar year period and comparing against the 4 ng/L limit. A violation of the annual average RL condition is not a WQBEL limit violation but is a permit violation at the specified station.[1]

   Example: The RL for four PFOS samples for a given year are: 1.8 ng/L, 3.2 ng/L, 4.0 ng/L, and 5.0 ng/L. This averages out to 3.5 ng/L as a yearly average and would be in compliance with the 4 ng/L value.

   Note: The annual average of the RL values for all monitoring stations shall be included in the comments cell of the December DMR for the respective monitoring stations.

[1] ***Note to MPCA***: We are requesting that the annual average RL requirement for PFOS analytical results be limited to SD 001 and 002. 3M sampling data demonstrate that analysis of samples of water that has not been treated will often require dilution and hence, result in a significantly higher RL. If MPCA wants reporting of the RL for other sampling stations, we are willing to discuss additional reporting.

Compliance Schedule for PFAS Parameters

The permittee shall initiate operation of the advanced water treatment system no later than 6 months after issuance of a final NPDES permit.

The permittee shall demonstrate compliance with final effluent limitations for PFBS, PFBA, PFHxS, PFHxA, and PFOA at SD001 and SD002 as prescribed by the conditions in this permit by no later than thirty-six months from the effective date of the permit.

The permittee shall demonstrate compliance with final effluent limitations for PFOS at SD001 and SD002 by no later than thirty-six months from the effective date of the permit, as prescribed by the conditions in this permit, unless the permittee requests, by December 31, 2025, a modification of this compliance schedule or other appropriate provisions of the permit (with supporting documentation), based on its determination that the limits and associated compliance demonstration for PFOS are not consistently attainable with the advanced wastewater treatment system.

Interim Limits

The permittee shall demonstrate compliance with the following interim limits for PFOS, PFBS, PFBA, PFHxS, PFHxA, and PFOA at SD001 and SD002 no later than 30 days following the effective date of the permit.

[3M and MPCA to discuss and insert table with daily maximum and monthly average values][2]

For interim limit compliance only, sampling shall be [insert sampling, frequency, location and analytes/].

DMR Requirements

An individual sample result that is below its reporting limit (RL) is considered to be in compliance with the associated daily maximum limit. [Minn. R. 7001].

For PFOS only, an individual sample result that is below the ML and a monthly average result that is below the ML is considered to be in compliance with the respective daily maximum or monthly average limit.

Use the following instructions to determine a reportable value where sample values are less than the RL and the permit requires reporting of an average.

---

[2] ***Note to MPCA***: 3M believes that appropriate interim limits at SD 001 and SD 002 for PFOS, PFBS, PFBA, PFHxS, PFHxA, and PFOA can be developed based upon performance of the current treatment system. 3M is prepared to discuss such limits at MPCA's convenience.

A. If some values are less than (<) the RL, substitute zero for those values to report the average or summed concentration.

   Example: The values for the month are: Sample 1: result is <RL and RL = 4 ng/L - use 0 ng/L; Sample 2: result is <RL and RL = 1.9 ng/L use 0 ng/L; Sample 3: result is 3.0 ng/L and RL is 2.0 ng/L, use 3.0 ng/L; Sample 4 is <RL and RL = 2.0 ng/L, use 0 ng/L. Sum values and divide by the number of samples then 0 ng/L, 0 ng/L, 3.0 ng/L and 0 ng/L. Report the monthly average or sum as (0 + 0 + 3.0 + 0) = 3 ÷ 4 = .75 ng/L.

B. If all values are less than (<) the RL, use the RL for all non-detectable values to calculate the average or sum and report as < the RL calculated average or summed concentration.

   Example: The values for the month are <RL, <RL, <RL, <RL. Report the monthly average or sum as <RL.

EXHIBIT F-14

May 1, 2024 MPCA request to 3M providing data/calculations re reporting limits

[EXTERNAL] RE: 3M Cottage Grove Center Pre-Public Notice Draft Permit – Additional Comments

Starr, Sarah (MPCA) <Sarah.Starr@state.mn.us>

Wed 5/1/2024 4:39 PM

To:Keith Schmuck [redacted]
Cc:Doucette, Elise (MPCA) <elise.doucette@state.mn.us>;Maurice, Tanya (MPCA) <tanya.maurice@state.mn.us>;Cottage Grove Environmental [redacted];Haugen, Theresa (MPCA) <theresa.haugen@state.mn.us>;Kyser, Scott (MPCA) <scott.kyser@state.mn.us>;Schnick, Emily (MPCA) <emily.schnick@state.mn.us>

Keith,

Thank you for the additional comments letter and proposed language. It is currently under review.

To help expedite the MPCA's review, please send us all the data and calculations to show how the 2.2 ng/L ML was calculated for PFOS. Please include similar data and calculations for PFOA and PFHxS.

Thank you,

Sarah Starr
Environmental Specialist
Water Quality Permits
Industrial Division
520 Lafayette Road | St. Paul, MN | 55155
Phone: 651.757.2335
sarah.starr@state.mn.us | www.pca.state.mn.us

MINNESOTA POLLUTION CONTROL AGENCY

Our mission is to protect and improve the environment and human health.

From: Keith Schmuck [redacted]
Sent: Tuesday, April 30, 2024 5:02 PM
To: Starr, Sarah (MPCA) <Sarah.Starr@state.mn.us>
Cc: Doucette, Elise (MPCA) <elise.doucette@state.mn.us>; Maurice, Tanya (MPCA) <tanya.maurice@state.mn.us>; Cottage Grove Environmental [redacted]
Subject: 3M Cottage Grove Center Pre-Public Notice Draft Permit – Additional Comments

---

Sarah,

3M is providing the attached letter for consideration of proposed language related to the NPDES/SDS Permit No. MN0001449 Pre-Public Notice Draft Permit.

If you have any questions regarding this submittal, please feel free to contact me.

Sincerely,

Keith Schmuck, CSP
Sr. Manager, Environment | Global Chemical Operations
Enterprise Supply Chain
[redacted]

EXHIBIT F-15

May 10, 2024 MPCA correspondence re: Updated Limit Notifications

Due to size restrictions, attachments were excluded from the electronic version. The full file was include in the hard copy of Exhibits filed with MPCA.

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May 10, 2024

Keith Schmuck, CSP
Sr. Environmental Manager
3M Chemical Operations LLC
3M Cottage Grove Center
10746 Innovation Rd
Cottage Grove, Minnesota 55016-4600
Sent Electronically

RE: ***Pre-Public Notice Draft Permit – Updated Limits Notification***
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Keith Schmuck:

As requested by 3M (3-28-2024 letter to Commissioner Kessler), the Minnesota Pollution Control Agency (MPCA) has recalculated the Site-Specific Criteria (SSC) for six PFAS compounds. As a result of the updated calculations, new water quality based effluent limits (WQBELs) were calculated for National Pollutant Discharge Elimination System/State Discharge System (NPDES/SDS) Draft Permit No. MN0001449 for 3M Chemical Operations LLC in Cottage Grove, MN. The following tables include the new PFAS compound WQBELs for stations SD 001 and SD 002.

Table 1. PFAS effluent limit summary for station SD 001.

Limit Type	Units	PFBA	PFBS	PFHxA	PFHxS	PFOA	PFOS	Hazard Index
Site Specific Criteria	ng/L	25,000	3,000	4,400	0.0023	0.0092	0.027	≤ 1.0
Daily Max	ng/L	60,752	7,290	10,692	0.0056	0.022	0.05	Monitor Only
Monthly Average	ng/L	35,068	4,208	6,172	0.0032	0.013	0.029	Monitor Only
Monthly Average	g/day	861,622	103,394	151,645	0.079	0.32	0.73	Monitor Only
Compliance Limit	ng/L	NA	NA	NA	TBD*	TBD*	2.2 ng/L as a daily max and monthly average*	NA

*See the section on the compliance limits below.

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Table 2. PFAS effluent limit summary for station SD 002.

Limit Type	Units	PFBA	PFBS	PFHxA	PFHxS	PFOA	PFOS	Hazard Index
Site Specific Criteria	ng/L	25,000	3,000	4,400	0.0023	0.0092	0.027	≤ 1.0
Daily Max	ng/L	Monitor Only	7,290	10,692	0.0056	0.022	0.05	Monitor Only
Monthly Average	ng/L	Monitor Only	4,208	6,172	0.0032	0.013	0.029	Monitor Only
Monthly Average	g/day	No monitoring	138,390	202,972	0.11	0.42	0.97	Monitor Only
Compliance Limit	ng/L	NA	NA	NA	TBD*	TBD*	2.2 ng/L as a daily max and monthly average*	NA

*See the section on the compliance limits below.

PFAS Compliance Limits

The proposed PFOS, PFOA and PFHxS limits are below the conventional (<2-4 ng/L) reporting limit for currently available analytical technology such as EPA method 1633. These limits are so low that a separate compliance limit must be established for the purposes of reporting limit compliance data to the MPCA.

On January 12, 2024, the MPCA sent 3M a pre-public notice permit that included daily max and monthly average PFOS water quality based effluent limits that had compliance limits below the detection limit. In that pre-public notice permit, the MPCA included a compliance limit of “below reporting limit” for both the daily max and monthly average PFOS effluent limits.

In a May 2, 2024, response letter, 3M requested a compliance limit for PFOS of 2.2 ng/L expressed as a daily max and monthly average instead of “below reporting limit” and provided their data and calculations. 3M’s 2.2 ng/L was calculated by compiling all PFOS reporting limit data for stations SD 001 and SD 002 from the calendar year 2023 and in that dataset, diluted samples with high reporting limits were removed (Figure 1). 3M determined that the dataset was best fit using the SHASH (Sinh-Arcsinh) probability distribution and that a 99% tolerance interval of that distribution should be used to establish the compliance limit of 2.2 ng/L.

The MPCA reviewed 3M’s calculations and agrees with their PFOS compliance limit value (2.2 ng/L) but not with how it was calculated. Specifically, MPCA disagrees with how 3M assigned the SHASH probability distribution. To assign the SHASH distribution, 3M used a software package that evaluated 10 different probability distributions and then chose the one with the lowest coefficient of fit. The top six ranked distributions had coefficients of fit that were similarly good and could have been interchangeably selected.

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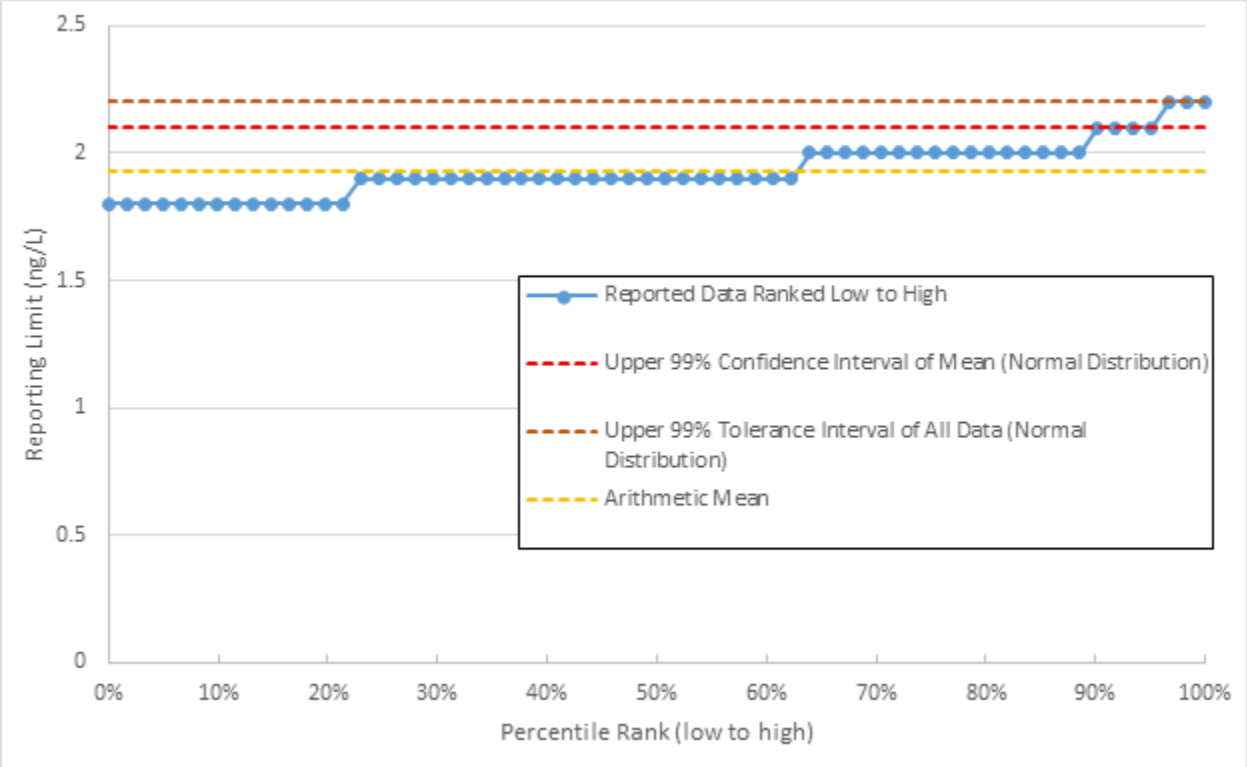
In the context of other environmental datasets, this dataset has a very small amount of variability. The difference in absolute variance between the minimum and maximum value in this data set is very small (0.4 parts per trillion or 0.00000000004%) and the entire dataset contains only five unique values. A simple analysis of the data could also generate a value of 2.2 ng/L, as well several other statistical methods. Whatever statistical method used would generate a value that differed from the next method by at most 0.2 parts per trillion. As a general rule, the MPCA prefers to use statistical analyses that focus on answering the right questions and that is less focused on whether the lowest coefficient of fit is always being used. A compliance value of 2.2 ng/L is similar to the value in EPA's recently promulgated PFAS drinking water rule, is simpler to understand, is simpler to enforce and provides the permittee regulatory certainty.

During the next permit re-issuance, MPCA will re-review the compliance limit based on the current state of PFAS analytical abilities and revise it downward if reporting limits lower over time. The MPCA retains the right to revise the compliance limits downward during the permit term based on information supplied by 3M in the Annual Laboratory Analytical Method Report.

The MPCA requests that 3M calculates compliance limits for PFOA and PFHxS by May 17, 2024.

Figure 1. 3M's PFOS reporting limit data for the year 2023 with the results of three statistical tests expressed as horizontal lines.



The intervention limits at WS 001 and WS 002 have also been updated to correspond with the updated PFAS compound limits above.

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Table 3. WS 001 and WS 002 intervention limits based on new WQBELs from recalculated SSC.

Parameter	Station	Calendar month average (ng/L)	Daily maximum (ng/L)
PFBS	WS 001/ WS 002	22,429	38,856
PFBA	WS 001	186,912	323,808
PFBA	WS 002	Monitor Only	Monitor Only
PFHxS*	WS 001/ WS 002	0.0171	0.0298
PFHxA	WS 001/ WS 002	32,897	56,988
PFOS*	WS 001/ WS 002	0.155	0.27
PFOA*	WS 001/ WS 002	0.069	0.117

* The PFOS, PFOA and PFHxS intervention limits are below the conventional (<2-4 ng/L) reporting limit for currently available analytical technology such as EPA method 1633. Therefore, their compliance level is non-detect.

As requested by 3M (3-26-2024 Compliance Schedule Revision Request Letter), the MPCA has calculated interim limits at SD 001 and SD 002 to include in a compliance schedule for the Permittee to meet the final WQBELs in the future.

Table 4. Proposed Interim limits for parameters that 3M has requested a compliance schedule for at SD 001.

Compound	Value	Interim Limit Type	Unit	Method
PFBA	288,125	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFBS	20,782	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFHxA	1,720	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFHxS	1,615	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFOA	1,798	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFOS	14	Monthly Max	ng/L	Jan 21, 2021 non-public enforcement action
PFOS	7	Monthly Average	ng/L	Jan 21, 2021 non-public enforcement action
Antimony	1,044	Monthly Max	ug/L	99th percentile of reported data with 2 samples per month
DEHP	73.1	Monthly Max	ug/L	99th percentile of reported data with 2 samples per month
Mercury	11.8	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
Selenium	29.6	Monthly Max	ug/L	99th percentile of reported data with 2 samples per month
Cadmium	11.8	Monthly Max	ug/L	99th percentile of reported data with 2 samples per month

Table 5. Proposed Interim limits for parameters that 3M has requested a compliance schedule for at SD 002.

Compound	Value	Interim Limit Type	Unit	Method
PFBS	7,299	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFHxA	6,729	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFHxS	9,250	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month

PFOA	11,287	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month
PFOS	14	Monthly Max	ng/L	Jan 21, 2021 non-public enforcement action
PFOS	7	Monthly Average	ng/L	Jan 21, 2021 non-public enforcement action
DEHP	72	Monthly Max	ug/L	99th percentile of reported data with 2 samples per month
Mercury	11.8	Monthly Max	ng/L	99th percentile of reported data with 2 samples per month

The following are additional changes that have been made to the Draft Permit:

1. Removed the following language from the sampling location information for WS 003, WS 004, WS 006, and WS 007 since the monitoring is from the lag columns: "Samples at this station shall be rotated sequentially each sampling event through the multiple GAC vessel pairs."

2. Upon receiving 3M's agreement (Response to Phase 3 and Reduced Monitoring Proposal 4-11-2024), the following language has been added to requirement 5.72.62 in the Pre-PN Draft Permit and the monitoring frequencies have been reduced as follows (Table 6):

"…
*Note – Process control sampling does not have to meet the reporting limits established in item "A" above or any other quality assurance requirements otherwise required of the monitoring required in the Limits and Monitoring Requirement table of this permit.
…
G. Process control sampling (see March 12, 2024 "Cottage Grove Advanced Water Treatment Proposed Draft Sampling Plan") PFAS results shall be submitted to the MPCA quarterly by 21 days after the calendar quarter as a Microsoft Excel spreadsheet output from the LIMS system attached to the DMR submittal."

Table 6. Revisions to Monitoring Frequencies in the Draft Permit

Stations	PFAS Parameters w/ Limits at SD 001 & SD 002 (6 total)	PFAS Parameters w/out Limits at SD 001 & SD 002	All Parameters
SD 001 & SD 002	1 x week (currently 2 x week)	1 x month (currently 2 x week)	-
WS 001 & WS 002	1 x week (currently 1 x week)	1 x month (currently 1 x week)	-
WS 003	1 x week (currently 2 x week)	1 x month (currently 2 x week)	-
WS 004	1 x week (currently 1 x week)	1 x month (currently 1 x week)	-
SW 001 – SW 004	-	-	1 x quarter (currently 1 x month)

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3. Removed 4:2 FTS from monitoring requirements (List 1 in Fact Sheet) given the lack of detections from prior analytical testing.

4. Removed Phosphonium, triphenyl(phenylmethyl)-, salt with 1,1,2,2,3,3,4,4,4-nonafluoro-N-methyl-1-butanesulfonamide (1:1) (C4 Methyl amide phosphonium curatives / TPBP:MeFBSA) from monitoring requirements (List 1 in Fact Sheet) because it is a duplicate for Benzyltriphenylphosphonium (TPBP) and MeFBSA is already included in the monitoring requirements separately.

5. More detailed information regarding compliance schedules related to final PFAS compound effluent limits, final effluent limits for additional parameters of concern (antimony, bis(2-ethylhexyl) phthalate, cadmium, mercury, and selenium), and Incinerator WW/Phase 3 will be addressed in a separate communication.

Thank you for taking the opportunity to provide input into the permitting process.

If you have any questions regarding any of the contents of this letter, please contact Sarah Starr at 651-757- 2335 or by email at sarah.starr@state.mn.us.

Sincerely,

Elise M. Doucette
This document has been electronically signed.

Elise M. Doucette
Supervisor
Effluent Limits Unit
Environmental Assessment and Outcomes Division

CC: Richard Allen Chasteen, Vice President, 3M
Alma Allen-Webb, Senior Environmental Specialist, 3M
Eric Funk, Site Director, 3M
Shane Symmank, WWT Process Engineer, 3M
Darren Schwankl, Civil Engineer-3M Facilities Engineering, 3M
Christopher Bryan, Global Water Resource Specialist, 3M
Matthew Garrison, Environmental Specialist, 3M
Andy Schulz, Operations Director, 3M
Abby Morrissette, Vice President – Senior Environment Engineer, Barr Engineering Co

EXHIBIT F-16

May 29, 2024 3M letter re: Compliance Schedule & Intervention Levels

3M Chemical Operations
Cottage Grove Center
10746 Innovation Road
Cottage Grove MN 55016-4600

May 29, 2024

ELECTRONIC MAIL emily.schnick@state.mn.us

Ms. Emily Schnick
Wastewater Permit Writer
Minnesota Pollution Control Agency, Industrial Division
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

Subject: **Pre-Public Notice Draft Permit – Compliance Schedule/Intervention Limits**
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Ms. Schnick:

On May 16, 2024, Commissioner Kessler and Minnesota Pollution Control Agency (MPCA) staff met with John Banovetz and Rebecca Teeters to discuss certain unresolved issues regarding the pre-public notice draft permit (Draft Permit) for 3M Chemical Operations, LLC's (3M) Cottage Grove facility (Cottage Grove). In that meeting, the 3M representatives emphasized the need for an appropriate compliance schedule that would afford 3M the time it needs to complete the on-going construction, start-up and optimization of its advanced water treatment system so that it can meet compliance limits of any final National Pollutant Discharge Elimination System (NPDES) permit for SD001 and SD002 at Cottage Grove ("Compliance Limits/ML")[1]. The Commissioner acknowledged the appropriateness of such and requested that 3M submit a revised proposed schedule with interim milestone dates. 3M's revised proposal for a compliance schedule is set out below.

[1] The term "Compliance Limits/ML" refers to a numerical value ("minimum level" or "ML") set at the threshold of the demonstrated consistently achievable quantitation limit (reporting limit) for PFOS in water treated by granular activated carbon at Cottage Grove. This approach was recommended in guidance published by the U.S. Environmental Protection Agency when, as here, water quality-based effluent limits are set below the reporting limits of approved analytical methods. By letter dated May 10, 2024, MPCA informed 3M that it would establish a daily and monthly average ML for PFOS at 2.2 ng/L. MPCA has indicated an intent to establish MLs for both PFOA and PFHxS. In this letter, we use the term Compliance Limits/ML to refer to the MLs that MPCA has established or may establish.

Compliance Schedule

The advanced water treatment system currently being constructed at Cottage Grove, with the approval of MPCA, is designed to control a suite of per- and polyfluoroalkyl substances (PFAS), not only those PFAS for which MPCA has proposed effluent limits at Outfalls SD001 and SD002. The configuration of the treatment systems to manage the volume and characteristics of water required for this suite of PFAS is at the cutting edge of water treatment engineering. The underlying driver of the proposed compliance schedule is the need to install, operate, evaluate, and optimize performance of each major new element of the advanced water treatment system.[2]

The compliance schedule set forth below reflects the engineering reality that multiple elements of the treatment system must be optimized in sequence. Upon their startup, and even during the optimization period, each element of the system will be providing PFAS removal. To ensure that Compliance Limits/ML are consistently achieved, performance of each treatment element must be monitored and adjusted while the complete system is in operation. For example, the reverse osmosis (RO) and granular activated carbon (GAC) elements must be optimized before the ion exchange (IX) systems are optimized.

To address the Commissioner's direction to include milestones and to limit, to the extent practicable, the time for achievement of Compliance Limits/ML, the proposed compliance schedule includes the time needed for optimization of each element of the treatment system (based on 3M's considerable experience working to start-up and optimize similar systems) and sets a deadline for compliance with the final Compliance Limits/ML. We propose that the deadline for meeting the Compliance Limit/ML be the earlier of (A) the date that the Permittee notifies the MPCA that the advanced treatment system is fully commissioned, or (B) thirty (30) months from the effective date of the permit. We propose the following provisions for inclusion in the permit.

PFAS Compliance Schedule

A. For purposes of this Permit, the treatment system or distinct element thereof shall be deemed "Commissioned" once it has achieved its operational design criteria. "Commissioning" shall mean the actions necessary to commission a system or distinct element thereof.

B. No later than thirty (30) months after the effective date of the Permit, the advanced treatment system shall be fully commissioned and in operation and Permitee shall comply with all PFAS Effluent Limits listed in [inset citation to provisions identifying

[2] Compliance schedules are authorized under EPA's NPDES regulations. 40 C.F.R. § 122.47(a)(3) (applicable to state programs, *see* § 123.25). Minnesota Rules also authorize the use of compliance schedules in permits. See, e.g. Minn. R. 7001.0100, subp. 2; 7001.0140, subp. 1; 7001.0150, subp. 1.

PFAS discharge limits] or the respective Compliance Limits/MLs for PFOA, PFOS and PFHxS [inset citation to provisions identifying PFAS discharge limits]. In addition, the Permittee shall meet the following interim commissioning milestone dates:

1. **System A RO Subsystem:**
    a. Start-up of the System A RO subsystem by no later than 30 days following the effective date of the Permit;
    b. Begin stable operation phase of commissioning by no later than 395 days following the effective date of the Permit;
2. **System A GAC Subsystem:**
    a. Start-up by no later than 90 days following the effective date of the Permit;
    b. Begin stable operation phase of commissioning by no later than 455 days following the effective date of the Permit;
3. **System A IX Subsystem**
    a. Start-up by no later than 180 days following the effective date of the Permit;
    b. Begin stable operation phase of commissioning by no later than 545 days following the effective date of the Permit;
4. **System B RO Subsystem:**
    a. Start-up by no later than 60 days following the effective date of the Permit;
    b. Begin stable operation phase of commissioning by no later than 425 days following the effective date of the Permit;
5. **System B GAC Subsystem:**
    a. Start-up by no later than 120 days following the effective date of the Permit;
    b. Begin stable operation phase of commissioning by no later than 485 days following the effective date of the Permit;
6. **System B IX Subsystem:**
    a. Start-up by no later than 210 days following the effective date of the Permit;
    b. Begin stable operation phase of commissioning by no later than 575 days following the effective date of the Permit;

C. **Reports and Notifications**

a. The Permittee shall submit notification reports no later than fourteen (14) days after each interim milestone date.

b. No later than fourteen (14) days of the determination that the advanced treatment system is fully commissioned, Permittee shall provide notice of the event to MPCA.

Because of the complexity of the system and the volume of water to be treated, we have also proposed a provision to allow for an extension of the milestone dates of the compliance schedule by MPCA for good cause shown. We suggest the following language for inclusion in the permit.

Conditions for Extension of Milestone and Compliance Dates

For good cause shown, MPCA may, in its sole discretion, extend one or more milestone dates and/or the deadline for meeting any Effluent Limits**.**

Intervention Levels

MPCA's proposal to establish water quality-based effluent limits that are below current analytical method detection limits and to establish measurable Compliance Limits/ML as the routinely achievable threshold for measurement leads us to also revisit our prior discussions about the "Intervention Limits"[3] proposed in the Draft Permit. Our design and engineering work on the advanced water treatment system supports the conclusion that the most effective way to ensure optimal PFAS removal is to develop a set of performance values for each element of the system and to establish a clear set of required actions when the specified values are measured at the appropriate locations within the treatment system. The parameters and values used for this purpose must be selected such that system operators are alerted to the possibility of potential exceedances of Compliance Limits/ML with sufficient lead time to make the necessary system adjustments.

We propose that performance values be developed by identifying PFAS compounds that have been demonstrated to potentially breakthrough a treatment element of the treatment system (e.g., GAC or IX) before PFOS, PFOA and/or PFHxS breakthrough. These "sentinel

[3] 3M continues to believe that MPCA has not provided an appropriate legal basis for its inclusion of intervention limits in the permit. Neither the Clean Water Act (CWA) nor state law authorizes MPCA to impose intervention limits for the purpose of evaluating technology or otherwise controlling the discharge of pollutants at the outfall under the circumstances posed here. Where the Agency is able to develop and apply effluent limitations at the outfall, no statutory or regulatory basis exists to impose intervention limits. Notably, MPCA's suggestion that these data may prove useful in the future is insufficient justification for the imposition of intervention limits. That said, 3M is willing to work with the MPCA to develop appropriate Intervention Levels for inclusion in an eventual permit as set forth in this letter.

compounds" will be chemistries that 3M laboratories will take steps to rapidly measure (within five (5) days or less) and be measurable at levels memorialized in the O&M manual(s) to provide real-time insight into any operational changes needed to ensure compliance with all Compliance Limit/ML. Using sentinel compounds to inform operation of the treatment system is critical because the Compliance Limits/ML for PFOS, PFOA, and PFHxS are at the threshold of reliable measurement.

At the extremely low Compliance Limit/ML for PFOS, PFOA and PFHxS, using those chemicals as monitoring parameters within the treatment system would not provide timely operational data to ensure compliance, in part because the turnaround times on laboratory samples for these constituents are typically four (4) weeks or longer. As is typically the case, to ensure continuous compliance, the system operator would have to target values for those compounds that are below the Compliance Limits/ML, which of course could not be measured. By the time those compounds are at a measurable level within the treatment system we would likely already be too close to the Compliance Limit/ML to act. 3M's operation of PFAS treatment systems at other facilities leads us to conclude that the use of sentinel compounds for monitoring system performance is the only way to ensure compliance with very low Compliance Limits/ML as proposed in the Draft Permit.

Finally, we respectfully recommend that the term "Intervention Limits" be changed to "Intervention Levels" to avoid public confusion over whether exceedance of these values indicates effluent limit exceedances or some other noncompliance.

3M proposes the following provision for the permit to address Intervention Levels in 5.36.5-9 and similar provisions:

> Intervention Levels shall be established as required by Sections 5.72.86 through 5.72.91.
>
> If an Intervention Level is exceeded, the Permittee shall:
>
> A. Within two (2) days of receiving a sample result that exceeds an Intervention Level, sample the associated monitoring station again, provided that the Permittee has not sampled at that monitoring station since the date of the sample associated with Intervention Level exceedance; and
>
> B. Evaluate the cause of the Intervention Level exceedance.
>
> C. The evaluation of the cause shall include:
>
> i. A review of the carbon changeout frequency of the granular activated carbon system(s) and the ion exchange media regeneration and changeout frequency;

ii. The need for immediate corrective action to mitigate the potential for recurrence of the exceedance; and

iii. The identification of any changes to the O&M manual monitoring requirements, including but not limited to, increasing sampling frequency and changing the Intervention Levels or parameters to be monitored. [Minn. R. 7001]

If MPCA determines to retain the root cause analysis and reporting structure reflected in the Draft Permit's "Intervention Limit" provisions, we suggest incorporating the revised permit language immediately below, which would require 3M to identify the most appropriate shorter-chain sentinel compounds to monitor, identify the specific monitoring locations at which to monitor them in order to best understand what operation and maintenance actions might be needed, and to ensure such actions are reflected in the Cottage Grove O&M manual(s). In this context, 3M does not object to the requirement proposed in the Draft Permit of a root-cause analysis of unexpected sampling results or system performance issues, the triggering criteria for which would be set out in the O&M manuals. As stated in the Draft Permit, the final, MPCA-approved O&M manuals establish enforceable conditions under the permit. Our proposed language follows.

A. Reverse Osmosis (RO) and Ion Exchange (IX) Operation and Maintenance (O&M) Manual

Within 60 days of commencement of operation of the advanced water treatment plant, the Permittee shall submit its Interim-Final Reverse Osmosis and Ion Exchange operations and maintenance manual (RO & IX O&M Manual). The RO & IX O&M Manual shall describe in detail the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure, and response procedure. The RO & IX O&M Manual shall identify the specific PFAS compounds and concentrations as well as the associated breakthrough curves used to understand and optimize system performance to cause PFAS to remain below any applicable Intervention Level. The Permittee shall identify the specific PFAS to be used to optimize the system and the associated rapid (target five (5) days or less) analytical method. The RO & IX O&M Manual will identify the representative monitoring locations and optimal frequency of monitoring for the Intervention Levels. The Permittee shall immediately implement and comply with the RO & IX O&M manual and shall submit any substantive revisions to a manual as part of the "Annual O&M Deviation & WWTP Optimization Report" once a year on March 31.

B. Granular Activated Carbon (GAC) Treatment Systems. [Minn. R. 7001]

GAC treatment systems shall be operated at all times except under emergency conditions, other conditions authorized by this permit, or under conditions of

maintenance or downtime as described in the MPCA-approved operations and maintenance plan for the systems. [Minn. R. 7001]

C. GAC O&M Manual. [Minn. R. 7001]

Within 60 days of commencement of operation the advanced water treatment plant Permittee shall submit its Interim-Final GAC O&M manual(s) for each building that contains the GAC treatment technology. The O&M manual(s) shall describe the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure, and response procedure. The GAC O&M Manual shall identify the specific PFAS compounds and concentrations as well as the associated breakthrough curves used to cause PFAS to remain below any applicable Intervention Level. Permittee shall identify specific PFAS to be used to optimize the system and the associated rapid (target five (5) days or less) analytical method. The GAC O&M Manual will identify the representative monitoring locations and optimal frequency of monitoring for the Intervention Levels. The Permittee shall immediately implement and comply with the GAC O&M manual(s) and submit revised versions within 60 days of any future revisions being made. The Permittee shall submit an O&M manual 60 days after permit issuance. and shall submit any substantive revisions to a manual as part of the "Annual O&M Deviation & WWTP Optimization Report" once a year on March 31. [Minn. R. 7001]

D. Additional Operation and Maintenance Requirements. [Minn. R. 7001]

Nothing precludes the Permittee from submitting a consolidated O&M manual for all operations.

For the reporting associated with Interim Limit exceedances and root cause analyses, we suggest the following language that is consistent with the consolidated reporting suggestion MPCA agreed with in its March 18, 2024, letter to 3M, at page 11.

Reporting. [Minn. R. 7001]

A. The Permittee shall submit an Intervention Level Exceedance Evaluation Report as part of "Annual O&M Deviation & WWTP Optimization Report" once a year on March 31 that would include this information.

B. This report shall describe the evaluations of the cause of the Intervention Level exceedance, conclusions, actions taken to respond to the Intervention Level exceedance, and a schedule for completing any planned actions to prevent the Intervention Level from being exceeded. [Minn. R. 7001] Thereafter, Permittee shall implement the actions identified in accordance with the schedule provided.

C. An exceedance of an Intervention Level does not constitute a violation under this permit. Failure to take action consistent with Condition **5.36.5-9, and A and B above** is a violation of the permit. [Minn. R. 7001]

See the Special Requirements section below for additional applicable requirements. [Minn. R. 7001]

We appreciate the continued opportunity to discuss these proposed modifications to the language in the Draft Permit and believe our suggestions meet MPCA goals, as well as achieve compliance with applicable law.

Sincerely,

[redacted]

Keith Schmuck, CSP
Sr. Environmental Manager
3M Global Chemical Operations

EXHIBIT F-17

May 30, 2024 3M provided AWTS milestones to MPCA

RE: 3M Cottage Grove Center Pre-Public Notice Draft Permit – Revised Compliance Schedule

Keith Schmuck [redacted]

Thu 5/30/2024 5:06 PM

To:Schnick, Emily (MPCA) <emily.schnick@state.mn.us>
Cc:Doucette, Elise (MPCA) <elise.doucette@state.mn.us>;Cottage Grove Environmental [redacted];Mike Parent [redacted];Mike Hult [redacted];Alma Allen-Webb [redacted];Matthew Garrison [redacted];Heather Brown [redacted];Abby Morrisette [redacted]

1 attachments (83 KB)

Advanced Water Treatment System Milestones.pdf;

Hi Emily,

We would prefer to meet on Monday 6/3 from 1:30 – 2:30 pm.
Please include the following attendees for 3M. Can you also let me know who will be attending for the MPCA?

3M Attendee list:

- Mike Parent [redacted]
- Alma Allen-Webb [redacted]
- Matthew Garrison [redacted]
- Abby Morrisette [redacted]
- Mike Hult [redacted]
- Heather Brown [redacted]

In addition, attached is the *Advanced Water Treatment System Milestones* document which provides information to supplement the proposed compliance schedule letter submitted yesterday.

Please feel free to reach out if you have any questions and I look forward to meeting next week.

Sincerely,

Keith Schmuck, CSP
Sr. Manager, Environment | Global Chemical Operations
Enterprise Supply Chain
[redacted]
3M Science. Applied to Life.™
3M.com

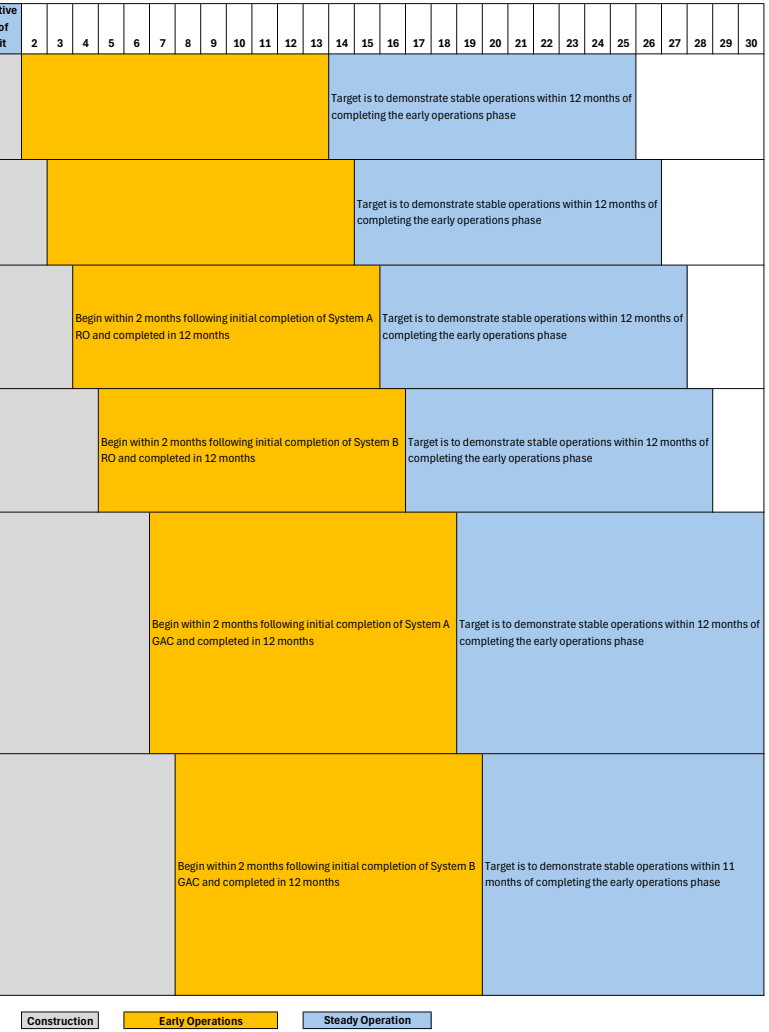
From: Schnick, Emily (MPCA) <emily.schnick@state.mn.us>
Sent: Thursday, May 30, 2024 2:47 PM
To: Keith Schmuck [redacted]
Cc: Doucette, Elise (MPCA) <elise.doucette@state.mn.us>; Cottage Grove Environmental [redacted]
Subject: [EXTERNAL] RE: 3M Cottage Grove Center Pre-Public Notice Draft Permit – Revised Compliance Schedule

Hi Keith,

Advanced Water Treatment System Milestones

System	Description	Construction Milestones	Examples of challenges faced previously During Early Operations	Milestone / Deliverable	Examples of challenges faced previously During Stable Operations	Milestone / Deliverable	Effective Date of Permit
System A RO	Non-contact cooling water and storm water ultra-filtration (UF) and reverse osmosis (RO) systems	-UFs, ROs, and associated equipment functional and capable of processing at the design flowrates of each skid	-One of the primary challenges is getting the chemical dosing right to eliminate biological fouling and excessive scale formation. We have had two biological fouling events, each impacted normal operations for approximately 4 weeks.	-Capable of processing average flow rates 90%+ uptime -Determine the system capability for the PFAS rejection % -O&M operating targets and operating windows established with clear troubleshooting guidance	-The primary challenges in this phase have continued to be fouling, some potentially due to shifting operating windows due to seasonal effects. -Changing temperatures and variation in stormwater flows and algae content have been contributing factors.	-Consistent operation of UFs/ROs at target PFAS rejection across the design range of flow rates, including seasonal impacts -Clear understanding of any seasonal impacts -Verifying O&M operating windows and troubleshooting are accurate	
System B RO	Waste water treatment water through UF and RO systems						
System A GAC	RO reject sent through lead/lag granular activated carbon (GAC) vessel configuration to capture PFAS that could be difficult to regenerate from Ion Exchange (IX)	-GAC installed in vessels and capable of flowing the design water flow rates	-The primary challenge is developing appropriate cleaning, backflushing, and chemical dosing strategies to allow the vessels to sustain flow for the necessary duration. Each fouling event interferes with the collection of data to build out the operating windows for the O&M manual. Each GAC cycle will be 4+ weeks. Not only does a fouling event take significant time to clear and restart operations, it also costs the time lost on the previous cycle for an incomplete data set.	-Determine expected bed volumes to breakthrough of TFSI -O&M operating targets and operating windows established with clear troubleshooting guidance -Clear understanding of breakthrough timing for key analytes	-The primary challenges have been fouling and some changing breakthrough times, believed to be due to seasonal temperature changes and other potentially seasonal WW factors, like total organic content.	-Stable GAC changeout frequency and performance, with breakthrough of TFSI minimized -Verifying O&M operating windows and troubleshooting are accurate	
System B GAC	RO reject sent through lead/lag GAC vessel configuration to capture PFAS that could be difficult to regenerate from IX						
System A Ion Exchange	RO reject post GAC processed through a series of three IX vessels; multiple "trains" of IX are required for full flow rate	-IX resin installed and capable of controlling to the desired flow rates -Regeneration processes installed and functional to be able to regenerate the IX vessels as needed	-There have been several challenges in the early operations phase of the IX due to the larger number of unit operations that are required. The IX vessels themselves have similar challenges as GAC, namely the need to develop appropriate cleaning, backflushing, and chemical dosing strategies to allow the vessels to sustain flow for the necessary durations in both forward flow and during regeneration. We have faced challenges with fouling and plugging, both from inorganic material and biological activity. -There have also been challenges with the distillation column used to recover alcohol from the regenerent (leading to concentrations of alcohol in water discharge larger than design). -There have also been challenges in the brine concentrating equipment which has hindered the ability to maintain an operational rhythm on the IX and regenerant recovery. Both the distillation and brine handling have required many more vendor visits for troubleshooting than originally planned and prevented building of the necessary data set for by several months.	-Determine breakthrough curves of PFAS analytes -Track and optimize regeneration conditions -Determine PFAS capture of XX% with specific targets for the sentinel compounds -Assess capability to deliver permit levels for the 6 PFAS. Determine treatment capability and target -O&M operating targets and operating windows established with clear troubleshooting guidance	-The primary challenges expected are due to shifting operating windows due to seasonal changes in water temperature, including an impact on the PFAS adsorption (breakthrough curves) and regeneration process efficiency. -Challenges are expected relating to shifting biological content and need for different chemical dosing to counter.	-Demonstrate process capability to achieve permit levels of 6 PFAS or determine the best possible performance -Demonstrate process capability to consistently deliver total PFAS reduction to target based on sentinel compounds -Consistently being able to proactively monitor/predict/anticipate breakthrough -Optimization of regeneration process to account for process variability while maintaining "total" regeneration. -Verifying O&M operating windows and troubleshooting are accurate.	
System B Ion Exchange	RO reject post GAC processed through a series of three IX vessels; multiple "trains" of IX are required for full flow rate						

Month



System A	Non-contact cooling water
System B	Wastewater
System C	Solids concentrating

EXHIBIT F-18

June 13, 2024 3M submittal to MPCA re NTAs

3M Chemical Operations
Cottage Grove Center
10746 Innovation Road
Cottage Grove MN 55016-4600

June 13, 2024

ELECTRONIC MAIL emily.schnick@state.mn.us

Ms. Emily Schnick
Wastewater Permit Writer
Minnesota Pollution Control Agency, Industrial Division
520 Lafayette Road North
St. Paul, MN 55155-4194

Re: Pre-Public Notice Draft Permit Comments – NTA / Instream Studies
3M Cottage Grove Center
NPDES/SDS Permit No. MN0001449
T27N, R21W, Section 27, Cottage Grove, Washington County, Minnesota

Dear Ms. Schnick:

This letter provides 3M Chemical Operations LLC's (3M) comments related to two aspects of the Minnesota Pollution Control Agency's (MPCA) Pre-Public Notice Draft National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Permit for 3M's Cottage Grove Center (Cottage Grove) facility: 1) the proposed requirements for annual non-targeted analysis(es) (NTA) found at conditions 5.72.62, 5.72.72, and 6.61.9, and 2) the proposed requirements for instream per- and polyfluorinated alkyl substances (PFAS) characterization studies found at conditions 5.72.75, 6.61.10-14, and Appendix A. 3M shares MPCA's interest in ensuring that PFAS associated with Cottage Grove wastewater and stormwater are characterized and addressed in any final permit for the Cottage Grove facility. Nonetheless, as we outline below, the NTA and instream characterization conditions as currently proposed by MPCA will not advance in any meaningful way our mutual understanding of the PFAS associated with Cottage Grove discharges and will also impose a significant and undue burden on 3M.

I. Annual Non-Targeted Analysis (5.72.62, 5.72.72 and 6.61.9)

A. Draft Permit Requirement 5.72.62:

Proposed permit condition 5.72.62.B states in pertinent part:

> "The Permittee shall analyze for all PFAS believed to be present (including but not limited to the compounds identified in this permit) in all water required to be monitored.
>
> Note -- Non-targeted PFAS analysis shall be conducted at a minimum frequency of once per year of the water required to be monitored at all locations in this permit. PFAS compounds detected during the non-targeted analysis that are not identified in this permit must be added to the PFAS analysis list for the applicable station immediately upon receipt of the non-targeted analysis results."

B. 3M Recommendation: For the reasons set forth below, 3M recommends that the NTA requirements be removed from the proposed permit in their entirety or, in the alternative, significantly curtailed:

1. **Imposition of an NTA Condition in an NPDES Permit:** NTA is a non-standardized, qualitative analytical approach used to search for potential unknown compounds in a sample. There are no standard analytical methods for NTA, and as such MPCA lacks the authority to require NTA as a condition of an NPDES permit. An obligation of a permittee is to fully characterize its discharges to receiving water bodies and identify for the permitting authority the pollutants "believed to be present" in its discharge. Minn. R. 7001.1060; 7001.1050. A permittee is not required, however, to search for and identify every potential breakdown product of, or impurity in, a pollutant. If that were the case, the applicable federal and state regulations would have stated so, and permit applicants would be required to conduct NTA of pollutants "believed to be present" – after all, virtually all chemical pollutants have some potential to transform. Notwithstanding the foregoing, 3M stands ready to voluntarily work with MPCA outside the framework of the NPDES permit to develop and implement a properly-tailored NTA program for the Cottage Grove facility.

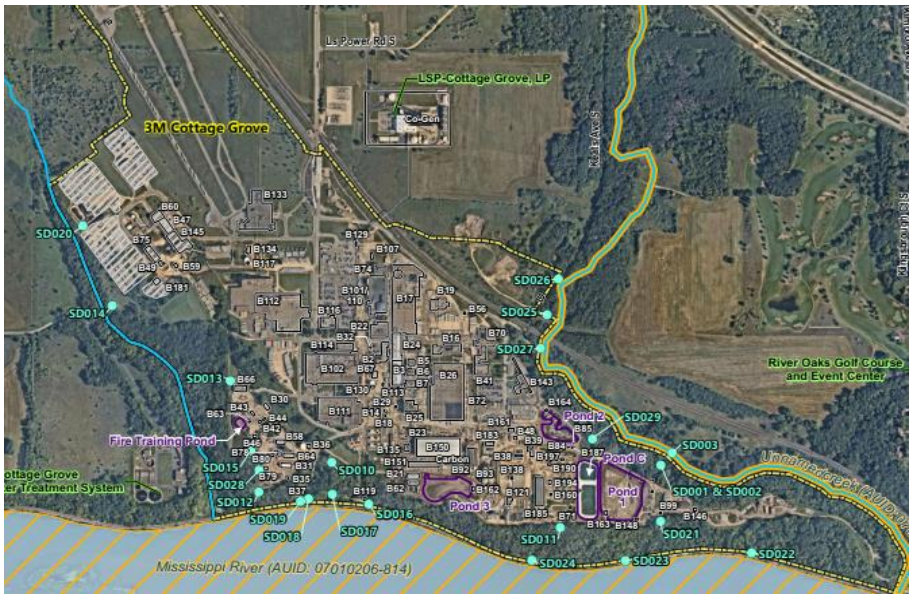
2. **Annual NTA at all Monitoring Locations:** Should MPCA publish a permit for the Cottage Grove facility that includes NTA, then it should significantly narrow the scope of the NTA conditions. The requirements in condition 5.72.62.B that 3M conduct NTA at "a minimum frequency of once per year" of the water required to be monitored "at all locations" in this permit should be modified to require NTA only at select SD locations and only for the purpose of identifying potential unknown PFAS that may be leaving the site.

First, the requirement that NTA be conducted annually is unwarranted. The PFAS present in water at the facility are largely the result of legacy releases. The manufacturing activity that was the source of most of those legacy PFAS started more than 70 years ago and ceased more than 20 years ago. 3M ceased the production of many of the predominant PFAS found in groundwater (i.e., PFOA, PFOS, and PFBA) in the early 2000s, and it ceased releasing wastewater from PFAS-related processes from both the Cottage Grove Product Development Center and from on-site manufacturing in 2019 -2020. Likewise, groundwater from the former Woodbury landfill that is treated at Cottage Grove has been present there for decades and had ample time to transform. Therefore, any PFAS at Cottage Grove capable of transformation by environmental processes have already done so in sufficient quantity to result in detectable transformation products.

Nonetheless, MPCA suggests that it is necessary to conduct annual NTA of samples collected from each of the proposed permit's 55 monitoring locations because PFAS can degrade in the environment. However, any transformation of PFAS in the environment at Cottage Grove would have been observed in the extensive data already collected from the site. We know this because during the course of the last five years, 3M has fully characterized discharges from the Cottage Grove facility, generating thousands of data points, virtually all of which have been shared with MPCA. A review of that data does not support the extensive NTA conditions MPCA seeks to impose. Moreover, under the terms of MPCA's January 2021 Notice of Violation (2021 NOV), 3M conducted a comprehensive NTA study of groundwater, wastewater, stormwater, soil, and air samples collected in 2021 from the Cottage Grove facility. A 12-month interim report was provided to MPCA in December 2022, with a comprehensive final report submitted to MPCA on April 24, 2024. The reports detail the sampled media and locations, the NTA procedures, and the results of the analyses. That work captured targeted PFAS, and non-targeted PFAS present as intentionally produced PFAS substances, residual impurities associated with PFAS production, and transformation products from environmental degradation (e.g., hydrolysis, photolysis, and biodegradation) of PFAS materials. The results of those analyses have been shared with MPCA, and any additional NTA is unlikely to provide additional meaningful data or information. Given the rate of transformation of PFAS in the environment, it is likely that such transformation would be just as observable if the analysis was conducted less frequently. Accordingly, while 3M recommends that the NTA conditions be removed, should MPCA insist on the inclusion of NTA conditions, such analysis should be conducted only once during the term of any duly-issued NPDES permit.

Second, MPCA has not provided either a factual or a technical basis for requiring NTA at each and every one of the 55 proposed monitoring locations identified in

the permit. As described above, the composition of the PFAS in wastewater, stormwater, and groundwater at, and discharged from, the Cottage Grove facility is associated with legacy production and releases. Analytical data of samples collected from the proposed or proximate monitoring locations show that there is little variability in the PFAS identified across the site and across monitoring locations, and it is simply unnecessary to require NTA for each of those locations. For example, there are 22 SD sampling locations identified in the permit that have the potential to discharge stormwater. As shown on the below map, many of those locations are clustered near one another and the discharge from one of the clustered locations has very similar characteristics to the discharge from a nearby location within that cluster. Likewise, the conduct of NTA on water collected at monitoring locations upstream of the SD locations is exceedingly unlikely to provide any additional information regarding the presence of PFAS identified at the downstream SD discharge locations. Moreover, 3M announced that it plans to exit the manufacturing and processing of PFAS by the end of 2025, including at the Cottage Grove facility, which means post-exit new or different PFAS will not be released from the facility. Based on the foregoing, there is no reason to believe that any future NTA would produce results that differ from those results to which MPCA is already privy.



Third, the currently proposed NTA program would be a very costly, resource-intensive undertaking that would detract from 3M's core objective of achieving and maintaining compliance with any final NPDES permit. For example, the NTA program conducted pursuant to the 2021 NOV took approximately ~30 months to complete. The 2021 NTA program is dwarfed by the NTA conditions MPCA seeks to impose by this permit.

3. **Addition of NTA-identified PFAS to Permit Analyte List:** MPCA's draft permit states that "PFAS compounds detected during the non-targeted analysis that are not identified in this permit must be added to the PFAS analysis list for the applicable station immediately upon receipt of the non-targeted analysis results." For the reasons described below, and based on 3M's experience, NTA does not yield the kind of information that would allow for newly-identified PFAS (tentative or otherwise) to be "immediately" added to the PFAS analyte list. PFAS that are tentatively identified by NTA would first need to have their identity confirmed. Such tentatively- identified PFAS would not have a reference standard and would not be able to be reliably quantified against calibrants. Even those PFAS identified and confirmed by NTA that have a reliable reference standard cannot be immediately added to the permit's PFAS analyte list, because there is extensive additional preliminary work that would be required to develop and validate a reliable laboratory analytical method prior to being able to analyze for those PFAS.[1] Outsourcing the analysis of newly-identified (discovered) analytes that do not have a reference standard to a third-party contract laboratory is not an option, because established methods (e.g., Method 1633) have not been, and potentially could not be, modified to analyze for such PFAS. Further analysis for such PFAS would first require the use of quantitative methods deploying LC/MS/MS, which could take at least six to 12 months to develop and validate. In addition, based on our experience, it may not be possible to develop a representative reference standard for some newly-identified PFAS. As described above, the cutting-edge and nascent nature of NTA work underscores why the NTA conditions should be removed from the permit in their entirety. Nonetheless, should MPCA insist (over 3M's objections) to finalize a permit with NTA conditions, the permit conditions should afford 3M at least 12 months to develop and validate laboratory analytical methods for those PFAS verified with an available reference standard.

C. **Reporting NTA Results:**

1. **Consolidated Reporting:** Draft permit condition 5.72.74 states in pertinent part that:

> "*Non-targeted Analysis (NTA) sampling shall have results submitted to the MPCA within six months of sample collection*. All new PFAS

[1] Only level-1 NTA identified PFAS are verified with a reference standard to conclusively determine their identity, so that subsequently they can be available for further analytical methods development and quantitation. Compounds identified as levels two (2) through five (5) are not verified by a reference standard because no standard is available. Those PFAS should not be listed in the permit because a reliable quantitation method would not be possible. See Emma L. Schymanski, et al., "Non-target Screening with High-Resolution Mass Spectrometry: Critical Review Using a Collaborative Trial on Water Analysis". *Anal. Bioanal. Chem.* (2015) 407:6237–6255.

> compounds identified as being present within the water(s) discharged from the facility shall have a MPCA verified Chemical Abstract Service (CAS) number provided along with their chemical structure. At least one (1) NTA Sampling Result Report shall be submitted every year with the first report due by April 30, 2025." (emphasis supplied).

To the extent that NTA analysis is required at all, 3M proposes that NTA results be reported annually on April 30th as part of the "NTA Sampling Result Report." As described above, NTA work is resource intensive, and it is not possible to report NTA results within six months of sample collection given the qualitative nature of NTA and the amount of data that must be manually evaluated. For example, the NTA that MPCA required in connection with the 2021 NOV required 30 months to complete. Allowing for a consolidated annual report would eliminate the duplicative reporting burden currently proposed as outlined in the above-quoted permit condition.

2. **Indefinite NTA and Reporting:** Draft permit condition 5.72.74 states in pertinent part that:

> "The Permittee shall submit an annual report: Due annually, by the 30th of April. *Subsequent results/reports shall continue to be submitted every year (even beyond permit expiration, until reissuance where this requirement will have been reassessed).* [Minn. R. 7001]" (emphasis supplied)

To the extent that any finally issued permit includes NTA conditions, 3M proposes that the permit require such analysis to commence post-PFAS exit. As discussed above, 3M conducted a comprehensive NTA study of groundwater, wastewater, and stormwater samples collected at Cottage Grove in 2021, and additional NTA would not be expected to generate new meaningful data and information. In December 2022, 3M announced it planned on exiting the manufacture and processing of PFAS by the end of 2025, which includes efforts to remove intentionally added PFAS from its products. Therefore, no significant amounts of PFAS are expected to be made or processed at Cottage Grove that would not have already been detected during previous NTA studies by that time. Accordingly, it is reasonable for any NTA conditions to reflect the foregoing.

D. **Chemical Abstract Service Registration Number: Draft permit condition 5.72.74 states in pertinent part that:**

> "All new PFAS compounds identified as being present within the water(s) discharged from the facility shall have a MPCA verified Chemical Abstract Service (CAS) number provided along with their chemical structure."

The condition requiring that 3M provide all substances with a Chemical Abstract Service registration number (CASRN) should be stricken. It is 3M's practice to provide a tentative chemical structure, molecular formula, derived chemical name, and a CASRN should one be available. However, it is sometimes the case that the tentatively identified non-targeted PFAS have not been assigned a CASRN, since the compounds were previously unknown. When NTA tentatively identifies a previously unknown PFAS, 3M conducts a search of databases to identify any potentially applicable CASRN and reports those. However, because NTA-identified compounds can be largely theoretical in identity some do not have a CASRN. Generation of a CASRN for a compound that is theoretical and not verified against a known reference standard via registration with CASRN and thus would not be appropriate. In addition, 3M fails to understand how this condition relates to NPDES permit compliance. Whether or not a PFAS has a CASRN has no bearing on whether it should be included as a parameter for NPDES monitoring purposes.

II. Instream PFAS Characterization Study (5.72.75-5.72.80, 6.61.10-6.61.14, Appendix A).

A. Draft Permit Requirement 5.72.76:

Proposed permit condition 5.72.76 states:

> "By January 1, 2026, the Permittee shall submit a work plan for review and approval by MPCA for an instream PFAS characterization study (Characterization Study) of surface water, sediments, and fish tissue PFAS as outlined in the PFAS Surface Water Monitoring Protocol (Appendix A). The work plan must, at a minimum, repeat all sample collection in the 2022 instream characterization study; if the Permittee would like to request a reduction in sampling, they must explain why the reduction is reasonable and needed. The MPCA reserves the right to make any changes to the sampling plan prior to approval. The Permittee shall submit a work plan: Due 01/01/2026. The MPCA will review and approve the work plan by March 1, 2026." [Minn. R. 7001]

Proposed Appendix A states in pertinent part:

> **"PFAS Variables to Be Analyzed:**
>
> Surface water: All PFAS parameters that are required to be analyzed at SD001.
>
> Fish Tissue: All PFAS parameters from the 2023 'Instream PFAS Characterization Study Interim Report Mississippi River Cottage Grove MN' report and any additional PFAS parameters required to be analyzed at SD001."

"Characterization Report Sampling:

All sampling required in the "Instream PFAS Characterization Study Work Plan Mississippi River Cottage Grove, Minnesota Revision 01" report must be replicated every five years. This sampling event samples surface water, fish tissue, sediment, macroinvertebrates, and sediment pore water. The sampling work plan document is available upon request. If the Permittee would like to request a reduction in sampling, they must explain why the reduction is reasonable and needed. If the permit is administratively continued past the permit expiration date, then this sampling must be repeated every five years until the permit is re-issued."

B. **3M's Recommendation:**

1. 3M recommends that the requirements to conduct instream studies be removed entirely from the proposed permit. First, MPCA proposes that 3M conduct an instream study every five years and indefinitely beyond the term of any duly-issued NPDES permit. Under the Clean Water Act (CWA), an NDPES permit can have a term of no more than five years. 33 U.S.C. § 1342(b)(1)(B). The MPCA has cited no authority to impose requirements that explicitly extend beyond the term of the permit, and 3M is aware of no such authority. Second, the instream condition represents a dramatic expansion of any permittee's NPDES compliance obligations. The CWA imposes upon authorized states the requirement that any water quality-based effluent limitations be based on water quality criteria and standards (WQC/WQS). It is the permitting authority's obligation to establish the basis for such effluent limitations *before* the issuance of a permit. On the other hand, it is the permittee's obligation to monitor its discharge to ensure that any duly-issued permit effluent limitations are being met and to install appropriate controls to ensure compliance. The CWA does not impose upon a permittee the obligation to monitor and assess a waterbody for the purpose of establishing of WQC/WQS-derived effluent limitations; that is the state's obligation.

2. Should MPCA issue a permit including instream study conditions, 3M recommends that the scope of any future instream studies be curtailed as follows:

   a. **Sampling should only occur in the 2021 IPCS study area identified as Reaches 02 and 03 (river miles 812-820).** Reaches 01, 04, 05, 06, and 07 should be excluded from the study area. The East Cove, West Cove, Upper East Cove locations should also be excluded. The only area relevant to the MPCA's 2024 site-specific WQC are river miles 812-820 in the main river channel which correspond to the IPCS study area identified as Reaches 02 and 03.

b. **Sediment, porewater, surface microlayer or suspended solids should be excluded from any further characterization work**; only surface water composite samples should be collected. As stated in the draft permit Appendix A, the goal of the instream studies is to ensure sufficient surface water and fish tissue data are collected to perform impaired water assessments and develop fish consumption guidance values. Other environmental sampling does not support such assessments or the establishment of site-specific WQC parameters.

c. **Biotic sampling should be limited to six fish species, 10 fillet/each.** 3M recommends that Bluegill Sunfish, Black Crappie, and Common Carp or Freshwater Drum be collected as representative of trophic level three (TL3), and that Smallmouth Bass, White Bass and Walleye/Sauger be collected as representative of trophic level four (TL4). The recommended fish for TL3 and TL4 were used to establish the site-specific criterion for RM 812-820 (MPCA 2024), and three TL3 fish and three TL4 fish would allow for the calculation of a geometric mean bioaccumulation factor for each trophic level. Also, the recommended species of fish are those that have been historically sampled and analyzed for PFAS in Pool 2 and Pool 3 and allow for temporal trend analysis to be conducted. The collection and sampling of other fish species, as well as the sampling and analytical testing of whole-body tissue and other aquatic biota (e.g., benthic macroinvertebrate (BMI)) performed in connection with the 2021 IPCS, should not be required. As stated in Appendix A of the draft permit, the goal of the instream studies is to ensure sufficient surface water and fish tissue data are collected to perform impaired water assessments and develop fish consumption guidance values. Other environmental sampling does not support such assessments or the establishment of site-specific WQC parameters. Fish fillet from the recommended TL3 and TL4 species have historically been sampled and can provide temporal trends and are adequate to develop site-specific WQC and fish consumption advice.

d. **The stable isotopes (δ^{15}N and δ^{13}C) determination for biota should be excluded from future studies.** 3M determined the appropriate stable isotopes in the 2021 IPCS to establish trophic levels of fish in the aquatic food web of the Mississippi River where sampled. Nonetheless, MPCA has already designated trophic level classification for fish species for purposes of calculating WQC (MPCA 2017). Importantly, 3M's analysis of the 2021 IPCS results shows that there is no trophic biomagnification of PFAS in the fish from the Mississippi River demonstrating that trophic level is not a critical parameter in calculating WQC.

e. **The condition that fish age be determined should be removed.** 3M's analysis of the IPCS data shows there is no discernible association of PFAS with fish age, size, or gender, and demonstrates that this is consistent with historical observations. Therefore, the condition that 3M use the cumbersome otolith removal and laboratory examination to determine age should be removed from the permit.

f. **A refined list of PFAS should be used for future instream studies**. 3M recommends that any laboratory analysis of instream samples include only the 22 PFAS detected in the 2021 IPCS study at a frequency of ≥20% in fish tissues and ≥50% frequency in surface water.[2] First, while 3M analyzed for the presence of 42 PFAS as part of the 2021 IPCS, only the above-referenced 22 PFAS were detected in fish and surface water in meaningful percentages. And of those 22 detected PFAS only a few have established water-quality criteria. Second, it is unlikely that expanding the list of PFAS to the 109 PFAS in the draft permit, would lead to a significant increase in the number of detected PFAS in a sufficiently high percentage of samples. Moreover, most of the 109 PFAS identified as parameters in the draft permit for SD001 have not been validated for analysis using EPA Method 1633 (or equivalent methods) nor for fish tissue analytical methods. The development of such methods requires years, and would need to occur prior to any study planning, field work, or laboratory analysis. As shown in Table 1 and Table 2 (attached hereto) the use of infrequently detected analytes (i.e., detected in <50% of the samples) would introduce a high level of uncertainty into the calculation of WQC as more than half of the data would be based on data at or below the limits of detection.

C. **Should MPCA issue a permit with instream conditions, 3M recommends that the period between studies be extended:**

Draft Permit Requirements:

"5.72.77. By January 1, 2028, the Permittee shall submit the results of the instream PFAS characterization study (Characterization Study) of surface water, sediments, and fish tissue for the PFAS as outlined in the Surface Water Monitoring Protocol (Appendix A). The Permittee shall submit sampling results: Due 01/01/2028. [Minn. R. 7001]"

"5.72.78. The Permittee shall continue to submit subsequent Characterization Study results every five years (even beyond permit expiration, until reissuance

[2] The 22 PFAS are PFOS, PFHxS, PFBS, TFMS, PFTrA, PFDoA, PFUnA, PFDA, PFNA, PFOA, PFHpA, PFHxA, PFPeA, PFBA, PFPA, TFA, N-EtFOSAA, N-MeFOSAA, FOSA, FBSA, TFSI and PIBA.

where this requirement will have been reassessed) with the second Characterization Study due by January 1, 2033. The Permittee shall submit sampling results: Due 01/01/2033. [Minn. R. 7001]"

"5.72.79. If this permit is administratively extended, the Permittee shall submit a third Characterization Study by January 1, 2038. The Permittee shall submit sampling results: Due 01/01/2038. [Minn. R. 7001]"

"5.72.80. If this permit is administratively extended, the Permittee shall submit a fourth Characterization Study by January 1, 2043. The Permittee shall submit sampling results: Due 01/01/2043. [Minn. R. 7001]"

Appendix A

"Sample Location and Frequency
The surface water monitoring will consist of two main portions. The first is monthly sampling at four surface water stations and the second is a larger scale once every five years." at p. 1418

"Data Decisions . . .
• A reduction in monitoring as part of the larger characterization report should be established if PFAS levels are trending downward and are meeting site-specific criteria applicable to Pool 2 of the Mississippi River." at p. 1420

"• When evaluating the reduction in monitoring, collection of surface water samples and fish tissue samples should be given critical priority. PFAS monitoring in sediment, sediment pore water, and benthic macroinvertebrate should be reduced or eliminated prior to any reduction in surface water and fish tissue monitoring." at p. 1420

As stated above, 3M requests that MPCA remove the instream study conditions from the draft permit. An NPDES permit is the wrong legal vehicle for requiring a source to undertake instream characterization studies of the nature and duration proposed by MPCA.

First, by operation of law, NPDES permits have a duration of five years. Although NPDES permits can be administratively extended in circumstances where a permittee applies for a new permit no later than 180 days prior to the expiration of its existing permit, that does not empower MPCA to impose permit conditions that assume that a permit will be administratively extended. See Minn. R. 7001.0160. It is MPCA's obligation to issue updated permits to a permittee every five (5) years. Minn. R. 7001.0500, subp. 5.A. Assuming that the proposed draft permit is issued as final in 2024, MPCA would lack the legal authority to impose the conditions in the current draft of the permit that extend

beyond that five-year permit term to 2033, 2038, and 2043, respectively a period of 9, 14, and 19 calendar years after the permit's expiration date. See Conditions 5.72.78, 5.72.79, and 5.72.80.

Second, MPCA's proposal of an instream inter-study timeframe of five years is not supported by the underlying data. Based on available historical data, an appropriate interstudy timeframe would be at least seven years. As such, a technically supportable interstudy timeframe cannot be accommodated by a five-year permit, further underscoring that an NPDES permit is the wrong legal vehicle for requiring instream characterization studies. Based on the 2021 IPCS study and historical sampling results generated by MPCA and 3M since 2005, there is sufficient data to provide irrefutable evidence that PFAS levels are decreasing in fish tissues for Pool 2 and Pool 3. The temporal trend data for PFOS, FOSA, PFDA, PFUnA and PFDoA in fish fillet from Pool 2 and Pool 3 all have decreased significantly. As shown in Figure 2 (attached hereto), PFOS median concentrations in Pool 2 fish fillets decreased by an average of 91% between 2005-2021. For this same period of time, concentrations of FOSA, have decreased by an average of 92%, and concentrations of PFDA, PFUnA, and PFDoA have decreased between 75-83% (not shown).

The decrease of PFOS and other PFAS in fish fits to an exponential equation (as shown in Figure 2 for PFOS; see attached) and suggest a pseudo-first order loss over time. Using single-first order (SFO) kinetic equation to calculate the time to depletion of 50% (DT_{50}, aka half-life time) and 90% (DT_{90}), the fish from Pool 2 ranged from two to six years and five to 20 years, respectively, depending on species, as shown in Table 3 (attached hereto). The DT_{50} and DT_{90} times for FOSA were similar to PFOS, but longer for PFDA, PFUnA and PFDoA. Furthermore, MPCA's PFOS fish and surface water data show that PFOS concentrations have been in decline in Bde Maka Ska (formerly Lake Calhoun) and Lake Harriet (Figure 3; attached hereto). For the period 2006-2021, the PFOS levels have decreased substantially in those waterbodies and most notably over the last ten years. In those water bodies, the calculated DT_{50} times for PFOS in fish ranged from two to ten years, supporting the half-life times observed in the Mississippi River fish. Based on these observations, an interstudy period longer than five years would be needed to capture temporal changes in both fish and surface waters of the Mississippi River.

Another reason to extend the interstudy timeframe is related to availability of resources. There is a limit on PFAS analytical resources. The IPCS studies are highly resource intensive (i.e., time, people, and instruments). The studies require extraordinary efforts by 3M's internal analytical laboratories as well as contracted professional services (e.g., Weston, Axys Labs, Eurofins, University of Georgia Center for Applied Isotope Studies, and Normandeau Associates). The 2021 IPCS study was initiated on an expedited basis for field sampling in July 2021, with the final report not issued until late June 2023, nearly two

full years after study initiation. Given the magnitude of that study (3M is unaware of any other instream PFAS study of this magnitude), 3M naturally encountered technical issues, such as analytical interferences, instrument failures, and analyte recovery. As MPCA is well aware, 3M went to extraordinary lengths in a highly resource-intensive effort to meet the two-year turnaround time required by the January 2021 Notice of Violation, and even then, some results could not be reported until after production of the initial results.

In the draft permit, MPCA proposes to require 3M to submit the first instream study plan by January 1, 2026, with a final report due January 1, 2028. However, from a practical and technical perspective, 3M will not be able to initiate field work to commence sampling until July or August, due to likely Spring high river water conditions, and a multitude of logistical issues associated with organizing boats, crews, contracted services by service providers, Department of Natural Resources permitting, etc. Hence, in effect, under MPCA's proposal 3M would have less than 1.5 years from first sample collection to issue a final report. This is a completely inadequate time frame due to the significant number of PFAS on the analyte list and because laboratory analysis of samples cannot commence until a sufficient number of fish tissue samples are available so that they can be extracted in bulk to facilitate more efficient sample preparation and analysis. At bottom, the MPCA proposed timeframe is not technically feasible to fully repeat the 2021 IPCS study. A comparison of the time to complete the 2021 IPCS with those of other PFAS fish studies from the scientific literature is borne out by the magnitude of impact on resources due to the short timelines imposed by MPCA during the 2021 IPCS study (Table 4; attached hereto). To further shorten this timeframe would invite failure to complete the instream studies within the allotted time and invite noncompliance with the permit. As outlined above, the minimum appropriate time to conduct an instream characterization study is greater than five years, and the time needed to report the results of such study would need to be at least three years from project inception. Notwithstanding the foregoing, instream characterization study conditions of the type proposed by MPCA are legally inappropriate and technically unsupportable and should not be included in a proposed permit.

Should you have any questions we stand ready to discuss our recommendations with you.

Sincerely,

[redacted]

Keith Schmuck, CSP
Sr. Environmental Manager
3M Global Chemical Operations

Attachments: Literature Cited
Tables & Figures

Attachment: **LITERATURE CITED**

3M 2023. Instream PFAS Characterization Study Final Report-Mississippi River, Cottage Grove, Minnesota. Weston Solutions Inc. Issued June 29, 2023.

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Helsel, D.R. 2005. "Better Methods for Interpreting Nondetect Data". *Environ. Sci. & Technol*

Attachment - **TABLES & FIGURES**

Table 1. PFAS Detections in Surface Water from Reaches 02 and 03

Analyte	Detection Frequency	Geomean [1] (ng/L)	Geomean Conc. with ½-LLOQ [2] (ng/L)
PFOS	100%	16.2	16.2
TFA	100%	1795	1795
PFHxA	100%	11.2	11.2
PFBA	97%	91.0	87.6
PFHxS	97%	5.04	4.79
PFBS	91%	10.6	8.58
PFPeA	85%	12.1	11.8
PFOA	85%	26.7	23.1
PFHpA	74%	3.06	2.24
TFSI	57%	26.1	12.9
TFMS	57%	63.0	31.5
PFPA	51%	59.6	27.9
N-EtFOSAA	6.1%	5.84	2.87
FOSA	5.9%	3.35	1.01
PIBA	2.9%	21.4	12.6

Twenty-seven PFAS analytes were not detected in surface water and are excluded from the table.
[1] Non-detects (< LLOQ) were ignored in calculating geometric mean value.
[2] Geometric mean calculated after applying ½-LOQ value to all non-detects.

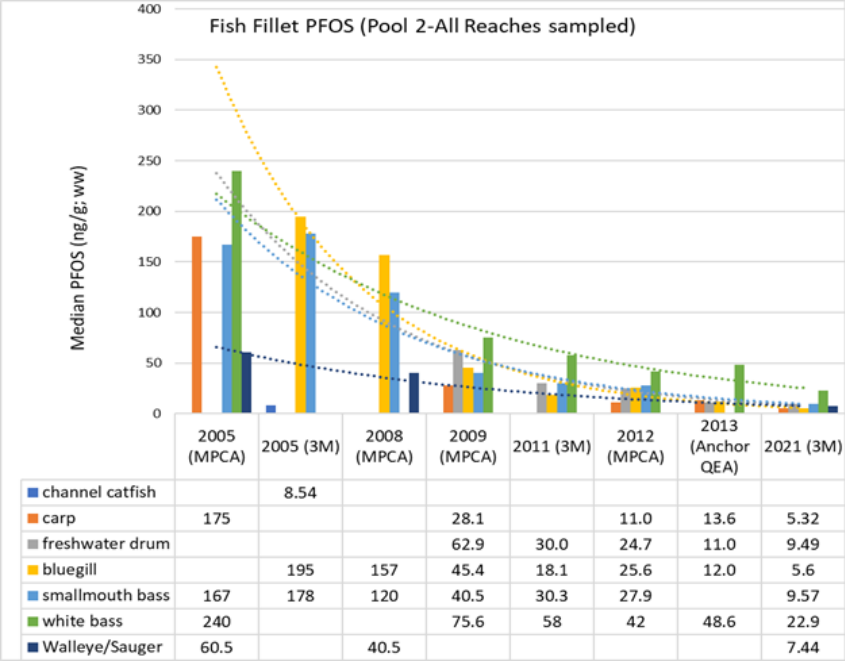
Table 2. PFAS Detections in Fish Fillet from Reaches 02 and 03 (7 fish species)

Analyte	Detection Frequency	Geomean Conc. [1] (ng/g; ww)	Geomean Conc. with ½-LLOQs [2] (ng/g; ww)
PFOS	100%	11.7	11.7
PFDA	100%	0.682	0.682
PFDoA	98%	0.368	0.359
PFUnA	94%	0.458	0.422
FOSA	84%	0.299	0.217
PFTrA	81%	0.133	0.106
PFNA	70%	0.150	0.104
N-EtFOSAA	66%	0.325	0.186
TFSI	54%	0.249	0.142
N-MeFOSAA	52%	0.135	0.0933
PFHxS	40%	0.119	0.0471
FBSA	35%	0.176	0.135
PFBA	35%	0.513	0.209
PFBS	28%	0.157	0.0830
PFOA	24%	0.229	0.180
N-MeFOSE	16%	1.54	0.143
TFMS	13%	0.168	0.128
PFPeA	10%	1.17	0.138
DBI	9.4%	0.0439	0.0341
MeFOSA	8.6%	0.0484	0.0518
EtFOSA	7.9%	0.120	0.0900
PFHxA	5.7%	0.294	0.0708
N-EtFOSE	5.1%	0.674	0.228
TFA	3.6%	12.5	8.82
FBSAA	2.9%	1.11	0.235
PFPA	2.9%	5.72	0.958
FBSEE-DA	1.4%	1.80	0.0826
FBSE	1.4%	2.17	0.141
HFPO-DA	1.4%	1.86	0.159
PBSA	1.4%	2.00	0.125
PBSA-C1	1.4%	2.24	0.196
PFES	1.4%	0.175	0.0461
2233 TFPA	0.7%	4.78	4.287
MeFBSAA	0.7%	0.103	0.0334
PFBSi	0.7%	0.0802	0.0854
PFHpA	0.7%	0.164	0.0364

Six PFAS analytes were not detected in fish fillet and are not shown. Those were 2333-TFPA, ADONA, FBSEE Diol, MeFBSE, MeFBSA, and PIBA.

[1] Non-detects (< LLOQ) were ignored in calculating geometric mean value.

[2] Geometric mean calculated after applying ½-LOQ value to all non-detects.



	2005 (MPCA)	2005 (3M)	2008 (MPCA)	2009 (MPCA)	2011 (3M)	2012 (MPCA)	2013 (Anchor QEA)	2021 (3M)
channel catfish		8.54						
carp	175			28.1		11.0	13.6	5.32
freshwater drum				62.9	30.0	24.7	11.0	9.49
bluegill		195	157	45.4	18.1	25.6	12.0	5.6
smallmouth bass	167	178	120	40.5	30.3	27.9		9.57
white bass	240			75.6	58	42	48.6	22.9
Walleye/Sauger	60.5		40.5					7.44

Figure 2. PFOS Decrease in Pool 2 fish fillet (2005-2021)

Table 3. DT_{50} and DT_{90} for PFOS in the Mississippi River Pools 2 and 3 (2005-2021)

Species	PFOS DT_{50} (years)		PFOS DT_{90} (years)	
	pool 2	pool 3	pool 2	pool 3
carp	1.60	3.43	5.43	11.4
freshwater drum	2.00	--	6.46	--
bluegill	2.30	4.82	8.71	16
smallmouth bass	2.80	--	9.33	--
white bass	2.90	5.51	9.57	18.3
walleye	5.93	4.58	19.7	15.2

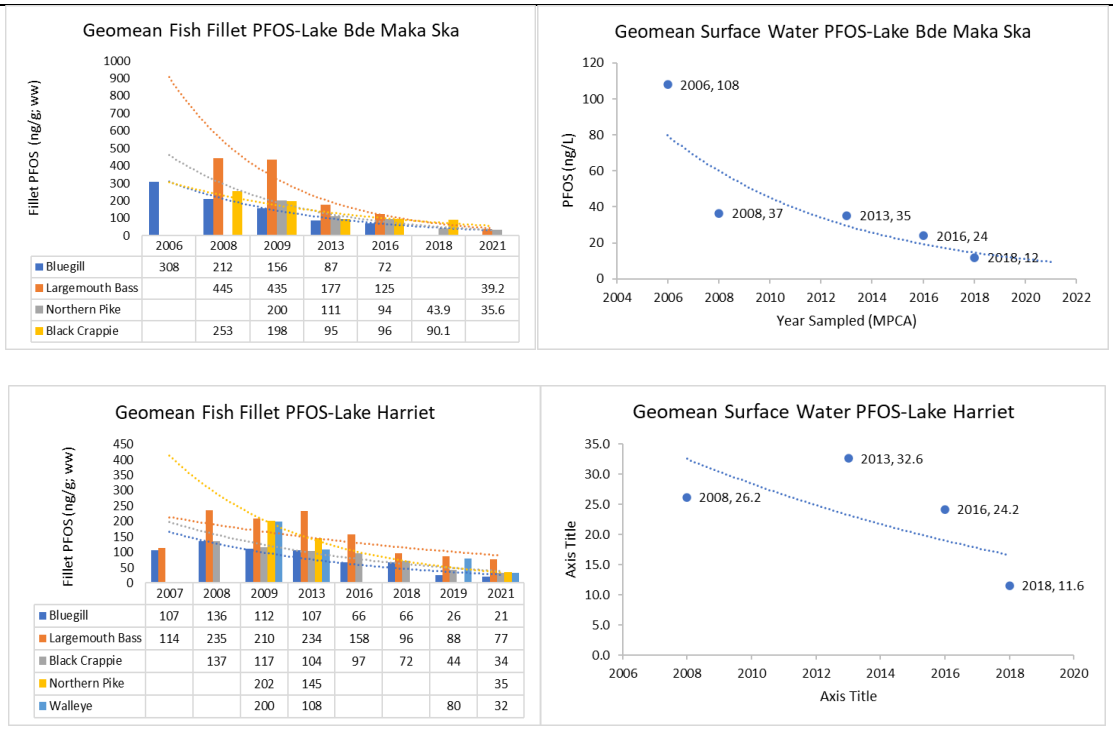


Figure 3. PFOS levels in Bde Maka Ska (formerly Calhoun) and Lake Harriet; MPCA Data

Table 4. Comparison of 2021 IPCS to recent instream PFAS studies in scientific literature

Fish Study	No. Specimens	No. Analytes	Days between sampling & reporting [1]	Datapoints per day [2]	No. QA/QC data
Munoz et al., 2022	75	60	970	4.6	N/A
Pickard et al., 2022	62	23	1700	0.8	N/A
Cara et al 2022	27	15	1170	0.3	N/A
3M 2023 (2021 IPCS)	790	42	660	50 [2]	106,000

[1] Approximated.
[2] Excludes QA/QC samples.
Note: For the 2021 IPCS study, time was from final sample receipt to report issuance date for fish and BMI analyses, and for sci. literature the time was calculated from date of sampling to date of manuscript submission.

EXHIBIT G

Gradient Expert Report

Expert Report of Robyn Prueitt, Ph.D., DABT, and Tim Verslycke, Ph.D., Related to Reissuance of the National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit MN0001449 for the 3M Cottage Grove Center Facility in Cottage Grove, Minnesota

Prepared by

Robyn Prueitt, Ph.D., DABT

Tim Verslycke, Ph.D.

August 27, 2024

GRADIENT

www.gradientcorp.com
One Beacon Street, 17th Floor
Boston, MA 02108
617-395-5000

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Abbreviations

3M	3M Company
$AF_{lifetime}$	Lifetime Adjustment Factor
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	Bioaccumulation Factor
BCC	Bioaccumulative Chemical of Concern
CC_{FR}	Fish Consumption and Recreation Use Class Chronic Criterion
CC_{FT}	Fish-Tissue-Based Chronic Criterion
CSF	Cancer Slope Factor
DL	Detection Limit
EGLE	Michigan Department of Environment, Great Lakes, and Energy
FCR	Fish Consumption Rate
FISH	Fish Are Important for Superior Health
FLDEP	Florida Department of Environmental Protection
GLCFCA	Great Lakes Consortium for Fish Consumption Advisories
IBERA	International Board of Environmental Risk Assessors
IRIS	Integrated Risk Information Systems
ITRC	Interstate Technology and Regulatory Council
MCLG	Maximum Contaminant Level Goal
MDH	Minnesota Department of Health
MPCA	Minnesota Pollution Control Agency
MRL	Minimal Risk Level
NHANES	National Health and Nutrition Examination Survey
NPDES	National Pollutant Discharge Elimination System
PFAS	Per- and Polyfluorinated Substance
PFBA	Perfluorobutanoic Acid
PFBS	Perfluorobutane Sulfonic Acid
PFHxA	Perfluorohexanoic Acid
PFHxS	Perfluorohexane Sulfonic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonic Acid
POD	Point of Departure
POD_{HED}	Point of Departure Human Equivalent Dose
RfD	Reference Dose
ROS	Regression on Order Statistics
RSC	Relative Source Contribution
RSL	Regional Screening Level
SDS	State Disposal System
SETAC	Society of Environmental Toxicology and Chemistry
SSC	Site-Specific Criterion
SSCs	Site-Specific Criteria
UF	Uncertainty Factor
US EPA	United States Environmental Protection Agency
WCBA	Women of Child-Bearing Age

WDNR	Wisconsin Department of Natural Resources
WHOI	Woods Hole Oceanographic Institution
WQC	Water Quality Criterion
WQCs	Water Quality Criteria

1 Introduction

1.1 Scope of Report

Drs. Robyn Prueitt and Tim Verslycke were retained by 3M Chemical Operations LLC (3M) to provide technical expert services related to the reissuance of its National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Permit for the 3M Cottage Grove Center facility located in Cottage Grove, Minnesota. Specifically, Dr. Prueitt was asked to provide expert toxicology support and Dr. Verslycke was asked to provide expert ecotoxicology support related to evaluating the proposed effluent limits for per- and polyfluorinated substances (PFAS) in a draft permit published by the Minnesota Pollution Control Agency (MPCA) on July 1, 2024 (MPCA, 2024a,b).

The qualifications of Drs. Robyn Prueitt and Tim Verslycke are presented in Section 1.2. The documents and sources relied upon are discussed in Section 1.3, with a full list provided in the References section at the end of this report. Gradient is compensated at the rate of $475/hour for the expert services of Drs. Robyn Prueitt and Tim Verslycke.

1.2 Professional Qualifications

1.2.1 Dr. Robyn Prueitt

I am a board-certified toxicologist with expertise in toxicology, carcinogenesis, and human health risk assessment. I received a BS degree in biology from Pacific Lutheran University and a Ph.D. in cell and molecular biology/human genetics from the University of Texas Southwestern Medical Center at Dallas. I was a postdoctoral fellow at the National Cancer Institute, where I managed multiple projects related to breast and prostate carcinogenesis. I was also a staff scientist at Fred Hutchinson Cancer Research Center, where I studied prostate tumor biology and biomarkers.

I joined Gradient in 2007, and my work has focused on evaluating human, experimental animal, and *in vitro* toxicology studies for health risk assessments of cancer and non-cancer endpoints, with special emphasis on mechanistic and weight-of-evidence evaluations of health risk and causation for chemical exposures. I have conducted some of this work in the context of regulatory comment and/or testimony to various state, national, and international regulatory agencies. I have previously provided toxicology and human health risk assessment support to 3M in several litigation matters involving PFAS and have testified on behalf of 3M to an Illinois State regulatory agency at a public hearing on proposed groundwater standards for PFAS.

I have been active in the Society of Toxicology since 2008. I have published multiple articles on toxicology, carcinogenesis, and risk assessment in peer-reviewed journals, books, and meeting proceedings, and I have been a peer reviewer for multiple toxicology journals. My *curriculum vitae* is provided as Attachment 1.

1.2.2 Dr. Tim Verslycke

I am an ecotoxicologist with 20 years of combined consulting and academic research experience in ecological risk assessment. I received a B.A. and an M.S. in bioscience engineering and subsequently a

Ph.D. in applied biological sciences from Ghent University (Ghent, Belgium) in one of the world's premier laboratories for ecotoxicology and risk assessment. Thereafter, I was a postdoctoral scholar in a toxicology laboratory at the Woods Hole Oceanographic Institution (WHOI), under WHOI Ocean Life Institute and Belgian American Educational Foundation scholarships and competitively funded government grants. Until 2019, I was appointed as a visiting investigator in the Biology Department at WHOI.

I have worked at Gradient since 2007. Gradient is an environmental and risk science consulting firm specializing in contaminant fate and transport analyses, human health and ecological risk assessment, and environmental chemistry. I am a principal at Gradient and my consulting practice consists of ecological risk assessments of contaminated sites, environmental safety assessments of new and existing products, and regulatory ecotoxicity testing. I have served, in an advisory capacity, to a wide range of governmental and non-profit organizations on issues related to environmental toxicology and ecological risk assessment. I have been active in the Society of Environmental Toxicology and Chemistry (SETAC) for many years and served as president of the North Atlantic Chapter. I am a founding member and currently serve as president of the International Board of Environmental Risk Assessors (IBERA). IBERA established the first international certification program in ecological risk assessment. I also served on the United States Environmental Protection Agency's (US EPA) Board of Scientific Counselors Safe and Sustainable Water Resources Subcommittee, which provides advice and recommendations to US EPA's Office of Research and Development on technical and management issues of its research programs. I have previously provided expert opinions regarding the scientific state of knowledge of PFAS ecotoxicity and bioaccumulation in organisms on behalf of the 3M Company in a number of cases.

I have published over 40 articles on environmental toxicology and risk assessment in peer-reviewed journals, books, and meeting proceedings. I have been a peer reviewer for multiple journals in the environmental sciences field. My *curriculum vitae* is provided as Attachment 2.

1.3 Information Sources

Data and information sources used to develop this report include academic journal articles, regulatory documents, textbooks, technical reports, publicly accessible databases, government studies and reports, and materials provided to us by counsel. Data and information sources that we relied upon in preparing this report are provided in the References section.

The types of information relied upon in this report are customarily reviewed, considered, and relied upon by experts in our field. The information we reviewed for this matter, in addition to our education, training, and professional experience, have allowed us to provide the opinions herein with a reasonable degree of scientific certainty. Upon review of additional information that may become available to us, we reserve the right to modify or supplement our opinions accordingly.

2 Summary of Opinions

Our opinions are based on the information sources we reviewed, in addition to our education, training, research, and professional experience in toxicology, ecotoxicology and risk assessment. Section 3 of this report provides the basis for these opinions. Date and information sources that were relied upon in preparing this expert report are provided in the References section. We reserve the right to supplement or amend our opinions should new facts or information be made known to us.

Dr. Prueitt offers the following opinion with a reasonable degree of scientific certainty:

1. MPCA's use of toxicological values is inconsistent with Minnesota's water quality rules and previous approaches used by MPCA.

Dr. Verslycke offers the following opinions with a reasonable degree of scientific certainty:

2. MPCA relies on an interim fish consumption rate (FCR) that overestimates fish consumption, is not representative of site-specific conditions, and is higher than what is used by other states and US EPA.
3. MPCA does not provide the necessary underlying information to allow for an independent evaluation and verification of its analyses. A number of calculation discrepancies and errors were identified where data verification was possible.
4. MPCA's approach to developing fish-tissue-based criteria for perfluorooctanoic acid (PFOA) and perfluorohexane sulfonic acid (PFHxS) is inconsistent with its own guidance and best available science.
5. MPCA's methodology for calculating fish bioaccumulation factors (BAF) is technically flawed and is inconsistent with US EPA guidance.

Drs. Prueitt and Verslycke offer the following joint opinion with a reasonable degree of scientific certainty:

6. MPCA's consistent reliance on unsupported toxicological values and exposure parameters, when considered in combination, results in site-specific criteria (SSCs) that are not site-specific, and are inconsistent with similar values developed by other regulatory entities and with MPCA's own regulatory processes to protect the designated uses of the Mississippi River Miles 820 to 812.

3 Basis for Opinions

This section provides the basis for the opinions summarized in Section 2. We evaluated various inputs and assumptions that MPCA relied upon to derive SSCs using the algorithms described below, as described in its May 2024 criteria development report (MPCA, 2024c). Dr. Prueitt evaluated the toxicological values and health endpoints (Section 3.1). Dr. Verslycke evaluated the FCR (Section 3.2), the adequacy of the provided information to be able to verify MPCA's analyses (Section 3.3), the fish-tissue-based criteria (Section 3.4), and the fish BAFs (Section 3.5). Drs. Prueitt and Verslycke jointly evaluated the cumulative impact of MPCA's reliance on unsupported assumptions on the SSCs MPCA developed (Section 3.6). As described further in the sections below, MPCA's derivation of SSCs is based on analyses that cannot be fully verified, contain calculation and transcription errors where verification was possible, and inappropriately compound overly conservative assumptions. This results in SCCs that are inconsistent with the prescribed regulatory process that was designed to ensure adequate water quality to protect the designated uses of the Mississippi River Miles 820 to 812

MPCA derived site-specific human health protective water quality criteria (WQCs) for six PFAS in a report dated May 2024: perfluorobutanoic acid (PFBA), perfluorobutane sulfonic acid (PFBS), perfluorohexanoic acid (PFHxA), perfluorohexane sulfonic acid (PFHxS), perfluorooctanoic acid (PFOA), and perfluorooctane sulfonic acid (PFOS) (see Table 1-1 in MPCA, 2024c). The "Site" is defined by MPCA as the Mississippi River main channel between river miles 820 and 812. This area is immediately adjacent to and downstream of 3M's Cottage Grove manufacturing facility (see Figure 1-1 in MPCA, 2024c).

As described in Section 3 of MPCA (2024c), MPCA states that the SSCs were derived for the Mississippi River Miles 820 to 812 to protect humans from potential adverse effects of eating fish and other edible aquatic organisms and incidental ingestion of water while recreating. The algorithms that MPCA used to derive chronic criteria for noncarcinogens (all six PFAS) and carcinogens (only PFOS and PFOA) were taken from Minn. R. 7050.0219 Subp.14 and Subp.15 (MPCA, 2020a), as presented below:

Surface water-based chronic criteria for noncarcinogenic chemicals:

$$CC_{FR} = \frac{RfD_{Chronic}\ (mg/kg\text{-}d) \times RSC\ (unitless) \times 1{,}000{,}000\ ng/mg}{\{IWR_{Chronic}\ (L/kg\text{-}d) + FCR_{Adult}\ (kg/kg\text{-}d)[(0.24 \times BAF_{TL3}\ (L/kg)) + (0.76 \times BAF_{TL4}\ (L/kg)]\}}$$

Surface water-based chronic criteria for linear carcinogenic chemicals with lifetime adjustment factors ($AF_{lifetime}$):

$$CC_{FR} = \frac{CR\ (1 \times 10^{-5})}{CSF\ (mg/kg\text{-}d)^{-1} \times AF_{Lifetime}} \times \frac{1{,}000{,}000\ ng/mg}{\{IWR_{Chronic}\ (L/kg\text{-}d) + FCR_{Adult}\ (kg/kg\text{-}d)[(0.24 \times BAF_{TL3}\ (L/kg)) + (0.76 \times BAF_{TL4}\ (L/kg))]\}}$$

Fish tissue-based chronic criteria for noncarcinogenic chemicals:

$$CC_{FT} = \frac{RfD_{Chronic}\ (mg/kg\text{-}d) \times RSC\ (unitless) \times 1{,}000{,}000\ ng/mg}{FCR_{Adult}\ (kg/kg\text{-}d)}$$

Fish tissue-based chronic criteria for linear carcinogenic chemicals with $AF_{lifetime}$:

$$CC_{FT} = \frac{CR\ (1 \times 10^{-5})}{CSF\ (mg/kg\text{-}d)^{-1} \times AF_{Lifetime}} \times \frac{1{,}000{,}000\ ng/mg}{FCR_{Adult}\ (kg/kg\text{-}d)}$$

where:

1,000,000 ng/mg = Conversion Factor
$AF_{Lifetime}$ = Lifetime Adjustment factor (unitless)
BAF_{TL3} = Final Bioaccumulation Factor (BAF) for Trophic Level 3 Fish in L/kg; Accounts for 24% of Fish Consumed
BAF_{TL4} = Final BAF for Trophic Level 4 Fish in L/kg; Accounts for 76% of Fish Consumed
CC_{FR} = Fish Consumption and Recreation Chronic Criterion in Class 2B Waters (ng/L)
CC_{FT} = Fish Consumption and Recreation Chronic Criterion Applied for Bioaccumulative Chemicals of Concern (BCC) in all Class 2 Waters (ng/g)
CR = Cancer Risk Level or an Additional Excess Cancer Risk Equal to 1×10^{-5}
CSF = Cancer Slope Factor in $(mg/kg\text{-}d)^{-1}$
FCR_{Adult} = 0.00094 kg/kg-d; MPCA Interim Fish Consumption Rate for Women of Childbearing Age
$IWR_{Chronic}$ = 0.0013 L/kg-d; Assumed Incidental Water Intake Rate Based on Minimum Chronic Duration
$RfD_{Chronic}$ = Reference Dose for Chronic Duration (mg/kg-d)
RSC = Relative Source Contribution (unitless)

The unsupported assumptions used by MPCA as inputs to these various algorithms and the cumulative impact of those assumptions on the SSCs is the basis of our opinions, summarized in Section 2 and detailed below.

3.1 MPCA's use of toxicological values is inconsistent with Minnesota's water quality rules and previous approaches used by MPCA.

The SSC for six PFAS for the Mississippi River Miles 820 to 812 that were developed by MPCA (2024c) used toxicological values from US EPA that are not consistent with Minnesota's water quality rules (MPCA, 2017, 2020a) and that differ from the toxicological values that MPCA previously used for developing WQCs for these same PFAS (MPCA, 2020b, 2023a). These toxicological values are reference doses (RfDs) or cancer slope factors (CSFs). An RfD is defined by Minnesota rules as "an estimate of a dose for a given duration to the human population, including susceptible subgroups such as infants, that is likely to be without an appreciable risk of adverse effects during a lifetime" (MPCA, 2017). A CSF, or cancer potency factor, is "an upper bound value for the number of cases of cancer estimated from a lifetime of exposure to a chemical" (MPCA, 2017). The RfD and CSF are determinative factors in the algorithms specified by Minnesota's water quality rules for developing site-specific WQCs (see algorithms for SSC above in Section 3).

According to the Technical Support Document for amendments to methods regarding human health-based water quality standards in Minnesota's water quality rules (Minn. R. chs. 7050 and 7052) (MPCA, 2017), and consistent with Minn. R. 7050.0219, Subp.2 (MPCA, 2020a), SSCs are to be based on RfDs and CSFs from Minnesota Department of Health's (MDH's) health risk limits or health-based guidance values for drinking water. While the rules indicate that these toxicological values can be RfDs and CSFs from US

EPA, such values can only be used after evaluation and completion of any needed modifications by MDH (MPCA, 2017). MDH's methodology for developing toxicological values for PFAS has generally differed from that of US EPA, as MDH has had a different understanding of the toxicokinetics (*i.e.*, the absorption, distribution, metabolism, and excretion) of PFAS in the body and thus has used different toxicokinetic model parameters to convert serum levels of PFAS to human equivalent doses compared to US EPA.

MPCA based its 2020 WQC for PFOS (MPCA, 2020b) and its 2023 WQCs for PFOA, PFHxS, PFHxA, PFBS, and PFBA (MPCA, 2023a) on RfDs developed by MDH, which is consistent with Minnesota's water quality rules. By contrast, and without an explanation, for the SSC for Mississippi River Miles 820 to 812 MPCA (2024c) used RfDs and CSFs from US EPA human health toxicity assessments and Integrated Risk Information Systems (IRIS) toxicological reviews that differ from the most recently developed RfDs and CSFs for the six PFAS by MDH.

3.1.1 The RfD and CSF used by MPCA for the PFOS SSC are inconsistent with those developed by MDH and with Minnesota's water quality rules.

MPCA (2024c) used an RfD of 1×10^{-7} mg/kg-d and a CSF of 39.5 per mg/kg-d from the US EPA Final Human Health Toxicity Assessment for PFOS (US EPA, 2024a). While MDH (2024a) developed an RfD for PFOS based on the same underlying health effect from the same study relied upon by US EPA (2024a), the MDH RfD was derived by dividing the point of departure (POD) of 7.7 ng/mL in serum by an uncertainty factor (UF) of 3, whereas US EPA (2024a) first converted the 7.7 ng/mL serum concentration to a POD human equivalent dose (POD_{HED}) and divided the POD_{HED} by a UF of 10. MDH (2024a) did not calculate a POD_{HED} in its derivation of the PFOS RfD; instead, MDH (2024a) represented the RfD as a serum concentration, stating that serum concentrations are the most appropriate dose metric for PFOS given its "highly bioaccumulative nature" (MDH, 2024a). Even if MDH had calculated a POD_{HED} for PFOS, it would differ from US EPA's POD_{HED} because MDH uses a different toxicokinetic model than US EPA to calculate POD_{HED} values for PFOS. If MDH (2024a) had calculated a POD_{HED} value using its toxicokinetic model for PFOS, this value would be 3×10^{-6} mg/kg-d;[1] dividing this value by a UF of 3 would yield a PFOS RfD of 1×10^{-6} mg/kg-d. Thus, the US EPA (2024a) RfD used for the PFOS SSC for Mississippi River Miles 820 to 812 is different from the RfD developed by MDH (2024a), based on the application of different toxicokinetic models for PFOS and different UF values.

MDH (2024a) used the same POD (19.8 mg/L in serum) as US EPA (2024a) to develop its CSF for PFOS, but the MDH CSF (13 per mg/kg-d) differs from the US EPA CSF (39.5 per mg/kg-d) because it was converted from a serum concentration to a dose in mg/kg-d using a different dosimetric adjustment factor for PFOS. Thus, the US EPA (2024a) CSF used for the PFOS SSC for Mississippi River Miles 820 to 812 is different from the CSF developed by MDH (2024a). However, the SSC for PFOS for Mississippi River Miles 820 to 812 is ultimately based on the use of the RfD as the toxicological value because MPCA stated that the non-carcinogenic SSC was lower than the carcinogenic SSC that was based on the use of the CSF for PFOS (MPCA, 2024c).

For its 2020 WQC for PFOS that is not specific to Mississippi River Miles 820 to 812, MPCA (2020b) used an RfD of 3.1×10^{-6} mg/kg-d, as developed by MDH (2019). This RfD is also different from the US EPA RfD MPCA used for the SSC for Mississippi River Miles 820 to 812.

The use of the RfD and CSF developed by MDH, rather than the values developed by US EPA, would result in a SSC for PFOS that is consistent with Minnesota's water quality rules and with other WQC for

[1] The POD_{HED} is calculated by multiplying the POD of 0.0077 mg/L by a dosimetric adjustment factor that is equivalent to the clearance rate of PFOS (MDH, 2024a). Clearance rate = Volume of distribution (L/kg) × (Ln2/half-life, days) = 0.56 L/kg × (0.693/996 days) = 0.00039 L/kg-d. POD_{HED} = 0.0077 mg/L × 0.000039 L/kg-d = 3×10^{-6} mg/kg-d.

PFOS developed by MPCA. MPCA (2024c) offered no explanation for not using the RfD and CSF developed by MDH (2024a) so we are unable at this time to comment further on MPCA's choice of these toxicological values.

3.1.2 The RfD and CSF used by MPCA for the PFOA SSC near Cottage Grove are inconsistent with those developed by MDH and with Minnesota's water quality rules.

MPCA (2024c) used an RfD of 3×10^{-8} mg/kg-d and a CSF of 29,300 per mg/kg-d derived from the US EPA Final Human Health Toxicity Assessment for PFOA (US EPA, 2024b). MDH (2024b) developed an RfD for PFOA of 2.8 ng/mL (serum concentration), which is based on a different underlying health effect and study than that used by US EPA for its RfD. The US EPA RfD is equivalent to a serum concentration RfD of 0.2 ng/mL. Thus, the US EPA (2024b) RfD used for the PFOA SSC for Mississippi River Miles 820 to 812 is different from the RfD developed by MDH (2024b).

MDH (2024b) used the US EPA (2024b) CSF as a basis to develop a CSF for PFOA of 12,600 per mg/kg-d, which differs from the US EPA CSF of 29,300 per mg/kg-d because it was converted from a serum concentration to a dose in mg/kg-d using a different dosimetric adjustment factor for PFOA. Thus, the US EPA (2024b) CSF used for the PFOA SSC for Mississippi River Miles 820 to 812 is different from the CSF developed by MDH (2024b). The SSC for PFOA for Mississippi River Miles 820 to 812 is based on the use of this CSF because MPCA stated that the carcinogenic SSC was lower than the non-carcinogenic SSC that was based on the use of the RfD for PFOA (MPCA, 2024c).

For its 2023 WQC for PFOA that is not specific to Mississippi River Miles 820 to 812, MPCA (2023a) used an RfD of 1.8×10^{-5} mg/kg-d (equivalent to a serum concentration RfD of 130 ng/mL) developed by MDH. This is also different from the US EPA RfD used for the SSC for Mississippi River Miles 820 to 812.

MPCA (2024c) offered no explanation for not using the RfD and CSF developed by MDH (2024b) so we are unable at this time to comment further on MPCA's choice of these toxicological values.

3.1.3 The RfD used by MPCA for the PFHxS SSC is inconsistent with the RfD developed by MDH and with Minnesota's water quality rules.

MPCA (2024c) used an RfD of 2×10^{-10} mg/kg-d from the External Review Draft of the IRIS Toxicological Review of PFHxS (US EPA, 2023a). The value for this RfD is incorrect and appears to be derived from an erroneous value listed in Table ES-1 in the Executive Summary of the US EPA draft document. The actual RfD value from US EPA (2023a) for PFHxS is 4×10^{-10} mg/kg-d. MPCA used the incorrect, lower RfD value of 2×10^{-10} mg/kg-d rather than the actual draft RfD value of 4×10^{-10} mg/kg-d. In addition, the RfD from US EPA (2023a) is a draft value that has not undergone external peer review and has not been finalized by US EPA; as such, it is not a reliable basis for use in developing WQCs. In fact, US EPA did not even use this draft RfD value as a basis for its most recent (May 2024) regional screening levels (RSLs) for PFHxS (US EPA, 2024c) or for its recent development of the maximum contaminant level goal (MCLG) for PFHxS in drinking water (US EPA, 2024d). Instead, US EPA used the minimal risk level (MRL) of 2×10^{-6} mg/kg-d for PFHxS derived by the Agency for Toxic Substances and Disease Registry (ATSDR, 2021) as the RfD for use in deriving its RSLs and the MCLG for PFHxS.[2] Thus, the draft US EPA (2023a)

[2] The intermediate oral MRL for PFHxS developed by ATSDR (2021) is 2×10^{-5} mg/kg-d and is based on an underlying toxicity study with a subchronic, and not chronic, duration of exposure. While US EPA (2024c) used the 2×10^{-5} mg/kg-d MRL as a basis for its RSLs for PFHxS, US EPA (2024d) divided the MRL by an additional UF of 10 to account for the subchronic exposure duration of the underlying study when applying the MRL to the development of a MCLG for PFHxS, yielding an RfD of 2×10^{-6}

RfD that MPCA (2024c) used for the PFHxS SSC for Mississippi River Miles 820 to 812 is 10,000-fold lower than the PFHxS RfD used by US EPA to derive the MCLG for PFHxS in drinking water (US EPA, 2024d).

MPCA's use of the RfD of 2×10^{-10} mg/kg-d in calculating the SSC for PFHxS is also inconsistent with the RfD for PFHxS of 9.7×10^{-6} mg/kg-d that MDH developed for its most recent health-based guidance in drinking water (MDH, 2023a). Moreover, for its 2023 WQC for PFHxS that is not specific to Mississippi River Miles 820 to 812, MPCA (2023a) also used the MDH RfD of 9.7×10^{-6} mg/kg-d. Thus, the draft US EPA (2023a) RfD that MPCA (2024c) used for the PFHxS SSC for Mississippi River Miles 820 to 812 is nearly 10,000 fold lower than the PFHxS RfD developed by MDH (2023a).

The use of the RfD developed by MDH, rather than the draft value developed by US EPA, would result in a dramatically higher SSC for PFHxS that is consistent with Minnesota's water quality rules and with other WQC for PFHxS developed by MPCA. MPCA (2024c) offered no explanation as to how the use of US EPA's draft RfD for PFHxS is more appropriate than the RfD recently developed by MDH (2023a) or is consistent with Minnesota WQC regulations. As a result, we are unable at this time to comment further on MPCA's choice of RfD.

3.1.4 The RfD used by MPCA for the PFHxA SSC is inconsistent with the RfD developed by MDH and with Minnesota's water quality rules.

MPCA (2024c) used an RfD of 5×10^{-4} mg/kg-d from the US EPA IRIS Toxicological Review of PFHxA (US EPA, 2023b). MDH developed an RfD for PFHxA of 3.2×10^{-4} mg/kg-d that was used in its health-based guidance in drinking water (MDH, 2023b). For its 2023 WQC for PFHxA that is not specific to Mississippi River Miles 820 to 812, MPCA (2023a) used the 3.2×10^{-4} mg/kg-d RfD that was developed by MDH (2023b).

The RfD used by MPCA (2024c) for the PFHxA SSC for Mississippi River Miles 820 to 812 is not consistent with Minnesota's water quality rules or with other WQC for PFHxA developed by MPCA. MPCA (2024c) offered no explanation for not using the RfD developed by MDH (2023b) so we are unable at this time to comment further on MPCA's choice of RfD.

3.1.5 The RfD used by MPCA for the PFBS SSC is inconsistent with the RfD developed by MDH and with Minnesota's water quality rules.

MPCA (2024c) used an RfD of 3×10^{-4} mg/kg-d from the US EPA Human Health Toxicity Values for PFBS (US EPA, 2021). MDH developed an RfD for PFBS of 8.4×10^{-5} mg/kg-d that was used in its health-based guidance for drinking water (MDH, 2023c). For its 2023 WQC for PFBS that is not specific to Mississippi River Miles 820 to 812, MPCA (2023a) used the 8.4×10^{-5} mg/kg-d RfD developed by MDH (2023c).

The RfD used by MPCA (2024c) for the PFBS SSC for Mississippi River Miles 820 to 812 is not consistent with Minnesota's water quality rules or with other site-specific WQCs developed by MPCA. MPCA (2024c) offered no explanation for not using the RfD developed by MDH (2023c) so we are unable at this time to comment further on MPCA's choice of RfD.

mg/kg-d for use in calculating the PFHxS MCLG. It is appropriate to apply the additional UF for exposure duration in this case because MCLGs (as well as surface water SSCs developed according to Minnesota regulations) incorporate chronic RfDs, not subchronic RfDs, in their derivation (see algorithms for SSC above in Section 3).

3.1.6 The RfD used by MPCA for the PFBA SSC is inconsistent with the RfD developed by MDH and with Minnesota's water quality rules.

MPCA (2024c) used an RfD of 1×10^{-3} mg/kg-d from the US EPA IRIS Toxicological Review of PFBA (US EPA, 2022a). MDH developed an RfD for PFBA of 3.8×10^{-3} mg/kg-d that was used in its health-based guidance in drinking water (MDH, 2018). Thus, the US EPA (2022a) RfD used for the PFBA SSC for Mississippi River Miles 820 to 812 is different from the RfD developed by MDH (2018). For its 2023 WQC for PFBA that is not specific to Mississippi River Miles 820 to 812, MPCA (2023a) used the 3.8×10^{-3} mg/kg-d RfD developed by MDH (2018).

The use of the RfD developed by MDH, rather than the value developed by US EPA, would result in a SSC for PFBA that is consistent with Minnesota's water quality rules and with other WQC for PFBA developed by MPCA. MPCA (2024c) offered no explanation for not using the RfD developed by MDH (2018) so we are unable at this time to comment further on MPCA's choice of RfD.

3.2 MPCA relies on an interim fish consumption rate (FCR) that overestimates fish consumption, is not representative of site-specific conditions, and is higher than what is used by other states and US EPA.

MPCA (2024c) used an interim FCR for women of child-bearing age (WCBA) of 66 g/d based on the MDH Fish are Important for Superior Health (FISH) survey of North Shore Minnesotans (MDH and UIC, 2017). MPCA (2024c) references a 2022 MPCA document, called "Interim fish consumption rate for women of childbearing age" for further detail on the derivation of this interim FCR (MPCA, 2022). In its 2022 document, MPCA states that the default FCR for adults in the Minnesota Rule chapters 7050 and 7052 is not appropriate given that PFOA and PFOS (and possibly other PFAS) have developmental health endpoints (MPCA, 2022). Instead, MPCA developed an interim FCR for WCBA of 66 g/d using what it calls "best available and reliable data" to meet its and US EPA's objectives for setting human health-protective WQCs. For the reasons detailed below, MPCA's interim FCR is not reflective of fish consumption patterns for the Mississippi River Miles 820 to 812, is not consistent with US EPA guidance on the development of WQCs, is greater than two-fold higher than Minnesota's default FCR, is substantially higher than FCRs developed by other states and US EPA, and hence is not based on the best available and reliable data:

- As cited by MPCA (2022), US EPA (2014) recommends that states develop WQCs that reflect the fish consumption patterns of the target population rather than using default values. Specifically, US EPA (2014) recommends using the following hierarchy of data sources to develop FCRs: (1) use local data; (2) use data reflecting similar geographical or population groups; (3) use data from national surveys; and (4) use US EPA's default FCR. MPCA's (2022) Table 1 describes information on fish consumption patterns from a range of regional and national surveys. Yet, inconsistent with US EPA's guidance, MPCA derived its interim FCR solely on the results of a 2017 survey of WCBA (ages 16 to 50) residing on the North Shore[3] (MDH and UIC, 2017) and provides no discussion of how the fish consumption patterns and local conditions in the 2017 survey of North Shore Minnesotans reflect those in the Mississippi River Miles 820 to 812:
    - The fish species included in the MDH survey of North Shore Minnesotans (MDH and UIC, 2017) are not representative of the fish species likely to be present and consumed in the Mississippi River near the Cottage Grove facility. The MDH survey of North Shore Minnesotans lists the following fish/shellfish species in descending order of mean number of

[3] The North Shore refers to the northern shore of Lake Superior in Minnesota.

meals consumed in the past 3 months as: tuna, canned; shellfish; salmon; lake trout; walleye; lake herring; whitefish, menominee; fish sticks/sandwiches; tuna steak; cod; tilapia; stream trout; other fish; northern pike; perch; bass; panfish and halibut (MDH and UIC, 2017, Table 4). Only three species (walleye, northern pike, and bass) that were reported as being consumed in lower relative amounts by North Shore Minnesotans in the 2017 survey are present in Mississippi River Miles 820 to 812 (Minnesota DNR, 2024a). The MDH and UIC (2017) survey reports fish caught from Lake Superior, which is a different watershed basin than the Mississippi River Miles 820 to 812, which is in the Upper Mississippi River basin (Minnesota DNR, 2024b).

- The MDH and UIC (2017) survey included questions pertaining to the consumption of store-bought and caught fish. Meals of fish that were caught comprised only 35 percent of total fish meals consumed by participants in the survey. The inclusion of purchased fish may have resulted in an overestimation of the FCR of the surveyed population. Further, MPCA applies the FCR from this survey to Mississippi River Miles 820 to 812 and incorrectly assumes that all consumed fish would be from the Mississippi River Miles 820 to 812.
- The MDH-surveyed population on the North Shore of Minnesota is not representative of the population that is expected to fish Mississippi River Miles 820 to 812 (MDH and UIC, 2017). A Great Lakes WCBA diary survey (Connelly *et al*., 2019) is described as a relevant and reliable survey by MPCA (2022) in its development of an interim FCR for WCBA. This survey found women participating (95% Caucasian) consumed less than 30 g/d (20.7 g/d at the 90th percentile) of total freshwater fish based on the reported portion size. In comparison, the higher amount of fish eaten in the MDH and UIC (2017) survey is consistent with the fact that study participants include subpopulations of WCBA who may eat more fish and shellfish for subsistence or cultural reasons. MPCA does not discuss how the surveyed population in the MDH and UIC (2017) survey compares to the demographics of the target population that may consume fish caught in the Mississippi River near the Cottage Grove facility.

- MPCA's (2024c) interim FCR of 66 g/d is substantially higher than Minnesota's default FCR and FCRs developed by other states and US EPA:
  - MPCA's (2024c) interim FCR of 66 g/d is greater than two-fold higher than the default FCR described in Minnesota Rules 7050.0219 Subp.13 (MPCA, 2020a) (30 g/d).
  - Wisconsin and Michigan rely on default FCRs of 20 and 15 g/d, respectively, for use in their state-specific human health water quality guidelines based on an average freshwater fish FCR for sport anglers (Ruffle *et al*., 2024).
  - GLCFCA (2019) assumes a FCR of 32 g/d.
  - US EPA (2014) derived a default FCR of 22 g/d at the 90th percentile for the US adult population (21 years of age or older) based on data from the National Health and Nutrition Examination Survey (NHANES) from 2003-2010. US EPA reported FCRs for WCBA (all races) of 15.8 g/d at the 90th percentile, 23.5 g/d at the 95th percentile, and 46.6 g/d at the 99th percentile. The interim FCR selected by MPCA is substantially higher than the 99th percentile value for WCBA derived by US EPA.

Overall, MPCA's interim FCR overestimates fish consumption in Mississippi River Miles 820 to 812 and results in overly conservative criteria, as illustrated further in Section 3.6.

3.3 MPCA does not provide the necessary underlying information to allow for an independent evaluation and verification of its analyses. A number of calculation discrepancies and errors were identified where data verification was possible.

A bioaccumulation factor (BAF) is the ratio of a chemical's concentration in fish tissue to its concentration in ambient surface water at steady-state (in L/kg). It is used in the derivation of the fish consumption and recreation use class chronic criterion (CC_{FR}), which, when met, will also result in compliance with the fish-tissue-based criterion (CC_{FT}). MPCA (2024c) states that it derived BAFs using fish tissue and surface water datasets collected in 2021 by 3M's contractor, Weston Solutions, Inc., representing the most recent data available for Mississippi River Miles 820 to 812 (Weston Solutions, Inc., 2023).

MPCA (2024c) describes how it processed the PFAS surface water and fish data prior to deriving the BAFs. As described in Appendix A to MPCA (2024c), data processing was completed to account for unit conversions, remove quality control sample data, remove data obtained using specific analytical methods, and address duplicates. No detail is provided on which data were adjusted or eliminated and for what reason. As a result, it is not possible to independently verify or provide comment on the appropriateness of MPCA's processing of the data that it relied upon to derive BAFs.

A review of the raw surface water and fish tissue datasets MPCA relied upon (provided in MPCA [2024d,e]) revealed that the method detection limit and reporting detection limit data fields are identical, and a quantitation limit is not clearly identified. US EPA Region III (1991) states that both a reporting limit and a quantitation limit need to be reported for each datapoint. A review of the underlying laboratory analytical reports included in Weston Solutions, Inc. (2023) shows that MPCA used the analytical reporting limit for non-detect substitutions where data verification was possible. However, a number of analytical reports lacked sufficient detail to distinguish between the analytical detection and reporting limits and MPCA's selected value for non-detect substitution could not be verified in these instances. Therefore, MPCA did not follow US EPA Region III (1991) by not clearly identifying what analytical quantitation limits it used to support its non-detect substitution calculations.

The processed data presented in Appendix A were used to independently verify MPCA's calculation of BAFs. Our review of MPCA's calculation identified a number of calculation discrepancies and errors, as illustrated by the following examples:

- The PFOA fish tissue geometric means for trophic levels 3 and 4 derived using the Regression on Order Statistics (ROS) method (Table 6) paired with the PFOA surface water geometric mean derived using the ROS method (Table 2) do not equate to the BAFs presented in MPCA (2024c) Section 5.2. The PFOA BAFs reported in Section 5.2 are 0.68 L/kg and 1.28 L/kg greater than the derived values from the data presented in Appendix A for trophic levels 3 and 4, respectively.[4]
- The PFOS fish tissue geometric mean for trophic level 4 derived using the zero method (Table 6) is presented as 10.6 ng/g. However, the geometric mean for PFOS trophic level 4 fish should be

[4] The PFOA fish tissue geometric means for trophic levels 3 and 4 derived using the ROS method and presented in Appendix A Table 6 of MPCA (2024c) are 0.511 and 0.955 ng/g, respectively. The PFOA surface water geometric mean derived using the ROS method and presented in Appendix A Table 2 of MPCA (2024c) is 23 ng/L. The fish tissue geometric mean by trophic level is divided by the surface water geometric mean and this product is then multiplied by a conversion factor of 1,000 to calculate a BAF in units of L/kg per trophic level. Using the values presented in Appendix A Tables 2 and 6, the calculated PFOA BAFs for trophic levels 3 and 4 are 22.22 and 41.52 L/kg, respectively, which are 0.68 and 1.28 L/kg less than the PFOA BAFs for trophic levels 3 and 4 presented in MPCA (2024c) Section 5.2.

13.4 ng/g and not 10.6 ng/g. The 10.6 ng/g value presented by MPCA in Table 6 appears to be a transcription error and reflects the PFOS fish tissue geometric mean for trophic level 3.

Overall, information is lacking to independently verify or meaningfully comment on MPCA's data processing and analyses and data discrepancies and errors were identified in MPCA's analyses.

3.4 MPCA's approach to developing fish-tissue-based criteria for perfluorooctanoic acid (PFOA) and perfluorohexane sulfonic acid (PFHxS) is inconsistent with its own guidance and best available science.

MPCA (2024c) derived chronic fish tissue (CC_{FT}) to protect fish consumers in Mississippi River Miles 820 to 812 from bioaccumulative chemicals of concern (BCCs), specifically PFOS, PFOA and PFHxS. BCCs are defined by Minnesota rules as any chemical that accumulates **in aquatic organisms** [emphasis added] by a BAF greater than 1,000 L/kg, as described in Minn. R. 7052.0010 Subp.4 (MPCA, 2024f). The datasets used in MPCA (2024c) show that PFOS BAFs exceed 1,000 L/kg for *Pomoxis nigromaculatus* (black crappie), *Sander canadensis* (sauger), and *Morone chrysops* (white bass) fish tissue samples collected adjacent to Cottage Grove. The Interstate Technology and Regulatory Council (ITRC, 2021; Table 5-1) reviewed BAFs for PFOS from freshwater field studies and similarly found values that exceed 1,000 L/kg.

However, evidence supporting PFOA and PFHxS as BCCs is lacking. MPCA (2024c) justifies the bioaccumulative potential of PFOA and PFHxS in fish with evidence that these PFAS are known to be highly bioaccumulative in humans. This qualitative consideration of the bioaccumulation potential of a chemical in humans as opposed to aquatic organisms is not consistent with how BCCs are defined in the Minnesota rules (MPCA, 2024f). MPCA (2024c) further cites ITRC (2021) as evidence that both PFOA and PFHxS have demonstrated BAFs greater than 1,000 L/kg in other field studies. However, an independent review of the studies cited in ITRC does not support MPCA's conclusion:

- Two field studies with PFOA and PFHxS BAFs greater than 1,000 L/kg in the Great Lakes Region were reported in ITRC (2021, Table 5-1). As described below, these studies calculated BAFs using whole fish instead of fish fillet analyses. Moreover, the collection of fish samples and surface water samples occurred at different times. Therefore, the findings in these studies carry substantial uncertainty and are not appropriate for evaluating bioaccumulation into edible fish tissue. Further, despite these uncertainties, one of the studies (*i.e.*, De Silva *et al*., 2011, as cited in ITRC, 2021, Table 5-1) describes PFOA field BAFs that are well below the BCC threshold of 1,000 L/kg.
    - Furdui *et al*. (2007, as cited in ITRC, 2021, Table 5-1) reported PFOA field BAFs from whole body *Salvelinus namaycush* (lake trout) collected from Lakes Superior, Huron, Erie, Ontario and Michigan in the range of 398-3,981 L/kg wet weight, and PFHxS field BAFs from whole body lake trout collected from Lakes Superior, Huron, Erie and Ontario in the range of 63-1,995 L/kg wet weight. Fish were collected in 2001 and surface water was collected in 2005 and 2006.
    - De Silva *et al*. (2011, as cited in ITRC, 2021, Table 5-1) reported PFOA field BAFs from whole body lake trout from Lakes Superior, Erie, and Ontario in the range of 10-203 L/kg wet weight, and from whole body *Sander vitreus* (walleye) from Lake Erie with a reported BAF of 91 L/kg wet weight. De Silva *et al*. (2011, as cited in ITRC, 2021, Table 5-1) reported PFHxS field BAFS derived from whole body lake trout from Lakes Huron, Erie and Ontario in the range of 745-2,183 L/kg wet weight. Fish were collected between 2006 and 2008 and surface water was collected between 2005, 2006, 2007 and 2010.

A review of the recent scientific literature on PFAS bioaccumulation and MPCA's own analyses further support the conclusion that PFOA and PFHxS are not BCCs:

- MPCA's own analysis presented in Figure 3 of Appendix A (MPCA, 2024c) clearly shows the difference in bioaccumulation of PFOS *versus* PFOA and PFHxS. While PFOS geomeans are greater in trophic level 4 fish than in trophic level 3 fish, providing evidence of biomagnification, geomeans between trophic levels 3 and 4 are nearly the same for PFOA and PFHxS, indicating that these two PFAS do not biomagnify and their relative tissue concentrations are well below those measured for PFOS.
- US EPA recently published a review of BCF and BAF values for PFOS, PFHxS and PFOA in aquatic organisms and reported median BAFs for fish muscle as 1,514, 20 and 8.5 L/kg wet weight for PFOS, PFHxS and PFOA, respectively (Burkhard, 2021, Table 4). Similarly, US EPA describes the current state of the science of PFOS and PFOA bioaccumulation in its draft aquatic life criteria documents for these two PFAS and reported geometric mean BAFs for fish muscle as 1,069 and 7.2 L/kg wet weight for PFOS and PFOA, respectively (US EPA, 2022b,c). These reviews by US EPA indicate that PFOA and PFHxS have BAFs that are much lower than those obtained for PFOS and would not meet the 1,000 L/kg BCC threshold.
- Lastly, MPCA came to the same conclusion that PFOA and PFHxS are not BCC in its 2023 generalized guidance for PFAS WQC to protect human health (MPCA, 2023a). MPCA states in that document that deriving CC_{FT} for PFOA and PFHxS is not applicable because BAFs derived from fish tissue-based field datasets indicate BAFs less than 1,000 L/kg, with geometric mean BAFs in a similar range of 32 to 60 L/kg.

Overall, MPCA's (2024c) approach to developing fish-tissue-based criteria for PFOA and PFHxS is not supported by the current state of the science and inconsistent with its own prior interpretation of the bioaccumulation potential of these two PFAS.

3.5 MPCA's methodology for calculating fish bioaccumulation factors (BAFs) is technically flawed and is inconsistent with US EPA guidance.

MPCA (2024c) calculated PFAS fish tissue and surface water geometric means for use in BAF derivations using five different approaches to address non-detected data (Appendix A in MPCA, 2024c). The ROS method was ultimately chosen by MPCA to calculate geometric means, and one half of the detection limit was used as a substitution for values reported as non-detected when the data did not meet the ROS criteria.[5] MPCA (2024c, Section 3.2) cites US EPA Region III (1991) to support its use of ROS and one half of the detection limit as appropriate approaches for addressing non-detect data. Although US EPA Region III (1991) states that statistical estimates of concentrations below the detection limit (such as the ROS method) are technically superior to evaluating non-detects at one half of the detection limit, this approach is only effective for datasets with a high proportion of detected results, typically greater than 50%. However, an US EPA's Office of Research and Development's (ORD) National Exposure Research Laboratory publication (US EPA, 2006) that post-dates US EPA Region III's 31-year-old guidance, emphasizes the need to consider data distribution and data outliers in selecting the appropriate method to address non-detect values. To appropriately use the ROS method, US EPA's ORD states both that the number of detected observations must be large enough to obtain accurate and reliable results and that the data follow a well-

[5] MPCA describes that it did not use the ROS method when (1) two or fewer values in a given dataset were detected or (2) two or fewer values in a given dataset were not detected (MPCA, 2024c, Appendix A, p. 30).

known parametric distribution (US EPA, 2006). MPCA's approach is inconsistent with US EPA's ORD guidance for several reasons:

- In 7 of the 10 instances where the ROS method was selected to calculate fish tissue geometric means across PFAS compounds and trophic levels, the frequency of non-detected results exceeded 50% (MPCA, 2024c, Appendix A). Due to the high percentage of non-detected results in the fish tissue dataset, ROS would not be an appropriate method for calculating geometric means used in BAF derivations.
- MPCA does not provide a rationale for using the ROS method in light of the distribution of the underlying dataset and the potential presence of data outliers. Multiple ROS methods are available to compute non-detected results based on different data distributions (normal, lognormal, gamma), although verifying the distribution of left-censored datasets is challenging when the frequency of non-detected results is large (US EPA, 2006). The distribution of the datasets used by MPCA is not adequately described to allow for independent ROS method verification. US EPA (2006) also summarizes the influence of outliers on various ROS methods and details how ROS approaches do not perform well when datasets contain outliers. MPCA does not describe whether statistical tests were used to identify outliers in these datasets or whether any outliers were identified, and does not discuss the potential impact of statistical outliers on its derivation of BAFs.
- The ROS method is known to potentially extrapolate non-detected results that are greater than detected values in the dataset, which can result in overestimates of a data population's geomean. When handling non-detects at the detection limit (DL), US EPA Region III (1991) states: "in this highly conservative approach, all non-detects are assigned the value of the DL, the largest concentration of analyte that could be present but not detected. This method always produces a mean concentration, which is biased high, and is not consistent with Region III's policy of using best science in risk assessments." However, MPCA's ROS-based geomeans are even higher than the detection limit-based geomeans that US EPA would consider inappropriately biased high. Specifically, all fish tissue geometric means calculated using the ROS method exceed the geometric means calculated using the detection limit method to evaluate non-detects, as presented in Appendix A Table 6 (MPCA, 2024c). In some instances, the ROS-based geomean that MPCA derived is greater than two times higher than the detection limit-based geomeans that US EPA would consider inappropriately biased high (*e.g.*, PFHxA fish trophic level 3 and PFOA fish trophic level 4).

MPCA used R software for statistical computing, which relies upon specialized programming languages that is not technically accessible. MPCA's use of R results unnecessarily complicates independent verification of their analyses. Instead, MPCA could have relied on US EPA's ProUCL statistical software which has functions for imputing non-detects using ROS methods. ProUCL is publicly available, easy to use, and considered the default software package by risk assessment practitioners for environmental data calculations.

Overall, MPCA's approach to addressing data sets with below detection limit observations is not consistent with applicable US EPA guidance, technically flawed, unnecessarily complicated, and lacks transparency. MPCA's approach resulted in higher BAF values and lower criteria as described further in Section 3.6.

3.6 MPCA's consistent reliance on unsupported toxicological values and exposure parameters, when considered in combination, results in site-specific criteria (SSCs) that are not site-specific, and are inconsistent with similar values developed by other regulatory entities and with MPCA's own regulatory processes to protect the designated uses of the Mississippi River Miles 820 to 812.

MPCA did not include any discussion of the uncertainty associated with its SSC derivation and the importance of the various input parameters it selected. This is a significant omission and contrary to established state and federal guidance and policy on risk assessment in environmental decision-making. For example, it is long-standing US EPA policy that stakeholders in environmental issues be provided with sufficient information to allow them to independently assess environmental risks and the reasonableness of risk reduction actions (US EPA Region VI and US EPA Region V, 2008). To ensure that risk assessments exhibit these qualities, US EPA has specified requirements that must be met when characterizing risk: (1) addressing qualitative and quantitative features of the risk assessment and (2) identifying uncertainties as a measure of the confidence in the assessment. Quantifying uncertainty in risk assessment is typically performed by conducting a sensitivity analysis where exposure parameters are varied, and the changes in risk estimates are compared to characterize the uncertainty associated with the final risk estimates (US EPA, 1989). In its exposure factors handbook, US EPA further describes how accounting for variability and uncertainty is fundamental to exposure assessment and risk analysis (US EPA, 2011). While historically, risk assessors may have used qualitative descriptors (*e.g.*, high-end, worst case, average), it is no longer considered best practice to rely on these types of descriptors when the data allow for quantification of the uncertainty as it relates to exposure estimates, risk estimates, environmental policy options, or – as in this case – WQCs. MPCA similarly has recognized the importance of uncertainty analysis in environmental decision making (*e.g.*, MPCA, 2023b).[6]

In consideration of MPCA's consistent reliance on overly conservative toxicological values and exposure parameters, we sought to understand the sensitivity of these parameters when used in combination to derive the SSCs for Mississippi River Miles 820 to 812. It is clear from the sensitivity analysis presented here that reliance on a more reasonable set of alternate parameters results in substantially different criteria. MPCA's consistent selection of overly conservative toxicological values and exposure parameters has a substantial compounding effect, as illustrated by our analysis. Our analyses consider the impact of changing one parameter at a time on the SSCs in a stepwise fashion, as summarized in Table 3.1:

1. The toxicological values derived by MDH were used instead of the US EPA values to better align with Minnesota Rules.
2. The BAFs derived using one half of the detection limit for non-detects were used (as presented in MPCA 2024c, Appendix A). Given the number of non-detects in several of the PFAS datasets, this substitution method is considered more appropriate than the ROS method used by MPCA (2024c).
3. The FCR was updated to 0.00043 kg/kg-d based on the 30 g/d default FCR as outlined in Minnesota Rules 7050.2019 Subp.13 (MPCA, 2020a), compared to the interim FCR for WCBA of 0.00094 kg/kg-d chosen by MPCA (2024c).

[6] In this example, MPCA identifies that risk assessments should include an uncertainty analysis with discussion of possible sources of uncertainty. The discussion should also indicate whether the uncertainty has a biased impact on the risk characterization results (*e.g.*, leading to an over- or under-estimation of risk) and, if possible, the magnitude of the effect.

Surface water and fish tissue-based chronic criteria were then calculated using these alternate parameters and the Minnesota Rules 7050.2019 Subp.14 and 15 (MPCA, 2020a) algorithms presented in Section 3 above. The stepwise increase in the calculated chronic criteria is shown in Figures 3.1 through 3.11. The multi-fold increase over MPCA's derived SSC is shown in these figures for each stepwise change in input parameter. The impact of individually changing each of the four parameters in Table 3.1 on the resulting SSCs is summarized in Table 3.2a and Table 3.2b.

Table 3.1 Sensitivity Analysis of the SSC Calculation Using Alternate Input Parameters

Parameter	MPCA (2024c)	Alternate Parameter	Reason for Alternate Parameter
RfD or CSF	Sourced from US EPA[a]	Sourced from MDH[b]	Aligns with Minnesota Rules
BAF	ROS Method[c]	½ Detection Limit Method[c]	More Appropriate Substitution Method
FCR	0.00094 kg/kg-d[d]	0.00043 kg/kg-d[e]	Aligns with Minnesota Rules

Notes:
BAF = Bioaccumulation Factor; CSF = Cancer Slope Factor; FCR = Fish Consumption Rate; MDH = Minnesota Department of Health; MPCA = Minnesota Pollution Control Agency; PFBA = Perfluorobutanoic Acid; PFBS = Perfluorobutane Sulfonic Acid; PFHxA = Perfluorohexanoic Acid; PFOA = Perfluorooctanoic Acid; PFOS = Perfluorooctane Sulfonic Acid; RfD = Reference Dose; ROS = Regression on Order Statistics; SSC = Site-Specific Criterion; US EPA = United States Environmental Protection Agency.
(a) Toxicological values used by MPCA (2024c) can be found in the following MPCA (2024c) sections: PFOS – Section 4.1; PFOA – Section 5.1; PFHxS – Section 6.1; PFHxA – Section 7.1; PFBS – Section 8.1; PFBA – Section 9.1.
(b) Toxicological values sourced from MDH can be found in the following sections of our report: PFOS – Section 3.1.1; PFOA – Section 3.1.2; PFHxS – Section 3.1.3; PFHxA – Section 3.1.4; PFBS – Section 3.1.5; PFBA – Section 3.1.6.
(c) Data sourced from MPCA (2024c) Appendix A.
(d) FCR used by MPCA (2024c) can be found in MPCA (2024c) Section 3.3.
(e) Alternate parameter sourced from Minnesota Rules 7050.0219 (MPCA, 2020a).

Table 3.2a Sensitivity Analysis of the Surface Water Chronic Criteria Calculation Using Alternate Input Parameters

PFAS	CC_{FR} (ng/L)			
	MPCA (2024c)	Alternate RfD or CSF	Alternate BAF	Alternate FCR
PFOS	0.027	0.270	0.027	0.060
PFOA	0.0092	0.021	0.033	0.019
PFHxS	0.0023	110	0.0043	0.0046
PFHxA	4,400	2,800	11,000	9,000
PFBS	3,000	840	5,500	6,100
PFBA	25,000	96,000	53,000	46,000

Notes:
BAF = Bioaccumulation Factor; CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; CSF = Cancer Slope Factor; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFAS = Per- and Polyfluorinated Substance; PFBA = Perfluorobutanoic Acid; PFBS = Perfluorobutane Sulfonic Acid; PFHxA = Perfluorohexanoic Acid; PFHxS = Perfluorohexane Sulfonic Acid; PFOA = Perfluorooctanoic Acid; PFOS = Perfluorooctane Sulfonic Acid; RfD = Reference Dose.
This table shows the surface water chronic criterion when using an alternate input for the RfD/CSF, BAF, or FCR (see Table 3.1)

Table 3.2b Sensitivity Analysis of the Fish Tissue Chronic Criteria Calculation Using Alternate Input Parameters

PFAS	CC_{FT} (ng/g)		
	MPCA (2024c)	Alternate RfD or CSF	Alternate FCR
PFOS	0.021	0.210	0.047
PFOA	0.00036	0.00084	0.00079
PFHxS	0.000043	2.10	0.000093

Notes:
CC_{FT} = Fish-Tissue-Based Chronic Criterion; CSF = Cancer Slope Factor; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFAS = Per- and Polyfluorinated Substance; PFHxS = Perfluorohexane Sulfonic Acid; PFOA = Perfluorooctanoic Acid; PFOS = Perfluorooctane Sulfonic Acid; RfD = Reference Dose.
This table shows the fish tissue chronic criterion when using an alternate input for the RfD/CSF or FCR (see Table 3.1)

Alternate PFOS surface water chronic criteria were derived using an RfD of 1×10^{-6} mg/kg-d (MDH, 2024a) and the alternate exposure parameters outlined in Table 3.1. Updating the PFOS RfD results in a 10-fold greater CC_{FR}. Additionally updating the FCR parameter results in a CC_{FR} value that is 21.8 times higher than the CC_{FR} derived by MPCA (Figure 3.1). Updating the BAF substitution method is not applicable to PFOS since this PFAS was detected in all fish tissue and surface water samples.

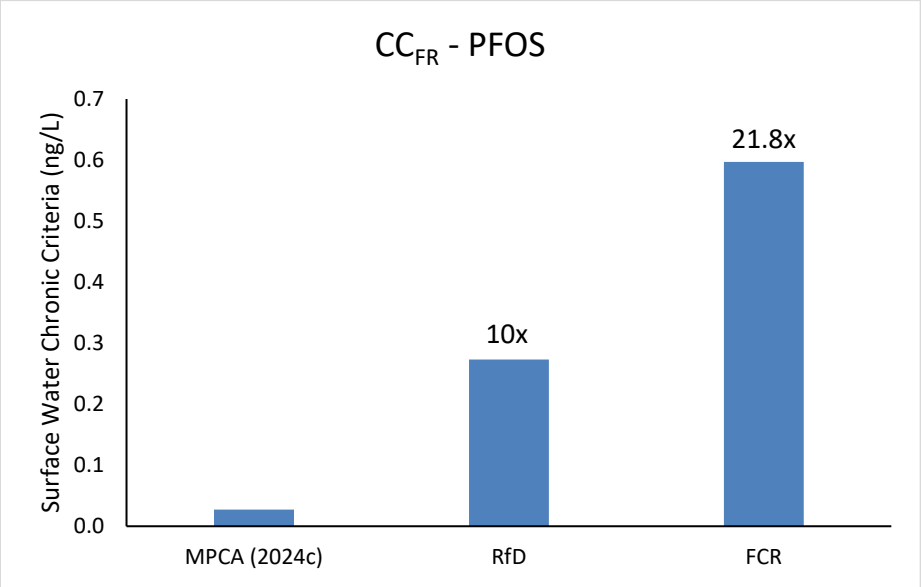

Figure 3.1 Sensitivity Analysis of PFOS CC_{FR} Using Alternate Input Parameters. CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFOS = Perfluorooctane Sulfonic Acid; RfD = Reference Dose. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

Alternate PFOA surface water chronic criteria were derived using a CSF of 12,600 mg/kg-d (MDH, 2024b) and the alternate exposure parameters outlined in Table 3.1. Updating the PFOA CSF results in a 2.3-fold greater CC_{FR}. Additionally updating the BAF and FCR parameters results in CC_{FR} values that are 8.3 and 15.9 times higher than the CC_{FR} derived by MPCA, respectively (Figure 3.2).

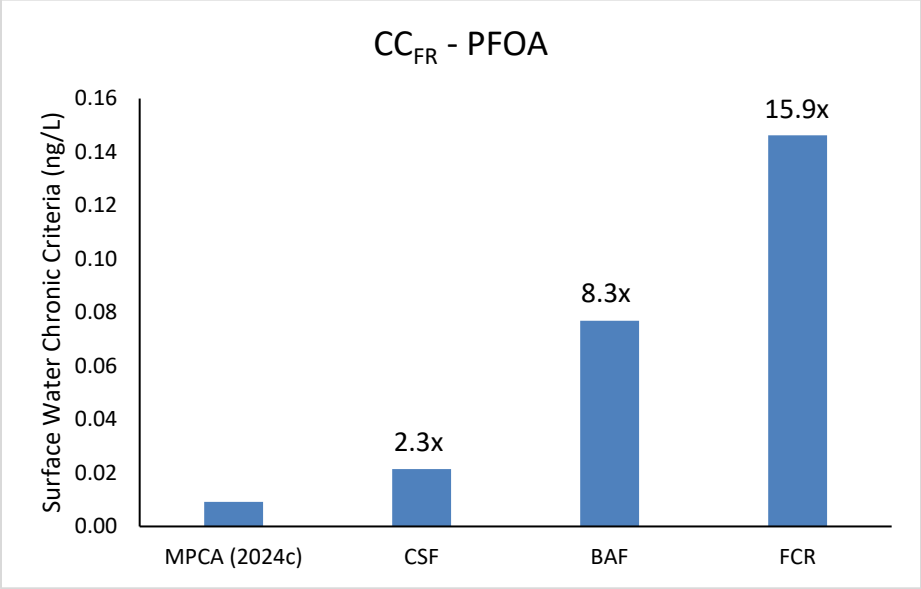

Figure 3.2 Sensitivity Analysis of PFOA CC_{FR} Using Alternate Input Parameters. BAF = Bioaccumulation Factor; CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFOA = Perfluorooctanoic Acid. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

Alternate PFHxS surface water criteria were derived using an RfD of 9.7×10^{-6} mg/kg-d (MDH, 2023a) and the alternate exposure parameters outlined in Table 3.1. Updating the PFHxS RfD results in a 48,500-fold greater CC_{FR}. Additionally updating the BAF and FCR parameters results in CC_{FR} values that are 92,533 and 173,334 times higher than the CC_{FR} derived by MPCA, respectively (Figure 3.3).

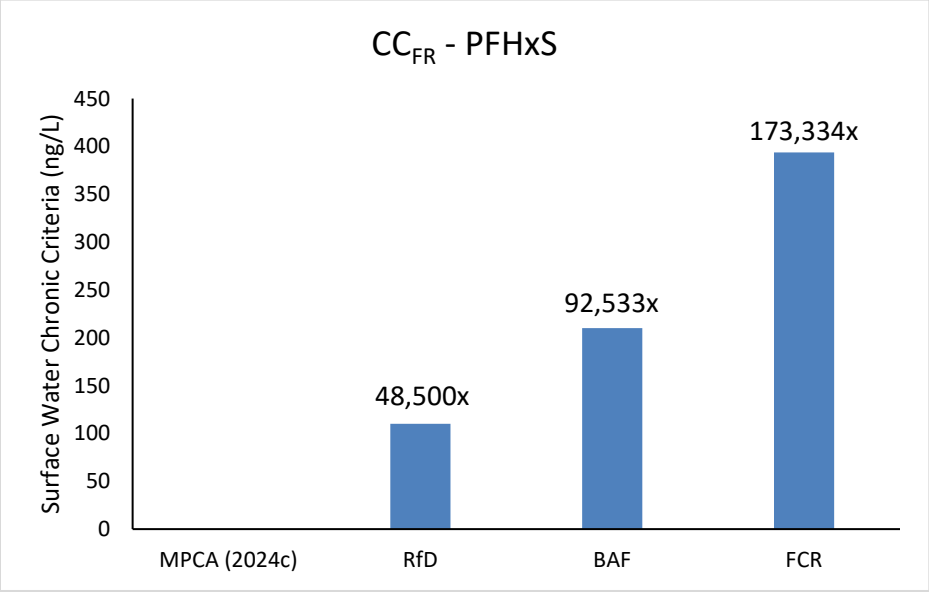

Figure 3.3 Sensitivity Analysis of PFHxS CC_{FR} Using Alternate Input Parameters. BAF = Bioaccumulation Factor; CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; MPCA = Minnesota Pollution Control Agency; PFHxS = Perfluorohexane Sulfonic Acid; RfD = Reference Dose. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

In addition, changing only the PFHxS RfD for the US EPA (2023a) draft IRIS RfD (4×10^{-10} mg/kg-d), the RfD used by US EPA (2024d) to derive the MCLG for PFHxS (2×10^{-6} mg/kg-d), or the RfD developed by MDH (2023a) (9.7×10^{-6} mg/kg-d) results in CC_{FR} values that are either 2, 10,000, or 48,500 times higher than the CC_{FR} derived by MPCA, respectively (Figure 3.4).

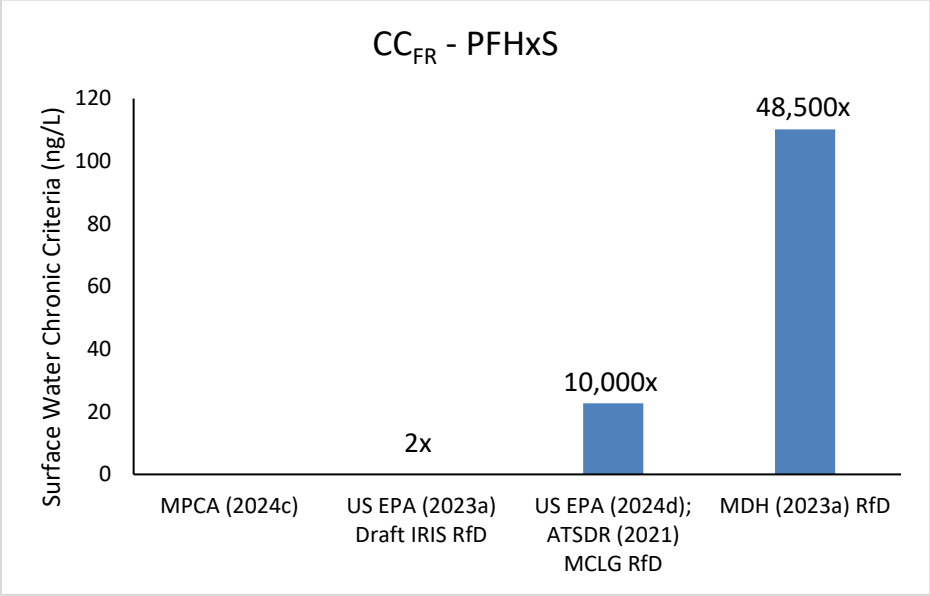

Figure 3.4 Sensitivity Analysis of PFHxS CC_{FR} Using Alternate RfDs. ATSDR = Agency for Toxic Substances and Disease Registry; CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; IRIS = Integrated Risk Information Systems; MCLG = Maximum Contaminant Level Goal; MDH = Minnesota Department of Health; MPCA = Minnesota Pollution Control Agency; PFHxS = Perfluorohexane Sulfonic Acid; RfD = Reference Dose; US EPA = United States Environmental Protection Agency.

Alternate PFHxA surface water chronic criteria were derived using an RfD of 3.2×10^{-4} mg/kg-d (MDH, 2023b) and the alternate exposure parameters outlined in Table 3.1. Updating the PFHxA RfD results in a lower CC_{FR}. Additionally updating the BAF and FCR parameters results in CC_{FR} values that are 1.6 and 3.0 times higher than the CC_{FR} derived by MPCA, respectively (Figure 3.5).

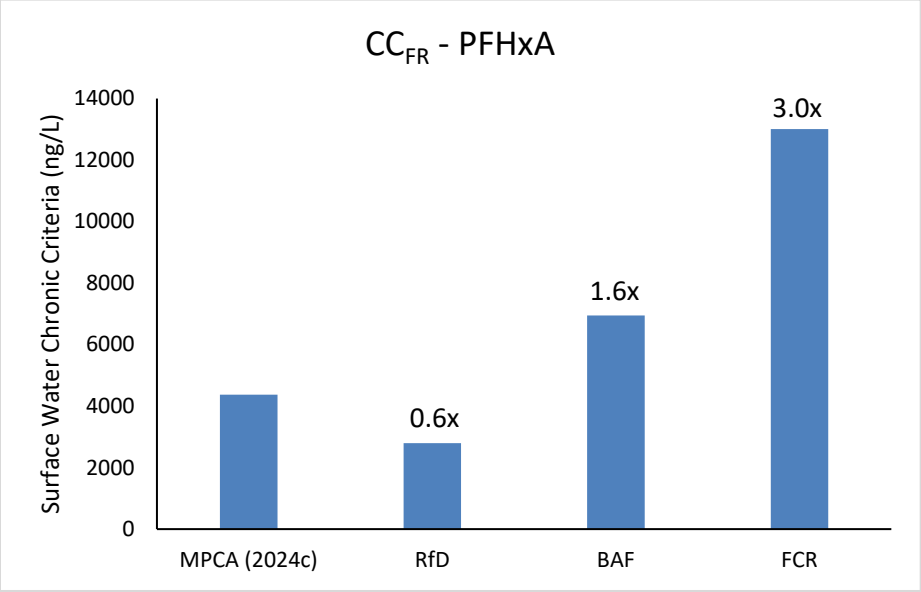

Figure 3.5 Sensitivity Analysis of PFHxA CC_{FR} Using Alternate Input Parameters. BAF = Bioaccumulation Factor; CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFHxA = Perfluorohexanoic Acid; RfD = Reference Dose. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

Alternate PFBS surface water chronic criteria were derived using an RfD of 8.4×10^{-5} mg/kg-d (MDH, 2023c) and the alternate exposure parameters outlined in Table 3.1. Updating the PFBS RfD results in lower CC_{FR}. Additionally updating the BAF and FCR parameters similarly results in a CC_{FR} that is lower than the CC_{FR} derived by MPCA (Figure 3.6).

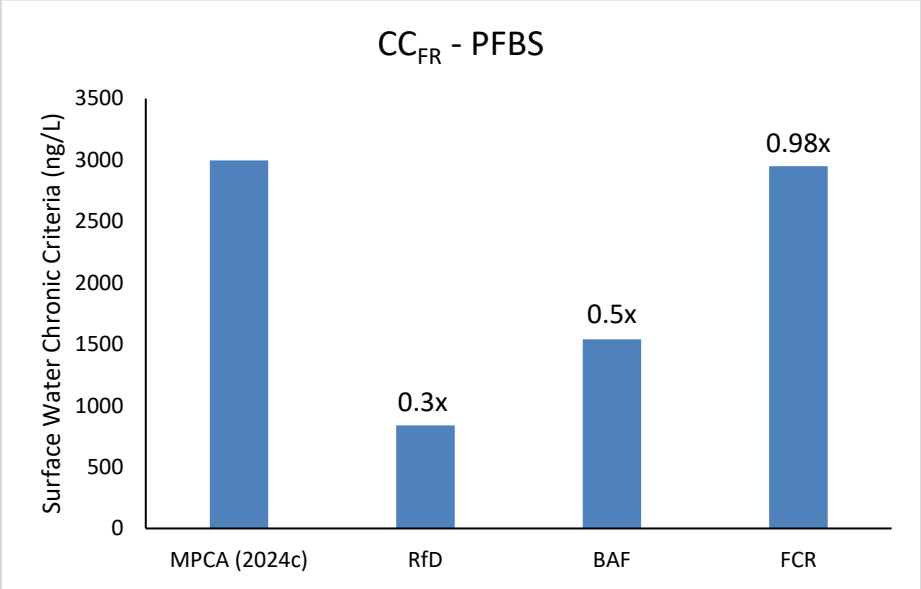

Figure 3.6 Sensitivity Analysis of PFBS CC_{FR} Using Alternate Input Parameters. BAF = Bioaccumulation Factor; CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFBS = Perfluorobutane Sulfonic Acid; RfD = Reference Dose. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

Alternate PFBA surface water chronic criteria were derived using an RfD of 3.8×10^{-3} mg/kg-d (MDH, 2018) and the alternate exposure parameters outlined in Table 3.1. Updating the PFBA RfD results in a 3.8-fold greater CC_{FR}. Additionally updating the BAF and FCR parameters results in CC_{FR} values that are 8.0 and 12.4 times higher than the CC_{FR} derived by MPCA, respectively (Figure 3.7).

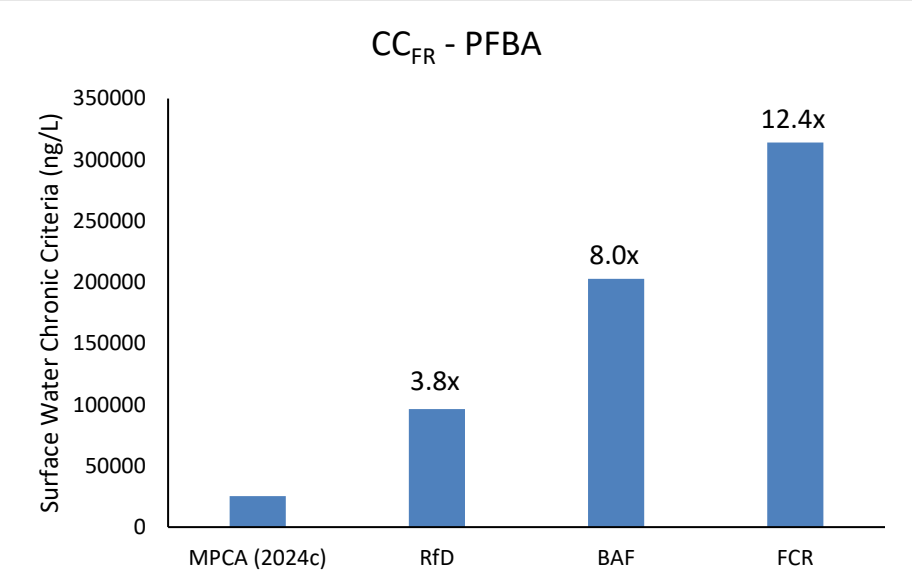

Figure 3.7 Sensitivity Analysis of PFBA CC_{FR} Using Alternate Input Parameters. BAF = Bioaccumulation Factor; CC_{FR} = Fish Consumption and Recreation Use Class Chronic Criterion; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFBA = Perfluorobutanoic Acid; RfD = Reference Dose. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

Alternate PFOS CC_{FT} were derived using an RfD of 1×10^{-6} mg/kg-d (MDH, 2024a) and the alternate exposure parameters outlined in Table 3.1. CC_{FT} is only derived for chemicals determined to be BCC and the BAF exposure parameter is not included in these algorithms. Updating the PFOS RfD results in a 10-fold increase in the CC_{FT}. Additionally updating the FCR parameter results in a CC_{FT} that is 21.9 times higher than the CC_{FT} derived by MPCA (Figure 3.8).

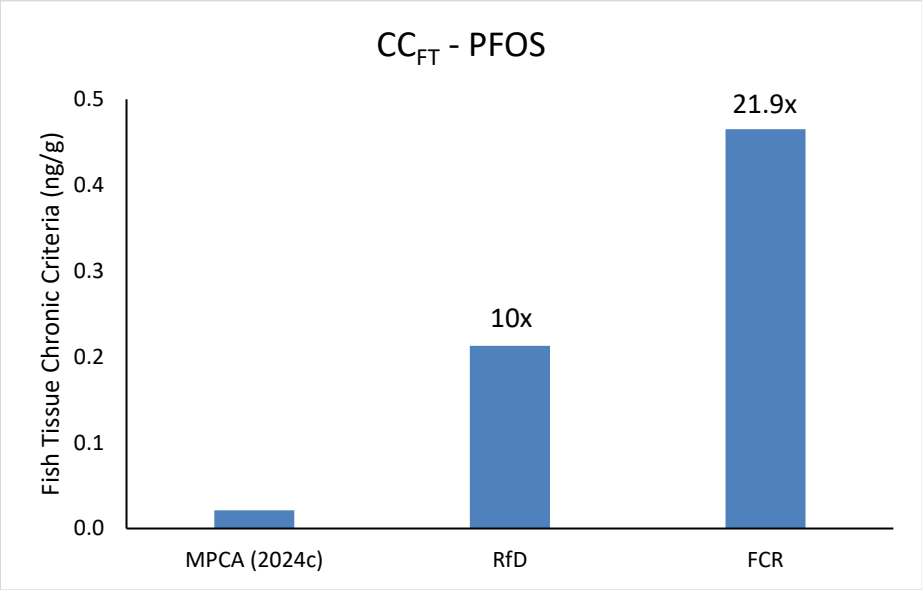

Figure 3.8 Sensitivity Analysis of PFOS CC_{FT} Using Alternate Input Parameters. CC_{FT} = Fish Tissue-Based Chronic Criterion; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFOS = Perfluorooctane Sulfonic Acid; RfD = Reference Dose. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

Alternate PFOA CC_{FT} were derived using a CSF of 12,600 mg/kg-d (MDH, 2024b) and the alternate FCR outlined in Table 3.1. CC_{FT} is only derived for chemicals determined to be BCC and the BAF exposure parameter is not included in these algorithms. Updating the PFOA CSF and FCR parameter results in CC_{FT} values that are 2.3 and 5.1 times higher than the CC_{FT} derived by MPCA, respectively (Figure 3.9).

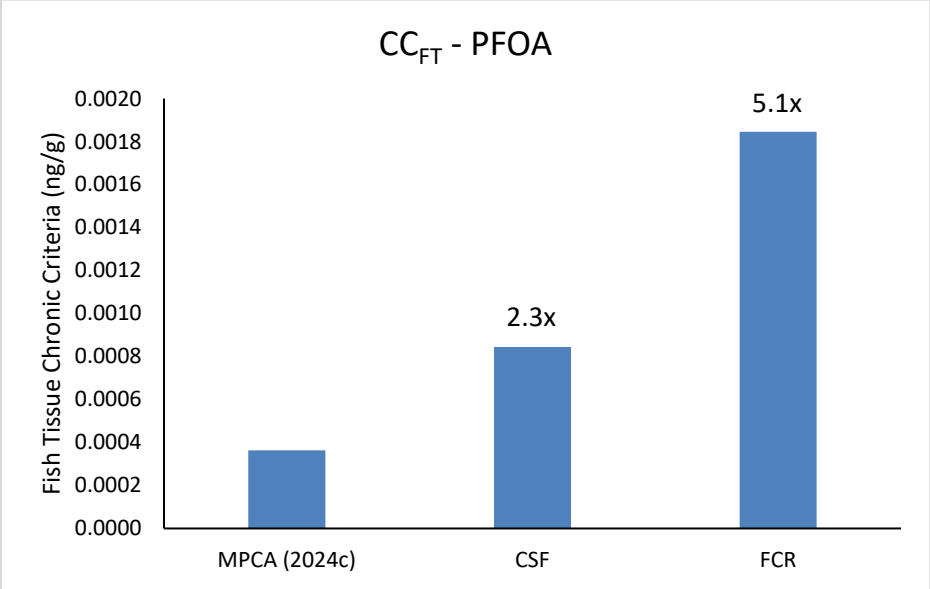

Figure 3.9 Sensitivity Analysis of PFOA CC_{FT} Using Alternate Input Parameters.
CC_{FT} = Fish Tissue-Based Chronic Criterion; CSF = Cancer Slope Factor; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFOA = Perfluorooctanoic Acid. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

Alternate PFHxS CC_{FT} were derived using an RfD of 9.7×10^{-6} mg/kg-d (MDH, 2023a) and the alternate exposure parameters outlined in Table 3.1. CC_{FT} is only derived for chemicals determined to be BCC and the BAF exposure parameter is not included in these algorithms. Updating the PFHxS RfD and FCR results in CC_{FT} values that are 48,500 and 106,023 times higher than the CC_{FT} derived by MPCA, respectively (Figure 3.10).

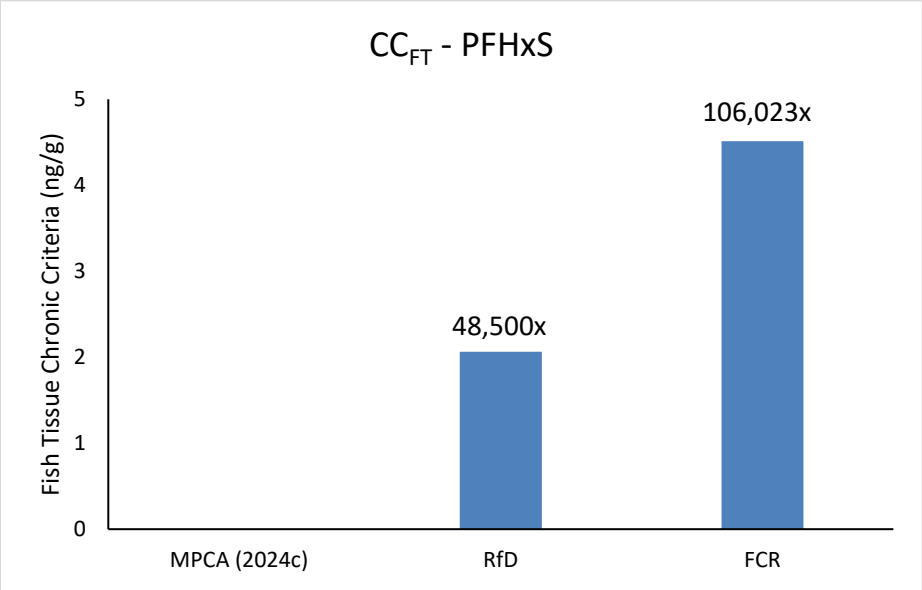

Figure 3.10 Sensitivity Analysis of PFHxS CC_{FT} Using Alternate Input Parameters. CC_{FT} = Fish Tissue-Based Chronic Criterion; FCR = Fish Consumption Rate; MPCA = Minnesota Pollution Control Agency; PFHxS = Perfluorohexane Sulfonic Acid; RfD = Reference Dose. Criteria were adjusted in a stepwise manner (as shown from left to right). The cumulative increase of the criteria is shown above each bar on the graph.

In addition, changing only the PFHxS RfD to either the correct value for the US EPA (2023a) draft IRIS RfD (4×10^{-10} mg/kg-d), the RfD used by US EPA (2024d) to derive the MCLG for PFHxS (2×10^{-6} mg/kg-d), or the RfD developed by MDH (2023a) (9.7×10^{-6} mg/kg-d) results in CC_{FT} values that are either 2, 10,000, or 48,500 times higher than the CC_{FT} derived by MPCA, respectively (Figure 3.11).

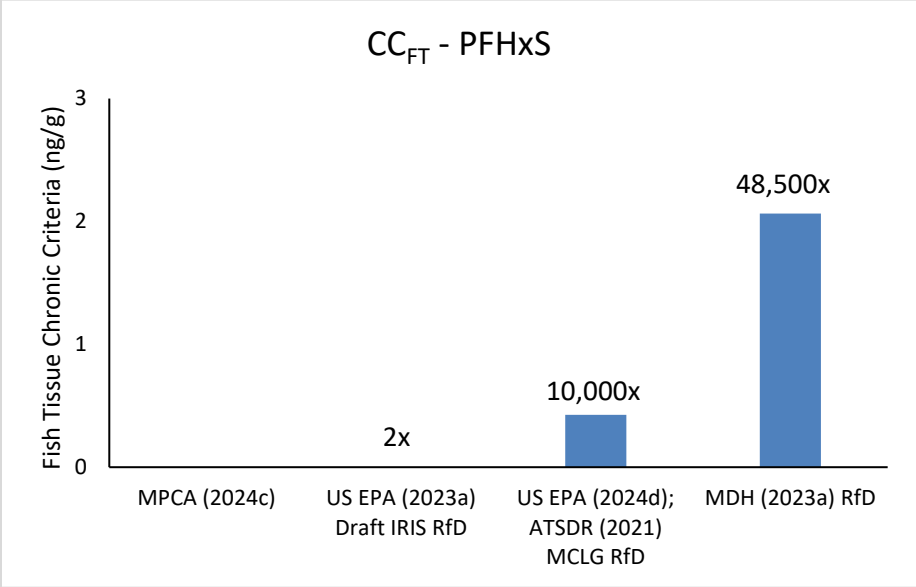

Figure 3.11 Sensitivity Analysis of PFHxS CC_{FT} Using Alternate RfDs. ATSDR = Agency for Toxic Substances and Disease Registry; CC_{FT} = Fish Tissue-Based Chronic Criterion; IRIS = Integrated Risk Information Systems; MCLG = Maximum Contaminant Level Goal; MDH = Minnesota Department of Health; MPCA = Minnesota Pollution Control Agency; PFHxS = Perfluorohexane Sulfonic Acid; RfD = Reference Dose; US EPA = United States Environmental Protection Agency.

The overall impact of MPCA's assumptions and parameter selection is a set of SSCs that is not supported by the best available science, is overly protective, and is inconsistent with similar criteria developed by other states. For example, the fish tissue action level for PFOS developed by WDNR (2022) is 50 ng/g as compared to 0.021 ng/g developed by MPCA (2024c). Similarly, human health WQCs for PFOS and PFOA, 12 and 170 ng/L, respectively, developed by Michigan Department of Environment, Great Lakes, and Energy (EGLE, 2024) are much higher than the SSC for PFOS and PFOA, 0.027 and 0.0092 ng/L, respectively, derived by MPCA (2024c).

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Attachment 1

***Curriculum Vitae* of Robyn Prueitt, Ph.D., DABT**

Robyn L. Prueitt, Ph.D., DABT
Principal

rprueitt@gradientcorp.com

Areas of Expertise

Toxicology, carcinogenesis, human genetics, toxicogenomics, molecular biology, molecular epidemiology, weight-of-evidence analysis, mode-of-action analysis, systematic review, human health risk assessment, risk communication.

Education and Certifications

Ph.D., Cell and Molecular Biology/Human Genetics, University of Texas Southwestern Medical Center at Dallas, 2001

B.S., Biology, Pacific Lutheran University, 1994

Diplomate of the American Board of Toxicology (DABT), 2013; recertified 2018, 2023

Professional Experience

2007 – Present GRADIENT, Seattle, WA
Principal. Provides toxicology and related expertise in support of human health risk assessment, regulatory comment, and toxic tort litigation. Reviews and evaluates toxicology and health-related data.

2006 – 2007 FRED HUTCHINSON CANCER RESEARCH CENTER, Seattle, WA
Staff Scientist. Managed studies of prostate cancer biomarker detection and glycoprotein mass spectrometry analysis. Designed and managed multiple large-scale prostate tumor xenograft studies.

2001 – 2006 NATIONAL CANCER INSTITUTE, Bethesda, MD
Post-doctoral Research Fellow. Investigated genetic susceptibility of cancer risk through molecular epidemiology studies. Managed multiple studies related to breast and prostate carcinogenesis. Performed genome-wide expression analysis of genes and microRNAs associated with prostate carcinogenesis. Developed animal models of leukemias associated with chromosome translocations.

Professional Activities

- Mentor: Society of Toxicology Mentor Match Program, 2015.
- Peer Reviewer: "Toxicological Profile for Toluene Diisocyanates and Methylenediphenyl Diisocyanates," Agency for Toxic Substances and Disease Registry Draft Document, 2014.
- Reviewer: *Archives of Oral Biology; Biomedicine Hub; Biomedicines; Cancers; Critical Reviews in Toxicology; Dose-Response; Ecotoxicology and Environmental Safety; Environmental Pollution; Environmental Research; Foods; Frontiers in Public Health; Human and Experimental Toxicology; Hygiene and Environmental Health Advances; Inhalation Toxicology; International Journal of Environmental Research and Public Health; International Journal of Hygiene and Environmental Health; International Journal of Molecular Sciences; Life; Molecules; Science of the Total Environment; Toxicology; Toxicology and Applied Pharmacology*; *Toxicology In Vitro; Toxicology and Industrial Health; Toxics.*

Professional Affiliations

Society of Toxicology; Pacific Northwest Association of Toxicologists

Continuing Education Courses and Other Training

- Next-Generation Data Transparency and Open Science Policies: What Toxicologists Need to Know, Society of Toxicology 63rd Annual Meeting, Salt Lake City, UT, 2024.
- Unique Applications of Systematic Review (SR) Methods, Society of Toxicology 62nd Annual Meeting, Nashville, TN, 2023.
- An Introduction to New Approach Methodologies (NAMs) and Understanding Their Potential to Support Regulatory Decisions, Society of Toxicology 59th Annual Meeting, Virtual Course, 2020.
- Uncertainty Characterization in 21st Century Toxicology: Current Practice and Practical Methods Supporting Regulatory Risk Assessment, Society of Toxicology 57th Annual Meeting, San Antonio, TX, 2018.
- Current Principles for Nonclinical Chronic Toxicity/Carcinogenicity Testing of Environmental Chemicals, Society of Toxicology 56th Annual Meeting, Baltimore, MD, 2017.
- Genetics and Population Variability in Chemical Toxicity: The What, the How, and So What? Society of Toxicology 55th Annual Meeting, New Orleans, LA, 2016.
- Toxicogenomics Meets Regulatory Decision-Making: How to Get Past Heat Maps, Network/Pathway Diagrams, and "Favorite" Genes, Society of Toxicology 54th Annual Meeting, San Diego, CA, 2015.
- Effective Risk Communication: Theory, Tools, and Practical Skills for Communicating About Risk, Harvard School of Public Health, Boston, MA, 2014.
- Methodologies in Human Health Risk Assessment, Society of Toxicology 53rd Annual Meeting, Phoenix, AZ, 2014.
- Mid-America Toxicology Course, Kansas City, MO, 2013.
- Epidemiology for Toxicologists, Society of Toxicology 47th Annual Meeting, Seattle, WA, 2008.
- Public Health Toxicology, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, 2007.
- Principles of Clinical Pharmacology, National Institutes of Health, Bethesda, MD, 2004-2005.

Honors and Awards

- Best Overall Abstract, Risk Assessment Specialty Section, Society of Toxicology, 2013.
- Top Ten Best Published Papers of 2012, Risk Assessment Specialty Section, Society of Toxicology, for the article "Hypothesis-Based Weight-of-Evidence Evaluation of Methanol as a Human Carcinogen."
- NIH/NHGRI Institutional Training Grant Award in Genomic Science, 1997-2001.

Selected Projects

Confidential Client: Assessed the toxicological significance and human health risks of exposure to per- and polyfluoroalkyl substances (PFAS) in drinking water and ambient air. Reviewed the literature regarding animal toxicology, human health effects, and chemical and environmental characteristics of PFAS, as well as the historical state of knowledge of these topics.

Industrial Client: Evaluated the potential for cancer and noncancer health effects from exposures to ethylene oxide in ambient air for individuals living near an industrial facility that used ethylene oxide.

US Government Agency: Evaluated human exposures and health risks from jet fuel release into a community drinking water source. Reviewed the literature on health effects of jet fuel and its constituents.

Health Care Company: Evaluated the potential cytotoxicity of a medical device by critically reviewing the experimental data and human clinical studies for the device and its components.

Law Firm: Evaluated potential associations between exposures to formaldehyde and methylenediphenyl diisocyanate emissions from application of spray foam insulation and respiratory health effects and multiple chemical sensitivity.

Manufacturing Companies: Reviewed the state of knowledge regarding asbestos exposures and health effects from the manufacture, installation, and repair of automotive friction products.

Manufacturing Company: Evaluated potential cancer risks from exposures to dioxins in ambient air for individuals residing near a copper recycling facility.

Industrial Client: Assessed toxicity and risks of methyl tert-butyl ether (MTBE) from tap water exposure, including evaluation of whether its metabolite, formaldehyde, can cause leukemia or other cancers by inhalation or oral exposure.

Waste Management Company: Evaluated exposures to hydrogen sulfide, dimethyl sulfide, and methyl mercaptan and potential health effects from these exposures in individuals residing near a municipal solid waste landfill. Evaluated potential odor impacts and the differences between odor perception and adverse health effects.

Railroad Company: Critically reviewed global gene expression profiling data for a population exposed to benzene and determined whether the expression profile could be used as a biomarker of benzene toxicity in a broader population, particularly without proof of benzene exposure from a specific source.

Energy Company: Evaluated potential toxicity and odor impacts of mercaptan compounds by comparing odor thresholds to health-based exposure limits.

Public Transportation Agency: Evaluated the potential for respiratory health effects from occupational use of a cleaning solution containing sulfuric and phosphoric acid.

Trade Organization: Summarized the literature regarding the potential reproductive, neurological, immunological, and carcinogenic effects of bisphenol A.

Health Care Company: Evaluated claims of associations between metals and fragrances in talc products and ovarian cancer, considering toxicological principles and best practices for evaluating causation.

Manufacturing Company: Evaluated the epidemiology and toxicology literature and conducted an exposure and risk assessment for cancer and non-cancer health effects of benzene, dioxin, and pentachlorophenol. Conducted a cluster analysis to determine whether individuals residing in an area with alleged exposures had increased rates of several cancers and non-cancer health effects.

Industrial Client: Evaluated the scientific basis for class certification in the context of property damage and medical monitoring for residents near a former zinc smelter site.

Industrial Client: Conducted weight-of-evidence evaluations of the potential carcinogenicity of inhalation exposure to trichloroethylene.

Law Firm: Developed a presentation on toxicology principles as part of a communication effort, using formaldehyde as an example chemical.

Trade Organization: Evaluated the basis for the American Conference of Governmental Industrial Hygienists (ACGIH) lowering the Threshold Limit Value for toluene diisocyanate.

Transportation Company: Evaluated whether occupational exposure to toluene diisocyanate *via* inhalation and dermal contact is a causal factor in acute myeloid leukemia.

Confidential Client: Compiled and reviewed studies regarding chemical-induced chromosome abnormalities to assess their potential association with acute myeloid leukemia.

Trade Organization: Critically reviewed the methodology and underlying toxicity data used as a basis for non-health-based occupational exposure limits (OELs) for bisphenol A and di- and triisocyanates and recommended health-based OELs in written comments to a European health agency.

Trade Organization: Critiqued draft templates for tabulating epidemiology and experimental animal study data for hazard identification proposed by the Developmental and Reproductive Toxicant Identification Committee (DARTIC) of California's Office of Environmental Health Hazard Assessment (CalOEHHA). Proposed an alternative set of tables to systematically present data for consideration in a full evidence integration process.

Industrial Client: Evaluated the state of the science as to the ability of asbestos in electrical products to cause mesothelioma and lung cancer.

Confidential Client: Conducted an analysis to evaluate the potential causality of various health symptoms from exposures to metals and odorous chemicals, including hydrogen sulfide, benzene, methane, and tert-butyl mercaptan.

Trade Organization: Evaluated best practices for evidence integration in National Ambient Air Quality Standards (NAAQS) Integrated Science Assessments (ISAs).

Trade Organization: Assessed whether a post-market skin patch epidemiology study should be used for risk assessment.

Trade Organization: Evaluated whether nickel should be classified as a reproductive or developmental toxicant under California EPA's Proposition 65.

Pharmaceutical Company: Evaluated the potential side effects and dose-response relationships for cosmetic botulinum toxin injections from reviews of clinical trials and FDA warning labels. Assessed whether claimed health effects in an individual were indicative of systemic toxicity.

State Environmental Agency: Conducted weight-of-evidence evaluations of the association between short-term and long-term ozone exposure and cardiovascular effects.

State Environmental Agency: Reviewed epidemiology, controlled human exposure, experimental animal, and mechanistic studies of ozone and markers of inflammation and oxidative stress.

Industrial Client: Evaluated the potential lung cancer risk from exposure to asbestos during vehicle brake repair and considered the association between cigarette smoking and lung cancer in comparison to that expected from asbestos exposure.

Trade Organization: Evaluated whether the weight of the evidence from epidemiology, controlled human exposure, and experimental animal studies supports ozone exposure as a causal factor in cardiovascular disease morbidity and mortality. This analysis used a causal framework developed at Gradient and was published in a peer reviewed journal.

Insurance Company: Evaluated whether exposure to asbestos can exacerbate chronic obstructive pulmonary disease (COPD) and examined the literature on the effects of smoking on COPD and its potential interaction with asbestos exposure.

Industrial Client: Reviewed the scientific literature spanning several decades to assess the state of knowledge regarding toxicity and exposure of asbestos in various industries, including knowledge of asbestos hazards on merchant ships.

Trade Organization: Conducted a critical review of the potential association between talc exposure and ovarian cancer.

Trade Organization: Reviewed and commented on the International Agency for Research on Cancer (IARC) Preamble, which summarizes the underlying scientific principles of the IARC Monographs, which evaluate the carcinogenic hazards of chemicals and other substances.

Chemical Company: Evaluated whether neural reflex activation is a plausible mode of action for respiratory toxicity caused by ozone exposure.

Trade Organization: Evaluated whether atherosclerosis development is a plausible mode of action for particulate matter-induced cardiovascular disease and whether this is supported by epidemiology evidence.

Trade Organization: Conducted a survey of nearly 50 weight-of-evidence frameworks to evaluate best practices for determining causation. Defined the key concepts of weight-of-evidence analyses and their application to particular problems, and articulated the best practices from among the spectrum of approaches.

Trade Organization: Evaluated whether the weight of epidemiology, animal toxicity, mechanistic, and pharmacokinetic evidence indicates that toluene diisocyanate is a human carcinogen. This analysis used Gradient's hypothesis-based weight-of-evidence approach and was published in a peer-reviewed journal.

Chemical Company: Assessed the potential toxicological and ecological effects of bisphenol A using a modification of the Green Screen method that was designed to advance the development of green chemistry. Modified the method to be risk-based, rather than hazard-based, by considering exposure information. For many endpoints, a weight-of-evidence approach was taken to integrate all the available data and to resolve conflicting information.

Trade Organization: Evaluated whether the weight of the evidence supports the plausibility of methanol as a causal factor in human lymphoma. This analysis used Gradient's hypothesis-based weight-of-evidence approach and was published in a peer-reviewed journal.

Trade Organization: Evaluated epidemiology and animal toxicity studies of styrene and their bearing on a weight-of-evidence analysis of whether styrene should be considered a human carcinogen. This work was submitted as written and oral testimony to the US National Toxicology Program and its Board of Scientific Councilors.

Trade Organization: Conducted a quantitative analysis of controlled human exposure studies to address whether there is a subset of individuals who are susceptible to health effects of ozone at particular exposure levels but whose response is obscured by analyzing data at the group level.

Chemical Company: Used Gradient's hypothesis-based weight-of-evidence approach to assess whether the epidemiology, toxicology, and mechanistic evidence supports chlorpyrifos being a neurobehavioral toxicant in humans at relatively low exposure levels.

Trade Organization: Conducted a weight-of-evidence review of epidemiology studies examining exposures to dioxins and dioxin-like compounds and thyroid hormone levels during early development.

Trade Organization: Assessed whether animal, mechanistic, and epidemiological data are consistent with the nickel ion bioavailability model, which asserts that the carcinogenicity of nickel-containing substances is based on the bioavailability of the nickel ion at nuclear sites of target respiratory epithelial cells.

Trade Organization: Classified, summarized, and entered relevant studies of lead into IUCLID (International Uniform Chemical Information Database) 5.2, a database for the intrinsic and hazard properties of chemical substances that companies can use to submit data under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) legislation in Europe.

Trade Organization: Provided written and oral comments on several occasions to US EPA on clinical and epidemiology studies and their bearing on US EPA's National Ambient Air Quality Standards (NAAQS) for ozone.

Trade Organization: Conducted a critical review and a weight-of-evidence assessment of causality based on animal carcinogenicity studies, mode-of-action studies, and occupational epidemiological studies of soluble nickel compounds and respiratory cancer risk.

Law Firm: Critically reviewed potential health effects associated with exposure to heating oil from a basement spill.

Trade Organization: Classified, summarized, and entered all relevant studies of bisphenol A into the toxicity section of IUCLID (International Uniform Chemical Information Database) 5, an electronic repository for the intrinsic and hazard properties of chemical substances that companies can use to submit data under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) legislation in Europe.

Consumer Product Company: Examined the underlying biological mechanisms for ionizing radiation-induced cancers, including those involving radiation in cigarettes.

Chemical Manufacturing Plant: Evaluated the toxicology and epidemiology literature regarding mercury and determined whether levels in residential soil were above background and likely attributable to a nearby manufacturing plant.

Industrial Client: Provided litigation support regarding health effects associated with lead for a case involving exposures in the vicinity of a smelter facility.

Industrial Client: Provided technical support in the evaluation of cost allocation issues at an industrial site. Reviewed information regarding the nature and extent of contamination within the site and assessed factors that could be evaluated to apportion costs among potentially responsible parties.

Industrial Company: Summarized literature on toxicity studies of perfluorinated alkane acids.

Confidential Client: Reviewed current data on background levels of trichloroethylene in the environment.

Confidential Client: Performed literature review of chemical associations and alternative causes of claimed health effects in individuals exposed to PCBs.

Publications – *Articles and Book Chapters*

Prueitt, RL; Drury, NL; Shore, RA; Boon, DN; Goodman, JE. 2024. "Talc and human cancer: A systematic review of the experimental animal and mechanistic evidence." *Crit. Rev. Toxicol.* doi: 10.1080/10408444.2024.2349668.

Boon, DN; Goodman, JE; Colonna, KJ; Espira, LM; Prueitt, RL. 2024. "A systematic review of the epidemiology evidence on talc and cancer." *Crit. Rev. Toxicol.* doi: 10.1080/10408444.2024.2351081.

Prueitt, RL; Meakin, CJ; Drury, NL; Goodman, JE. 2024. "Evaluation of neural reflex activation as a potential mode of action for respiratory and cardiovascular effects of fine particulate matter." *Inhal. Toxicol.* 36(3):125-144. doi: 10.1080/08958378.2024.2324033.

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Publications – *Abstracts*

Prueitt, RL; Hixon, ML; Goodman, JE. 2024. "Critical evaluation of immunotoxicity data used as the basis for a tolerable daily intake for bisphenol A." Society of Toxicology (SOT) 63rd Annual Meeting, Salt Lake City, UT, March 10-14.

Hixon, ML; Prueitt, RL; Goodman, JE. 2024. "Critical analysis of sperm parameter data used as the basis for a tolerable daily intake for bisphenol A." Society of Toxicology (SOT) 63rd Annual Meeting, Salt Lake City, UT, March 10-14.

Yeh, A; Kerper, LE; Prueitt, RL; Beck, BD. 2023. "Considerations in evaluating dermal absorption of per- and polyfluoroalkyl substances (PFAS)." Society of Toxicology (SOT) 62nd Annual Meeting, Nashville, TN, March 19-23.

Prueitt, RL; Li, W; Zhou, J; Goodman, JE. 2021. "Systematic Review of the Association Between Long-Term Exposure to Ambient Fine Particulate Matter and Mortality." Society of Toxicology (SOT) 60th Annual Meeting (virtual conference), March 14-18.

Prueitt, RL; Li, A; Chang, RY; Goodman, JE. 2020. "Systematic review of the potential respiratory carcinogenicity of metallic nickel in humans." Prepared for Society of Toxicology (SOT) 59th Annual Meeting, Anaheim, CA, March 15-19 (Conference cancelled).

Goodman, JE; Johnson, G; Prueitt, RL; Zu, K. 2019. "Systematically evaluating and integrating evidence in National Ambient Air Quality Standards (NAAQS) reviews." National Academies of Sciences, Engineering, and Medicine (NASEM) Evidence Integration Workshop, Washington, DC, June 3-4.

Zu, K; Goodman, JE; Prueitt, RL. 2019. "Strengthening the evaluation of mechanistic evidence categorized by the IARC 10 key characteristics of carcinogens." National Academies of Sciences, Engineering, and Medicine (NASEM) Evidence Integration Workshop, Washington, DC, June 3-4.

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Prueitt RL; Lynch, HN; Zu, K; Shi, L; Goodman, JE. 2018. "Evaluation of respiratory cancer risk from dermal exposure to toluene diisocyanate." Society of Toxicology (SOT) 57th Annual Meeting, San Antonio, TX, March 11-15.

Lynch, HN; Prueitt, RL; Mohar, I; Goodman, JE. 2018. "Critical evaluation of thresholds for respiratory effects of toluene diisocyanate." Society of Toxicology (SOT) 57th Annual Meeting, San Antonio, TX, March 11-15.

Prueitt, RL; Goodman, JE. 2017. "Mode-of-action Evaluation for Ozone-induced Respiratory Effects Through Activation of Neural Reflexes." Society of Toxicology (SOT) 56th Annual Meeting, Baltimore, MD, March 12-16.

Peterson, MK; Lemay, JC; Pacheco Shubin, S; Prueitt, R. 2017. "Comprehensive Multipathway Human Health Risk Assessment of Recycled Rubber in Synthetic Turf Applications." Society of Toxicology (SOT) 56th Annual Meeting, Baltimore, MD, March 12-16.

Prueitt, RL; Cohen, JM; Goodman, JE. 2016. "Evaluation of Atherosclerosis as a Mode of Action for the Cardiovascular Effects of Particulate Matter." Society of Toxicology (SOT) 55th Annual Meeting, New Orleans, LA, March 13-17.

Sax, SN; Pizzurro, DM; Zu, K; Lynch, HN; Prueitt, RL; Goodman, JE. 2015. "Ozone Exposure and Systemic Biomarkers: Evaluation of Evidence of Adverse Cardiovascular Health Impacts." Society of Toxicology (SOT) 54th Annual Meeting, San Diego, CA, March 22-26.

Prueitt, RL; Lynch, HN; Tabony, JA; Beck, NB; Goodman, JE; Rhomberg, LR 2015. "Evaluation of Study Quality Criteria Frameworks." Society of Toxicology (SOT) 54th Annual Meeting, San Diego, CA, March 22-26.

Goodman, JE; Lynch, HN; Prueitt, RL; Beck, NB; Tabony, JA; Rhomberg, LR. 2014. "Evaluation of Study Quality Criteria Frameworks." Society for Risk Analysis Annual Meeting, Denver, CO, December 7-10.

Sax, SN; Pizzurro, DM; Zu, K; Lynch, HN; Prueitt, RL; Goodman JE. 2014. "Weight-of-Evidence Evaluation of Short-term Ozone Exposure and Cardiovascular Biomarkers." Society for Risk Analysis Annual Meeting, Denver, CO, December 7-10.

Prueitt, RL; Sax, SN; Lynch, HN; Lemay, JC; King, JM; Goodman, JE. 2014. "Weight-of-Evidence Evaluation of Short-Term Ozone Exposure and Cardiovascular Effects." Society of Toxicology (SOT) 53rd Annual Meeting, Phoenix, AZ, March 23-27.

Lemay, JC; Prueitt, RL; Hixon, ML; Goodman, JE. 2013. "Distinguishing between Risks and Hazards: A Case Study of Bisphenol A." Society for Risk Analysis Annual Meeting, Baltimore, MD, December 8-11.

Sax, SN; Prueitt, RL; Goodman, JE. 2013. "Weight-of-Evidence Evaluation of Short-Term Ozone Exposure and Cardiovascular Effects." Society for Risk Analysis Annual Meeting, Baltimore, MD, December 8-11.

Goodman, JE; Prueitt RL; Rhomberg, LR. 2013. "Hypothesis-Based Weight-of-Evidence Evaluation of the Human Carcinogenicity of Toluene Diisocyanate." Isocyanates and Health Conference. April 3.

Prueitt, RL; Goodman, JE; Rhomberg, LR. 2013. "Hypothesis-based Weight-of-Evidence Evaluation of the Human Carcinogenicity of Toluene Diisocyanate." *Toxicologist* 132(1):415. Abstract No. 1951. Society of Toxicology (SOT) 52nd Annual Meeting, San Antonio, TX, March 10-14.

Prueitt, RL; Goodman, JE; Bailey, LA; Rhomberg, LR. 2012. "Hypothesis-Based Weight-of-Evidence Evaluation of the Neurodevelopmental Effects of Chlorpyrifos." Society of Toxicology (SOT) 51st Annual Meeting, San Francisco, CA, March 11-15.

Prueitt, RL; Goodman, JE. 2011. "Evaluation of Adverse Effects on Human Lung Function Caused by Ozone." *Toxicologist* 120(Suppl. 2):491. Abstract No. 2286. Society of Toxicology (SOT) 50th Annual Meeting, Washington, DC, March 6-10.

Haber, LT; Prueitt, RL; Goodman, JE; Thakali, S; Patterson, J. 2010. "Report of a Workshop: An Evaluation of Hypotheses for Determining the Carcinogenic Potential of Nickel-Containing Substances." Society for Risk Analysis Annual Meeting, Salt Lake City, UT, December 5-8.

Prueitt, RL; Goodman, JE; Thakali, S. 2010. "An Evaluation of Hypotheses for Determining the Carcinogenic Potential of Nickel-Containing Substances." Society of Toxicology (SOT) 49th Annual Meeting, Salt Lake City, UT, March 7-11.

Prueitt, RL; Goodman, JE; Dodge, DG; Thakali, S. 2009. "A Weight-of-Evidence Evaluation of the Carcinogenicity of Soluble Nickel." Society of Toxicology (SOT) 48th Annual Meeting, Baltimore, MD, March 15-19.

Prueitt, RL; Howe, TM; Ambs, S. 2006. "Nicotine-Induced Progression of Prostate Cancer through Activation of the Akt Signaling Pathway." American Association for Cancer Research 97th Annual Meeting, Washington, DC, April 1-5.

Boersma, BJ; Howe, TM; Prueitt, RL; Chanock, S; Ambs, S. 2004. "Breast Cancer Risk Associated with Allele Variant Genes in the Estrogen Pathway." American Association for Cancer Research 95th Annual Meeting, Orlando, FL, March 27-31.

Prueitt, RL; Ross, JL; Zinn, AR. 1999. "Identification of a Premature Ovarian Failure Candidate Gene." American Society of Human Genetics Annual Meeting, San Francisco, CA, October 19-23.

Zinn, AR; Prueitt, RL; Papenhausen, PR; Roberts, VL; Ross, JL. 1999. "Short Stature and Premature Ovarian Failure Loci in Proximal Xp." American Society of Human Genetics Annual Meeting, San Francisco, CA, October 19-23.

McDaniel, LD; Prueitt, RL; Probst, L; Schultz, RA. 1997. "Evaluation of the Roberts Syndrome Complementing Factor in a Transient Cell Fusion Assay." American Society of Human Genetics Annual Meeting, Baltimore, MD, October 28-31.

Presentations and Oral Testimony

Prueitt, RL. 2023. "Ethylene Oxide: A New Toxic Tort Battleground?" Panelist for presentation at the Defense Research Institute (DRI) Toxic Torts and Environmental Law Seminar, New Orleans, LA, April 26-28.

Prueitt, RL. 2022. Oral testimony on the proposed listing of bisphenol A as a chemical known to the State of California to cause cancer under Proposition 65. Presented to the Carcinogen Identification Committee (CIC) of the California EPA Office of Environmental Health Hazard Assessment (OEHHA) (virtual), December 14.

Prueitt, RL. 2022. Oral testimony on Illinois Environmental Protection Agency's proposed groundwater quality standards for per- and polyfluoroalkyl. Presented to the Illinois Pollution Control Board, Chicago, IL, December 7.

Prueitt, RL. 2022. "What's Next for Groundwater Claims: Emerging Contaminants and Related Litigation." Panelist for presentation at the Defense Research Institute (DRI) Toxic Torts and Environmental Law Seminar, Atlanta, GA, March 14-16.

Prueitt, RL. 2021. "Regulating PFAS as a Class." Panelist for presentation at the Chemical Watch PFAS Updates 2021 Virtual Conference, June 23.

Prueitt, RL. 2021. "PFAS 360: Risk Assessment Update." Panelist for presentation at the Association for Environmental Health Sciences (AEHS) Foundation 30th Annual International Conference on Soil, Water, Energy, and Air (virtual conference), March 24.

Prueitt, RL. 2021. "PFAS Updates." Presented at the North Atlantic Chapter of the Society of Environmental Toxicology and Chemistry (NAC-SETAC) Webinar Series, February 10.

Prueitt, RL. 2019. "Diagnosis and Pathogenesis of Mesothelioma: Genomics of Asbestos-related Cancer." Panelist for presentation at the Perrin Conferences National Asbestos Litigation Conference, San Francisco, CA, September 9.

Prueitt, RL. 2018. Oral testimony on the proposed listing of nickel and nickel compounds as reproductive toxicants under Proposition 65. Presented to the Developmental and Reproductive Toxicant Identification Committee (DARTIC) of the California EPA Office of Environmental Health Hazard Assessment (OEHHA), Sacramento, CA, October 11.

Prueitt RL. 2016. "Genetic Susceptibility in Toxic Tort Litigation." Panelist for presentation at the American Bar Association (ABA) 25th Annual Spring CLE Meeting: Trends in Toxic Torts and Environmental Law, Phoenix, AZ, April 7-9.

Prueitt, RL; Gold, SC. 2016. "The Holy Grail? The Potential of Genomics to Shape Toxic Tort Litigation." Presented at the DRI Toxic Torts and Environmental Law Seminar, New Orleans, LA, March 17-18.

Prueitt, RL. 2012. Oral testimony on the proposed rule for the National Ambient Air Quality Standards (NAAQS) for particulate matter. Presented to US EPA, Sacramento, CA, July 19.

Prueitt, RL. 2011. Oral testimony on the reconsideration of the 2008 primary ozone NAAQS. Presented to the US EPA Clean Air Scientific Advisory Committee (CASAC) Ozone Review Panel. February 18.

Prueitt, RL. 2010. Oral testimony on the proposed reconsideration of the 2008 NAAQS for ozone. Presented to US EPA, Houston, TX, February 2.

Prueitt, RL. 2009. Oral testimony on the proposed revisions to the NO_2 NAAQS. Presented to US EPA, Los Angeles, CA, August 6.

Attachment 2

***Curriculum Vitae* of Tim Verslycke, Ph.D.**

Tim Verslycke, Ph.D.
Principal
(he/him)
tverslycke@gradientcorp.com

Areas of Expertise

Ecotoxicology, ecological risk assessment, natural resource damage assessment, product stewardship, sustainability, emerging contaminants, endocrine disruptors, pharmaceuticals, personal care products.

Education

Ph.D., Applied Biological Sciences, Ghent University, Ghent, Belgium, 2003

M.S., Bioscience-engineering/Environmental Technology, Ghent University, Ghent, Belgium, 1999

B.S., Bioscience-engineering, Ghent University, Ghent, Belgium, 1996

Professional Experience

2007 – Present GRADIENT, Boston, MA
Principal. Ecotoxicology and ecological risk assessment, natural resource damage assessment, industrial and consumer product environmental safety assessment, and emerging contaminants.

2007 – 2019 WOODS HOLE OCEANOGRAPHIC INSTITUTION, Woods Hole, MA
Guest Investigator. Biology Department. Environmental toxicology studies.

2003 – 2007 WOODS HOLE OCEANOGRAPHIC INSTITUTION, Woods Hole, MA
Postdoctoral Researcher. Research on hormone signaling in marine animals and its potential disruption by chemical and other environmental stressors. National and international collaboration on research, protocol development, and policy-making for endocrine disruptors.

1999 – 2003 LABORATORY FOR ENVIRONMENTAL TOXICOLOGY AND AQUATIC ECOLOGY, GHENT UNIVERSITY, Ghent, Belgium
Ph.D. Researcher. Endocrine disruption studies using mysid shrimp. Laboratory research and field studies in Belgium, The Netherlands, and South Africa. Supervising students, teaching graduate-level courses in environmental toxicology and marine ecology, managing multi-stakeholder international projects on endocrine disruption, managing marine ecotoxicological research in the laboratory.

Professional Affiliations

Flanders Marine Institute (VLIZ Belgium); International Board of Environmental Risk Assessors (IBERA); International Society of Regulatory Toxicology and Pharmacology (ISRTP); Society for Risk Analysis (SRA); Society of Environmental Toxicology and Chemistry (SETAC); Society of Toxicology (SOT).

Professional Activities

- President, IBERA, 2023-2024.
- Vice-President, IBERA, 2020-2022.
- Founding Member, IBERA, 2020-2021.
- Member, US EPA Board of Scientific Counselors (BOSC), 2017-2022.
- Member, Steering Committee, SETAC's Global Endocrine Disruptor Testing and Risk Assessment (EDTRA) Advisory Group, 2014-2020.
- President, SETAC North Atlantic Chapter, 2013-2014.
- Member, Steering Committee, SETAC's Global Pharmaceutical Advisory Group, 2010-2013.
- Instructor, Short Course "Endocrine Disruptors: The Good, The Bad, and The Regulations." SETAC North Atlantic Chapter Annual Meeting, Freeport, ME, 2011.
- Participant, ISRTP conference on "The Endocrine Disruptor Screening Program: What Can Screening Results Tell Us About Potential Adverse Endocrine Effects?" NIH, Bethesda, MD, 2009.
- Participant, ISRTP conference on "Conducting and Assessing the Results of Endocrine Screening." NIH, Bethesda, MD, 2008.
- Expert input on marine pollution module of the e-learning projects "Expeditie Zeeleeuw" and "Planeet Zee," Flanders Marine Institute, Ostend, Belgium, 2004-2005.
- Participant, seminar on the use of mysid shrimp for endocrine disruptor studies, US EPA's Atlantic Ecology Division, Narragansett, RI, 2005.
- Instructor, three-day training seminar on the use of mysid shrimp for endocrine disruptor studies, US EPA's Gulf Ecology Division, Gulf Breeze, FL, 2004.
- Participant, Program Review of US EPA's Endocrine Disruptor Screening Program, North Carolina, December 2004.
- Research Assistant Representative, Department Board Faculty of Bioscience Engineering, Ghent University, Ghent, Belgium, 2002-2003.
- Scientific Advisor, Center for Health and Environment of the Flanders Regional Government, Brussels, Belgium, 2002-2003.
- Scientific Committee Member, Flanders Marine Institute, Ostend, Belgium, 2001-2003.

Projects – *Ecological Risk Assessment and Natural Resource Damage Assessment*

Environmental Trust Group: Provide an expert review of the scope of sediment, surface water, and biota sampling proposed in a long-term monitoring plan for a large contaminated estuary in the northeast.

Industrial Client, NY: Develop and implement a tissue biomonitoring plan for PCBs in finfish and crayfish to evaluate the performance and effectiveness of a planned remedial action.

Utility Client: Evaluated risks to human health and the environment associated with coal combustion residual (CCR) surface impoundments at six coal fired power plants in the Southern US.

Utility Client: Evaluated risks to human health and the environment at a closed CCR surface impoundment. Prepared report materials suitable to update regulatory agency, and aid in communication to the public.

Law Firm, FL: State of knowledge of natural resource damage (NRD) assessment and settlements from the late 1990s until the late 2000s. Evaluate potential NRD liability at a portfolio of US chemical sites.

Confidential Clients, NH, CT: Evaluating the impact of the presence of perfluorinated compounds (PFCs) at contaminated sites where PFC-containing products may have been used historically (*e.g.*, in fire fighting, hexavalent chromium-based plating or other operations).

PRP Group, NJ: Review chemical and ecological risk assessment data to support an equitable cost allocation at a large Superfund site containing tidal estuarine and marshland habitats.

Industrial Client, CT: At an industrial facility going through Connecticut's Voluntary Remediation Program, conducted a baseline ecological risk assessment (BERA) for a river and associated wetlands.

Industrial Client, CT: Evaluated the ecological protectiveness of a proposed sediment remedy for a fire protection pond impacted by historic polychlorinated biphenyl (PCB) contamination.

Industrial Client, CT: Evaluated the ecological protectiveness of a proposed sediment remedy for a drainage swale and associated wetlands impacted by historic PCB contamination.

Industrial Client, CT: Evaluated current and post-remedial ecological risks, following planned remediation to comply with Connecticut's Remediation Standard Regulations (RSRs), at a site impacted by historic PCB contamination.

Industrial Client, CT: At an industrial facility going through the Connecticut's Voluntary Remediation Program, evaluated ecological risks to nearby wetlands from historic wastewater discharges.

Industrial Client, NJ: At a coastal Superfund site in NJ impacted by metal slag materials, evaluated US EPA's human health and ecological risk assessments in order to determine the appropriateness of the proposed cleanup levels.

Industrial Client, NY: Supplied ecological risk assessment support for a sediment Superfund site with an extensive industrial history dating back to the 1800s. Reviewed historical site data, evaluated previous and ongoing ecological investigations and risk analyses. Our analyses will be used to support the basis of an equitable and scientifically defensible cost allocation.

Municipal Client, CT: Conducted a screening level ecological risk assessment (SLERA) to assess potential risks from groundwater discharge from a landfill to a nearby surface water. Metals and volatile organic compounds were evaluated in surface water, groundwater, and sediments and potential risks to aquatic receptors were determined. Results were used to design a sampling plan to fill data gaps.

Industrial Client, CT: Conducted a BERA for a site located near a large river and containing an active manufacturing facility, around 700 acres of undeveloped land, brooks, and wetlands. The BERA was accepted by the Connecticut Dept. of Energy and Environmental Protection (CTDEEP) and US EPA Region I, who agreed that no further remediation was required to address ecological risks.

Industrial Client, KY: Evaluated technical approaches for developing Alternate Concentrations Limits (ACLs) for groundwater to surface water discharge from a manufacturing facility located next to a large river. Reviewed existing groundwater data and evaluated the relative sensitivity of benthic *versus* pelagic organisms for key chemicals of concern at the facility. Reviewed current state-of-the-science on mixing of groundwater with surface water in the hyporheic zone.

Industrial Client,, NJ: Assisted with the development of sampling plans, conducted ecological risk assessments, and responded to US EPA and New Jersey Dept. of Environmental Protection (NJDEP) comments for a Superfund site surrounding a former paint manufacturing plant in Gibbsboro, New Jersey.

Industrial Client, Canada: Conducted an ecological risk assessment for environmental media affected by the historical presence of a preservative and estrogens in wastewater associated with a pharmaceutical manufacturing facility. Conducted a feasibility study to evaluate remedial options.

Industrial Client, CT: Evaluated ecological risks at a former aircraft engine testing facility. Results of a SLERA indicated the potential for ecological impacts in several upland areas, requiring further evaluation as part of a BERA. The SLERA and BERA were approved by CTDEEP and formed the basis for selecting the final remedy.

Industrial Client, CT: Evaluated risks to ecological receptors in a brook adjacent to a closed landfill at a former manufacturing facility for aircraft engines and components. Site-specific bioavailability and sediment toxicity were collected and results were used to develop a remedial action plan that was approved by CTDEEP and US EPA. Assisted with the preparation of a request for a site-specific Surface Water Protection Criterion that was accepted by CTDEEP.

Industrial Client, CT: Evaluating risks to ecological receptors at a large industrial manufacturing facility going through voluntary remediation in CT. To support the ERA, we are evaluating existing site data, identifying data gaps, developing and overseeing additional data collection, conducting the risk assessment, and assisting with agency negotiations.

Utility Company, WI: Evaluated the technical basis for a proposed Natural Resource Damages (NRD) settlement offer at a Great Lakes Superfund site. Performed a benchmarking analysis to quantitatively compare NRD settlements at other sediment sites to our client's offer. Our analysis considered the nature and extent of the ecological harm, as well as our client's potential role in causing the harm.

Montana Environmental Trust Group, MT: In coordination with state (*e.g.*, Montana Department of Environmental Quality) and federal (*e.g.*, US EPA, US FWS) beneficiaries and as part of a RCRA facility investigation, performed a BERA for a former lead smelter site in East Helena, Montana.

Industrial Client, CT: As part of review of the effectiveness of a Superfund remedy, and at the request of US EPA and CTDEEP, reviewed historical fish metal and PCB tissue data and coordinated additional fish tissue sampling in a pond at an old landfill. Additional tissue data were used to evaluate population-level effects in fish, higher trophic level ecological receptors, and human health.

Aircraft Manufacturer, CT: Assisted in preparing a response letter to US EPA to provide the technical basis for selection of a targeted set of chemicals of concern (COCs) to be carried forward for the development of Media Protection Standards (MPS) at a former aircraft manufacturing site. Conducted sediment triad studies to support the development of site-specific MPS values. Conducted a Corrective Measures Study (CMS) and assisted with the development of pre-design data to support an ecological risk-based wetland remedy.

Utility Company, WI: Prepared comments on US EPA's proposed Superfund site remedy, including a large sediment component driven by ecological concerns, for non-aqueous phase liquid (NAPL) and polycyclic aromatic hydrocarbon (PAH) impacts from historical wood treatment plant and manufactured gas plant (MGP) operations. Our comments were submitted to US EPA for consideration prior to a final remedy selection in the record of decision.

Research Organization Sponsored by Power Utility Companies: Prepared a summary of the risks of selenium to organisms in aquatic and sediment environments, including a review of case studies where selenium from coal ash caused documented adverse ecological impacts. Our report, which provides ecological risk assessment resources for selenium, is part of a larger reference library that is made available to all members of the utility company consortium.

Water Supplier, New Zealand: At the request of New Zealand's largest company in the water and wastewater industry, developed a risk-based discharge limit for the pesticide methoprene at its Mangere wastewater treatment plant. Methoprene is used to control insect (midge) nuisance from the plant to the surrounding local community. Presented our analysis and proposed discharge limit to the relevant regulatory authority, which was subsequently approved.

Industrial Client, CT: To comply with RCRA Corrective Action requirements, performed an ecological risk assessment for terrestrial and aquatic receptors potentially exposed to contaminants in soil, surface water, and sediment. Reviewed historical data, developed a conceptual site model, and designed a comprehensive sampling program to fill data gaps. Based on the site-specific data, evaluated contaminant bioavailability and ecological risk-based cleanup levels for the proposed remediation. Our risk assessment was prepared for CTDEEP review as a component of the remedy negotiations.

Energy Services Company, Brazil: Conducted a complex human and ecological risk assessment in a marine setting to define the need for remedial actions associated with a former barite mine in South America. The project included design and oversight of field sampling, dietary surveys, and presentation of the risk assessment results to regional regulators.

Industrial Client, CT: At a plant under RCRA Corrective Action requirements, developed a soil and sediment remedial strategy. Evaluated risks to terrestrial and aquatic receptors from exposure to metals, PCBs, and PAHs in soil, surface water, and sediment. Examined bioavailability and considered contribution from multiple urban background sources to develop a health-protective and cost-effective solution. The approach was presented to the CTDEEP.

Industrial Client, CT: Performed an ecological risk assessment (ERA) of a former aircraft manufacturing facility, defining the need for sediment and wetland soil remediation in accordance with RCRA Corrective Action requirements. Designed and implemented a sampling program that resulted in an approved performance-based remedy without the need for the development of numerical cleanup goals or delineation sampling.

Projects – *Product Environmental Safety, Environmental Stewardship*

Asian Trade Association: Provide technical support with environmental exposure modeling and meetings with the environmental authorities related to the use of a fuel constituent in China.

US Trade Association: Conducted a literature review to evaluate the current state of science of microplastics with a focus on coatings-related microplastics.

Global Chemical Company: Evaluated the human and environmental safety of three titanium dioxide by-products sold for beneficial reuse at a European manufacturing facility.

Global Personal Care Products Company: Conducted an ecological risk assessment and a review of environmental monitoring data for 1,4-dioxane.

Washington State Department of Ecology: Prepared GreenScreen® assessments to support a safety evaluation of three chemicals, which will be used by the state to assist companies in identifying and selecting safer chemical alternatives. The assessment profiles were published on the Interstate Chemicals Clearinghouse (IC2) database.

Global Chemical Company: Prepared GreenScreen® assessments to support a safety evaluation of different wood preservative alternatives.

Global Personal Care Products Company: Conducted an ecological risk assessment associated with the use of an antimicrobial soap in the US and EU.

Global Personal Care Products Company: Evaluated human health risks from potential exposure to triclosan *via* land-applied biosolids.

Global Personal Care Products Company: Reviewed published studies on the potential effects of triclosan on fish, conducted a state-of-the-science review of the toxicological mode of action of triclosan in ecologically-relevant species, and identified important areas of ongoing and future research.

Global Energy Services Company: Evaluated the environmental safety of hydraulic fracturing fluid components to be used in Australia.

Chemical Manufacturer: To evaluate the potential environmental impacts of amending an over-the-counter drug monograph for a sunscreen ingredient, performed a US FDA-compliant environmental assessment. Leveraged existing data to recommend a cost-effective environmental testing approach for the same ingredient under Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

Global Energy Services Company: Led project assessing a comprehensive relative hazard evaluation system developed by the client for scoring and ranking its products. Reviewed all aspects of the system and developed a sensitivity analysis to assess possible alternative approaches.

Global Cleaning Products Manufacturer: Developed a user-friendly guide defining potential adverse impacts on biological treatment systems (*e.g.*, waste water treatment plant failures) due to disposal of used cleaning products. The client used the guide to communicate best practices to its customers.

Trade Association: Assessed the relative ecotoxicity of vegetable oils to petroleum oils. Developed a robust literature-based assessment and compared regulatory requirements for the safe handling of both product groups.

Global Personal Care Products Company: Managed the development of a protocol to assess environmental risks associated with their ingredient portfolio.

Projects – *Pharmaceuticals*

Pharmaceutical Supply Chain Initiative (PSCI): Developed a set of user-friendly tools for predicting active pharmaceutical ingredient (API) concentrations in different environmental media following different discharge scenarios.

Self: Provided public comments on EMA's proposed revision of its guideline on the environmental risk assessment of human medicines.

Global Veterinary Pharmaceutical Company: Assisted with responding to US FDA comments on an Environmental Impact Assessment of a broad-spectrum antiparasitic drug used to treat cattle.

Multiple Pharmaceutical Companies: Designed and oversaw environmental fate and ecotoxicity testing to support EMA and/or US FDA submissions of a wide range of new human drugs, including hormone replacement, pain management, cholesterol management, depression management, diabetes management, and antimicrobial drugs. Prepared EMA and US FDA-compliant environmental assessments and responded to EMA and US FDA comments.

Global Pharmaceutical Company: Developed a streamlined, yet environmentally-protective, approach for estimating Predicated No Effect Concentrations (PNECs) for APIs that lack environmental toxicity data.

Global Pharmaceutical Company: Developed a screening framework to identify potential risk-driving APIs ("surrogate APIs") that could be used to define the need for and extent of remediation at a former drug synthesis facility. Our approach was accepted by the state.

Global Pharmaceutical Company: Developed protocol to generate environmental fate and effects data required for APIs for international drug registration, environmental risk assessments, and setting effluent compliance criteria.

Global Pharmaceutical Company: Developed a new fish estrogen receptor (ER) *in vitro* binding assay in collaboration with the Woods Hole Oceanographic Institution. Assay was used to evaluate the estrogenicity of individual APIs and API manufacturing plant effluents. Performance of fish ER assay was also evaluated against the E-SCREEN assay.

Global Pharmaceutical Company: Conducted an environmental assessment of risks associated with the use of a pharmaceutical compound to treat river blindness in Africa.

Projects – *National Ambient Air Quality Standards (NAAQS)*

Trade Association: Attended several Clean Air Scientific Advisory Committee (CASAC) meetings related to the policy assessment for the review of the secondary NAAQS for oxides of nitrogen, oxides of sulfur (NO_x/SO_x) and particulate matter (PM). Developed a summary of the key discussion topics presented during this meeting.

Trade Association: Attended a US EPA workshop on policy-relevant science organized to inform US EPA's review of the secondary NAAQS for NO_x/SO_x. Developed a summary of the key discussion topics presented during this meeting.

Trade Association: Conducted an independent scientific analysis of the welfare risk and exposure assessment and the policy assessment, which were used to support US EPA's proposed rule for ozone. Submitted written comments and provided public testimony to CASAC.

State Environmental Agency: Organized and participated in a workshop focused on the scientific evidence for ozone effects and the societal implications of lowering the ozone NAAQS.

State Environmental Agency: As part of US EPA's NAAQS review for ozone, assisted the agency with written comments on the welfare risk and exposure assessment and the policy assessment.

Projects – *Regulatory Comment*

Self: Provided public comments on the European Medicines Agency's 2018 proposed revision of its 2006 guideline on the environmental risk assessment of human medicines.

Environmental Professionals' Organization of Connecticut (EPOC): Reviewed a proposed amendment to the Significant Environmental Hazard Notification Statute for remediation sites in Connecticut. As part of our review, we evaluated the potential policy implications of the proposed amendment and the scientific basis of an analysis conducted by the Connecticut Dept. of Health in support of the amendment. Gradient's comments were submitted to CTDEEP.

Non-profit, Washington: For the Common Sense Alliance, prepared comments on proposed changes to critical areas ordinances for wetlands and fish and wildlife habitat conservation areas in San Juan County, Washington. Our comments focused on consistency of the proposed changes with existing regulations and regulatory guidance, the use of best available science, and the need and effectiveness of the proposed measures. Our comments were submitted to the San Juan County Council.

Environmental Professionals' Organization of Connecticut (EPOC): Reviewed proposed revisions to CTDEEP's Remedial Standard Regulations. Assessed the scientific basis of proposed groundwater volatilization and surface water protection criteria for petroleum hydrocarbon fractions. Our analysis and comments were submitted to CTDEEP.

Global Energy Services Company: Reviewed NY's proposed guidelines for regulating natural gas hydraulic fracturing (HF) fluid additives and prepared a risk assessment for multiple potential spill and migration pathways. Our work was submitted to New York State Department of Environmental Conservation (NYSDEC) as part of the public comment process, to US EPA in response to its Request for Information to inform its national HF study, and presented at technical workshops on HF convened by US EPA.

Projects – *Endocrine Disruptors*

European Trade Association: Compiled relevant information regarding the endocrine disruption potential of hydrocarbons and petroleum substances following the 2018 European Chemicals Agency (ECHA)/European Food Safety Authority (EFSA) "Guidance for the identification of endocrine disruptors in the context of Regulations (EU) No 528/2012 and (EC) No 1107/2009".

Society of Environmental Toxicology and Chemistry (SETAC) Pellston® Workshop: Invited expert participant in a 2016 workshop called "Guidance for Environmental Hazard and Risk Assessment Approaches for Endocrine-Active Chemicals (GEHRA): A Case Studies Approach."

US EPA – Office of Science Coordination and Policy: Served as co-author and lead technical expert on the Integrated Summary Report (ISR) of the Invertebrate (Mysid) Two-Generation Toxicity Test that was being proposed as a Tier 2 testing assay under US EPA's Endocrine Disruptor Screening Program.

Global Pharmaceutical Company: Developed a new fish ER *in vitro* binding assay. The assay was used to screen new APIs and environmental samples.

Belgian-American Educational Foundation Fellowship: Research project using a mode-of-action approach to understanding early-life stage effects and critical time windows of exposure in endocrine disruptor studies with mysid crustaceans.

Ocean Life Institute Postdoctoral Fellowship at Woods Hole Oceanographic Institution (WHOI): Research project on hormonal regulation and disruption of early development, molting, growth, and reproduction of crustaceans.

Federally Funded Research Project in Belgium (OSTC-PODO II): ENDIS-RISKS/Endocrine disruption in the Scheldt Estuary: distribution, exposure, and effects.

European Research Project: *In vivo* and *in vitro* evaluation of endocrine-disrupting compounds with invertebrate model organisms.

Ghent University Research Fund Project: Analytics and metabolization studies with endocrine disruptors (natural hormones and xenobiotics) in aquatic invertebrates.

European Research Project: The energy metabolism of the estuarine mysid *Neomysis integer* (Crustacea, Mysidacea) as a biomarker for endocrine disruption in estuaries.

Bilateral Research Project between Belgium and South Africa: Development of routine biological test methods for the assessment of endocrine-disrupting compounds in the environment, a complementary approach using *in vivo* and *in vitro* test endpoints.

Projects – *Expert Testimony & Litigation Support*

Law Firm: Evaluated the historical scientific state of knowledge of perfluoroalkyl and polyfluoroalkyl substances (PFAS) bioaccumulation and ecotoxicity. Prepared expert reports and provided expert testimony in deposition.

Law Firm: In the context of a RCRA citizen suit, prepared an expert report and provided expert testimony regarding the likely ecological protectiveness of a proposed remedy for treating conductivity in surface mine discharges in West Virginia.

Law Firm: In the context of a RCRA citizen suit, provided expert witness services regarding potential environmental risks associated with seeps and other releases resulting from historic disposal of glass manufacturing waste.

Law Firm: For a Natural Resource Damages (NRD) case at an oil refinery in the Caribbean, provided expert witness services regarding potential damages to marine ecological receptors.

Law Firm: Prepared an expert report regarding potential post-remediation impacts of chloride and total dissolved solids (TDS) in wastewater pond sediments on nearby vegetation.

Chemical Manufacturer: Provided technical support to evaluate potential sources of synthetic organic chemicals found in processed brine shrimp.

Law Firm: Prepared an expert report and provided expert testimony regarding ecologically-based clean-up criteria for an active natural gas exploration site in Texas.

Law Firm: Prepared expert report in a case before the Commonwealth of Pennsylvania Environmental Hearing Board. The work involved evaluating ecological risks following a potential spill of coal combustion byproducts during river transport.

Law Firm: Prepared an expert report and sworn deposition in a trespass and negligence case in the Atascosa County District Court in Texas. The work involved evaluating ecological risks at a power plant and associated lignite mine.

Projects – *Coastal/Marine Environmental Research*

New England Lobster Initiative Grant: A molecular approach to understanding lobster shell disease.

MIT Sea Grant: Development and *in situ* validation of *in vitro* assays for pesticides in coastal waters.

Woods Hole Sea Grant: Identifying differentially-expressed genes in shell-diseased *versus* healthy American lobster, *Homarus americanus*.

Ocean Life Institute Project at WHOI: Diapause regulation in marine copepods.

Publications – *Peer Reviewed*

Mebane, CA; Sumpter, JP; Fairbrother, A; Augspurger, TP; Canfield, TJ; Goodfellow, WL; Guiney, PD; LeHuray, A; Maltby, L; Mayfield, DB; McLaughlin, MJ; Ortego, LS; Schlekat, T; Scroggins, RP; Verslycke TA. 2019. "Scientific Integrity Issues in Environmental Toxicology and Chemistry: Improving Research Reproducibility, Credibility, and Transparency." *Integr. Environ. Assess. Manag.* 15(3): 320-344.

Fairbrother, A; Muir, D; Solomon, KR; Ankley, GT; Rudd, MA; Boxall, ABA; Apell, JN; Armbrust, KL; Blalock, BJ; Bowman, SR; Campbell, LM; Cobb, GP; Connors, KA; Dreier, DA; Evans, MS; Henry, CJ; Hoke, RA; Houde, M; Klaine, SJ; Klaper, RD; Kullik, SA; Lanno, RP; Meyer, C; Ottinger, MA; Oziolor, E; Petersen, EJ; Poynton, HC; Rice, PJ; Rodriguez-Fuentes, G; Samel, A; Shaw, JR; Steevens, JA; Verslycke, TA; Vidal-Dorsch, DE; Weir, SM; Wilson, P; Brooks, BW. 2019. "Toward sustainable environmental quality: Priority research questions for North America." *Environ. Toxicol. Chem.* 38(8):1606-1624.

Marty, MS; Blankinship, A; Chambers, J; Constantine, L; Kloas, W; Kumar, A; Lagadic, L; Meador, J; Pickford, D; Schwarz, T; Verslycke, T. 2017. "Population-relevant endpoints in the evaluation of endocrine-active substances (EAS) for ecotoxicological hazard and risk assessment." *Integr. Environ. Assess. Manag.* 13(2):317-330.

Matthiessen, P; Ankley, GT; Biever, RC; Bjerregaard, P; Borgert, C; Brugger, K; Blankinship, A; Chambers, J; Coady, KK; Constantine, L; Dang, Z; Denslow, ND; Dreier, DA; Dungey, S; Gray, LE; Gross, M; Guiney, PD; Hecker, M; Holbech, H; Iguchi, T; Kadlec, S; Karouna- Renier, NK; Katsiadaki, I; Kawashima, Y; Kloas, W; Krueger, H; Kumar, A; Lagadic, L; Leopold, A; Levine, SL; Maack, G; Marty, S; Meador, J; Mihaich, E; Odum, J; Ortego, L; Parrott, J; Pickford, D; Roberts, M; Schaefers, C; Schwarz, T; Solomon, K; Verslycke, T; Welter, L; Wheeler, JR; Williams, M; Wolf, JC; Yamazaki, K. 2017. "Recommended approaches to the scientific evaluation of ecotoxicological hazards and risks of endocrine-active substances." *Integr. Environ. Assess. Manag.* 13(2):267-279.

Verslycke, T; Mayfield, DB; Tabony, JA; Capdevielle, M; Slezak, B. 2016. "Human health risks of triclosan in land-applied biosolids." *Environ. Toxicol. Chem.* 35(9):2358-2367.

Verslycke, T; Reid, K; Bowers, T; Thakali, S; Lewis, A; Sanders, J; Tuck, D. 2014. "The Chemistry Scoring Index (CSI): A hazard-based scoring and ranking tool for chemicals and products used in the oil and gas industry." *Sustainability* 6:3993-4009.

Boxall, ABA; Rudd, MA; Brooks, BW; Caldwell, DJ; Choi, K; Hickmann, S; Innes E; Ostapyk, K; Staveley, JP; Verslycke, T; Ankley, GT; Beazley, KF; Belanger, SE; Berninger, JP; Carriquiriborde, P; Coors, A; DeLeo, PC; Dyer, SD; Ericson, JF; Gagné, F; Giesy, JP; Gouin, T; Hallstrom, L; Karlsson, MV; Larsson, DGJ; Lazorchak, JM; Mastrocco, F; McLaughlin, A; McMaster, ME; Meyerhoff, RD; Moore, R; Parrott, JL; Snape, JR; Murray-Smith, R; Servos, MR; Sibley, PK; Oliver Straub, J; Szabo, ND; Topp, E; Tetreault, GR; Trudeau, VL; Van Der Kraak, G. 2012. "Pharmaceuticals and personal care products in the environment: What are the big questions?" *Environ. Health Perspect.* 120(9):1221-1229.

Tarrant, AM; Franks, DG; Verslycke, T. 2012. "Gene expression in American lobster (*Homarus americanus*) with epizootic shell disease." *J Shellfish Res* 31(2):505-513.

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Poelmans, S; Verslycke, T; Monteyne, E; Noppe, H; Verheyden, K; Janssen, CR; De Brabander, HF. 2006. "Testosterone metabolism of *Neomysis integer* following exposure to benzo(a)pyrene." *Comp. Biochem. Physiol. B: Biochem. Mol. Biol.* 144(4):405-412.

Verslycke, T; Goldstone, JV; Stegeman, JJ. 2006. "Isolation and phylogeny of novel cytochrome P450 genes from tunicates (*Ciona* spp.): A CYP3 line in early deuterostomes?" *Mol. Phylogenet. Evol.* 40(3):760-771.

Ghekiere, A; Verslycke, T; Janssen, CR. 2006. "Effects of methoprene, nonylphenol and estrone on the vitellogenesis of the mysid *Neomysis integer*." *Gen. Comp. Endocrinol.* 147(2):190-195.

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Verslycke, T; Reid, K. 2015. "Hazard *versus* Risk Assessment of Endocrine Disruptors: A Communications Challenge." Presented at the SETAC Europe 25th Annual Meeting, Barcelona, Spain, May 3-7.

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Presentations – *Selected Posters*

Bamgbose, I; Vo, J; Verslycke, T. 2024. "A Refined Read-Across Approach to Support Environmental Assessment of Data-Poor Pharmaceuticals." Poster # 3.20.P-Th34 5. Presented at the SETAC Europe 34th Annual Meeting, Seville, Spain, May 5-9.

Verslycke, T; Bamgbose, IA. 2023. "An Updated Concordance Assessment of Predicted No-Effect Concentration (PNEC) Aquatic Toxicity Data for Pharmaceuticals." Poster # 3.13.P-We157. Presented at the SETAC Europe 33rd Annual Meeting, Dublin, Ireland, April 30-May 4

Rominger, JT; Verslycke, T; Hoque, WT. 2023. "Comparing the Sensitivity of Predicted Environmental Concentrations of Pharmaceuticals Using Empirical and Quantitative Structure-Activity Relationship (QSAR)-Derived Physico-chemical Parameters." Poster # 3.02.P-Tu142. Presented at the SETAC Europe 33rd Annual Meeting, Dublin, Ireland, April 30-May 4

Verslycke, T; Lewis, AS; Manidis, T; Lyon, D; Synhaeve, N; Hinkal, G; Saunders, L; Villalobos, SA; Colvin, K. 2023. "Screening Assessment of Endocrine Disruption Properties of a Large Portfolio of Petroleum-Related UVCB Substances." Poster # 4.05.P-We301. Presented at the SETAC Europe 33rd Annual Meeting, Dublin, Ireland, April 30-May 4.

Bamgbose, IA; Verslycke, T. 2022. "Environmental Assessment for Human Drug Approval: An Outdated Technical Framework?" Abstract/Poster ID #: P521. Presented at the American College of Toxicology (ACT) 43rd Annual Meeting 2022, Denver, CO, November 13-16.

Bamgbose, IA; Mohar, I; Verslycke, T. 2020. "Are Existing Environmental Assessment Approaches Appropriate for Novel Drug Products?" Presented at the American College of Toxicology (ACT)'s 41st Annual Meeting, Austin, TX, held virtually November 12-19.

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Other Publications

Verslycke, T; Mayfield, D. 2019. "Cultivating Scientific Integrity." *Gradient Trends – Risk Science & Application* 76(Fall):1-2.

Lemay, J; Verslycke, T. 2019. "Is Urban Background an Urban Myth." *Gradient Trends – Risk Science & Application* 74(Winter):4.

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Vandenbergh, G; Verslycke, T; Janssen, CR; De Coen, W; Comhaire, F; Dhooge, W; Callebaut, K. 2001. "Evaluation of the Impact of Endocrine Disruptors on the North Sea Ecosystem: Final Report." Plan for Scientific Support for A Policy of Sustainable Development (DWTC - PODO II), Program "Sustainable Management of the North Sea."

Versonnen, B; Arijs, K; Vandenbergh, G; Du Four, V; Verslycke, T; Janssen, CR. 2000. "Community Program of Research on Environmental Hormones and Endocrine Disrupters (COMPREHEND)." Technical report on *in situ* exposures in Belgium.

Awards

- SETAC Exceptional Paper Award, 2020.
- Best Risk Assessment Poster Award, Annual Society of Toxicology Meeting, 2009.
- Highlighted paper in Ecotoxicology and Environmental Safety, 2007.
- Belgian American Educational Foundation (BAEF) Postdoctoral Research Fellowship, 2005-2006.
- Annual Flanders Marine Institute (VLIZ) North Sea Award for Ph.D. Thesis, 2004.
- Woods Hole Oceanographic Institution Postdoctoral Scholarship, 2003-2004.
- SETAC North America Student Travel Award, 2002.
- Best poster award Flanders Marine Institute (VLIZ) Young Scientists' Day, 2001.

Other Qualifications

Reviewer

- *Aquatic Toxicology*; *Journal of Experimental Marine Biology and Ecology*; *Steroids*; *Ecotoxicology and Environmental Safety*; *Integrative and Comparative Biology*; *Pesticide Biochemistry and Physiology*.

Session Chair

- "Advances in Environmental Risk Assessment and Management of Pharmaceuticals in the Environment." Co-chair with Ericson J (Pfizer), Silverman K (Merck), Mills M (US EPA), and Erikson C (US FDA) at SETAC North America 30th Annual Meeting, November 7-11, 2010, Portland, OR.
- "Pharmaceuticals in the Environment." Soils, Sediments and Water 24th Annual Conference, October 23, Amherst, MA.
- "Endocrine Disruption in Invertebrates: History, Regulation and Future Research." Co-chair with Meiller J. (US EPA) at SETAC North America 26th Annual Meeting, November 13-17, 2005, Baltimore, MD.

Languages

Dutch (native proficiency), English (bilingual proficiency), French (limited working proficiency), German/Portuguese/Spanish (elementary proficiency)

EXHIBIT H

Vitale Expert Report

Due to size restrictions attachments A-1, A-2 and A-3 were not included in the electronic version. These were included in the hard copy of the Exhibits filed with MPCA.

ENVIRONMENTAL® STANDARDS
Montrose Environmental Group

Date: August 27, 2024

Expert Report of Rock J. Vitale, CEAC – Environmental Standards, Inc.[1]

Subject: Response to MPCA Proposed Intervention Limits for 3M's Cottage Grove, Minnesota facility, Calendar Average and Daily Maximum

Attachments: A1) Wastewater Discharge Draft Permit Analytical Review (PFOS) (May 7. 2024)
A2) Response to MPCA Letter– PFOA & PFHxS RL Data (May 17, 2024)
A3) Curriculum Vitae for Rock J. Vitale, CEAC

Overview

Environmental Standards, Inc. (Environmental Standards) was retained to serve as a subject-matter chemistry consultant in connection with the 3M Chemical Operations LLC's (3M) application for a National Pollutant Discharge Elimination System (NPDES) to be issued by the Minnesota Pollution Control Agency (MPCA) for 3M's Cottage Grove, Minnesota facility. This permit will establish limits applicable to an advanced water treatment system currently under construction at the Cottage Grove Facility (the "Advance Water Treatment System").

In January 2024, MPCA provided 3M with a pre-publication notice draft of a proposed permit. Environmental Standards provided analysis of the demonstrated limits of measurement for three PFAS for which final effluent limits were proposed (PFOS, PFOA, and PFHxS). The results of these analyses were provided to MPCA on May 7, 2024 (Attachment A1) and May 17, 2024 (Attachment A2).

On July 1, 2024, MPCA published for public comment a draft NPDES permit (Draft Permit) that included in addition to effluent limits applicable to discharge at the permitted discharge points, so called "Intervention Limits" for PFOS, PFOA, and PFHxS. The Draft Permit requires 3M to sample wastewater at various locations within the wastewater treatment system. If water sampled at these designated locations[2] contains concentrations for PFOS, PFOA or PFHxS above the Intervention Limit values, the Draft Permit requires 3M to take specified actions.

Environmental Standards was asked to assess whether the proposed final effluent limits and intervention limits are below the ability of current analytical measures to reliably and consistently measure. As discussed below, in my professional opinion they are.

[1] A copy of Mr. Vitale's CV is attached as Attachment A3.
[2] These locations are identified in the Draft Permit as sampling locations WS 001 and WS 002.

Background

The analytical techniques used by a laboratory to identify and quantify chemical constituents in samples are referred to as “methods.” The Draft Permit identifies EPA Method 1633 as a preferred analytical technique for the analysis of PFAS to demonstrate compliance with proposed permit limits. In its initial engagement, Environmental Standards was asked to assess the concentration at which the EPA Method 1633 (Revision 5), is capable of measuring PFOS.

The lowest level at which a numerical value is considered acceptable (i.e. quantitatively reliable) under an analytical method is called the reporting limit (RL), limit of quantitation (LOQ) or the method limit (ML). These terms are synonymous for purposes of this report. Method 1633 establishes the statistical criteria for evaluating the RL for each analytical run.

The US EPA has acknowledged RLs for PFOS and PFOA vary to a limited extent from laboratory to laboratory. For example, EPA has identified a “Practical Quantitation Limit (PQL)” that essentially represents the RL that at least 75% of the surveyed commercial laboratories can achieve using the analytical methods used for drinking water (Method 537.1 and Method 533). For PFOA and PFOS, EPA determined that this PQL is 4.0 ng/L (*Federal Register*, Volume 88 Number 60, March 2023). Other regulatory agencies use the same approach to determine PFAS PQLs.[3] The State of New Jersey has established the PFOS PQL as 4.0 ng/L ([Interim Practical Quantitation Level (PQL) determination to support Interim Specific Ground Water Quality Standard development for Perfluorooctane Sulfonate (PFOS) New Jersey Department of Environmental Protection Division of Science and Research]).

The sample-specific RL for any analytical run using Method 1633 can be influenced by multiple factors, including other chemicals in the sample being analyzed and any sample-specific dilutions that may be required [4]. To estimate the RL that should be achievable when the Advanced Water Treatment System currently under construction is fully optimized, 3M requested that Environmental Standards analyze the actual data generated from the analysis of Cottage Grove water that has been treated by the existing granular activated carbon systems in Building 92 and Building 185. It is my opinion that the analytical results of samples of this water from an accredited PFAS proficient laboratory using Method 1633 provide a reasonable basis

[3] For example, for the State of New Jersey, the PFOS PQL is listed as 4.0 ng/L ([Interim Practical Quantitation Level (PQL) determination to support Interim Specific Ground Water Quality Standard development for Perfluorooctane Sulfonate (PFOS) New Jersey Department of Environmental Protection Division of Science and Research]). Furthermore, the US EPA also specifies a PQL of 4 ng/L (Proposed PFAS National Primary Drinking Water Regulation FAQs for Drinking Water Primacy Agencies Overview).

[4] In some instances, samples contain non-target compounds that will interfere with the successful analysis for target compounds and as such the sample must be first diluted prior to analysis to minimize the detrimental effects off these non-target compounds interferences.

[5] When contract laboratories for analytical support, 3M has a systematic process of procuring analytical services utilizing rigorous technical, service and quality requirements. Furthermore, once under contracts, analytical service providers are required to under periodic on-site audits, periodic performance testing and their data subject to critical Level 4 data validation.

for estimating the expected RL achievable for water treated by the Advanced Water Treatment System.[5]

3M provided Environmental Standards with 12 months of such data for PFOS, PFOA, and PFHxS. The statistical analyses of PFOS data were first completed based on 2023 PFOS RL data representing Method 1633 analyses generated by Eurofins Laboratories Environment Testing, LLC. These RL data were compiled from the laboratory analyses of 102 unique grab samples collected from Cottage Grove surface discharge outfall monitoring stations SD001 and SD002 over a period of one year (January – December 2023). Water sampled at SD001 and SD002 had been treated by granular activated carbon (GAC) at Building 92 or 185 prior to use in manufacturing processes or as non-contact cooling water.

The statistical analyses of PFOA and PFHxS data were based on 2023 laboratory RL data representing 761 (PFOA) and 106 (PFHxS) Method 1633 analyses also generated by Eurofins. The RL data used were compiled from available laboratory analyses of samples collected downstream of GAC treatment systems located in Building 185 (PFOA only) and Building 92 (PFOA and PFHxS) from the Cottage Grove facility over a period of one year (January – December 2023). Attachment A1 to this report is a memorandum dated May 7, 2024, detailing the results of this analysis.

After review of Environmental Standards' PFOS data assessment, the MPCA requested that a similar assessment be done for PFOA and PFHxS. Attachment A2 to this report is the result of the requested assessment that was provided to MPCA dated May 17, 2024.

Based on these additional assessments, I opined that the following RLs are reasonably achievable on a routine basis at a 99% or greater confidence level for each of the specified PFAS: PFOS 2.2 ng/L; PFOA 2.1 ng/L and PFHxS 2.1 ng/L. This means that, barring confounding factors, Method 1633 analysis of water after treatment by the Advanced Water Treatment system currently under construction would be expected to achieve the same RLs. The draft NPDES permit acknowledges this fact and identifies these RLs as the "compliance limit." [4]

The Proposed Final Effluent and Intervention Limits

MPCA proposes in the Draft Permit final effluent limits at sampling locations SD 001, SD 002 and SD 003, which are the designated points for sampling treated wastewater prior to discharge to surface water (i.e., Unnamed Creek). I have been advised that these final effluent limits are based upon water quality criteria. The proposed final effluent limits in the Draft Permit are:

- PFOS – 0.066 ng/L calendar month average and 0.038 ng/L as a daily maximum.
- PFOA – 0.022 ng/L calendar month average and 0.013 ng/L as a daily maximum.
- PFHxS – 0.0056 ng/L calendar month average and 0.0032 ng/L as a daily maximum.

[6] For example, the Draft Permit provides that because the final effluent limits for PFOA and PFHxS are below the reporting limits "for currently available analytical technology" "a separate compliance limit (2.1 ng/L) has been established for the purpose of reporting limit compliance data to the MPCA."

MPCA also proposes in the Draft Permit intervention limits at sampling locations WS 001 and WS 002. Water collected from those locations will have been treated by the GAC and ion exchange (IX) systems and will not undergo additional treatment prior to being discharged from the SD 001, SD 002 or SD 003. Under the terms of the Draft Permit, if an intervention limit is exceeded, 3M must undertake a series of evaluations and actions. Failure to take these steps is a violation of the permit which is subject to imposition of monetary penalties. The intervention limits are:

- PFOS - 0.155 ng/L calendar month average and 0.27 ng/L as a daily maximum.
- PFOA - 0.069 ng/L calendar month average and 0.117 ng/L as a daily maximum.
- PFHxS - 0.0171 ng/L calendar month average and 0.0298 ng/L as a daily maximum.

Based on the RL statistical analysis reflected in Attachments A1and A2, it is my opinion that these proposed final effluent and intervention limits are not measurable using Method 1633 (or any other commercially available analytical technique). Moreover, as discussed below, these limits are all below the method detection limits (MDLs) for Method 1633.

Method Detection Limits

MDLs are defined as the minimum concentration of a substance (analyte) that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte (40 CFR 136 Appendix B and Methods for the determination of limit of detection and limit of quantitation of the analytical methods). In other words, results obtained below MDLs are not considered to true qualitative, reportable detections.

Presented on the table below are the pooled MDLs were published with the US EPA multi-laboratory validation report for US EPA Method 1633 for PFOS, PFOA and PFHxS (Multi-Laboratory Validation Study for Analysis of PFAS by EPA Draft Method 1633 (Volume I): Wastewater, Surface Water, and Groundwater Matrices).

Analyte	1633	InterMonth	InterDaily
PFOS	0.542	0.155	0.27
PFOA	0.629	0.069	0.117
PFHxS	0.535	0.0171	0.0298

1633 – Method 1633

InterMonth – MPCA Proposed Monthly Intervention Limits (Average)

InterDaily – MPCA Proposed Daily Maximum Intervention Limits

As presented on the table above, the MPCA-proposed intervention limits are notably well below the best achievable pooled MDLs published in the Method 1633 multi-laboratory validation study.

Results below the RL are not considered quantitative, but only indicative that the target analyte is present. Results between MDLs and RLs are estimates that cannot reliably be used for quantitative limits. See, Laboratory Quality Control and Data Policy – Minnesota Pollution Control Agency – April 2022. Accordingly, and purely from a detection standpoint, the MPCA-proposed final effluent limits and intervention limits in the Draft Permit are not achievable.

Conclusions

On the basis of the pooled MDLs reported in US EPA Method 1633, and the statistical RL assessment provided (Attachments A1 and A2), the monthly (average) and daily (quantitative) final effluent and intervention limits in the Draft Permit for PFOA, PFOS and PFHxS are not capable of being measured, or even detected, using Method 1633. In addition, it is my opinion that there are no other commercially available analytical techniques capable of measuring these chemicals at the final effluent and intervention limits in the Draft Permit.

Respectfully submitted,

Rock J. Vitale, CEAC
Environmental Standards, Inc.

References

US EPA Method 1633 - Method 1633 Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS (epa.gov)

US EPA Method 537.1 - Method 537.1 Determination of Selected Per- and Polyflourinated Alkyl Substances in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) | Science Inventory | US EPA

US EPA Method 533 - Method 533: Determination of Per- and Polyfluoroalkyl Substances in Drinking Water by Isotope Dilution Anion Exchange Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry | US EPA

Federal Register, Volume 88 Issue 60 (Wednesday, March 29, 2023) (govinfo.gov)

eCFR :: Appendix B to Part 136, Title 40 -- Definition and Procedure for the Determination of the Method Detection Limit—Revision 2

Multi-Laboratory Validation Study for Analysis of PFAS by EPA Draft Method 1633 (Volume I): Wastewater, Surface Water, and Groundwater Matrices - ER19-1409 Multi-Laboratory Validation Study Report (Volume I)_0.pdf (sepub-prod-0001-124733793621-us-gov-west-1.s3.us-gov-west-1.amazonaws.com)

Interim Practical Quantitation Level (PQL) determination to support Interim Specific Ground Water Quality Standard development for Perfluorooctane Sulfonate (PFOS) New Jersey Department of Environmental Protection Division of Science and Research March 6, 2019 - 1763-23-1-pql.pdf (nj.gov)

Proposed PFAS National Primary Drinking Water Regulation FAQs for Drinking Water Primacy Agencies Overview: What action is EPA taking to address PFAS in drinking water - https://www.epa.gov/system/files/documents/202303/FAQs_PFAS_States_NPDWR_Final_3.14.23_0.pdf

Methods for the determination of limit of detection and limit of quantitation of the analytical methods - Methods for the determination of limit of detection and limit of quantitation of the analytical methods (researchgate.net)

Laboratory Quality Control and Data Policy – Minnesota Pollution Control Agency – April 2022- Laboratory Quality Control and Data Policy (state.mn.us)

Guidance on Water Quality Based Effluent Limits Set Below Analytical Detection/Quantitation Limits – April 2005 - r10-npdes-ml-mdl-policy-04-25-05.pdf (epa.gov)

Development of Compliance Levels From Analytical Detection and Quantitation Levels - Document Display | NEPIS | US EPA

End of Memorandum.

EXHIBIT I

PFAS Analyte Table

				Is compound listed in Draft NPDES Permit Fact Sheet also on the following list (YorN)			
CAS #	**Abbreviation**	**Draft NPDES Permit Fact Sheet (110 Compounds)**	**Remove, not 3M, or not expected at CG, not seen in NTA**	**3M NPDES Application, Appendix D2-Effluent Characterization PFAS Substance Characterization (49 Compounds)**	**3M Annual Analytical Methods Report (2024) (71 compounds)**	**1633 Analyte (38 Compounds)**	**Curent monthly NPDES Reporting (WW and Stormwater) (84 Compounds)**
347872-22-4	FBSAA	Y		Y	Y		Y
2416366-21-5	R-PSDCA	Y	Remove	N	N		
120226-60-0	10:2 FTSA	Y	Remove	N	N		
763051-92-9	11Cl-PF3OUdS/ F-53B Minor	Y	Remove	N	N	Y	Y
1268835-43-3	FBSEE-DA	Y		Y	Y		Y
93449-21-9	MTP	Y	Remove	N	N		
773804-62-9	Hydro-EVE Acid	Y	Remove	N	N		
662-20-4	PIBA	Y		Y	Y		Y
359-49-9	2333-TFPA	Y		Y	Y		Y
34454-97-2	MeFBSE	Y		Y	Y		Y
2991-50-6	N-EtFOSAA / NEtFOSAA / EtFOSAA	Y		Y	Y	Y	Y
24448-09-7	N-MeFOSE	Y		N	Y	Y	Y
2355-31-9	N-MeFOSAA / NMeFOSAA / MeFOSAA	Y		Y	Y	Y	Y
53826-13-4	10:2 FTCA / FDEA	Y	Remove	N	N		
865-86-1	10:2 FTOH	Y	Remove	N	N		
53826-12-3	6:2 FTCA / FHEA	Y	Remove	N	N		
647-42-7	6:2 FTOH	Y	Remove	N	N		
27854-31-5	8:2 FTCA	Y	Remove	N	N		
678-39-7	8:2 FTOH	Y	Remove	N	N		
914637-49-3	5:3 FTCA	Y	Remove	N	N	Y	Y
70887-84-2	8:2 FTUCA	Y	Remove	N	N		
70887-94-4	10:2 FTUCA	Y	Remove	N	N		
70887-88-6	6:2 FTUCA	Y	Remove	N	N		
756771-34-3	PHSA-DC	Y		Y	Y		Y
2089108-94-9	PBSA-S1	Y		Y	Y		Y
2254560-13-7	PBSA-DC	Y		Y	Y		Y
73772-32-4	PHSA-OH1	Y		N	Y[1]		Y
81190-41-2	PHSA-C2	Y		Y	Y		Y
812-70-4	7:3 FTCA	Y	Remove	N	N	Y	Y
38850-58-7	PHSA-S1	Y		Y	Y		Y
38850-60-1	PHSA-S3	Y		Y	Y		Y
356-02-5	3:3 FTCA	Y	Remove	N	N	Y	Y
919005-14-4	ADONA	Y		N	Y	Y	Y
2416366-22-6	R-EVE	Y	Remove	N	N		
2043-47-2	4:2 FTOH	Y	Remove	N	N		
679-12-9	4H-PFBA	Y		N	Y		Y
749836-20-2	Hydro-PS Acid/PFESA BP 2	Y	Remove	N	N		
27619-97-2	6:2 FTS	Y	Remove	N	Y[1]	Y	Y
24015-83-6	7:2 FTOH	Y	Remove	N	N		
15853-35-7	TPBP	Y		Y	Y		Y
1478-61-1	BPAF	Y		N	Y		Y
-	AOF	Y	Remove; does not represent low-molelcular weight PFAS	N	N		
-	TOF	Y		Y	Y		
2416366-19-1	Hydrolyzed PSDA / 49Byproduct 5	Y	Remove	N	N		
90076-65-6	HQ-115 / TFSI-LI	Y		Y	Y		Y
428-76-2	MEDSULF	Y		N	Y		Y
34455-00-0	FBSEE / FBSEE Diol	Y		Y	Y		Y

				Is compound listed in Draft NPDES Permit Fact Sheet also on the following list (YorN)			
CAS #	**Abbreviation**	**Draft NPDES Permit Fact Sheet (110 Compounds)**	**Remove, not 3M, or not expected at CG, not seen in NTA**	**3M NPDES Application, Appendix D2-Effluent Characterization PFAS Substance Characterization (49 Compounds)**	**3M Annual Analytical Methods Report (2024) (71 compounds)**	**1633 Analyte (38 Compounds)**	**Curent monthly NPDES Reporting (WW and Stormwater) (84 Compounds)**
736877-37-5	PHSA-E1	Y		Y	Y		Y
50598-28-2	PHSA	Y		Y	Y		Y
68298-12-4	MeFBSA	Y		Y	Y		Y
172616-04-5	PBSA-C1	Y		Y	Y		Y
141607-32-1	PHSA-C1	Y		Y	Y		Y
1691-99-2	N-EtFOSE	Y		N	Y	Y	Y
4151-50-2	EtFOSA / N-EtFOSA	Y		Y	Y	Y	Y
159381-10-9	MeFBSAA	Y		Y	Y		Y
31506-32-8	MeFOSA / NMeFOSA	Y		Y	Y	Y	Y
756426-58-1	9Cl-PF3ONS / F53B Major	Y	Remove	N	N	Y	Y
863090-89-5	PFECA-A / PFMBA	Y		N	Y	Y	Y
13140-29-9	PMPA / PFECA F	Y		N	N		
113507-82-7	PFEESA	Y	Remove	N	N	Y	Y
267239-61-2	PEPA	Y		N	N		
674-13-5	PFMOAA	Y	Remove	N	N		
13252-13-6	HFPO-DA	Y		Y	Y	Y	Y
39492-91-6	PFO5DA	Y	Remove	N	N		
39492-90-5	PFO4DA	Y	Remove	N	N		
39492-89-2	PFO3OA	Y	Remove	N	N		
39492-88-1	PFO2HxA	Y	Remove	N	N		
29311-67-9	PS Acid / PFESA BP 1	Y	Remove	N	N		
151772-58-6	PFECA-B / NFDHA	Y	Remove	N	N	Y	Y
377-73-1	PFMPA	Y		N	Y	Y	Y
69087-46-3	EVE Acid	Y	Remove	N	N		
2416366-18-0	R-PSDA/ BPFESA	Y	Remove	N	N		
801212-59-9	PFECA-G	Y	Remove	N	N		
34642-43-8	PFBSi	Y		Y	Y		Y
34454-99-4	FBSE	Y		Y	Y		Y
68555-77-1	PBSA	Y		Y	Y		Y
30334-69-1	FBSA	Y		Y	Y		Y
375-73-5	PFBS	Y		Y	Y	Y	Y
375-22-4	PFBA	Y		Y	Y	Y	Y
335-77-3	PFDS	Y		Y	Y	Y	Y
335-76-2	PFDA	Y		N	Y	Y	Y
79780-39-5	PFDoS	Y		Y	N	Y	Y
307-55-1	PFDoA	Y		N	Y	Y	Y
2837-92-5	PFES / PFEtS	Y		Y	Y		Y
375-92-8	PFHpS	Y		Y	Y	Y	Y
375-85-9	PFHpA	Y		Y	Y	Y	Y
67905-19-5	PFHxDA	Y		N	Y		Y
41997-13-1	PFHxSA	Y		N	Y		Y
355-46-4	PFH1S / PFHS / PFHxS	Y		Y	Y	Y	Y
307-24-4	PFHxA	Y		Y	Y	Y	Y
68259-12-1	PFNS	Y		Y	Y	Y	Y
375-95-1	PFNA	Y		N	Y	Y	Y
16517-11-6	PFODA	Y		N	Y		Y
754-91-6	PFOSA / FOSA	Y		Y	Y	Y	Y
1763-23-1	PFOS	Y		Y	Y	Y	Y
335-67-1	PFOA	Y		Y	Y	Y	Y

				Is compound listed in Draft NPDES Permit Fact Sheet also on the following list (YorN)			
CAS #	**Abbreviation**	**Draft NPDES Permit Fact Sheet (110 Compounds)**	**Remove, not 3M, or not expected at CG, not seen in NTA**	**3M NPDES Application, Appendix D2-Effluent Characterization PFAS Substance Characterization (49 Compounds)**	**3M Annual Analytical Methods Report (2024) (71 compounds)**	**1633 Analyte (38 Compounds)**	**Curent monthly NPDES Reporting (WW and Stormwater) (84 Compounds)**
2706-91-4	PFPeS	Y		Y	Y	Y	Y
2706-90-3	PFPeA	Y		Y	Y	Y	Y
423-41-6	PFPrS	Y		N	Y		Y
422-64-0	PFPA / PFPrA	Y		Y	Y		Y
376-06-7	PFTeDA / PFTeA / PFTA	Y		N	Y	Y	Y
72629-94-8	PFTrA / PFTrDA	Y		N	Y	Y	Y
2058-94-8	PFUnA	Y		N	Y	Y	Y
756-09-2	2233-TFPA	Y		Y	Y		Y
39847-39-7	DBI	Y		N	Y		Y
335-24-0	PECHS / PFECHS	Y		N	Y		Y
801209-99-4	NVHOS	Y	Remove	N	N		
76-05-1	TFA	Y		Y	Y		Y
1493-13-6	TFMS / PFMeS	Y		Y	Y		Y
30295-51-3	PFOSA-NO	Y		N	Y		Y
60805-12-1	METSULF				Y		Y[1]
83071-25-4	MV4S-SA				Y[1]		Y[1]
913556-89-5	MV4S-DA				Y[1]		Y[1]
757124-72-4	4:2 FTS						Y
39108-34-4	8:2 FTS						Y
120226-60-0	10:2 FTS						Y

EXHIBIT J

2023 IPC Study

Due to size restrictions, 3M incorporates by reference the full report (including Appendices, Tables, Figures, etc.) which was provided to MPCA (Tayna Maurice, Water Quality Compliance Supervisor) on April 28, 2023 by Misty Howell of Hogan Lovells and the final version sent to Justin Barrick on June 29, 2023.

Attached hereto is the cover page, table of contents, index of Appendices, Tables, Figures, etc. and the Executive Summary of the final 2023 IPC Study.

From: Barrick, Justin (MPCA) justin.barrick@state.mn.us
Sent: Thursday, June 29, 2023 5:11 PM
To: Karie Blomquist [redacted]
Subject: [EXTERNAL] RE: Cottage Grove Instream

WARNING: This email is not from 3M. If you are not expecting an email from this sender, do not click on links or open attachments and report it using the Report Phish button.

No worries – downloading now.

Justin

From: Karie Blomquist [redacted]
Sent: Thursday, June 29, 2023 5:07 PM
To: Barrick, Justin (MPCA) <justin.barrick@state.mn.us>
Subject: RE: Cottage Grove Instream

> **This message may be from an external email source.**
> Do not select links or open attachments unless verified. Report all suspicious emails to Minnesota IT Services Security Operations Center.

Sorry for the delay, Hogan Lovells is sending it now. Please let me know when you receive it. Thanks!

From: Karie Blomquist
Sent: Thursday, June 29, 2023 2:02 PM
To: Justin Barrick <justin.barrick@state.mn.us>
Subject: Cottage Grove Instream

Hi Justin,
You should see the final report here shortly. As I mentioned, due to size, it is being transmitted via Hogan Lovell.

Thanks!

3M Science. Applied to Life.™

Karie Blomquist, P.E. | Remediation Senior Manager, Global EHS
3M Environment, Health, Safety and Product Stewardship
[redacted]

[redacted]

From: Maurice, Tanya (MPCA) <tanya.maurice@state.mn.us>
Sent: Friday, April 28, 2023 3:28 PM
To: Howell, Misty [redacted]; Karie Blomquist [redacted]
Cc: Peter Surdo [redacted]; Kushner, Adam M. [redacted]
Subject: RE: Misty Howell shared 2023.04.28 Instream Study with you

[EXTERNAL]
Misty, thank you. We take these matters seriously and I appreciate your quick response.

And thank you Kari for getting us this instream study in advance of the final study.

Have a good weekend everyone,
Tanya

From: Howell, Misty [redacted]
Sent: Friday, April 28, 2023 2:24 PM
To: Maurice, Tanya (MPCA) <tanya.maurice@state.mn.us>; Karie Blomquist [redacted]
Cc: Peter Surdo [redacted] Kushner, Adam M. [redacted]
Subject: RE: Misty Howell shared 2023.04.28 Instream Study with you

Good afternoon Tanya,

The report and the information contained therein is not marked confidential, and we do not intend its contents to be treated as such. We would expect that MPCA would want to be able to share the information with MDH and others.

We assume from your email that you are referring to the following language: "Confidentiality Notice: This e-mail and any files transmitted with it are confidential and intended solely for the use of the individual or entity to whom it is addressed. If you have received this e-mail in error, please notify the sender." This language accompanies every secure file transfer and is intended as notice that the contents of the secure file transfer are intended for the specific recipients identified therein.

Therefore, 3M Company has not, and is not, asserting a claim of confidentiality with respect to the report or its contents.

Please let us know if you have any questions.

Sincerely,
Misty Howell

From: Maurice, Tanya (MPCA) [redacted]
Sent: Friday, April 28, 2023 3:02 PM
To: Howell, Misty [redacted]; Karie Blomquist [redacted]
Cc: Peter Surdo [redacted]
Subject: RE: Misty Howell shared 2023.04.28 Instream Study with you

[EXTERNAL]
Hello Misty and Kari,

I am inquiring about the notice attached to the study that states it is confidential. It is my understanding based on past discussions and email correspondence that 3M agreed to make this information public. Thus, I just want to verify that the notice is not, in fact, applicable in this instance.

As Kari and I discussed in March, MPCA thinks it's important to get the data to MDH and DNR right away. We think the data is important to share in order to protect human health, especially related to the fish in Rebecca Lake. MPCA intends to provide the study to both MDH and DNR for their use in making fish consumption guidelines and signage.

Thank you for your prompt attention to this matter.

Best Regards,
Tanya Maurice
Supervisor
Water Quality Compliance
Minnesota Pollution Control Agency
(651)757-2555

From: [redacted]egresscloud.com [redacted]
Sent: Friday, April 28, 2023 12:23 PM
To: Maurice, Tanya (MPCA) <tanya.maurice@state.mn.us>
Cc: [redacted]
Subject: Misty Howell shared 2023.04.28 Instream Study with you

---

This Egress Secure Workspace notification has been sent using Egress

You have been invited to join 2023.04.28 Instream Study

Dear Justin:
Please find available for download at this link 3M Company's Instream PFAS Characterization Study Interim Report. Please contact me if you encounter any problems with accessing the report.
Sincerely,
Misty Howell

View Secure Content

have received this e-mail in error, please notify the sender.

About Hogan Lovells
Hogan Lovells is an international legal practice that includes Hogan Lovells US LLP and Hogan Lovells International LLP. For more information, see www.hoganlovells.com.

Instream PFAS Characterization Study Final Report
Mississippi River
Cottage Grove, Minnesota

June 29, 2023

Prepared for

3M Company

By

WESTON SOLUTIONS, INC.
West Chester, Pennsylvania 19380

W.O. No. 02181.002.230.0001

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ES. EXECUTIVE SUMMARY

Since the early 1980s, 3M has worked cooperatively with the Minnesota Pollution Control Agency (MPCA) in conducting investigations to characterize environmental media at the Site. Sampling in the Mississippi River was performed dating back to the 2000s, when a Facility-wide Fluorochemical (FC) Investigation was performed in two phases. Since 2000, additional samples were collected of various environmental media including surface water, pore water, sediment, and fish. Additional description of these historical sampling events can be found in Section 2.1.1 of the Instream PFAS Characterization Study (IPCS) Work Plan (WESTON, 2021). These sampling activities were executed with the knowledge and/or involvement of the MPCA.

The 2021 IPCS was the most comprehensive study of the upper portion of the Mississippi River performed to date for PFAS compounds. The 2021 IPCS spanned an approximately 41 river mile (RM) portion of the Mississippi River from approximately RM 833 in Pool 2 of the Mississippi River downstream to RM 792 in Pool 4 of the Mississippi River. This most recent sampling was performed between July 26, 2021 and September 18, 2021, by Weston Solutions, Inc. (WESTON®), on behalf of 3M. The fish tissue samples, homogenized by the Eurofins Laboratory, were received by the 3M Global EHS Laboratory on December 2, 2021. Various environmental media were sampled including surface water, pore water, sediment, surface microlayer (SML), benthic macroinvertebrates and fish.

The IPCS Work Plan was prepared in accordance with the MPCA's request and follow up discussions and agreements reached during a June 9, 2021 meeting between 3M and the MPCA. The IPCS Work Plan was reviewed and approved by the MPCA prior to the initiation of field activities. In the IPCS Work Plan, WESTON proposed to collect 56 surface water samples, 56 porewater samples, six SML samples, 56 sediment samples, 14 benthic macroinvertebrate samples, and 870 fish samples. Fish sampling was performed in accordance with a Fisheries Research Permit (FRP) issued by the Minnesota Department of Natural Resources (MNDNR) to WESTON. All proposed surface water,

SML and sediment samples were collected in accordance with the IPCS Work Plan. Additionally, 48 pore water samples, 11 benthic macroinvertebrate samples and 779 fish samples were collected, representing 86%, 71%, and 90%, respectively, of targeted sampling numbers. In accordance with the IPCS Work Plan, benthic macroinvertebrate samples were only collected in Pool 2 Section 4.

The 2021 sampling event was performed to develop a comprehensive data set for the upper portion of the Mississippi River as well as to support comparison with previous data to evaluate changes in PFAS concentrations in relevant media over time. The data evaluation focused on certain PFAS compounds based on a variety of factors, including frequency of detection and its identification in historical data sets. The PFAS compounds focused on in this report had the highest percentage frequencies of detected concentrations in the respective media during the 2021 sampling event and/or have been routinely analyzed during multiple rounds of sampling over the period of record. Focal compounds discussed in the report sections include eight compounds for surface water, pore water, SML and sediment (PFOS, PFBA, PFBS, PFOA, PFHxA, PFHxS, PFPeA, and PFHpA), and 11 compounds in fish tissue and benthic macroinvertebrates tissue (PFOS, PFOA, PFDA, PFUnA, PFDoA, PFOSA, PFNA, PFHxS, PFBA, PFTriA, and N-EtFOSAA). In total, the actual analytical list for PFAS compounds was more extensive and included over 40 PFAS compounds for all media types (surface water, pore water, SML, sediment, benthic macroinvertebrate tissue, and fish tissue).

All primary, non-fish tissue samples, as well as duplicates at a 10% duplicate to primary ratio, were submitted to the 3M Global EHS Laboratory in St. Paul MN for analysis. In accordance with the MPCA-approved IPCS Work Plan, select samples were subcontracted by the 3M Global EHS Laboratory to Eurofins Laboratory in Sacramento, CA, for analysis of legacy PFAS compounds. At the request of the MPCA, field duplicates from approximately 10% of the surface water sampling locations were sent to SGS AXYS for PFAS analysis. Fish tissue samples were submitted to the Eurofins Laboratory in Sacramento California (Eurofins) for homogenization. Following homogenization, Eurofins submitted aliquots of the homogenate to (1) the 3M Global

EHS Laboratory in Minnesota for PFAS analysis, (2) the Stable Isotope Ecology Laboratory at the Center for Applied Isotope Studies (CAIS) for stable isotope analysis in Georgia and (3) approximately 10% to the SGS AXYS Analytical Services, Ltd., Laboratory (SGS AXYS) in Sidney, British Columbia, Canada for verification. Interlaboratory and intralaboratory comparisons indicated very good agreement between PFAS analytical results and reinforce the validity of the results.

EXHIBIT K

Tables & Figures from 2023 IPC Study

INSTREAM CHARACTERIZATION
TABLES & FIGURES

Table 1. PFAS Detections in Surface Water from Reaches 02 and 03

Analyte	Detection Frequency	Geomean [1] (ng/L)	Geomean Conc. with ½-LLOQ [2] (ng/L)
PFOS	100%	16.2	16.2
TFA	100%	1795	1795
PFHxA	100%	11.2	11.2
PFBA	97%	91.0	87.6
PFHxS	97%	5.04	4.79
PFBS	91%	10.6	8.58
PFPeA	85%	12.1	11.8
PFOA	85%	26.7	23.1
PFHpA	74%	3.06	2.24
TFSI	57%	26.1	12.9
TFMS	57%	63.0	31.5
PFPA	51%	59.6	27.9
N-EtFOSAA	6.1%	5.84	2.87
FOSA	5.9%	3.35	1.01
PIBA	2.9%	21.4	12.6

Twenty-seven PFAS analytes were not detected in surface water and are excluded from the table.
[1] Non-detects (< LLOQ) were ignored in calculating geometric mean value.
[2] Geometric mean calculated after applying ½-LOQ value to all non-detects.

TABLES & FIGURES

Table 2. PFAS Detections in Fish Fillet from Reaches 02 and 03 (7 fish species)

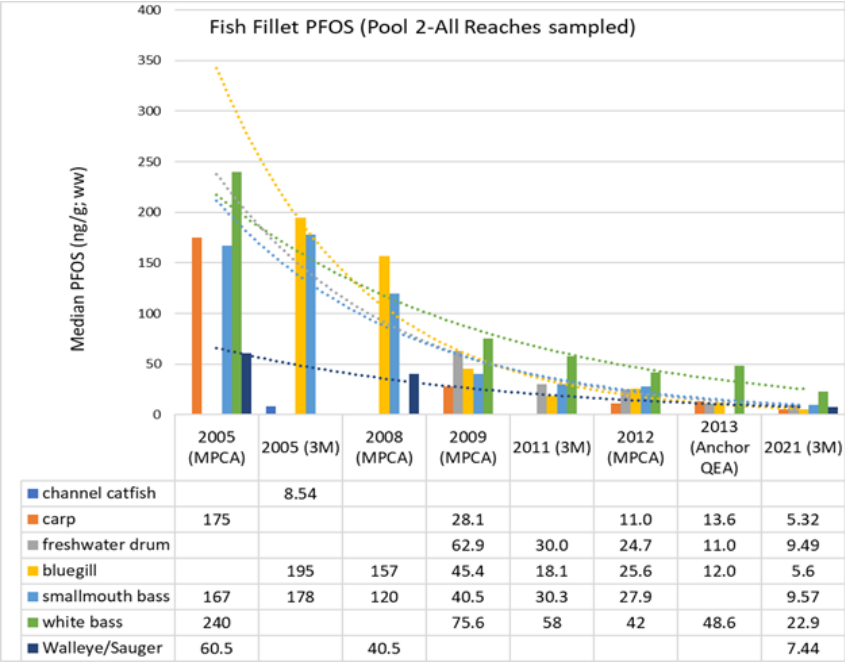
Analyte	Detection Frequency	Geomean Conc. [1] (ng/g; ww)	Geomean Conc. with ½-LLOQs [2] (ng/g; ww)
PFOS	100%	11.7	11.7
PFDA	100%	0.682	0.682
PFDoA	98%	0.368	0.359
PFUnA	94%	0.458	0.422
FOSA	84%	0.299	0.217
PFTrA	81%	0.133	0.106
PFNA	70%	0.150	0.104
N-EtFOSAA	66%	0.325	0.186
TFSI	54%	0.249	0.142
N-MeFOSAA	52%	0.135	0.0933
PFHxS	40%	0.119	0.0471
FBSA	35%	0.176	0.135
PFBA	35%	0.513	0.209
PFBS	28%	0.157	0.0830
PFOA	24%	0.229	0.180
N-MeFOSE	16%	1.54	0.143
TFMS	13%	0.168	0.128
PFPeA	10%	1.17	0.138
DBI	9.4%	0.0439	0.0341
MeFOSA	8.6%	0.0484	0.0518
EtFOSA	7.9%	0.120	0.0900
PFHxA	5.7%	0.294	0.0708
N-EtFOSE	5.1%	0.674	0.228
TFA	3.6%	12.5	8.82
FBSAA	2.9%	1.11	0.235
PFPA	2.9%	5.72	0.958
FBSEE-DA	1.4%	1.80	0.0826
FBSE	1.4%	2.17	0.141
HFPO-DA	1.4%	1.86	0.159
PBSA	1.4%	2.00	0.125
PBSA-C1	1.4%	2.24	0.196
PFES	1.4%	0.175	0.0461
2233 TFPA	0.7%	4.78	4.287
MeFBSAA	0.7%	0.103	0.0334
PFBSi	0.7%	0.0802	0.0854
PFHpA	0.7%	0.164	0.0364

Six PFAS analytes were not detected in fish fillet and are not shown. Those were 2333-TFPA, ADONA, FBSEE Diol, MeFBSE, MeFBSA, and PIBA.

[1] Non-detects (< LLOQ) were ignored in calculating geometric mean value.

[2] Geometric mean calculated after applying ½-LOQ value to all non-detects.

TABLES & FIGURES



	2005 (MPCA)	2005 (3M)	2008 (MPCA)	2009 (MPCA)	2011 (3M)	2012 (MPCA)	2013 (Anchor QEA)	2021 (3M)
channel catfish		8.54						
carp	175			28.1		11.0	13.6	5.32
freshwater drum				62.9	30.0	24.7	11.0	9.49
bluegill		195	157	45.4	18.1	25.6	12.0	5.6
smallmouth bass	167	178	120	40.5	30.3	27.9		9.57
white bass	240			75.6	58	42	48.6	22.9
Walleye/Sauger	60.5		40.5					7.44

Figure 2. PFOS Decrease in Pool 2 fish fillet (2005-2021)

Table 3. DT_{50} and DT_{90} for PFOS in the Mississippi River Pools 2 and 3 (2005-2021)

Species	PFOS DT_{50} (years)		PFOS DT_{90} (years)	
	pool 2	pool 3	pool 2	pool 3
carp	1.60	3.43	5.43	11.4
freshwater drum	2.00	--	6.46	--
bluegill	2.30	4.82	8.71	16
smallmouth bass	2.80	--	9.33	--
white bass	2.90	5.51	9.57	18.3
walleye	5.93	4.58	19.7	15.2

TABLES & FIGURES

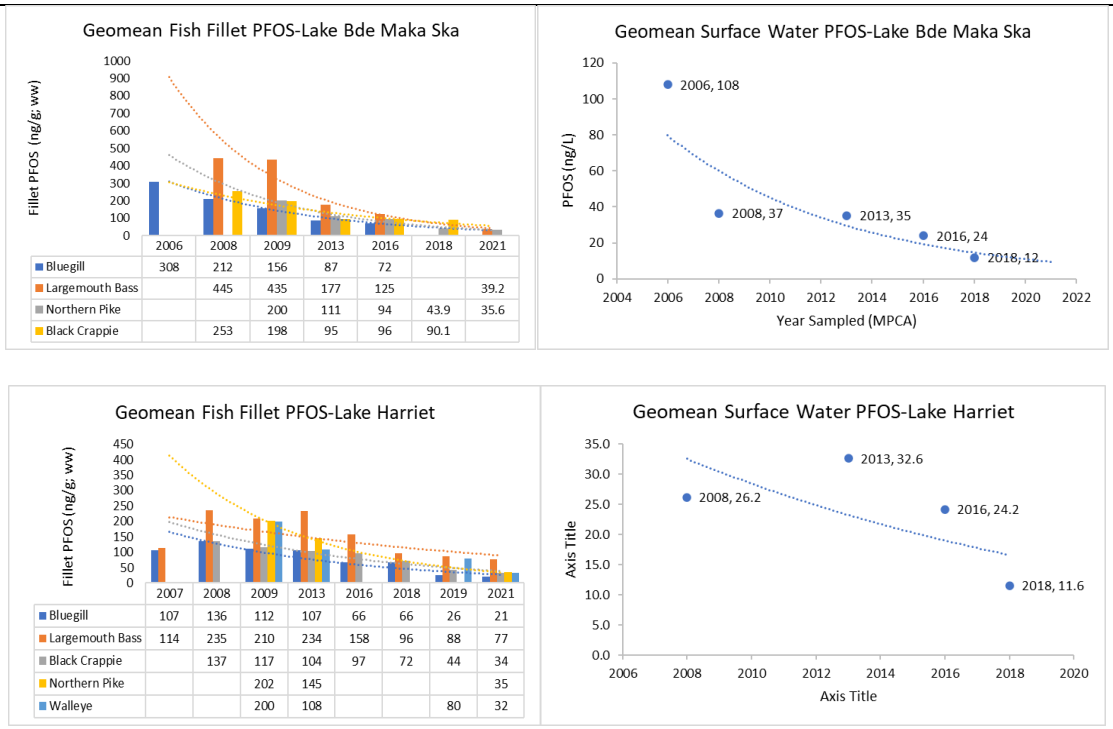


Figure 3. PFOS levels in Bde Maka Ska (formerly Calhoun) and Lake Harriet; MPCA Data

Table 4. Comparison of 2021 IPCS to recent instream PFAS studies in scientific literature

Fish Study	No. Specimens	No. Analytes	Days between sampling & reporting [1]	Datapoints per day [2]	No. QA/QC data
Munoz et al., 2022	75	60	970	4.6	N/A
Pickard et al., 2022	62	23	1700	0.8	N/A
Cara et al 2022	27	15	1170	0.3	N/A
3M 2023 (2021 IPCS)	790	42	660	50 [2]	106,000

[1] Approximated.
[2] Excludes QA/QC samples.
Note: For the 2021 IPCS study, time was from final sample receipt to report issuance date for fish and BMI analyses, and for sci. literature the time was calculated from date of sampling to date of manuscript submission.

EXHIBIT L

2007 SACO between MPCA and 3M

Due to size restrictions, the full copy is included in the hard copy of Exhibits filed with MPCA.

STATE OF MINNESOTA

MINNESOTA POLLUTION CONTROL AGENCY

In the matter of Releases and Discharges of Perfluorochemicals At and From Sites in Washington County, Minnesota, and Certain Related Matters.

SETTLEMENT AGREEMENT AND CONSENT ORDER

Pursuant to the Minnesota Environmental Response and Liability Act, Minn. Stat. §§ 115B.01 to 115B.20, the Water Pollution Control Act, Minn. Stat. ch. 115, and Minn. Stat. ch. 116.

Based on the information available to the parties on the effective date of this SETTLEMENT AGREEMENT and CONSENT ORDER, and without trial or adjudication of any issues of fact or law, the parties hereto agree and it is hereby ordered as follows:

I.

Jurisdiction

In entering this SETTLEMENT AGREEMENT and issuing this CONSENT ORDER the Minnesota Pollution Control Agency (MPCA) is acting pursuant to the Minnesota Environmental Response and Liability Act, Minn. Stat. §§ 115B.01 to 115B.20 (MERLA), and Minn. Stat. chs. 115 and 116, for the purpose of providing for remedial investigations and response actions to address certain discharges to waters of the State and releases or threatened releases to the environment in order to minimize or abate pollution of waters of the State and to protect public health and welfare and the environment.

A. The parties to this Agreement have disputed and continue to dispute the jurisdiction of MPCA under MERLA with respect to releases and threatened releases of PFCs at

Appendix

3M's Comments to
Draft NPDES/SDS Permit No. MN0001449 for
3M Operations LLC Cottage Grove Facility
Cottage Grove, Washington County, Minnesota
August 30, 2024

APPENDIX NO.	APPENDIX DESCRIPTION
1.	3M Comments on Draft Permit and Fact Sheet Additional Draft Permit Comments
2.	3M Comments on Draft Permti and Fact Sheet – Additional Draft Permit Comments – Compliance Dates

APPENDIX 1

Appendix 1 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments

Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
Universal Comment	See Appendix 2, attached hereto	Due dates for completing permit obligations and requirements	See Appendix 2, attached hereto, regarding compliance obligation and requirement due dates	Throughout the Draft Permit, MPCA uses the terms "within," "by," and "at least" to modify the date a permit obligation is required to be completed. These terms are ambiguous with regard to the actual due date as they imply that the obligation is due before the identified date. 3M proposes that MPCA use the term "no later than" to signify that the obligation or requirement is required to be completed no later than the identified date.
Permitted facility description	4		Compliance Schedule Phases: There are four different phases associated with the ~~permit's~~ Draft Permit's compliance schedules. Different effluent limitations and other requirements are applicable as the phases are complete. The phases are summarized below. Phase 1 • Interim effluent limits for PFBS, PFBA, PFHxA, PFOS, PFOA, and PFHxS • Interim effluent limits for antimony, cadmium, mercury, selenium, and bis(ethylhexyl)phthalate Phase 2 • Interim effluent limits for PFBS, PFBA, PFHxA, PFOS, PFOA, and PFHxS • Interim effluent limits for antimony, cadmium, mercury, selenium, and bis(ethylhexyl)phthalate • Flow monitoring required at SW 001 Phase 3 • Final effluent limits for PFBS, PFBA, PFHxA, PFOS, PFOA, and PFHxS	The *Permitted facility description* (Draft Permit, at p.3) and the *Description of permitted facility* (Fact Sheet, at p. 7) describe three different "phases" of the Cottage Grove wastewater treatment system as Phase 1, Phase 2, and Phase 3. Throughout the Draft Permit and Fact Sheet, MPCA also uses the term "phase" to describe the Cottage Grove sewers and the wastewater treatment system (phase) to which they flow – (e.g., "Chem Sewer Phase 1 Group 3 flows to the Phase 1 treatment train). Further, MPCA uses the term "phase" to describe the four major milestones of the Cottage Grove advanced wastewater treatment system compliance schedule. See e.g., Draft Permit Condition 5.68.61. MPCA's multiple use of the term 'phase" to mean different things under the Draft Permit and Fact Sheet renders important conditions of the Draft Permit ambiguous and difficult to understand. For example, Draft Permit Condition 7, *Limits and monitoring* table at p. 104, and elsewhere in that table, describes the "Subject item" as "SD 001

Appendix 1 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments

Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
			• Interim effluent limits for antimony, cadmium, mercury, selenium, and bis(ethylhexyl)phthalate • Flow monitoring required at SW 001 Phase 4 • Final effluent limits for PFBS, PFBA, PFHxA, PFOS, PFOA, and PFHxS • ~~Final effluent limits for antimony, cadmium, mercury, selenium, and bis(ethylhexyl)phthalate~~ • ~~~~ • Flow monitoring required at SW 001	Process & Sanitary Effluent Phase 1". It is not clear from the quoted language whether the term "phase" refers to the Cottage Grove waste water treatment system train or the advanced wastewater treatment system compliance schedule. To address this ambiguity, 3M proposes adding the "Proposed Draft Permit Language" in the Draft Permit *Permitted facility description* at p. 4.
Permitted facility description figures	10-18	Permitted facility description figures	Do not include ~~map/~~figures 3, 6, 7, 8, 9 and 10 in ~~a~~ the final permit	On April 26, 2024, 3M submitted to MPCA four updated figures for inclusion in a final permit and fact sheet, with a request that map/figures 3, 6, 7, 8, 9 and 10 *not* be included in a final permit. *Figure 3. Facility stormwater map* is a map of stormwater sampling locations at the site. The title is not accurate because the figure is not inclusive of all stormwater features at the site. Moreover, stormwater conveyances structures and features as well as management practices are shown and described in the Cottage Grove Stormwater Pollution Prevention Plan ("SWPPP"), Draft Permit Conditions 5.77.296–299. As required by the Draft Permit and applicable law, 3M continuously evaluates and updates its SWPPP to ensure that it is current. The inclusion of Figure 3 in a final permit may necessitate a permit modification anytime 3M updates its SWPPP and associated figures. It is 3M's understanding that this would be consistent with other permits in the state.

Appendix 1 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments

Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
				Figure 6. Wastewater treatment system process flow was included in 3M's April 15, 2021 permit renewal application. As MPCA knows, since that time, many changes have been made at the facility, including changes to stormwater management, shutdown of the Cottage Grove corporate incinerator, and construction of the advanced wastewater treatment plant. Accordingly, Figure 6 is not an accurate rendition of the wastewater treatment system process flow, and therefore should not be included in the final permit or fact sheet. *Figure 7. Locations of WS Stations in process flow* shows the location of the Waste Stations (WS). 3M is requesting that these stations be removed. As such, this figure should not be included in the final permit or fact sheet. Figures 8, 9 and 10 were taken from previous studies and submittals and are no longer accurate. 3M requests that these figures not be included in the final permit or fact sheet.
Part 4	19	Summary of stations and station locations - WS 005	BLD 185 GAC ~~Lead~~ Lag Vessel Effluent (Bld 185)	MPCA requires that WS 005 sampling occur mid-bed (i.e., at the effluent from the Building 185 lead granular activated carbon (GAC) vessel). Consistent with the WS 003, 004, 006, and 007 sampling locations, 3M requests that WS 005 be re-located to sample the effluent from the Building 185 GAC lag vessel.

Appendix 1 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments

Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
Part 4	19	Summary of stations and station locations – SD 009	~~Local name~~ Basin 3U Overflow: 3U-01~~/BML-001~~: Former Incinerator Area	3M's proposed changes are intended to clarify the description of monitoring station SD 009, which is associated with the overflow from 3U. "BML-001" is a current monitoring station under the Minnesota Industrial Stormwater General Permit (MNR050000). When the proposed permit is finalized, 3M's coverage under the General Permit will be terminated and BML-001 will cease to be a monitoring station. As such, it should be removed from the final permit and fact sheet.
Part 4	19	Summary of stations and station locations – SD 010	~~Local name~~ Basin 2AA~~-01/BML-003~~ Overflow~~: Former D8 Disposal Area~~	3M's proposed changes are intended to clarify the description of monitoring station SD 010, which is associated with the overflow from 2AA. "BML-003" is a current monitoring station under the Minnesota Industrial Stormwater General Permit (MNR050000). When the proposed permit is finalized, 3M's coverage under the General Permit will be terminated and BML-003 will cease to be a monitoring station. As such, it should be removed from the final permit and fact sheet.
Part 4	19	Summary of stations and station locations – SD 011	~~Local name~~ ~~BML-004/~~Basin AD Overflow: AD-02, AD-03: Wastewater Treatment Plant	3M's proposed changes are intended to clarify the description of monitoring station SD 011, which is associated with the overflow from AD. "BML-004" is a current monitoring station under the Minnesota Industrial Stormwater General Permit (MNR050000). When the proposed permit is finalized, 3M's coverage under the General Permit will be terminated and BML-003 will cease to be a monitoring station. As such, it should be removed from the final permit and fact sheet.

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Part 4	20	Summary of stations and station locations – SD 025	~~Local name~~ Basin 1E Overflow: AR~~/BML-002/~~1E-01, 1E-02, 1F-01, 1G-02, AM-01: Front Entrance/Building 57/North Access Road	3M's proposed changes are intended to clarify the description of monitoring station SD 025, which is associated with the overflow from 1E. "BML-002" is a current monitoring station under the Minnesota Industrial Stormwater General Permit (MNR050000). When the proposed permit is finalized, 3M's coverage under the General Permit will be terminated and BML-002 will cease to be a monitoring station. As such, it should be removed from the final permit and fact sheet.
Part 4	20	Summary of stations and station locations – SD 027	Basin AG Overflow~~: AG-01, AG-02, AG-03:~~ Building 57/North Access Road	3M's proposed changes are intended to clarify the location of monitoring station SD 027. The subwatersheds listed do not exclusively route to Basin AG.
Part 4	20	Summary of stations and station locations – SD 028	~~Manhole~~ 3Y Catch Basin Overflow: 3Y-01: Contractor Village	3M's proposed changes are intended to clarify the location of this station. This station is not located at a manhole, it is located at a catch basin overflow.
5.38.3	33	Facility Specific Limit and Monitoring Requirements - WS 005	Samples for Station WS 005 shall be taken at a point representative of the effluent from the ~~lead~~ lag vessels of the Phase 1/2 GAC system in Building 185. Samples at this station shall be rotated sequentially each sampling event through the multiple GAC vessel pairs. [Minn. R. 7001.0150, subp. 2(B)]	MPCA proposes that WS 005 sampling occur mid-bed (i.e., at the effluent from the Building 185 lead GAC vessel). Consistent with the WS 003, 004, 006, and 007 sampling locations, 3M requests that WS 005 be re-located to sample the effluent from the Building 185 GAC lag vessel.

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5.27.3	30	Facility Specific Limit and Monitoring Requirements - SD 029	Samples for Station SD 029 shall be collected from flow near the swale between Trestle Rd. and creek just upstream from the SD 001/SD 002 discharge location ~~the metal culvert - 30" pipe (located between Trestle Rd. and creek just upstream from the SD 001/SD 002 discharge location, marked by manhole near the road)~~. [Minn. R. 7001.0150, subp. 2(B)]	The description of the sampling location is inaccurate. The language proposed by 3M accurately reflects a representative sampling location for this station.
5.68.56, 6.59.1	42, 88	Compliance Schedule - Proposed Advanced Wastewater Treatment System	As soon as possible and no later than March 31, 2025, the Permittee shall complete construction of the ~~proposed~~ advanced wastewater treatment system. The Permittee shall submit a notice of initiation of operation ~~within~~ no later than 90 days of initiating startup operations. ~~The Permittee shall submit notice of initiation of operation: Due 06/30/2025~~.	The Draft Permit requires construction be completed by March 31, 2025. The Draft Permit also requires the Permittee to submit a notice of initiation of operation within 90 days of initiating startup operations. The Draft Permit Condition requires the notice of initation of operation be submitted by 6/30/2025, which is 90 days after completing construction. MPCA appears to assume that the date that construction is complete is the same day that 3M will initiate start-up, which does not reflect construction and operational reality. 3M recommends removing the June 30, 2025 deadline for submitting the notice of initiation of operation.
5.68.57	42, 88	Compliance Schedule - Phase 3	The Permittee shall submit an annual progress report,~~:D~~ due annually following permit issuance until such time as the final compliance schedule date is achieved. The progress report shall discuss actions taken during the calendar year ~~in order~~ to meet the final compliance schedule date. 3M may cease submission of the annual progress reports.	The submission of annual reports should not be required beyond the final compliance schedule date. 3M recommends that MPCA add language to the final permit that submission of annual progress reports is not required beyond the final compliance schedule date.
5.68.70	44	Compliance Schedule ~~—~~ Phase 3	Phase 3 Treatment Train After July 1, 2025, the Permittee no longer has approval or authorization to discharge treated wastewater and stormwater from the Phase 3	3M recommends adding the term “Treatment Train” to modify and clarify the term “phase.”

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			Treatment Train unless it first receives comparable PFAS treatment efficacy as that found in Buildings 150 and 151.	The *Permitted facility description* (Draft Permit, at p.3) and the *Description of permitted facility* (Fact Sheet, at p. 7) describe three different "phases" of the Cottage Grove wastewater treatment system as Phase 1, Phase 2, and Phase 3. Throughout the Draft Permit and Fact Sheet, MPCA also uses the term "phase" to describe the Cottage Grove sewers and the wastewater treatment system (phase) to which they flow – (e.g., "Chem Sewer Phase 1 Group 3 flows to the Phase 1 treatment train). Further, MPCA uses the term "phase" to describe the four major milestones of the Cottage Grove advanced wastewater treatment system compliance schedule. See e.g., Draft Permit Condition 5.68.61. MPCA's multiple use of the term 'phase" to mean different things under the Draft Permit and Fact Sheet renders important conditions of the Draft Permit ambiguous and difficult to understand. For example, Draft Permit Condition 7, *Limits and monitoring* table at p. 104, and elsewhere in that table, describes the "Subject item" as "SD 001 Process & Sanitary Effluent Phase 1". It is not clear from the quoted language whether the term "phase" refers to the Cottage Grove waste water treatment system train or the advanced wastewater treatment system compliance schedule.
5.68.71	44	Compliance Schedule — Phase 3	~~Phase 3~~ ~~The Permittee shall submit quarterly progress reports detailing its intentions and plan for Phase 3 water. The Permittee shall submit a progress~~	3M is actively working on plans for Phase 3 water with MPCA, and believes that quarterly progress reports would be unnecessary. 3M requests that the frequency of reporting be annual.

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			~~report: Due by the end of each calendar quarter following permit issuance. [Minn. R. 7001]~~	
5.68.73	44	Compliance Schedule - Definitions	"Initiation of operation" means the date that ~~MPCA~~ the Permittee determines the ~~all~~ components of the advanced wastewater treatment system are online and operational. ~~complete and functioning and the project begins operating for the purposes for which it was planned, designed, and built.~~ [Minn. R. 7001]	Draft Permit Condition 5.68.73 is vague and ambiguous. ~~-~~MPCA seeks to define "initiation of operation" as the date that "all components" are "complete and functioning" and the "project begins operating for the purposes for which it was planned, designed, and built." Yet, none of those terms are defined in the Draft Permit or in Chapter 7001 of the Minnesota Administrative Rules. For example, MPCA fails to identify the specific components it refers to. Likewise, by use of the terms "complete and functioning" we can infer that MPCA is intending to relate those concepts to the construction of the advanced wastewater treatment system, but Draft Permit Condition 5.68.73 permit language does not reference the advanced wastewater treatment system. In the construction world, the concept of completeness can mean "final completion" or "substantial completion," but Draft Permit Condition 5.68.73 fails to distinguish between the two. Each of the preceding quoted terms are undefined and ambiguous. "Substantial completion" means that the project is built but that minor, punch-list and warranty work remain to be completed. "Final completion" means that all major and minor work has been completed and there is no further work to be performed. Moreover, the approach in Draft Permit Condition 5.68.73 is inconsistent with the approach to initiation

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				of operation in Draft Permit Condition 5.68.56, which requires the Permittee submit a notice of initiation of operation to MPCA "within 90 days of initiating startup operations." It is not clear what is the purpose of such notice if MPCA is making the determination described in Draft Permit Condition 5.68.73. The initiation of operation notification requirement only makes sense if 3M and not MPCA is making that determination.
5.69.76	44	Special Requirements - Per- and Polyfluoroalkyl Substances Analyses	The Permittee shall analyze per- and polyfluoroalkyl substances (PFAS) at all monitoring locations in accordance with the following: A. The Permittee must sample and analyze PFAS compounds using methodology capable of detecting PFAS to the minimum reporting levels available and specifically below a 4 ng/L reporting limit for PFOS, PFOA, and PFHxS, such as EPA method 1633, a method equivalent to EPA 1633, or a method better than EPA method 1633. * * * Note - Due to the variable stormwater characteristics, stormwater SD and WS stations (SD 009, 010, 011, 012, 013, 014, 015, 016, 017, 018, 019, 020, 021, 022, 023, 024, 025, 026, 027, 028, and 029, WS 002 and 003) may use all results from all stormwater stations when assessing compliance with the 4 ng/L reporting limit. * * *	3M recommends the following changes to Draft Permit Condition 5.69.76. 1) The specification of SD and WS stations. 2) The condition states that the Permittee may request a change or reduction in PFAS monitoring frequency if monitoring data over a 12-month period shows that a pollutant(s) is not present. 3M recommends defining the phrase "not present" in reference to the method detection limit [or reporting limit]. 3) Quarterly reports should be due to MPCA "no later than" 21 days after the calendar quarter. 4) "Believed to be present" should be defined more precisely. 5) It is unreasonable to add parameters to a station's sampling list "immediately." Rather, 3M recommends that parameters be added at the next scheduled sampling event after the NTA results are reviewed, verified, and interpreted by 3M personel. 3M disagrees that NTA is in scope of the permit, but if included, 3M recommends the MPCA clarify and specifically list all locations that NTA is to be done for non-targeted PFAS analysis. 3M requests that these include locations that discharge

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			B. The Permittee shall analyze for all PFAS believed to be present (including but not limited to the compounds identified in this permit) in all water required to be monitored at all locations in this permit. "Believed to be present" means that the parameter is required in this permit, has been observed on a non-targeted PFAS analysis, or 3M has other reason to believe that the parameter be present. Note - Non-targeted PFAS analysis shall be conducted at a minimum frequency of once every five years of the water required to be monitored at all locations in this permit. PFAS compounds detected during the non-targeted analysis that are not identified in this permit must be added to the applicable station's PFAS analysis list at the next scheduled sampling event after results are reviewed and finalized. ~~For the applicable station immediately upon receipt of the non-targeted analysis results.~~ * * * D. The Permittee may request a parameter be removed from the permit if ~~a change or reduction in monitoring frequency for PFAS analysis after 12 months if~~ monitoring data over a 12-month period of time ~~proves~~ shows that the pollutants(s) are not present above the method detection limit [or reporting limit] at a particular monitoring location.	to the receiving water body. It would be arbitrary and capricious to require that all locations be measured.

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			* * * G. Process control sampling (see March 12, 2024 ""Cottage Grove Advanced Water Treatment Proposed Draft Sampling Plan"") PFAS results shall be submitted to the MPCA quarterly ~~by~~ no later than 21 days after the calendar quarter as a Microsoft Excel spreadsheet output from the LIMS system attached to the DMR submittal.	
5.69.78 6.60.15	45, 90	Special Requirements - Annual PFAS Source Identification and Reduction Report	~~**Annual PFAS Source Identification and Reduction Report**~~ The Permittee shall submit an Annual PFAS Source Identification and Reduction Report no later than ~~March 31~~ May 1 of each year. The first such report shall be submitted no later than May 1 of the first full calendar year following the calendar year in which the permit was issued as final. Each ~~The~~ report shall contain a detailed account for the most likely/probable source of each PFAS compound found in the facility's discharge(s), what source reduction and/or elimination efforts the Permittee has taken in the prior calendar year, and corrective actions planned for the future. The Permittee shall submit a PFAS source identification and reduction report: Due annually, no later than May 1~~, by the 31st of March~~.	3M requests the first Annual PFAS Source Identification and Reduction Report be submitted no later than May 1 of the first full calendar year following the calendar year in which the permit is finalized. 3M lacks the resources to undertake the work required of this section and prepare the required report in less than one year's time. The reporting approach recommended by 3M will ensure that it has sufficient time to perform the work required by this permit condition. Further, laboratory processing time for PFAS parameters will not allow for adequate time to prepare the report by March 31 annually, especially with significant other environmental reporting requirements occurring during the first calendar quarter. As such, 3M requests that all non-standard annual reporting [Annual PFAS Source Identification and Reduction Report, Annual Laboratory Analytical Method Report, Annual PFAS Removal and Disposal Report] deadlines be moved to May 1.

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5.69.79 6.60.16	45, 91	Special Requirements - Annual Laboratory Analytical Method Report	~~**Annual Laboratory Analytical Method Report**~~ The Permittee shall submit an Annual Laboratory Analytical Method Report~~s~~ by no later than ~~March 31~~May 1 of each year. The first such report shall be submitted no later than ~~March 31~~May 1 of the first full calendar year following the calendar year in which the permit was issued as final. Each ~~The~~ report shall identify the laboratory analytical methods, method detection and reporting limits, and reference standards for the PFAS it currently or historically has had the capability of quantifying for in wastewater, surface water, fish tissue, and groundwater. The report shall identify the year that each existing method was first developed. This report shall also include research into new PFAS compounds methodology capable of detecting PFAS to the minimum reporting levels available. The Permittee shall submit an annual report: Due annually no later than May 1~~, by the 31st of March~~. . . .	3M requests the first Annual PFAS Source Identification and Reduction Report be submitted no later than May 1 of the first full calendar year following the calendar year in which the permit is finalized. ~~-~~3M lacks the resources to undertake the work required of this section and prepare the required report in less than one year's time. ~~-~~The reporting approach recommended by 3M will ensure that it has sufficient time to perform the work required by this permit condition. Further, laboratory processing time for PFAS parameters may not allow for adequate time to prepare the report by March 31 annually, especially with significant other environmental reporting requirements occurring during the first quarter. As such, 3M requests that all non-standard annual reporting [Annual PFAS Source Identification and Reduction Report, Annual Laboratory Analytical Method Report, Annual PFAS Removal and Disposal Report] deadlines be moved to May 1.
5.69.80	46	Special Requirements - DMR Requirements	~~**DMR Requirements**~~ An individual sample result that is below a) its reporting limit, or b) the Compliance Limit in 5.69.128 is in compliance with the associated daily maximum compliance limit. A monthly average sampling result that is below a) its reporting limit (calculated per 5.69.80(B), below) or b) the Compliance Limit in 5.69.128 is in compliance with the associated monthly average compliance limit. [Minn. R. 7001] Use the following instructions to determine a reportable value where sample values are less	3M proposes that Draft Permit Condition 5.69.80 make explicit that an individual sample result for PFOA, PFOS, and PFHxS that is below the Compliance Limits in Draft Permit Condition 56.69.128 is "considered to be in compliance with the associated daily maximum limit." Also, 3M proposes to clarify that a calculated monthly average that is below the average reporting limit or its Compliance Limit is in compliance with the monthly average result for that pollutant as described in Draft Permit Condition 5.69.80(B).

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			than the RL and the permit requires reporting of an average. A. If some values are less than (<) the RL, substitute zero for all non-detectable values to report the average or summed concentration. Example: The values for the month are: 5.0 ng/L, 4.0 ng/L, 3.0 ng/L and <2.0 ng/L. Report the monthly average or sum as (5.0 + 4.0 + 3.0 + 0.0) = 12.0 divided by 4 = 3.0 ng/L B. If all values are less than (<) the RL, use the RL for all non-detectable values to calculate the average or sum and report as < the RL calculated average or summed concentration. Example: The values for the month are <0.2 ng/L, <0.4 ng/L, <0.2 ng/L, <2.0 ng/L. Report the monthly average or sum as (0.2 + 0.4 + 0.2 + 2.0) = 2.8 divided by 4 = < 0.7 ng/L. C. For calculating the average reporting limit: Average the numeric reporting limit for each PFOS or PFOA sample over the calendar year. If the average reporting limit is less than 4 ng/L, then the reporting limit is in compliance for that year. Example: The reporting limits for four PFOS samples at SD 001 for a given year are: 1.8 ng/L, 3.2 ng/L, 4.0 ng/L, and 5.0 ng/L. This averages out to 3.5 ng/L as a yearly average and would be in compliance with the 4 ng/L value. [Minn. R. 7001]	
5.69.82 6.60.17	46, 91	Special Requirements - Annual PFAS Removal and Disposal Report	~~**Annual PFAS Removal and Disposal Report**~~ The Permittee must report the annual (Jan-Dec) combined removal of each PFAS compound across all PFAS treatment systems in units of kilograms per year and percent removal no later than May 1 of each year. The first such report shall be submitted no later than May 1 of the first full	3M requests the first Annual PFAS Source Identification and Reduction Report be submitted no later than May 1 of the first full calendar year following the calendar year in which the permit is finalized. 3M lacks the resources to undertake the work required of this section and prepare the required report in less than one year's time. The

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			calendar year following the calendar year in which the permit was issued as final. The goal is to quantify the total PFAS captured on all GAC and IX media in one year and explain the methodology by which the quantification was performed. The Permittee must also report where the captured PFAS is sent for disposal and whether that PFAS is fully destroyed. The Permittee shall submit an annual report: Due annually no later than May 1~~, by the 31st of March~~.	reporting approach recommended by 3M will ensure that it has sufficient time to perform the work required by this permit condition. Further, ~~-~~laboratory processing time for PFAS parameters may not allow for adequate time to prepare the report by March 31 annually, especially with significant other environmental reporting requirements occurring during the first quarter. As such, 3M requests that all non-standard annual reporting [Annual PFAS Source Identification and Reduction Report, Annual Laboratory Analytical Method Report, Annual PFAS Removal and Disposal Report] deadlines be moved to May 1.
5.69.88 6.60.18	47, 91	Special Requirements - Non-Targeted Analysis	Non-targeted Analysis (NTA) sampling shall have results submitted to the MPCA ~~within~~ no later than six months ~~of~~ after sample collection. All new PFAS compounds identified as being present within the water(s) discharged from the facility shall have a MPCA verified Chemical Abstract Service (CAS) number provided along with their chemical structure. At least one (1) NTA Sampling Result Report shall be submitted every five years. ~~The Permittee plans to phase out all PFAS manufacturing and processing by the end of 2025~~. The Permittee shall submit a report: Due by permit expiration. Subsequent results/reports shall continue to be submitted every five years (even beyond permit expiration, until reissuance where this requirement will have been reassessed).	3M's announcement that it will "exit all PFAS manufacturing by the end of 2025" and "work to discontinue use of PFAS across our product portfolio by the end of 2025" is a voluntary commitment and not mandated by law. While MPCA's proposed language reads as arguably informational, the placement of this editorial-type language in an enforceable permit condition creates an opportunity for MPCA or third-parties to argue that 3M's voluntary phase-out decision is a legally-enforceable NPDES permit condition. The proposed language should be stricken.

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5.69.92	47	Special Requirements - Instream PFAS Characterization Study	~~The Permittee shall continue to submit subsequent Characterization Study results every five years following submittal of the submittal of the 2028 study. [Minn. R. 7001]~~	For the reasons stated in the body of our comment letter, Draft Permit Condition 5.69.92, which requires the continued submission of instream characterization studies beyond the five-year permit term of a final permit, exceeds MPCA's authority under both the federal Clean Water Act and the statutes and regulations authorizing implementation of the Clean Water Act in Minnesota. The condition should be stricken in its entirety. In addition, Draft Permit Condition 5.69.92 includes a typographical error in that the phrase "submittal of the" language is repeated twice.
6.60.21	92	Special Requirements - Instream PFAS Characterization Study	~~The Permittee shall continue to submit subsequent Characterization Study results every five years. [Minn. R. 7001]~~	For the reasons states in the body of our comment letter, Draft Permit Condition 6.60.21, which requires the continued submission of instream characterization studies beyond the five-year permit term of a final permit, exceeds MPCA's authority under both the federal Clean Water Act and the statutes and regulations authorizing implementation of the Clean Water Act in Minnesota. -The condition should be stricken in its entirety.
5.69.101	48	Special Requirements - RO and AIX Treatment Systems	Once online, the RO and AIX treatment systems shall be operated at all times except under emergency conditions or other conditions authorized by this permit, including maintenance, or downtime as described in the ~~MPCA approved (once approved)~~ operations and maintenance plan for the systems. [Minn. R. 7001]	Draft Permit Condition 5.69.101 requires that 3M submit for MPCA's approval the O&M manuals for the ion exchange (IX) and reverse osmosis (RO) systems. The proposed requirement departs from MPCA's practice in other permits, which do not require O&M manual submission and approval. O&M manuals are updated regularly to reflect the in-practice learnings of systems operations (e.g., during start-up and optimization stages) – i.e., the manuals are living documents. Imposing an O&M manual approval process will hamstring 3M's operations of

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				the system. The language requiring MPCA approval of the O&M manuals should be stricken. In addition, as written, Draft Permit Condition 5.69.101 is unclear. -3M offers comments to clarify the conditions during which the IX and RO treatment systems may not be operated.
5.69.102	48	Special Requirements - RO & IX O&M Manual	~~Within~~ No later than 60 days after the associated system stabilization, optimization, and conduct[s] reliability testing dates in 5.68.55, ~~advanced wastewater treatment system start-up date~~, the Permittee shall complete its ~~i~~ion ~~E~~exchange (IX) operations and maintenance (O&M) manuals. The O&M manuals shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure and response procedure. The Permittee shall immediately implement and comply with the IX O&M ~~manual and submit a revised version within~~ no later than 365 days ~~of~~ after any future revisions being made. ~~The Permittee shall submit an operations and maintenance (O & M) manual: Due 05/31/2025.~~ [Minn. R. 7001]	The title of Draft Permit Condition 5.69.102 is mislabeled as the language of the condition only refers to ion exchange. -This condition refers to the ion exchange system in the permit by use of the acronym IX. -Elsewhere in the Draft Permit MPCA uses the acronym AIX to refer to the ion exchange system. See e.g., Draft Permit Condition 5.69.101. MPCA should choose one acronym to use consistently throughout the permit. Draft Permit Condition 5.69.102 requires that 3M submit for MPCA's approval the O&M manuals for the ion exchange (IX) system. The proposed requirement departs from MPCA's practice in other permits, which do not require submission and approval. O&M manuals are updated regularly to reflect the in-practice learnings of systems operations (e.g., during start-up and optimization stages) – i.e., the manuals are living documents. Imposing an O&M manual approval process will hamstring 3M's operation of the sub-systems. The language requiring MPCA approval of the O&M manuals should be stricken. System start-up and optimization will take months to complete and the O&M manuals will be continually

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				updated during that time. 3M proposes to finalize its O&M manuals for the IX system no later than 60 days after it completes "system stabilization, optimization, and conduct[s] reliability testing" (see Draft Permit Condition 5.68.55) to ensure that the IX O&M manuals reflect conditions learned during that phase of the compliance schedule. Consistent with the foregoing, the O&M manual submittal requirements should be updated to reflect that manuals should be completed no later than 60 days after the system stabilization dates in Draft Permit Condition 5.68.55. As written, the language is ambiguous as "start up" is not equivalent to completion of construction or completion of stabilization.
5.69.104	48	Granular Activated Carbon Treatment Systems	The granular activated carbon treatment systems shall be operated at all times except under emergency conditions or other conditions authorized by this permit, including ~~and under conditions of~~ maintenance ~~or~~ downtime as described in the ~~MPCA approved~~ operations and maintenance plan for the systems. [Minn. R. 7001]	Draft Permit Condition 5.69.104 requires that 3M submit for MPCA's approval the O&M manual for the GAC treatment systems. The proposed requirement departs from MPCA's practice in other permits, which do not require submission and approval of O&M manual, and the language referencing MPCA approval should be stricken. O&M manuals are updated regularly to reflect the in-practice learnings of systems operations (e.g., during start-up and optimization stages) – i.e., the manuals are living documents. Imposing an O&M manual approval process will hamstring 3M's operations of the system. In addition, as written, Draft Permit Condition 5.69.101 is unclear. 3M offers comments to clarify the conditions during which the GAC treatment systems may not be operated and to offer parallel construction of this condition and Draft Permit Condition 5.69.101.

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5.69.105, 6.60.27	48, 93	GAC O&M Manual	~~**GAC O&M Manual**~~ ~~Within~~ No later than 60 days after ~~of~~ permit issuance, the Permittee shall submit its current GAC O&M manual(s) for each building that contains the GAC treatment technology. The O&M manual(s) shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedure~~s, breakthrough thresholds/determination procedure and response procedure~~ and the activated carbon changeout procedures. The Permittee shall immediately implement and comply with the GAC O&M manual(s) and update the plan annually ~~submit revised versions within 30 days of any future revisions being made~~. ~~The Permittee shall submit an operations and maintenance (O & M) manual: Due by 60 days after permit issuance. [Minn. R. 7001]~~	This section is confusing as the facility has multiple GAC systems. For the two existing GAC systems (i.e., the GAC systems in Buildings 92 and 185), completion of the O&M manuals no later than 60 days of permit issuance is acceptable. For the GAC systems associated with the advanced treatment system, the language should mirror Draft Permit Condition 5.69.102. The PFAS breakthrough requirements are unclear and confusing. It appears the MPCA is imposing internal wastestream compliance requirements that should be reserved for effluent discharge from the end of the entire treatment system, and determining the level of PFAS breakthrough is difficult based on current analytical methods limitations.
5.69.107, 6.60.28	48, 93	Additional Operation and Maintenance Requirements - WWTP O&M Manual	~~**WWTP O&M Manual**~~ No later than ~~Within~~ ~~60 days~~ six months after ~~of~~ permit issuance the Permittee shall submit its Wastewater Treatment Plant (WWTP) O&M manual covering the treatment units that comprise the Phase 1, Phase 2, and Phase 3 treatment trains. The WWTP O&M manual shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedure~~s, breakthrough thresholds/determination procedure~~ and response procedure. The Permittee shall immediately implement and comply with the WWTP O&M	It is unclear what process units this WWTP O&M Manual covers. 3M proposes defining the scope of this manual as described above. The timeline of 60 days for the report is unreasonable. 3M proposes to require submittal of the plan no later than 6 months of permit issuance. This timeline may be modified depending on the outcome of the scope definition. The PFAS breakthrough requirements are unclear and confusing. It appears that MPCA is imposing internal wastestream compliance requirements that should be reserved for effluent discharge from the end of the entire treatment system, and determining

Appendix 1 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments

Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
			manual and ~~submit a revised version within 30 days of any future revisions being made~~ update annually. The Permittee shall submit an operations and maintenance (O & M) manual: Due no later than ~~by 60 days~~ 6 months after permit issuance. [Minn. R. 7001]	the level of PFAS breakthrough is difficult based on current analytical methods limitations.
5.69.108, 6.60.29	48, 93	Additional Operation and Maintenance Requirements - WWTP O&M Manual	~~As soon as possible and no later than September 30, 2024, the Permittee shall submit the currently in effect editions/revisions of O&M manuals for all PFAS treatment technology buildings and equipment at its facility. The manuals shall specify the control system alarms and setpoints. The Permittee shall submit an operations and maintenance (O & M) manual: Due 09/30/2024. [Minn. R. 7001]~~	The condition exceeds MPCA's authority as it imposes obligations that pre-date final permit issuance. Moreover, the condition is duplicative of other requirements of the Draft Permit. The Draft Permit includes multiple O&M conditions in multiple locations throughout the Draft Permit. 3M recommends that MPCA consolidate the O&M manual conditions into a single permit condition to streamline the requirements. For example, this condition is duplicative of Draft Permit Conditions 5.69.101, 5.69.102, 5.69.104, 5.69.105, 5.69.107, 6.60.27, and 6.60.28.
5.69.109, 6.60.30	49, 93	Additional Operation and Maintenance Requirements - WWTP O&M Manual	~~As soon as possible and no later than September 30, 2024, the Permittee shall submit the currently in effect editions/revisions of Standard Operating Procedures (SOPs) for all PFAS treatment technology buildings and equipment at its facility. The Permittee shall submit a submittal: Due 09/30/2024. [Minn. R. 7001]~~	The condition exceeds MPCA's authority as it imposes obligations that pre-date final permit issuance date. -Moreover, the condition is duplicative of other requirements of the Draft Permit. The Draft Permit includes multiple O&M conditions in multiple locations throughout the Draft Permit. 3M recommends that MPCA consolidate the O&M manual conditions into a single permit condition and section and streamline the requirement. For example, this condition is duplicative of Draft Permit Conditions -5.69.101, 5.69.102, 5.69.104, 5.69.105, 5.69.107, 6.60.27, and 6.60.28.
5.69.110, 6.60.31	49, 93	Additional Operation and	~~As soon as possible and no later than September 30, 2024, the Permittee shall submit the currently~~	The condition exceeds MPCA's authority as it imposes obligations that pre-date final permit

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Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
		Maintenance Requirements - WWTP O&M Manual	~~in effect editions/revisions of Operator Forms for all PFAS treatment technology buildings and equipment at its facility. The Permittee shall submit a submittal: Due 09/30/2024. [Minn. R. 7001]~~	issuance date. ~~-~~Moreover, the condition is duplicative of other requirements of the Draft Permit. The Draft Permit includes multiple O&M conditions in multiple locations throughout the Draft Permit. 3M recommends that MPCA consolidate the O&M manual conditions into a single permit condition and section and streamline the requirement. For example, this condition is duplicative of Draft Permit Conditions 5.69.101, 5.69.102, 5.69.104, 5.69.105, 5.69.107, 6.60.27, and 6.60.28.
5.69.121	50	Additional Operation and Maintenance Requirements - pH Setpoints - Optimization of Metals Removed Removed. [Minn. R. 7001]	The Permittee shall operate the pH adjustment/chemical precipitation systems for the phase 1 Treatment Train (inorganic wastewater) so that metal removals are optimized. Chemical pH adjustment and precipitation systems shall be optimized for removal of nickel and zinc specifically. [Minn. R. 7001]	The *Permitted facility description* (Draft Permit, at p.3) and the *Description of permitted facility* (Fact Sheet, at p. 7) describe three different "phases" of the Cottage Grove wastewater treatment system as Phase 1, Phase 2, and Phase 3. Throughout the Draft Permit and Fact Sheet, MPCA also uses the term "phase" to describe the Cottage Grove sewers and the wastewater treatment system (phase) to which they flow – (e.g., "Chem Sewer Phase 1 Group 3 flows to the Phase 1 treatment train). Further, MPCA uses the term "phase" to describe the four major milestones of the Cottage Grove advanced wastewater treatment system compliance schedule. See e.g., Draft Permit Condition 5.68.61. MPCA's multiple use of the term 'phase" to mean different things under the Draft Permit and Fact Sheet renders important conditions of the Draft Permit ambiguous and difficult to understand. For example, Draft Permit Condition 7, *Limits and monitoring* table at p. 104, and elsewhere

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Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
				in that table, describes the "Subject item" as "SD 001 Process & Sanitary Effluent Phase 1". It is not clear from the quoted language whether the term "phase" refers to the Cottage Grove waste water treatment system train or the advanced wastewater treatment system compliance schedule. To address this ambiguity, 3M proposes adding the "Proposed Draft Permit Language" in the Draft Permit *Permitted facility description* at p. 4.
5.69.128	50	Adsorbable Organic Fluorine - Definitions	Compliance limit (CL)" shall mean: The value deemed as compliance with the Daily Maximum and Monthly Average PFAS limits. The monthly average and daily maxim~~i~~um PFOS WQBELs are below the reporting limits (limits of quantitation) achievable when analyzing treated effluent at Cottage Grove. For PFOS, a statistical analysis of the actual reporting limit wastewater at Cottage Grove sampling stations SD 001and SD 002 is 2.2 ng/L. For PFOA and PFHxS, the actual reporting limit is 2.1 ng/L. For these three parameters, any effluent value less than or equal to the numbers above will be considered to be in compliance with the daily maximum limit; and any monthly average effluent value reported above a reporting limit per 5.69.80(A) that is equal to or below the numbers above will be considered to be in compliance with the monthly average limits. [Minn. R. 7001]	Draft Permit Condition 5.68.73 is vague and ambiguous. MPCA seeks to define "initiation of operation" as the date that "all components" are "complete and functioning" and the "project begins operating for the purposes for which it was planned, designed, and built." Yet, none of those terms are defined in the Draft Permit or in Chapter 7001 of the Minnesota Administrative Rules. For example, MPCA fails to identify the specific components it refers to. Likewise, by use of the terms "complete and functioning" we can infer that MPCA is intending to relate those concepts to the construction of the advanced wastewater treatment system, but Draft Permit Condition 5.68.73 permit language does not reference the advanced wastewater treatment system. In the construction world, the concept of completeness can mean "final completion" or "substantial completion," but Draft Permit Condition 5.68.73 fails to distinguish between the two. Each of the preceding quoted terms are undefined and ambiguous. "Substantial completion" means that the project is built but that minor, punch-

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Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
				list and warranty work remain to be completed. "Final completion" means that all major and minor work has been completed and there is no further work to be performed. Moreover, the approach in Draft Permit Condition 5.68.73 is inconsistent with the approach to initiation of operation in Draft Permit Condition 5.68.56, which requires the Permittee submit a notice of initiation of operation to MPCA "within 90 days of initiating startup operations." It is not clear what is the purpose of such notice if MPCA is making the determination described in Draft Permit Condition 5.68.73. The initiation of operation notification requirement only makes sense if 3M and not MPCA is making that determination.
5.75.245	59	Treatment System Operation and Maintenance	The Permittee shall maintain a Treatment Operations Plan that describes the treatment system used to achieve compliance with the permit conditions. The plan shall be inclusive of all wastewater treatment units described in the Facility Description. The plan shall include, at a minimum: A. A description of how the processes employed and physical design of the treatment works to ensure compliance with the permit limits; B. A contingency plan to be activated in the event of an emergency, including measures for the protection of the health and safety of employees and the public; C. Provisions for system start-up including a description of additional sample collection needed to show that the system is operating as designed	It is unclear what process units this Treatment Operations Plan covers. 3M proposes that the scope of this manual be defined, and be consistent with the units described in 5.69.107.

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Additional Draft Permit Comments

Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
			before wastewater is released; D. Provisions for system shutdown; and E. Provisions to determine if the treatment system requires maintenance or other corrective actions to meet the permit limits. The Permittee shall provide a copy of this plan upon the request of the MPCA. [Minn. R. 7001.0150, subp. 3]	
5.77.346	69	Industrial Stormwater Annual Report	The Annual Report must cover those portions of the previous calendar year the Permittee had authorization to discharge industrial stormwater. The Annual Report must include, at a minimum, the following information: * * * ~~K. A detailed narrative describing the operation and maintenance procedures utilized for PFAS treatment of stormwater that monitored for PFAS breakthrough. Response procedures in place to ensure that PFOS is consistently non-detect after treatment so as to determine changeout frequency consistent with optimizing the technologies shall also be included.~~	Section K should be stricken from the stormwater annual report requirements as duplicative because the information MPCA seeks by this condition is required to be included in the O&M manuals and annual reports under other conditions of this Draft Permit.
5.69.125	50	Special Requirements	~~**Adsorbable Organic Fluorine**~~ ~~Analysis of Adsorbable Organic Fluorine (AOF) is required for all stations that require Total Organic Fluorine (TOF) at the same monitoring frequency.~~	Draft Permit Condition 5.69.125 should not be included in a final permit for the following reasons. First, TOF is the proven and preferred method for analyzing for the presence of organic fluorine, particularly those that comprise shorter-chain PFAS. Second, there is no information that would be generated from performing AOF analyses that would not be available from TOF analyses, and hence this Draft Permit condition is duplicative and unnecessary. Third, notwithstanding the foregoing, to

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Draft Permit Condition	Draft Permit Condition Page No.	Title/Subject Matter of Draft Permit Condition/Fact Sheet	Proposed Draft Permit Language/Request	Reason For Recommended Modification
				the extent that MPCA proposes to prescribe analytical methods, all such methods should be included in Table 7 of the Draft Permit. Finally, there are multiple inconsistent references to AOF in the Draft Permit. For example, compare Draft Permit Condition 5.69.127 to the Draft Permit's reference to "[3- (Heptadecafluorooctyl sulfonylamino)propyl] dimethylamine Noxide (AOF)" on page 127.

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3M's Proposed Draft Permit Table Changes

<table>
<tr><th>Part</th><th>Table</th><th>Reason for Recommended Modification</th></tr>
<tr>
<td>7- Limits and Monitoring - Calculation of Monthly Averages</td>
<td>
<table>
<tr><th>Subject Item</th><th>Parameter</th><th>Quantity /Loading avg.</th></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 3</td><td>Perfluorobutanesulfonic acid (PFBS)</td><td><s>103,394</s> 103 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 4</td><td>Perfluorobutanesulfonic acid (PFBS)</td><td><s>103,394</s> 103 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 3</td><td>Perfluorobutanoic acid (PFBA)</td><td><s>861,622</s> 862 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 4</td><td>Perfluorobutanoic acid (PFBA)</td><td><s>861,622</s> 862 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 3</td><td>Perfluorohexanesulfonic acid (PFH1S / PFHS / PFHxS)</td><td><s>0.079</s> 0.052 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 4</td><td>Perfluorohexanesulfonic acid (PFH1S / PFHS / PFHxS)</td><td><s>0.079</s> 0.052 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 3</td><td>Perfluorohexanoic acid (PFHxA)</td><td><s>151,645</s> 152 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 4</td><td>Perfluorohexanoic acid (PFHxA)</td><td><s>151,645</s> 152 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 3</td><td>Perfluorooctanesulfonic acid (PFOS)</td><td><s>0.93</s> 0.054 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 4</td><td>Perfluorooctanesulfonic acid (PFOS)</td><td><s>0.93</s> 0.054 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 3</td><td>Perfluorooctanoic acid (PFOA)</td><td><s>0.32</s> 0.052 calendar month average</td></tr>
<tr><td>SD 001 Process & Sanitary Effluent Phase 4</td><td>Perfluorooctanoic acid (PFOA)</td><td><s>0.32</s> 0.052 calendar month average</td></tr>
</table>
</td>
<td>The calendar month average (g/day) limits for PFAS are incorrectly calculated. They should be updated as shown.

In addition, mass-based effluent limitations for PFOA, PFOS, and PFHxS should be calculated based on the Compliance Limits for those PFAS and not the WQBELs.</td>
</tr>
</table>

Appendix 1 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments

<table>
<tr><th>Part</th><th>Table</th><th>Reason for Recommended Modification</th></tr>
<tr><td></td><td>
<table>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 3</td><td>Perfluorobutanesulfonic acid (PFBS)</td><td><s>138,390</s> 138 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 4</td><td>Perfluorobutanesulfonic acid (PFBS)</td><td><s>138,390</s> 138 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 3</td><td>Perfluorohexanesulfonic acid (PFH1S / PFHS / PFHxS)</td><td><s>0.11</s> 0.069 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 4</td><td>Perfluorohexanesulfonic acid (PFH1S / PFHS / PFHxS)</td><td><s>0.11</s> 0.069 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 3</td><td>Perfluorohexanoic acid (PFHxA)</td><td><s>202,972</s> 203 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 4</td><td>Perfluorohexanoic acid (PFHxA)</td><td><s>202,972</s> 203 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 3</td><td>Perfluorooctanesulfonic acid (PFOS)</td><td><s>1.25</s> 0.072 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 4</td><td>Perfluorooctanesulfonic acid (PFOS)</td><td><s>1.25</s> 0.072 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 3</td><td>Perfluorooctanoic acid (PFOA)</td><td><s>0.42</s> 0.069 calendar month average</td></tr>
<tr><td>SD 002 NCCW, GW, & ISW Effluent Phase 4</td><td>Perfluorooctanoic acid (PFOA)</td><td><s>0.42</s> 0.069 calendar month average</td></tr>
</table>
</td><td></td></tr>
<tr><td>Removing Requested Waste Stations</td><td>
<table>
<tr><th colspan="4">Public Notice Draft Fact Sheet Language</th></tr>
<tr><td><s>WS 001</s></td><td><s>Internal Waste Stream</s></td><td><s>Process & Sanitary AIX Effluent Prior to Mixing into SD 001 (Bld. 151)</s></td><td><s>T27N, R21W, S34, NE Quarter</s></td></tr>
<tr><td><s>WS 002</s></td><td><s>Internal Waste Stream</s></td><td><s>NCCW, GW, & ISW AIX Effluent Prior to Mixing into SD 002 (Bld. 151)</s></td><td><s>T27N, R21W, S34, NE Quarter</s></td></tr>
<tr><td><s>WS 003</s></td><td><s>Internal Waste Stream</s></td><td><s>GW/ISW/NCCW GAC Lag Vessel Effluent (Bld 150)</s></td><td><s>T27N, R21W, S34, NE Quarter</s></td></tr>
</table>
</td><td>MPCA failed to provide justification for implementing internal waste stream monitoring stations. The MPCA is required to include a basis for any permit condition and references to statutes or regulations supporting the permit condition per 40 C.F.R §§ 124.8 and 124.56 and Minn. R. 7001.0100, Subp. 3.

Furthermore, MPCA can only establish internal waste stream monitoring stations after MPCA has determined that it is not feasible to establish effluent limitations and monitoring</td></tr>
</table>

Appendix 1 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments

Part	Table				Reason for Recommended Modification
	~~WS 004~~	~~Internal Waste Stream~~	~~WW GAC Lag Vessel Effluent (Bld 150)~~	~~T27N, R21W, S34, NE Quarter~~	requirements at the point of discharge to waters of the state per Minn. R. 7001.1080, Subp. 2. MPCA did not cite any statutes or regulations that support the implementation of internal waste stream monitoring stations nor did it document an infeasibility determination. Therefore, MPCA should remove the internal waste stream monitoring stations. 3M previously commented on legal deficiencies and failure to adhere to regulations in the initial pre-PN comment letter. The WS 020 station should also be removed. The sampling location is 1G-01 which will not receive flow from the borrow pit and instead gets runoff from film and bubbles manufacturing. Water from the borrow pit will flow into Basin 1AI (SD026) or Lift Station 1E01 (SD 025).
	~~WS 005~~	~~Internal Waste Stream~~	~~BLD 185 GAC Lead Vessel Effluent (Bld 185)~~	~~T27N, R21W, S34, NE Quarter~~	
	~~WS 006~~	~~Internal Waste Stream~~	~~BLD 92 Potable Lag Vessel Effluent~~	~~T27N, R21W, S34, NE Quarter~~	
	~~WS 007~~	~~Internal Waste Stream~~	~~BLD 92 Non-Potable Lag Vessel Effluent~~	~~T27N, R21W, S34, NE Quarter~~	
	~~WS 008~~	~~Internal Waste Stream~~	~~Basin 2L-01: Former D8 Disposal Area & East Cove/Railroad~~	~~T27N, R21W, S34, NE Quarter~~	
	~~WS 009~~	~~Internal Waste Stream~~	~~Basin 3J/3T: 3J-01, 3R-01, 3R-02, 3R-03, 3T-01: Former Incinerator Area~~	~~T27N, R21W, S27, SW Quarter~~	
	~~WS 010~~	~~Internal Waste Stream~~	~~Basin 3U: 3U-01/BML 001: Former Incinerator Area~~	~~T27N, R21W, S27, SW Quarter~~	
	~~WS 011~~	~~Internal Waste Stream~~	~~Basin 3V: 3V-01: Former Incinerator Area~~	~~T27N, R21W, S27, SW Quarter~~	
	~~WS 012~~	~~Internal Waste Stream~~	~~Basin 3Z: 3Z-01, 3Z-02/BML 005: Contractor Village~~	~~T27N, R21W, S34, NW Quarter~~	
	~~WS 013~~	~~Internal Waste Stream~~	~~Fire Training Area Pond: 3AL-02/Fire Training Pond: Fire Training Area~~	~~T27N, R21W, S34, NW Quarter~~	
	~~WS 014~~	~~Internal Waste Stream~~	~~Basin 3AL: 3AL-01, 3AL-03, 3AL-04: Contractor Village~~	~~T27N, R21W, S34, NW Quarter~~	
	~~WS 015~~	~~Internal Waste Stream~~	~~Manhole 3Y Basin: 3Y-01: Contractor Village~~	~~T27N, R21W, S34, NW Quarter~~	
	~~WS 016~~	~~Internal Waste Stream~~	~~Basin AB-01: Former D8 Disposal Area~~	~~T27N, R21W, S34, NE Quarter~~	
	~~WS 017~~	~~Internal Waste Stream~~	~~Basin 2AA: 2AA-01/BML 003: Former D8 Disposal Area~~	~~T27N, R21W, S34, NE Quarter~~	
	~~WS 018~~	~~Internal Waste Stream~~	~~Basin 2I/Pond 3: Bypass Basin (fka 2I-01, 2I-02, 2I-03, 2I-04 and 2I-05): Former D5 Disposal Area~~	~~T27N, R21W, S34, NE Quarter~~	

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Additional Draft Permit Comments

Part	Table				Reason for Recommended Modification
	~~WS 019~~	~~Internal Waste Stream~~	~~Basin AD: AD-02, AD-03/BML 004: Wastewater Treatment Plant~~	~~T27N, R21W, S34, NE Quarter~~	
	~~WS 020~~	~~Intermediate: WW to Land~~	~~1G-01: Borrow Pit~~	~~T27N, R21W, S27, SE Quarter~~	
	~~WS 021~~	~~Internal Waste Stream~~	~~Basin 1E: 1E-01, 1E-02, 1F-01, 1G-02, AM-01: Front Entrance/Building 57/North Access Road~~	~~T27N, R21W, S27, SE Quarter~~	
	~~WS 022~~	~~Internal Waste Stream~~	~~Basin AG: AG-01, AG-02, AG-03: Building 57/North Access Road~~	~~T27N, R21W, S27, SE Quarter~~	
	~~WS 024~~	~~Internal Waste Stream~~	~~Basin AB-03: Former D8 Disposal Area~~	~~T27N, R21W, S34, NW Quarter~~	
	~~WS 025~~	~~Internal Waste Stream~~	~~Basin AB-04: Former D8 Disposal Area~~	~~T27N, R21W, S34, NW Quarter~~	
	~~WS 026~~	~~Internal Waste Stream~~	~~Basin 3W/3X: 3W-01, 3X-01, 3X-02: Fire Training Area~~	~~T27N, R21W, S34, NW Quarter~~	
	~~WS 027~~	~~Internal Waste Stream~~	~~Basin 1AI-01: Building 57/North Access Road~~	~~T27N, R21W, S27, SE Quarter~~	

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Additional Draft Permit Comments

3M's Proposed Fact Sheet Changes

Fact Sheet Page Number(s)	Fact Sheet Language	Proposed Fact Sheet Language	Reason For Recommended Modification
35-40			The *Special Conditions* listed in the fact sheet should be updated to correspnd to the proposed language for the following permit conditions: • Permit Condition Permit Condition 5.69.76 • Permit Condition 5.69.78 and 6.60.15 • Permit Conditions 5.69.79 and 6.60.16 • Permit Condition 5.69.80 • Permit Condition 5.69.82 and 6.60.17 • Permit Condition 5.69.88 and 6.60.18 • Permit Condition 5.69.92 and 6.60.21 • Permit Condition 5.69.102 • Permit Condition 5.69.105 and 6.60.27 • Permit Condition 5.69.107 and 6.60.28 • Permit Condition 5.69.108 and 6.60.29 • Permit Condition 5.69.109 and 6.60.30 • Permit Condition 5.69.110 and 6.60.31 • Permit Condition 5.69.121
47	This Permittee is proposing to increase the facility's maximum daily flow at SD 002 from 6.8 mgd to 8.7 mgd. Because of this expansion, a Modified WLA Justification Memo has been completed. Adding the original WLA of 545 kg/day (SD 001) to the expanded WLA of 978 kg/day	This Permittee is proposing to increase the facility's maximum daily flow at SD 002 from 6.8 mgd to 8.7 mgd. Because of this expansion, a Modified WLA Justification Memo has been completed. Adding the original WLA of 545 kg/day (SD 001) to the	MPCA mistakenly identifies the South Metro TMDL Turbidity Impairment as 978 kg/day. The correct value is 987 kg/day.

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Fact Sheet Page Number(s)	Fact Sheet Language	Proposed Fact Sheet Language	Reason For Recommended Modification
	(SD 002) gives a total of 1,532 kg/day.	expanded WLA of ~~978~~ 987 kg/day (SD 002) gives a total of 1,532 kg/day.	

APPENDIX 2

Appendix 2 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments – Compliance Dates

Draft Permit Condition	Proposed Draft Permit Language/Request
5.1.1, 5.3.1, 6.1.1, 6.3.1	The Permittee shall submit a monthly DMR: Due ~~by~~no later than 21 days after the end of each calendar month following permit issuance. [Minn. R. 7001.0150, Subp. 2(B)]
5.6.32	All WET test data and TAC must be submitted to the MPCA ~~by~~no later than the dates required by this section of the permit using both the MPCA Ceriodaphnia dubia Chronic Toxicity Test Report and the MPCA Fathead Minnow Chronic Toxicity Test Report found on the MPCA website at https://www.pca.state.mn.us/business-with-us/step-4-create-swppp-choose-bmps. Data not submitted on the correct form(s), or submitted incomplete, will be returned to the Permittee and deemed incomplete until adequately submitted on the designated form(s). These are legal forms and must be signed and dated by the Permittee. [Minn. R. 7001]
5.7.1, 6.7.1	The Permittee shall submit a quarterly DMR: Due ~~by~~no later than 21 days end of each calendar quarter following permit issuance. [Minn. R. 7001.0 Subp. 2(B)]
5.8.1−5.27.1, 6.8.1−6.27.1	The Permittee shall submit a quarterly DMR: Due ~~by~~no later than 21 days after the end of each calendar quarter following permit issuance. [Minn. R. 7001.0150, Subp. 2(B)]
5.28.1−5.31.1, 6.28.1−6.31.1	The Permittee shall submit a quarterly DMR: Due ~~by~~no later than 21 days after the end of each calendar quarter following permit issuance. [Minn. R. 7001.0150, Subp. 2(B)]
5.32.1, 5.34.1, 5.36.1, 5.37.1, 5.38.1, 5.40.1, 5.42.1, 6.32.1, 6.33.1, 6.34.1, 6.35.1, 6.36.1, 6.37.1, 6.38.1	The Permittee shall submit a monthly DMR: Due ~~by~~no later than 21 days after the end of each calendar month following permit issuance. [Minn. R. 7001.0150, Subp. 2(B)]
5.44.1, 5.45.1, 5.46.1, 5.47.1, 5.48.1, 5.49.1, 5.50.1, 5.51.1, 5.52.1, 5.53.1, 5.54.1, 5.55.1, 5.56.1, 5.57.1, 5.58.1, 5.59.1, 5.60.1, 5.61.1, 5.62.1, 5.63.1, 6.39.1, 6.40.1, 6.41.1, 6.42.1, 6.43.1, 6.44.1, 6.45.1, 6.46.1, 6.47.1, 6.48.1, 6.49.1, 6.50.1, 6.51.1, 6.52.1, 6.53.1, 6.54.1, 6.55.1, 6.56.1, 6.57.1, 6.58.1	The Permittee shall submit an annual DMR: Due ~~by~~no later than 21 days after the end of each calendar year following permit issuance. [Minn. R. 7001.0150, Subp. 2(B)]
5.68.69, 6.59.12	Flow monitoring (once per day) is required to be conducted at surface water station SW 001. By no later than one year after permit issuance, the Permittee shall have installed a flow monitoring device at station SW 001 so daily flow monitoring may be conducted. The Permittee shall notify the MPCA once installation is complete and the device is operational. Flow monitoring and eDMR reporting of flow (Phases 2, 3, and 4) will become effective once the MPCA receives notification. The

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	Permittee shall submit notice of equipment installation: Due ~~by~~no later than one year after permit issuance. [Minn. R. 7001]
5.68.71, 6.59.13	The Permittee shall submit quarterly progress reports detailing its intentions and plan for Phase 3 water. The Permittee shall submit a progress report: Due ~~by~~no later than the end of each calendar quarter following permit issuance. [Minn. R. 7001]
5.69.77, 6.60.14	The Permittee shall submit an Annual PFAS Certification Statement ~~by~~no later than January 21 of each year. * * *
5.69.78, 6.60.15	The Permittee shall submit an Annual PFAS Source Identification and Reduction Report ~~by~~no later than March 31 of each year. The report shall contain a detailed account for the most likely/probable source of each PFAS compound found in the facility's discharge(s), what source reduction and/or elimination efforts the Permittee has taken in the prior calendar year, and corrective actions planned for the future. The Permittee shall submit a PFAS source identification and reduction report: Due annually, ~~by~~no later than the 31st of March. [Minn. R. 7001]
5.69.79, 6.60.16	The Permittee shall submit an Annual Laboratory Analytical Method Report ~~by~~no later than March 31 of each year. The report shall identify the laboratory analytical methods, method detection and reporting limits, and reference standards for the PFAS it currently or historically has had the capability of quantifying for in wastewater, surface water, fish tissue, and groundwater. The report shall identify the year that each existing method was first developed. This report shall also include research into new PFAS compounds methodology capable of detecting PFAS to the minimum reporting levels available. The Permittee shall submit an annual report: Due annually, ~~by~~no later than the 31st of March. * * *
5.69.82, 6.60.17	The Permittee must report the annual (Jan-Dec) combined removal of each PFAS compound across all PFAS treatment systems in units of kilograms per year and percent removal. The goal is to quantify the total PFAS captured on all GAC and IX media in one year and explain the methodology by which the quantification was performed. The Permittee must also report where the captured PFAS is sent for disposal and whether that PFAS is fully destroyed. The Permittee shall submit an annual report: Due annually, ~~by~~no later than the 31st of March. [Minn. R. 7001]
5.69.88, 6.60.18	Non-targeted Analysis (NTA) sampling shall have results submitted to the MPCA ~~within~~no later than six months of sample collection. All new PFAS compounds identified as being present within the water(s) discharged from the facility shall have a MPCA verified Chemical Abstract Service (CAS) number provided along with their chemical structure. At least one (1) NTA Sampling Result Report shall be submitted every five years. The Permittee plans to phase out all PFAS manufacturing and processing by the end of 2025. The Permittee shall submit a report: Due ~~by~~no later than permit expiration. Subsequent results/reports shall continue to be submitted every five years (even

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	beyond permit expiration, until reissuance where this requirement will have been reassessed). [Minn. R. 7001]
5.69.90, 6.60.19	~~By~~No later than January 1, 2026, the Permittee shall submit a work plan for review and approval by MPCA for an instream PFAS characterization study (Characterization Study) of surface water, sediments, and fish tissue PFAS as outlined in the PFAS Surface Water Monitoring Protocol (Appendix A). If the Permittee would like to request a reduction in sampling from what was ~~in~~ required in the 2023 instream characterization study, they must explain why the reduction is reasonable and needed. The MPCA reserves the right to make any changes to the sampling plan prior to approval. The Permittee shall submit a work plan: Due 01/01/2026. The MPCA will review and approve the work plan ~~by~~no later than March 1, 2026. [Minn. R. 7001]
5.69.91, 6.60.20	~~By~~No later than January 1, 2028, the Permittee shall submit the results of the instream PFAS characterization study (Characterization Study) of surface water, sediments, and fish tissue for the PFAS as outlined in the Surface Water Monitoring Protocol (Appendix A). The Permittee shall submit sampling results: Due 01/01/2028. [Minn. R. 7001]
5.69.94, 6.60.22	The Permittee shall conduct a meeting annually to disclose factual information to the community regarding facility operations, changes made or planned to reduce pollutants in discharges, management of hazardous materials and compliance with environmental permits and regulations. The Permittee shall provide the time, date, location, format, and agenda of the meeting to the public 60 days before the meeting. The Permittee shall hold a meeting: Due annually, ~~by~~no later than the 31st of December. Submit a written notification following each meeting. [Minn. R. 7001.0150, subp. 2, Minn. Stat. ch. 115.03, subd. 1(2), Minn. Stat. ch. 115.03, subd. 1(8)]
5.69.96, 6.60.23	~~Within~~No later than 60 days of permit issuance, the Permittee shall submit its current version of a Foam Release, Detection, and Recovery (FRDR) Plan for review and approval. The Permittee shall immediately implement and comply with the FRDR plan version submitted for approval by MPCA once approved by MPCA. The Permittee shall submit a plan: Due ~~by~~no later than 60 days after permit issuance. [Minn. R. 7001]
5.69.98, 6.60.24	The Permittee shall submit an implementation plan ~~within~~no later than 90 days after permit issuance detailing the following: A. Timeline (maximum of three years for high priority/high risk pipes and maximum of ten years for all other pipes) for assessing condition of all underground piping conveying water at the facility; B. Timeline (maximum of one year) for restoring integrity of any underground piping found to have defects allowing either infiltration or exfiltration of water; and C. Maps, drawings, and diagrams along with methods for both pipe assessment and restoration of integrity. High priority/high risk pipes include but are not limited to (Reference: Cottage Grove Sewer Operations and Maintenance Manual dated July

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	28, 2023 Revision 0): Chem Sewer Phase 1 Group 3 Sanitary Sewer Group 1 Sanitary Sewer Group 2 Sanitary Sewer Group 3 Chem Sewer Phase 1 Group 2 Storm Sewer Group 2 Storm Sewer Group 3 Chem Sewer Phase 2 Group 3 The Permittee shall submit a plan: Due ~~by~~no later than 90 days after permit issuance. [Minn. R. 7001]
5.69.99, 6.60.25	The Permittee shall submit an Annual Underground Piping Report ~~by~~no later than March 31 of each year. The report shall include findings (e.g. including but not limited to televising footage) and summaries of actions taken responsive to the Underground Piping Integrity Plan. The Permittee shall submit an annual report: Due annually, ~~by~~no later than the 31st of March. [Minn. R. 7001
5.69.105, 6.60.27	~~Within~~No later than 60 days of permit issuance, the Permittee shall submit its current GAC O&M manual(s) for each building that contains the GAC treatment technology. The O&M manual(s) shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure and response procedure. The Permittee shall immediately implement and comply with the GAC O&M manual(s) and submit revised versions ~~within~~no later than 30 days of any future revisions being made. The Permittee shall submit an operations and maintenance (O & M) manual: Due ~~by~~no later than 60 days after permit issuance. [Minn. R. 7001]
5.69.107, 6.60.28	~~Within~~No later than 60 days of permit issuance, the Permittee shall submit its Wastewater Treatment Plant (WWTP) O&M manual. The WWTP O&M manual shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure and response procedure. The Permittee shall immediately implement and comply with the WWTP O&M manual and submit a revised version ~~within~~no later than 30 days of any future revisions being made. The Permittee shall submit an operations and maintenance (O & M) manual: Due ~~by~~no later than 60 days after permit issuance. [Minn. R. 7001]
5.69.111, 6.60.32	The Permittee shall submit an Annual O&M Deviation & WWTP Optimization Report ~~by~~no later than March 31 of each year. The report shall include all instances of effluent and intervention limit exceedances at any stations where and when related O&M deviations (e.g. including but not limited to carbon and IX changeouts not occurring prior to breakthrough and other set points established in both the IX and GAC O&M manuals) occurred. * * * The Permittee shall submit an annual report: Due annually, ~~by~~no later than the 31st of March. [Minn. R. 7001]
5.71.161−5.71.162, 6.61.33−6.61.34	The Permittee shall submit pond performance evaluation plan: Due ~~by~~no later than 180 days prior to permit expiration. [Minn. R. 7001]
5.71.177, 6.61.35	The Permittee shall submit a report: Due ~~by~~no later than 180 days prior to permit expiration. The report shall describe the findings of the inspection of the wastewater treatment ponds, related conveyances,

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	and appurtenances to the pond system at the permitted facility. [Minn. R. 7001]
5.71.178, 6.61.36	Based on the inspection, the Permittee shall certify to the MPCA: Due ~~by~~no later than the end of each calendar five years following permit issuance that the pond system maintains structural integrity, complete containment, and compliance with performance standards in the Stabilization Pond Systems Operations, Maintenance, Management (2013) or most recent version. [Minn. R. 7001]
5.77.345, 6.62.37	The Permittee shall submit a stormwater annual report: Due annually, ~~by~~no later than the 31st of March of each year following permit issuance. The Permittee shall submit the Annual Report online through the electronic submittal system e-Services. [Minn. R. 7090]
5.79.389	Submitting Reports. The Permittee shall submit eDMRs, Sample Values Forms, and other supplemental attachment forms via MPCA e-Services after the MPCA approves their authorization request. The Permittee shall electronically submit eDMRs, Sample Values Forms, and other supplemental attachment forms ~~by~~no later than the 21st day of the month following the sampling period or otherwise as specified in this permit. The Permittee shall complete eDMR submittal on or before 11:59 p.m. of the 21st day of the month following the sampling period or as otherwise specified in this permit. The Permittee shall submit an eDMR for each required station even if no discharge occurred during the reporting period. The Permittee shall submit other reports required by this permit electronically. The Permittee shall submit reports ~~by~~no later than the date specified in this permit. The Permittee shall submit on or before 11:59 p.m. on the date specified in this permit. * * *
5.79.423, 6.63.38	Permit Reissuance. If the Permittee desires to continue permit coverage beyond the date of permit expiration, the Permittee shall submit an application for permit reissuance: Due ~~by~~no later than 180 days prior to permit expiration. [Minn. R. 7001.0040]
5.68.62, 6.59.6	The Permittee shall attain compliance with final effluent limitations for PFOS, PFOA, and PFHxS (Phases 3 and 4) at SD 001 and SD 002 as prescribed by the conditions in this permit by no later than December 31, 2026, unless the Permittee requests by no later than October 31, 2026, a modification of this compliance schedule or other appropriate provisions of the permit (with supporting documentation), based on its determination that the limits and associated compliance demonstration for PFOS and/or PFOA and/or PFHxS are not consistently attainable with the advanced wastewater treatment system. The Permittee shall attain compliance with final effluent limits: Due 12/31/2026. Prior to final effluent limits becoming effective, the Permittee shall meet the applicable interim limits established for PFOS, PFOA, and PFHxS (Phases 1 and 2). [Minn. R. 7001

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5.69.29	The TRE shall be submitted ~~within~~no later than 60 days after the toxicity discovery date and include a Facility Performance Review.
5.33.5, 5.35.5, 5.39.5	If an intervention limit is exceeded, the Permittee shall: A. Sample the monitoring station again ~~within~~no later than two days of receiving sample results if the previous samples at the monitoring location did not exceed the intervention limit and a sample hasn't already been taken since the sample with the associated intervention limit exceedance; B. Evaluate the significance and the cause of the intervention limit having been exceeded. The cause shall include a thorough review of the carbon changeout frequency of the GAC system and the ion exchange media regeneration and/or changeout frequency; C. Evaluate the need for immediate corrective action to prevent pollutant levels from exceeding the intervention limits again; and D. Evaluate the need for changes in monitoring, including but not limited to, increasing sampling frequencies, changing the characteristics monitored, installing additional monitoring stations, identifying appropriate shorter-chain sentinel compounds to monitor, identify the specific monitoring locations at which to monitor them in order to best understand what operation and maintenance actions might be needed, and to ensure such actions are reflected in the Cottage Grove O&M manual(s), and reducing pollutant loadings. [Minn. R. 7001]
5.33.7, 5.39.7	The Permittee shall submit an Intervention Limit Exceedance Evaluation Report ~~within~~no later than 30 days after obtaining intervention limit exceedance sample results. [Minn. R. 7001]
5.68.66	When the Permittee determines that it has attained compliance, they shall notify the MPCA in writing ~~within~~no later than 14 days of the attainment. This notification is required for each final limit for the specified parameters listed above. [Minn. R. 7001]
5.69.96, 6.60.23	~~Within~~No later than 60 days of permit issuance the Permittee shall submit its current version of a Foam Release, Detection, and Recovery (FRDR) Plan for review and approval. The Permittee shall immediately implement and comply with the FRDR plan version submitted for approval by MPCA once approved by MPCA. The Permittee shall submit a plan: Due ~~by~~no later than 60 days after permit issuance. [Minn. R. 7001]
5.69.98, 6.60.24	The Permittee shall submit an implementation plan ~~within~~no later than 90 days after permit issuance detailing the following: A. Timeline (maximum of three years for high priority/high risk pipes and maximum of ten years for all other pipes) for assessing condition of all underground piping conveying water at the facility; B. Timeline (maximum of one year) for restoring integrity of any underground piping found to have defects allowing either infiltration or exfiltration of water; and

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	C. Maps, drawings, and diagrams along with methods for both pipe assessment and restoration of integrity. High priority/high risk pipes include but are not limited to (Reference: Cottage Grove Sewer Operations and Maintenance Manual dated July 28, 2023 Revision 0): Chem Sewer Phase 1 Group 3 Sanitary Sewer Group 1 Sanitary Sewer Group 2 Sanitary Sewer Group 3 Chem Sewer Phase 1 Group 2 Storm Sewer Group 2 Storm Sewer Group 3 Chem Sewer Phase 2 Group 3 The Permittee shall submit a plan: Due ~~by~~no later than 90 days after permit issuance. [Minn. R. 7001]
5.69.102, 6.60.26	~~Within~~No later than 60 days after the advanced wastewater treatment system start-up date, the Permittee shall submit its Ion Exchange (IX) operations and maintenance (O&M) manual. The O&M manual shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure and response procedure. The Permittee shall immediately implement and comply with the IX O&M manual and submit a revised version ~~within~~no later than 365 days of any future revisions being made. The Permittee shall submit an operations and maintenance (O & M) manual: Due 05/31/2025. [Minn. R. 7001]
5.69.105, 6.60.27	~~Within~~No later than 60 days of permit issuance the Permittee shall submit its current GAC O&M manual(s) for each building that contains the GAC treatment technology. The O&M manual(s) shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure and response procedure. The Permittee shall immediately implement and comply with the GAC O&M manual(s) and submit revised versions ~~within~~no later than 30 days of any future revisions being made. The Permittee shall submit an operations and maintenance (O & M) manual: Due ~~by~~no later than 60 days after permit issuance. [Minn. R. 7001]
5.69.107, 6.60.28	~~Within~~No later than 60 days of permit issuance the Permittee shall submit its Wastewater Treatment Plant (WWTP) O&M manual. The WWTP O&M manual shall contain a dedicated section highlighting the PFAS breakthrough monitoring, procedures, breakthrough thresholds/determination procedure and response procedure. The Permittee shall immediately implement and comply with the WWTP O&M manual and submit a revised version ~~within~~no later than 30 days of any future revisions being made. The Permittee shall submit an operations and maintenance (O & M) manual: Due ~~by~~no later than 60 days after permit issuance. [Minn. R. 7001]
5.71.171	The Permittee shall complete a water balance (barrel test) on the pond ~~within~~no later than seven months of each removal action. The MPCA may review the results at the facility or upon request. The water balance evaluation procedure is described in the MPCA document "Prefill and Water Balance Criteria" (12/10) or the most recent version: https://www.pca.state.mn.us/sites/default/files/wq-wwtp5-61b.pdf. [Minn. R. 7001]

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5.71.181	If repairs are necessary as a result of the professional engineer's inspection, a detailed proposal for restoration shall be submitted to the MPCA for review ~~within~~no later than 180 days of discovery, and at least 60 days prior to initiation of restoration work. [Minn. R. 7001]
5.75.228	The Permittee is responsible for obtaining the necessary federal, state, and local approvals and permits. Water appropriation approval/permits are regulated by the Department of Natural Resources (DNR), and the Permittee shall secure authorization according to the DNR rules and regulations. Discharges to municipal storm sewers may require approval from the local municipal authority. It is the Permittee's responsibility to acquire local approval. This permit does not grant the Permittee access or a right to connect to a municipal storm sewer. If the Permittee discharges into a regulated Municipal Separate Storm Sewer System (MS4), the Permittee shall notify the operator of the MS4 of the existence of this permit ~~within~~no later than 30 days of its issuance. * * *
5.76.263	The certified operator shall also become a certified Service Provider ~~within~~no later than one year of permit issuance. The MPCA will evaluate and any equivalent training. The equivalent training must be pre-approved by the MPCA. [Minn. R. 7001.0150, subp. 3(F)]
5.76.265	The Permittee shall notify the MPCA ~~within~~no later than 30 days of a change in operator certification or contract status. [Minn. R. 9400]
5.77.302	The SWPPP shall be developed and implemented ~~within~~no later than 180 days after permit issuance and shall be available to the MPCA upon request. [Minn. R. 7090]
5.77.321	If the findings of a site inspection indicate that BMPs are not meeting the objectives as identified above, corrective actions shall be initiated ~~within~~no later than thirty days and the BMP restored to full operation as soon as conditions allow. [Minn. R. 7090]
5.77.324	The Permittee shall maintain all stormwater BMPs at the facility, to ensure BMP effectiveness. A. The Permittee shall develop a schedule for preventive maintenance of all stormwater BMPs, and store the schedule with the SWPPP; B. If the Permittee identifies BMPs that are not functioning properly, the Permittee shall replace, maintain, or repair the BMPs ~~within~~no later than 7 calendar days of discovery. If the Permittee cannot complete BMP replacement, maintenance, or repair ~~within~~no later than 7 calendar days, the Permittee shall implement effective backup BMPs ~~within~~no later than 48 hours of discovery, and maintain the backup BMPs until the Permittee restores the effectiveness of the original BMPs. The Permittee shall document the justification for an extended replacement, maintenance, or repair schedule of the failed BMPs, and store it with the SWPPP; and

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	C. The Permittee shall record dates of maintenance and repairs. The Permittee shall store these records with the SWPPP. [Minn. R. 7090]
5.77.341	The Permittee shall complete the following steps if intervention limits are exceeded: A. Collect at least one sample in the following quarter at the benchmark monitoring location(s) where exceedance(s) have occurred. Calculate the average of the four most recent quarters and compare this new average with the applicable intervention limit(s); B. Modify the SWPPP and document all corrective actions necessary to meet the applicable intervention limits, including improvements to BMPs; C. Initiate modifications and upgrade the SWPPP and BMPs immediately, but no later than 14 days beyond discovery of an intervention limit exceedance; and D. Install a new or repair an existing control measure to make it operational as soon as possible. i. If the Permittee is unable to complete the installation or repair ~~within~~no later than 14 calendar days, the Permittee shall document why it is infeasible within the 14-day timeframe. ii. Identify a schedule for completing the work, and document as soon as practicable after the 14-day timeframe but no longer than 45 days after discovery. * * *
5.79.399	* * * If the Permittee discovers that noncompliance with a condition of the permit occurred and that the noncompliance could endanger human health, public drinking water supplies, or the environment, the Permittee shall ~~within~~no later than 24 hours of the discovery of the noncompliance orally notify the Commissioner and submit a written description of the noncompliance ~~within~~no later than five days of the discovery. If the Permittee discovers other noncompliance that does not explicitly endanger human health, public drinking water supplies, or the environment, the Permittee shall report the description of noncompliance ~~within~~no later than 30 days of the discovery. If no eDMR is required within 30 days, the Permittee shall submit a written report including the description of noncompliance ~~within~~no later than 30 days of the discovery of the noncompliance. This description shall include the following information: A. A description of the event including volume, duration, monitoring results, and receiving waters; B. The cause of the event; C. The steps taken to reduce, eliminate, and prevent reoccurrence of the event; D. The exact dates and times of the event; and

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	E. Steps taken to reduce any adverse impact resulting from the event. [Minn. R. 7001.0150, subp. 3(K)]
5.79.404	* * * The Permittee shall submit the Release Report to the MPCA with the next eDMR or ~~within~~no later than 30 days, whichever is sooner. [Minn. R. 7001.1090]
5.68.56, 6.59.1	As soon as possible and no later than March 31, 2025, the Permittee shall complete construction of the proposed advanced wastewater treatment system. The Permittee shall submit a notice of initiation of operation ~~within~~no later than 90 days of initiating startup operations. The Permittee shall submit notice of initiation of operation: Due 06/30/2025. [Minn. R. 7001]
5.68.56, 6.59.1	As soon as possible and no later than March 31, 2025, the Permittee shall complete construction of the proposed advanced wastewater treatment system. The Permittee shall submit a notice of initiation of operation ~~within~~no later than 90 days of initiating startup operations. The Permittee shall submit notice of initiation of operation: Due 06/30/2025. [Minn. R. 7001]
5.68.62, 6.59.6	The Permittee shall attain compliance with final effluent limitations for PFOS, PFOA, and PFHxS (Phases 3 and 4) at SD 001 and SD 002 as prescribed by the conditions in this permit by no later than December 31, 2026, unless the Permittee requests by no later than October 31, 2026, a modification of this compliance schedule or other appropriate provisions of the permit (with supporting documentation), based on its determination that the limits and associated compliance demonstration for PFOS and/or PFOA and/or PFHxS are not consistently attainable with the advanced wastewater treatment system. The Permittee shall attain compliance with final effluent limits: Due 12/31/2026. * * *
5.77.341	The Permittee shall complete the following steps if intervention limits are exceeded: * * * C. Initiate modifications and upgrade the SWPPP and BMPs immediately, but no later than 14 days beyond discovery of an intervention limit exceedance; and D. Install a new or repair an existing control measure to make it operational as soon as possible. i. If the Permittee is unable to complete the installation or repair ~~within~~no later than 14 calendar days, the Permittee shall document why it is infeasible within the 14-day timeframe. ii. Identify a schedule for completing the work, and document as soon as practicable after the 14-day timeframe but no ~~longer~~later than than 45 days after discovery.

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5.68.58	The Permittee shall notify the MPCA in writing ~~at least~~no later than 14 days before the planned completion of construction. The MPCA may complete a final inspection. [Minn. R. 7001]
5.71.173	The requirements of a water balance barrel test or groundwater monitoring requirements listed above can be waived if the Permittee can successfully demonstrate that the removal action will not impact the liner of the wastewater pond, or the integrity thereof. To make this demonstration, submit a Removal Plan for MPCA review and approval ~~at least~~no later than 90 days prior to the anticipated removal date. * * *
5.73.188	There shall be no discharge of pipeline test waters without prior written approval from the MPCA. Prior authorization shall be requested for all discharges regardless of discharge point. The Permittee shall notify the MPCA ~~at least~~no later than forty-five days in advance of its intention to discharge; and shall request authorization and approval of the proposed discharge site from the MPCA. [Minn. R. 7001]
5.73.193	The Permittee shall submit a written request for approval to discharge no later than forty-five days prior to any hydrostatic test activity. The Permittee shall provide information necessary to evaluate the potential impact of this discharge and to ensure compliance with this permit. * * *
5.74.219	There shall be no discharge of hydrostatic test waters without prior written approval from the MPCA. The Permittee shall notify the MPCA ~~at least~~no later than forty-five days in advance of its intention to discharge; and shall request authorization, effluent limitations, monitoring and reporting criteria from the MPCA. [Minn. R. 7001]
5.74.220	The Permittee shall submit a written request for approval to discharge no later than forty-five days prior to any hydrostatic test activities. * * *
5.79.406	The Permittee may allow any bypass to occur that does not cause effluent limitation exceedances, but only if the bypass is for essential maintenance to assure efficient operation of the facility. The Permittee shall submit prior notice to the MPCA ~~at least~~no later than ten days before the date of the bypass, if possible. * * *
5.79.415	* * * Permittees that propose to make changes to the facility or discharge that requires permit modification shall follow Minn. R. 7001.0190. If the Permittee cannot determine whether the proposed changes require a permit modification, the Permittee shall contact the MPCA prior to any action. The MPCA recommends that Permittees submit the application

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	for permit modification to the MPCA ~~at least~~no later than 180 days prior to the planned change. [Minn. R. 7001.0030]
5.79.418	* * * The Permittee shall request approval for an increase or new use of a chemical additive ~~at least~~no later than 60 days, or as soon as possible, before the proposed increase or new use. * * *
5.79.422	The Permittee is responsible for closure and post-closure care of the facility. The Permittee shall notify the MPCA of a significant reduction or cessation of the activities described in this permit ~~at least~~no later than 180 days before the reduction or cessation. * * *
5.79.424	If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA in writing ~~at least~~no later than 180 days before permit expiration. * * *
5.68.63, 6.59.7	~~By~~No later than twelve months after permit issuance, and annually thereafter, the Permittee shall report progress made in attaining compliance with the final effluent limitations for antimony, cadmium, mercury, selenium, and bis(ethylhexyl)phthalate (Phase 4) at SD 001 and SD 002. The Permittee shall submit an annual progress report: Due annually following permit issuance. [Minn. R. 7001]
5.68.64, 6.59.8	~~By~~No later than 24 months after permit issuance, the Permittee shall submit a report that describes wastewater treatment technology upgrades, operation and management practices, or source control measures for attaining compliance with the final effluent limitations for antimony, cadmium, mercury, selenium, and bis(ethylhexyl)phthalate (Phase 4) at SD 001 and SD 002. The report must include a description of the measure(s) determined to meet the final effluent limitations. The Permittee shall submit a report: Due ~~by~~no later than two years after permit issuance. [Minn. R. 7001]
5.68.65, 6.59.9	~~By~~No later than five years after permit issuance, the Permittee shall complete the construction or implementation of the selected treatment system or other method and attain compliance with the final effluent limits for antimony, cadmium, mercury, selenium, and bis(ethylhexyl)phthalate (Phase 4) at SD 001 and SD 002. The Permittee shall attain compliance with final effluent limits: Due by permit expiration. * * *
5.68.69, 6.59.12	Flow monitoring (once per day) is required to be conducted at surface water station SW 001. By no later than one year after permit issuance, the Permittee shall have installed a flow monitoring device at station SW 001 so daily flow monitoring may be conducted. The Permittee

Appendix 2 to 3M Comments on Draft Permit and Fact Sheet
Additional Draft Permit Comments – Compliance Dates

Draft Permit Condition	Proposed Draft Permit Language/Request
	shall notify the MPCA once installation is complete and the device is operational. Flow monitoring and eDMR reporting of flow (Phases 2, 3, and 4) will become effective once the MPCA receives notification. The Permittee shall submit notice of equipment installation: Due by no later than one year after permit issuance. [Minn. R. 7001]
5.69.76	The Permittee shall analyze per- and polyfluoroalkyl substances (PFAS) at all monitoring locations in accordance with the following: * * * F. All targeted PFAS analysis results shall have results finalized for potential submission to the MPCA as soon as possible and ~~a maximum of~~no later than 51 days after sample collection. G. Process control sampling (see March 12, 2024 "Cottage Grove Advanced Water Treatment Proposed Draft Sampling Plan") PFAS results shall be submitted to the MPCA quarterly ~~by~~no later than 21 days after the calendar quarter as a Microsoft Excel spreadsheet output from the LIMS system attached to the DMR submittal. [Minn. R. 7001]
5.6.11, 6.6.2	The Permittee shall submit annual chronic toxicity test battery results: Due no later than 180 calendar days after Permit Issuance Date annually thereafter. [Minn. R. 7001]