MassDEP PFAS Comments Received February 2020

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Kyla Bennett, PEER
Ashley Hammell, TAC
Gary Martin, Boxford
Grace Hall, Somerville
Constance Glore, NPCJ
Jim Starbard, RCAP
Michael Delaney, Quincy
Laurie Nehring, PACE
Sue Phelan, GreenCAPE
Lynn McGregor, Cambridge
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Bob Worthley, Foxborough Water Department
Susan Chapnick, NEH
Elizabeth Denly, TRC
Jennifer Schlezinger, BU School of Public Health
Kirsten King, NEWWA
Alex Papali, Jamaica Plain
Don Keeran/Andrew Gottlieb, APCC
Donald DiMartino, Bellingham DPW
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Connor Read, Town of Easton
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Jim Occhialini, Alpha Analytical
Beth Willson, Town of Amherst
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Erica Kyzmir-McKeon, CLF
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Emily Hammel, BU School of Public Health
Adam Kran, Environmental Partners
Gerry Connell, Plainfield, MA
Grace Jimenez, BU School of Public Health
Greylin Nielsen & Jennifer Oliver, BU School of Public Health
John Velis, State Representative, Hampden District
Kate Lila Wheeler

Katie McCann, BU School of Public Health
Laura Buckley, BU School of Public Health
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Janine Burke-Wells, NEBRA
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Robert Rutkowski
Stephen Zemba, Sanborn Head
Deb Pasternak, Sierra Club–Massachusetts Chapter
Kathryn Rodgers, SSI
Laurel Schaider, STEEP
Stephanie Grady, BU School of Public Health
Tom Webster, BU School of Public Health
Tracy Stewart
Wendy Heiger-Bernays, BU School of Public Health
Heather Stayton, City of Westfield
Kristen Mello, WRAFT
Brendan Shea, Somerville

From: d <didi116@aol.com>
Sent: Friday, January 24, 2020 11:21 AM
To: Director-DWP, Program (DEP)
Subject: Public Comment PFAS MCL with supporting comment from Dr Graham Peaslee

https://www.mass.gov/lists/development-of-a-pfas-drinking-water-standard-mcl

https://www.mass.gov/doc/310-cmr-2200-pfas-amendments-public-hearing-notice/download

To Whom it May Concern,
January 24, 2020

Please submit for public comment on the matter of PFAS MCL.

Good Morning,

I'm Diane Cotter, and I advocate for firefighters PFAS exposures.
Regarding AFFF: October 2nd, 2017 the NH DES sent every fire station in the NH a letter advising them to test their water, as recent findings showed 6 of 7 stations tested elevated for PFOA/PFOS. This was an accidental discovery brought on by construction next to a fire station. Soil samples required by nearby building construction discovered high levels of PFOA at the firehouse.

https://www4.des.state.nh.us/nh-pfas-investigation/wp-content/uploads/2017/11/Fire_Department_H20Sample.pdf

There are 58,000 fire stations in the USA. It would be wise to test every station.
Yesterday I was told by a 30 year Massachusetts firefighter that years ago they would wash the walls of the station with AFFF, wash their turnout gear, their trucks, and bring their gear home for wives to wash. Then, they would discharg their tanks in the nearby reservoir.

We applaud the Mass initiative to collect old AFFF to be disposed of properly and ask that this program continue.

Today I'm here to talk to you about the staggering amounts of PFAS used in the manufacturing of firefighter turnout gear. Textiles make up over 30% of the fluoro-industry footprint.
It was not the manufacturers of our gear, or NFPA, OSHA, CDC, EPA, or ACC that made this discovery and notified us. It was the diagnosis of my firefighter husband's career ending cancer that led to this discovery.

Searching for information on chemicals used in manufacturing of gear was hopeless. Manufacturers cited propriety CBI. These same manufactures are immersed in every aspect of firefighter cancer research, prevention, and outreach. But they will not discuss the chemicals used in the gear.
I went to the extreme length of purchasing 'new never-worn' turnout gear, with the hopes of finding a scientist who would be willing to test it for us. And I found him, I found Profess of Physics, Graham Peaslee of Notre Dame University. He relayed the initial fluorine results were so high in fluorine the

amounts had to be read in 'volume' not the usual ppb/ppm. Further testing would reveal PFOA thousands of times higher than the new MRL, as well as PFNA, PFDA, and PFHxS…
PFOA causes testicular cancer. PFOA is the number one cancer in the fire service. DuPont is a manufacturer of our gear. DuPont knew in 1992 PFOA causes testicular cancer. DuPont has never told us about the PFOA in turnout gear.

Professor Peaslee is now testing 20 years worth of new, never-worn turnout gear. We are funding this research through private fundraising, car washes, bake-sales, and grants given by Boston's own Last Call Foundation Honoring Fire Fighter Michael Kennedy, as well as Fire Maul Tools of Chicago. Professor Peaslee is working pro-bono. It's the commercial testing that is extremely expensive.

Please accept this explanation of concern from nuclear physicist,

Dr Graham Peaslee:
Diane, we don't know how much of the PFAS coating in a jacket will degrade into PFOA, and how much will degrade into other PFAS unfortunately. I do know the timescale on textiles like turnout gear will be on the order of a decade or two before it all decomposes. And I do know from literature (attached) that the majority of clothing will decay in PFOA compared to other PFAS…maybe 50–60% will end up as PFOA. This leads to a scary amount of PFOA in a typical landfill leachate.
So to get you something more concrete, I went back to the measurement of the new turnout gears, that had 116 ppm of PFOA that was readily available from the material on the jacket. I am guessing 95+ % remain on the jacket, but this was what would come off immediately if you soaked the jacket in water for a couple days. I went to the internet and looked up how much material is in a men's jacket, and it is about 3 yards x 45 in wide fabric or 1620 inches squared. Then I weighed a piece of jacket fabric in my lab from Boston FD, and I calculate about 730 g of fabric per jacket. (This is under 2 lbs, which seem a little light, but there is a lt of reinforced cloth and buckles on a typical jacket that probaly gives it a few more pounds, but no more PFAS.) If there are 730 g of fabric per jacket and there are 116 ppm PFOA per gram, then you end with about 85 mg of free PFOA per jacket. This may not seem like much, but if you tossed two jackets into an Olympic-sized swimming pool (with 660,000 gallons of water), this amount of PFOA would exceed the 70 parts per trillion EPA standard for drinking water! This is without decaying in a landfill 20 years. Imagining pants are about the same as a jacket, that means one set of new turnout gear tossed into water would produce enough waste PFOA to contaminate a full-sized swimming pool. Then if you let it decay in a landfill for 10–20 years you would probably get enough PFOA to contaminate 100 times that much…but the exact ratio of PFOA to to other PFAS isn't known in decaying fabric, and the total amount of fluorochemicals applied to the clothing isn't known exactly by anybody but manufacturers, so it will be hard to say whether it is 100x or 500x. But the bottom line is that these heavily treated textiles will contaminate 300,000 gallons of water per item readily, and maybe 100 times that over a couple of decades in the landfill…which is a lot of water.
There are some assumptions in here…but this is why I am concerned about the end-of-life disposal of turnout gear…like carpets they represent a significant source of PFAS for a few generations to come.

………………………………

From Diane;
A few comments to consider. Gear is replaced every 5 to 10 years. The NFPA standard is every 10 years (with more frequent use some will be replaced sooner). NFPA annex recommends 2 sets of gear for every firefighter. There are 1.5 million firefighters in the USA. There are approximately 15,000 firefighters in

Massachusetts. Our best guess is the chemicals began their use in turnout gear in the 80's or 90's. We're not exactly sure.
You must consider the textiles and the PFAS soup they contain.
Thank you.
Diane Cotter
Rindge, NH
508-769-9869

https://www.youtube.com/watch?v=Kztii2V3g2w&feature=share&fbclid=IwAR190GP3SI3uK03Wa_xmYPOngkCZoa4NztpUPRvQiCHAVJB9ntxRt2O-Bog&app=desktop

Review of the fate and transformation of per- and polyfluoroalkyl substances (PFASs) in landfills...
Environ Pollut. 2018 Apr;235:74-84. doi: 10.1016/j.envpol.2017.12.030. Epub 2017 Dec 21. Review
www.ncbi.nlm.nih.gov

https://www.ncbi.nlm.nih.gov/pubmed/27095439

2004 PFAS TESTING RESULTS..

These are the PFAS compounds found in the same gear samples that Professor Peaslee of Notre Dame, IN gave us in August 2017. Those samples were to confirm or deny there was 'fluorine' in the PPE. If there were no fluorine, there wold be no PFOA.

Please read careful Professor Peaslee's explanation on the testing and the amounts revealed.

January 29, 2018, Professor Graham Peaslee:

Hi Diane,

I have some LC-MS/MS results from an academic lab that I trust...they took the four pieces of clothing you sent me and took a small piece of each and rinsed it three times in heated methanol, and analyzed the rinse for the presence of 78 different PFAS. We know from previous textile work that this only will get some small fraction of what is adhered to the fabrics, but it will identify what is there. The results look something like this:

	Concentration (ng/g)							
Item	PFBA	PFHxA	PFHpA	PFOA	PFNA	PFDA	PFTeDA	FHUEA
Right Sleeve	<LOQ	14	<LOQ	<LOD	121	66	<LOD	<LOD
Left Under Arm	<LOQ	<LOD	13	116	74	57	<LOD	<LOD
Moisture barrier	<LOQ	<LOD	<LOD	41	<LOD	25	<LOD	<LOD
Tail	<LOQ	<LOD	14	<LOD	84	28	30	<LOD
Envelope	46	109	<LOD	<LOD	<LOD	<LOD	<LOD	40

A quick explanation...these are the 7 diffferent PFAS that showed up above level of detection (LOD), or above level of quantification (LOQ). The PFBA are C4 acids, the PFHxA are C6 acids, the PFHpA are C7 acids, the PFOA are C8 acids, the PFNA are C9 acids, and the PFDA are C10 acids, and the last one is a C11 acid.

The first four rows are your four fabric samples with concentrations in ppb, and the last sample is the brown envelope in which the samples were shipped, so it is possible it contained some short-chained PFAS that might have contaminated the right sleeve sample. If you want to send these to a commercial lab at some point, you will want to put them in individual ziploc bags.

In summary, there are C8, C9 and C10 PFAS found on each garment, but less on the moisture barrier. These are "long-chain" PFAS, and the majority seems to be heavier than PFOA, although there is certainly PFOA present. Combined with the PIGE results which showed high levels of F present, and a methanol rinse that only removes a small fraction for analysis I would guess there is plenty of these long-chain PFAS applied to these garment samples.

The lab also did a GC/MS test for volatile PFAS, and found only volatile PFAS on the Tail sample, but with fairly high concentrations: 6:2 FTOH (120 ng/g), 8:2 FTOH (3600 ng/g), and 10:2 FTOH (1300 ng/g) (with all other analytes below detection.)

The fact that both the GC and LC/MS data are indicating C8 and C10 in the samples helps confirm the long-chain observation. To my knowledge, this type of long-chain PFAS chemistry is not typically used in textiles these days...so it is unusual to see them in samples.

I trust these data, and you are can share these results with your colleagues - but if you want to go further with the data in a court of law or elsewhere, you would have to have a commercial lab confirm these results...and that is

pricey I know, but now you know what to look for at least. Armed with this information I bet you can start asking who used these long-chain PFAS commercially in fire-resistant clothing.

I wish you luck in your investigation. Sorry this took so long, but all the labs are very busy these days.

GRAHAM

Public Employees for Environmental Responsibility's statement at 1/28/2020 Hearing on PFAS MCL, DEP SERO, Lakeville, MA

My name is Kyla Bennett, and I am the Science Policy Advisor for Public Employees for Environmental Responsibility (PEER). Thank you for the opportunity to comment on Massachusetts Department of Environmental Protection's (MADEP) proposed MCL of 20 ppt for six PFAS in drinking water.

PEER applauds MADEP's efforts to tackle the PFAS crisis with this proposed rule, and the recently promulgated clean up standard. We appreciate the comprehensive research and thought that went into both standards, and we believe that the proposed drinking water MCL is an excellent start.

However, given the industry's propensity to simply create new PFAS as states try to regulate the most common fluorinated compounds, we are left playing whack-a-mole with these dangerous chemicals. Despite industry claims, we have yet to find a PFAS that is harmless. Indeed, as investigative reporting has shown, industry has provided the U.S. Environmental Protection Agency (EPA) with "substantial risk" reports on many of the new short-chain PFAS, and EPA has not publicized these risks.

Given the potential for harm to both human health and the environment, together with emerging science on dermal exposure of PFAS, we respectfully urge MADEP to apply the precautionary principle and regulate PFAS as a class of all 5,000+ chemicals. We cannot trust the industry or the current EPA to protect us.

In addition, we request that MADEP consider regulating the *sources* of PFAS rather than just regulating the contamination itself. For example, biosolids and artificial turf are two known sources of contamination – they should be banned. If we can stop PFAS from polluting soil, groundwater and drinking water, we will have less to remediate. In addition, the Commonwealth should consider requiring manufacturers to disclose whether PFAS is used in the manufacture or as an ingredient in all goods sold to consumers. The fact that we do not know which materials contain PFAS – together with the fact that industry refuses to tell us – is troubling.

Thank you again for this opportunity to comment. PEER will be providing more extensive technical comments in writing.

Toxics Action Center
294 Washington St., #500
Boston, MA 02108

January 29, 2020

To: Massachusetts Department of Environmental Protection
From: Ashley Higgs Hammell, Toxics Action Center, Cambridge resident

My name is Ashley Higgs Hammell, I am a resident of Cambridge, MA, and am here representing Toxics Action Center. I appreciate all the work you have done, and recognize that the Massachusetts proposed PFAS regulations would be some of the strongest standards in the nation. And, we want them to be stronger. I am here to advocate for setting a PFAS drinking water standard at 1 part per trillion, for strong testing methods and annual evaluations, public notification of any PFAS found in public drinking water, and public hearings that are more accessible.

At Toxics Action Center, we start our work with the core belief that everyone has a right to breathe clean air, drink clean water, and live in a healthy community where the government operates responsively and democratically. Our mission is to make these rights a reality by organizing side by side with community groups to tackle environmental threats, as well as develop and train non-traditional leaders to strengthen the environmental and social change movements.

Toxics Action Center has been around since 1987 and has helped hundreds of communities prevent and clean up pollution. We work proactively to protect our health and environment throughout the region. We began working on the ground with residents impacted by PFAS contamination in Bennington, Vermont in February 2016 after one resident's drinking water well came back hundreds of times above the state's limit. After supporting community members in Bennington to organize for clean PFAs-free water and health protections, we formed the National PFAS Contamination Coalition in June of 2017 to assist communities in creating state and national campaigns to protect our water, environment, and health from PFAS contamination. From this experience, we have seen first hand the toll these chemicals take on our health and the environment.

While these chemicals are not naturally occurring, they are omnipresent in our lives and our bodies. Since their introduction in the 1950s, this man-made chemical has found its way into many everyday products like Teflon frying pans, microwave popcorn bags, and other food packaging. Today, only 60 years since their introduction, PFAS have been found in the blood serum of nearly every American.[1] This is particularly alarming as per- and poly-flouroalkyl substances (PFCs or PFASs) have been linked to serious health effects across the board, like testicular and kidney cancer, liver malfunction, hormonal changes, thyroid disease, birth abnormalities, obesity, and other diseases.[2]

Given the grave health consequences of these chemicals, why would we allow anything more than the very smallest amount of PFAS in our drinking water? And why wouldn't we adhere to the strictest standards of testing and evaluation?

WE NEED STRONG STANDARDS:
Setting a drinking water standard of 20ppt for 6 PFAS would be some of the strongest PFAS drinking water standards in the country. However, there are nearly 5,000 PFAS chemicals in the market, still largely unregulated in use, commerce, disposal, and in our drinking water. More and more scientists are raising the alarm that there is *no* safe level of PFAS in our water. That's why we're calling for a 1ppt drinking water standard for *total* PFAS. This level would best protect communities like Boston that just found out their water is contaminated at 8ppt total PFAS. As an interim step, we need to ensure that the regulation is for using the strongest testing methods (as of now, EPA method 533). Additionally, this regulation should incorporate a trigger for re-evaluation every year (and give the DEP the ability to revise at will) to incorporate newly published studies and new testing methods.

WE NEED STRONG TESTING METHODS:
When the UCMR3 data was taken, the detection limit was set so high, that many communities that faced toxic levels of PFAS contamination were not alerted when the federal PFAS recommended limit dropped from 400ppt to 70ppt in 2016, meaning that this vast and expensive data collection in 2013 was not helpful to many communities that were concerned about PFAS in their water. Massachusetts' new drinking water standard needs to make sure that labs can test as low as possible (at least 2ppt), to include detections under the detection limit (rather than just saying "non detect" and treating it as a 0), and for as many PFAS as possible

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[1] Calafat, A.M. et al. "Polyfluoroalkyl Chemicals in the U.S. Population: Data from the National Health and Nutrition Examination Survey (NHANES) 2003–2004 and Comparisons with NHANES 1999–2000." *Environmental Health Perspectives* 115.11 (2007): 1596–1602. *PMC.*

[2] American Public Health Association. Policy Number 20163. (2016); Scheringer, et al. *Chemosphere* 114 (2014): 337-339
Rosenmai, et al. *Andrology* 4.4 (2016): 662-672
Perez, et al. x*Environment International* 59 (2013): 354-362.

(we recommend the new EPA testing method 533 until there is approved total PFAS testing). Boston recently tested for 8ppt for total PFAS by EWG. I don't want to be drinking 8ppt of PFAS in my water and I hope that I could know about this level to make a choice to put a filter on for my home and my family! However, finding 8ppt could easily be missed under the proposed testing protocol. We need strong PFAS testing methods to make sure we keep our communities safe.

PUBLIC NOTIFICATION:
When the last round of national PFAS testing was done, it was looking for 400ppt for PFOA and PFOS. We need to test for lower levels and alert the public for any and all PFAS found, not just levels found above standards to allow them to make decisions for themselves. Bostonians deserve to know that when they turn on the tap, their water is safe to drink. But recent tests coming out from EWG showing that Boston has 8ppt of PFAS in their water is terrifying for Bostonians. While this level wouldn't turn off the tap under these new proposed regulations, Bostonians deserve to know immediately the results of their tests to make informed choices for their families.

PUBLIC PARTICIPATION:
All of these public hearings are during the work day. These hearings are not in locations that are already identified as being the hardest hit by PFAS drinking water contamination (Westfield, the Cape, the Vineyard, Ayer, Devens, and Danvers. And these hearings are not easily accessible by public transportation. We know that you are livestreaming the Boston session, but that is not very accessible either. Please have hearings in communities most impacted by PFAS drinking water contamination, at times and in locations accessible to that population.

In summary, we applaud your efforts to protect the public from the horrible health implications of ingesting PFAS, and

- 20ppt for 6 PFAS is strong, but we need 1ppt for total PFAS
- Communities should test using method 533
- Labs should test to maximum 2ppt to ensure they're not missing the cumulative limit
- Public notification of contaminated water needs to be stronger
- The rulemaking should trigger re-evaluation annually or after a few years
- The public hearings should be at better times to better encourage public participation

Thank you for all of your work to create strong PFAS standards to protect the health of Massachusetts residents, and for hearing our concerns, and incorporating this feedback based on work with dozens of communities impacted by PFAS.

Sincerely,
Ashley Higgs Hammell

From: gary martin <gdmartin51@yahoo.com>
Sent: Friday, January 31, 2020 2:41 PM
To: Director-DWP, Program (DEP)
Subject: PFAS limits

I am very concerned about the heath impacts of PFAS chemicals that are very slow to break down and can build up in people and the environment. I urge you to adopt very strict limits in drinking water, in the range of a few PPT.

Thank you,
Gary Martin
Boxford, MA

From: Grace Hall <gracewhall@msn.com>
Sent: Friday, January 31, 2020 10:52 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Ms. Yvette DePeiza:

I am writing to say that I strongly endorse a limit of 20 ppt for 6 PFAS compounds. It is much better than the federal standard. As a chemist, I believe that limit is approximately what is needed to safeguard the health of Massachusetts residents, including young children, with respect to this class of compounds.

Please do all you can to make sure that this requirement goes into effect.

Sincerely,

Grace Hall
1188 Broadway #307
Somcrville, MA 02144

From: connie glore <connieglore@mac.com>
Sent: Friday, January 31, 2020 2:44 PM
To: Director-DWP, Program (DEP)
Subject: PFAS hearing in Wilmington

Good afternoon,

On January 29, 2020, I attended the hearing regarding the setting of allowable levels for PFAS's at the DEP in Wilmington. There was only one person who spoke about the need to more closely monitor and limit the allowable ppt of 6 of the 5,000 existing PFAS's. Ashley Hamil of Toxics Action Center in Cambridge spoke for setting the standard for PFAS at 1ppt and pointed out that the DEP hearings are not being held in communities with the highest levels of PFAS's. Merrimack River and it's Watershed show 11ppt in places. Braintree exhibits 13-20 ppt.

I am extremely concerned that the regulations of these forever chemicals, PFAS's is still too high at 20 ppt. Is the DEP willing to brush aside the proven illness caused by PFAS's? PFAS chemicals cause, "decreased fertility, hormonal changes, increased cholesterol, weakened immune system response, increased cancer risk, and growth and learning delays in infants and children."

Long lasting and harmful consequences will continue to ensue if the DEP does not set a lower ppt of these forever chemicals.

Sincerely,

Constance Glore
North Parish Climate Justice
North Andover, MA

From: Jim Starbard <jstarbard@rcapsolutions.org>
Sent: Monday, February 3, 2020 12:06 PM
To: Director-DWP, Program (DEP)
Subject: PFOS MCL Comments

Hi MASS DEP,
Attached are my comments for the proposed PFOS regulation.
Thanks,

James P. Starbard, MS, REHS/RS
Massachusetts State Lead
JStarbard@RCAPSolutions.org
978-502-0227
www.rcapsolutions.org/community-resources/

Attachment: PFOS comments-MA.docx

RCAP Solutions
Resources for Communities And People

2/3/2020

TO: MASS DEP

FROM: James P. Starbard
Massachusetts State Lead
RCAP Solutions

RE: Comments of PFOS MCL

Dear MASS DEP,

I am very supportive of MASS DEP's forward action on regulating PFOS chemicals in the drinking water and applaud the agency for its efforts. My comments are based on two areas on concern I have mostly due to the ambiguity of the proposed regulation in these regards. I feel a regulation with this ambiguity will leave the regulation open to legal challenges and will allow for confusion from the public and regulated community.

1. **Rounding of detections below lab reportable limits**-I have a great concern with rounding of results that the lab can't quantify but has detected some PFOS content of the sample. Rounding is fine when the result is clear but when the results are very close to the MCL using rounding may cause unnecessary violations and open the regulation up to legal challenges.
2. **TNC systems-**Having the systems test for PFOS and not having a standard present for them to meet again opens the regulation to challenges and confusion. Finding PFOS in one of these wells and saying the results will be analyzed and we will get back to you with needed actions is not clear and fair process.
   Example-A restaurant tests positive for PFOS chemicals and the Board of Health is concerned they should revoke their Food Permit as a result. What would DEP's guidance be to that Board of Health who wants to act immediately to protect the Public Health?
   Having pre-determined classes of TNC acceptable PFOS levels for each category would be a better way to bring the regulation into fruition.

I thank you for considering my comments and would be happy to discuss further with any MASS DEP staff.

Respectfully Submitted.

James P. Starbard
MA. State Lead-RCAP Solutions

From: Mike Delaney <mike@mikedelaney.org>
Sent: Friday, February 7, 2020 8:59 AM
To: Director-DWP, Program (DEP)
Cc: Pancorbo, Oscar (DEP); 'Mike Delaney'
Subject: PFAS MCL Comments

Dear DEP DWP Program Director,

Attached are my comments on the proposed drinking water MCL for PFAS.

Please let me know if you have any questions.

Thanks,

Mike

Michael F. Delaney, Ph.D.
Laboratory Consultant
mike@mikedelaney.org
857-939-8893
1022 Hancock St. Unit 109
Quincy, MA 02169

CC: Oscar Pancorbo, DEP

Mike Delaney
LinkedIn: folkmikedelaney
Facebook: folkmikedelaney
mike@mikedelaney.org
www.mikedelaney.org
857-939-8893

Attachment: PFAS MCL Comment Letter 2-7-20.pdf

Michael F. Delaney, PhD
Laboratory Consultant

Via electronic mail to program.director-dwp@mass.gov
(Subject: PFAS MCL Comments)

February 7, 2020

Program Director, DWP
MassDEP
1 Winter Street, 5th floor
Boston, MA 02108

RE: Proposed PFAS MCL Amendments to 310 CMR 22.00: Drinking Water Regulations

To Whom It May Concern:

Please accept these comments on the proposed PFAS MCL revisions to 310 CMR 22.00: Drinking Water Regulations. Here are my specific suggestions, which are detailed below:

The Specific Suggestions in Brief

1. **The term "Total PFAS" should be removed from the regulation because it is inaccurate and misleading.**
2. **The six individual PFAS compounds should each have their own MCLs.**
3. **The calculations of Total PFAS and the Running Quarterly Average should be made consistent with each other.**
4. **Total PFAS with non-detects should be calculated without fabricating results. No numbers should be substituted for non-detect results because this is data fabrication creating invasive data.**
5. **Labs may not be capable of achieving MRLs of 2.0 ng/L for each compound.**
6. **Labs should be required to make sure that the concentration designated as "1/3 MRL" gives quantitative results (±50%).**
7. **The decision whether to accept Method Blank (MB) and Field Blank (FB) results should not be predicated on uncertain, highly variable results below the MRL.**

Each of these suggestions will be explained after I summarize my background and expertise.

My Background. I am an expert in environmental laboratory operations. I recently retired as the Director of Laboratory Services for the Massachusetts Water Resources

Authority (MWRA). I have been contracted by the Town of Nantucket to design and start up a water testing laboratory on Nantucket Island. I have over 40 years of relevant experience and B.S. and Ph.D. degrees in analytical chemistry. I served for five years on EPA's Environmental Laboratory Advisory Board (ELAB), was a member of the Independent Testing Laboratory Association (ITLA), am a member of The NELAC Institute (TNI) and participated in DEP's Laboratory Advisory Committee for about 25 years.

The Details

1. **The term "Total PFAS" should be removed from the regulation because it is inaccurate and misleading.** There are thousands of PFAS compounds, yet the regulation and MCL only address six PFAS compounds. Also, analytical method 537 only covers 14 PFAS compounds and method, 537.1, only covers 18 PFAS compounds. The simplicity of using the term Total PFAS is of limited benefit when the details of its arbitrary definition are overlooked.

2. **The six individual PFAS compounds should each have their own MCLs.** Certainly, individual PFAS compounds differ in their toxicity and the estimates of their toxicity will continue to be re-evaluated and re-estimated over time. By regulating individual PFAS compounds, the MCLs can be revised if needed in the future and there won't be a Total PFAS parameter with a definition that varies over the course of time.

3. **The calculations of Total PFAS and the Running Quarterly Average should be made consistent with each other.** Total PFAS is defined in 310 CMR 22.07G(3):

    Total PFAS Detection shall mean the sum of the measured concentrations of the PFAS listed in 310 CMR 22.07G(3).

    PFAS detection is also defined in this section:

    PFAS Detection shall mean a measured concentration of any PFAS in the scope of the analytical method greater than or equal to the analytical laboratory's MRL.

    The term MRL is defined in 310 CMR 22.02(1):

    Minimum Reporting Level or MRL means the minimum concentration that can be reported as a quantitated value for a target analyte in a sample following analysis.

    So, for the Total PFAS calculation, only concentrations of the six regulated PFAS that are at or above their MRL are included in this total. Any PFAS below their MRL are counted as zero.

    Conversely, the Running Quarterly Average (RQA) of the Total PFAS results is defined in 310 CMR 22.07G(10)(e) and (f):

(e) If an analytical result is less than one-third of the MRL, then the Running Quarterly Average shall be calculated using zero as the concentration for that PFAS.
(f) If an analytical result is equal to or greater than one-third of the MRL but less than the MRL, then the Running Quarterly Average shall be calculated using one-half of the MRL as the concentration for that PFAS.

The RQA calculation treats results between the corresponding MRLs and 1/3 the MRL differently from the way the same results are treated in the Total PFAS calculation.

This discrepancy should be rectified. If the discrepancy is intentional, DEP should be transparent and tell laboratories that they need to determine their Detection Limits (DLs), and report results down to the DL, even though the method doesn't require DL determinations.

4. **Total PFAS with non-detects should be calculated without fabricating results. No numbers should be substituted for non-detect results because this is data fabrication, creating invasive data.** As seen above in the RQA calculation, values between the MRL and 1/3 the MRL are substituted with 1/2 the MRL. This is data fabrication, fake data, and also known as invasive data. For that matter, substituting zero for non-detects is also data fabrication. It's an arbitrary way to handle non-detects in order to simplify the calculation of averages or totals. Laboratories and Public Water Suppliers should not be obliged to fabricate data.

   Results below the MRL are highly uncertain. When the MRL is set as low as possible, the uncertainty in the results at the MRL is ±50%. Below the MRL the uncertainty is even larger. Furthermore, the lowest calibration standard is typically at the MRL, so results below the MRL can only be obtained by extrapolating the calibration relationship, which the MassDEP Laboratory Certification Program generally doesn't allow.

   There is very little incremental increase in protection to the public gained by considering the numerical results below the exceeding low required MRLs of 2 ng/L.

   Also, please note that EPA has indicated that PFAS results below the MRL should be treated as zero. [NOTE 1]
   https://web.archive.org/web/20190112054531/https:/www.epa.gov/pfas/epa-drinking-water-laboratory-method-537-qa

   Substituting arbitrary values like 1/2 the MRL for non-detects is not necessary to calculate an average or total, like Total PFAS or RQA. There are better statistically valid approaches. In particular, Dr. Dennis Helsel, who has studied how to probably handle non-detects, recommends the Kaplan-Meier approach for computing means and sums when there are non-detect results. This approach avoids using arbitrary substitutions and doesn't assume anything about the statistical distribution of the data. The calculation can be made with a simple spreadsheet.

Some of Helsel's pertinent publications are listed below. Please especially note the paper "Summing Nondetects". It explains the Kaplan-Meier approach for computing a sum when there are non-detect results. This is done without any arbitrary assumptions or fabrications.

5. **Labs may not be capable of achieving MRLs of 2.0 ng/L for each compound.** This may preclude laboratories from testing samples from Massachusetts, which decreases the available laboratory capacity. Note that in EPA Method 537.1, out of the 18 Lowest Concentration MRLs (LCMRLs), eight are above 2.0 ng/L, including three of the six PFAS for which are included in the proposed MCL. Laboratories will probably need to expend a lot of wasted effort trying to get all 18 PFAS to have verified MRLs at or below 2.0 ng/L and then when they test real samples they have a high risk of the entire extraction batch invalidated because the MRL check at 2.0 ng/L doesn't pass.

   MassDEP should consider restricting the 2.0 ng/L MRL to the six MCL compounds and allow higher MRLs for the other twelve PFAS.

6. **Labs should be required to make sure that the concentration designated as "1/3 MRL" gives quantitative results (±50%).** Laboratories should not have to make important decisions on whether a QC or sample result is above or below the MRL or above or below 1/3 the MRL based on estimated, uncertain results using an extrapolation of the calibration relationship. One way to avoid this is difficulty is to use the lowest calibration standard as 1/3 the MRL and require that this concentration passes the MRL verification check. By passing the MRL check at 1/3 the MRL, the uncertainly of results above 1/3 the MRL would tend to have uncertainties less than ±50%.

   The downside to this recommendation is that it makes 1/3 the MRL the new *de facto* MRL and laboratories could be obliged to evaluate QC sampes and blanks down to 1/9 the MRL. A simpler solution would be to treat all results below the MRL as equivalent to zero and not consider those values as part of any sum or compliance calculation.

7. **The decision whether to accept Method Blank (MB) and Field Blank (FB) results should not be predicated on uncertain, highly variable results below the MRL.** Required quality control (QC) samples are especially important for PFAS testing due to the ubiquitous nature of PFAS compounds and the potential for contamination during field sampling and laboratory testing. MassDEP should not require laboratories to evaluate any MB or FB below the laboratory's verified MRL. Going lower than the MRL violates MassDEP's laboratory certification requirement that quantitative results only be reported down to the MRL.

   Method 537.1 requires a decision point for acceptable Method Blank (MB) and Field Blank (FB) results at 1/3 the MRL. When the MRL is set to give uncertainties of ±50%, results at 1/3 the MRL are highly variable and uncertain. This will result in many otherwise useful and valuable sample results being rejected due to minor QC exceedances. Other than setting the MRL as described in #6 above, there are other ways to address this issue. For example, accept MB and FB up to the MRL and qualify the affected sample results, at least for the non-MCL PFAS compounds.

The MRL is set as a sample concentration that gives results within 50 to 150% of the MRL. Uncertainty is expected to increase exponentially as the results fall below that. Evaluating MB and FB against a 1/3 MRL limit to decide if they are acceptable is ill-advised due to the high variability at this concentration. Note that this approach violates the principle that QC samples should be treated the same as regular samples. Any samples or QC samples with concentrations below the MRL would be expected to have highly uncertain results with unknown and unverified accuracy and precision. Any QC or sample results below the MRL should be regarded as simply that—below the MRL.

Also, unless this change to setting the MRL is adopted, the DEP Lab Reporting Form for PFAS should be revised. Laboratories should not be designating whether a sample is less than the MRL versus less than 1/3 the MRL. Any results that are below the MRL are highly uncertain and it is not possible to reliably conclude whether a sample's concentration is above or below 1/3 the MRL.

It should be noted that EPA is currently not regulating PFAS in drinking water and that the methods that MassDEP has proposed for this compliance testing have not been proposed by EPA for this purpose. The methods have not been subject to the federal proposed rule comment process. Therefore, it is reasonable for MassDEP to vary the requirements in the analytical methods to be supportive of the low MCL that MassDEP has proposed for PFAS.

I would be more than willing to contribute my expertise on these issues, which could be addressed via the DEP Laboratory Advisory Committee.

Thank you for this opportunity.

Sincerely,

Michael F. Delaney

Michael F. Delaney, Ph.D.
Laboratory Consultant
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1022 Hancock St. Unit 109
Quincy, MA 02169

CC: Oscar Pancorbo, DEP

References:

How to Interpret my PFAS Laboratory Report 8-30-19, downloaded from https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas.

Helsel, D.R., 2012. Statistics for censored environmental data using Minitab and R, 2nd edition. John Wiley and Sons, New York. 344 p. http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470479884.html

Helsel, D.R., 2010. Summing Nondetects. Integr Environ Assess and Manag 6, 361-366. http://dx.doi.org/10.1002/ieam.31

Helsel, D.R., 2010. Much Ado About Next to Nothing: Incorporating Nondetects in Science. Ann Work Exposures and Health 54, 257-262. http://dx.doi.org/10.1093/annhyg/mep092

Helsel, Dennis R., 1990, Less Than Obvious: Statistical Treatment of Data Below the Detection Limit, Environmental Science and Technology 24(12), 1766-1774. http://dx.doi.org/10.1021/es00082a001

NOTE 1: As of 1/12/19, this link, https://www.epa.gov/pfas/epa-drinking-water-laboratory-method-537-qa, said the following, though this text has subsequently been removed from this web page:

When interpreting drinking water analytical data, what is EPA's recommendation for handling "non-detect" values for PFAS analytes?

Because PFOA, PFOS, and the other PFAS are not regulated under the Safe Drinking Water Act, EPA looks to states and water systems to decide how to interpret PFAS drinking water monitoring data. However, EPA took the following approach when assessing the UCMR 3 PFOA/PFOS results relative to the 2016 Health Advisories:

- *EPA treated results below the UCMR minimum reporting levels (MRLs) [20 ppt PFOA; 40 ppt PFOS] as "zero"*
- *EPA used MRL (not detection limit) as our reference point because we have greater confidence in the analytical accuracy for values at/above the MRL*
- *EPA calculated the sum of the PFOA and PFOS results and then rounded to the nearest 10 ppt (e.g., 70 ppt versus 74 ppt; 80 ppt versus 76 ppt).*

However, the link is shown on page 63 of the following document, published by EPA in 2019:

EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan, EPA 823R18004 | February 2019.

From: Laurie Nehring <lnehring100@gmail.com>
Sent: Monday, February 10, 2020 12:00 PM
To: Director-DWP, Program (DEP)
Cc: lnehring100+self@gmail.com; Anna Fadden; Beth Suedmeyer; Bill Dustin; Carolyn MccrearyHOME; Dawn Ives; Irving Rockwood; Julie Corenzwit-home; Laurel Schaider; Laurie Nehring; Laurie Sabol; Marion Stoddart; James Eldridge; Dina Samfield; Harrington, Sheila - Rep (HOU); Martha Morgan; Ayer Town Administrator; Mark Wetzels Email; Board of Health- Ayer; Libby Levison; Jon Winkler; Rich Doherty-Jun04; joeltickner@comcast.net; Joseph Thibodeau
Subject: Public Comments submitted to MaDEP: PFAS Proposed Regulations in Drinking Water

Dear Commissioner Suuberg,
Please accept the attached comments, on behalf of People of Ayer Concerned About the Environment regarding the proposed regulations for PFAS in drinking water. These were submitted orally at the January 31st Public Hearing in Worcester, and are being submitted herein, electronically, with a small revision. As you know, Ayer is one of the communities directly impacted by this issue.

We are pleased that all communities will be mandated to test for this 'forever chemical' and know that as the science evolves, our understandings of the impacts will grow and our regulations adapt to those new understandings.

We appreciate the opportunity to comment.

Sincerely yours,
Laurie S. Nehring,
President of PACE

--
Laurie Nehring
lnehring100@gmail.com

Attachment: Comments to MassDEP Public Hearing for PFAS MCL for public Drinking Water updated Feb10.docx

Comments to the Massachusetts Department of Environmental Protection Public Hearing for the Proposed Amendments to 310 CMR 22.00 for the MCL Drinking Water Regulations for Six PFAS Contaminants.

Submitted January 31, 2020
MassDEP Central Regional Office, Worcester, MA
And Submitted electronically February 10, 2020

Laurie Nehring, President of PACE.
35 Highland Avenue, Ayer MA.
LNehring100@gmail.com

I have been a resident of Ayer for over 20 years, and am actively involved in a local environmental advocacy group known as PACE (People of Ayer Concerned About the Environment). I have had the pleasure of serving as President for most of those 20 years.

I would like to begin by offering some background information that will serve to frame my comments.

Ayer is a small town of just over 8000 residents, covering 9.6 square miles. The town's municipal drinking water wells are in two separate locations, both drawing from groundwater but from completely different aquifers. These sources for drinking water are considered precious and invaluable, as there are no alternatives within our town boundaries for replacement wells.

Ayer is one of the unfortunate communities with unacceptable levels of PFAS compounds in found in our public drinking water and even more unfortunate, it has been found at both wells. The Grove Pond wells, to the south, have been contaminated by AFFF from fire fighting practice areas on the former Fort Devens, and probably also from large, historic fires at Devens.
The source for PFAS in the Spectacle Pond wells, to the eastern side of town, are currently unknown, but are being investigated with the town of Littleton.

Many of you here are probably aware that the former Ft. Devens is a Superfund Site, and that a number of contamination issues have impacted Ayer either directly or indirectly. As part of the CERCLA process, numerous studies have been completed on the groundwater and soil for petroleum products, arsenic, and PCE. When PFAS came into the picture as THE new Chemical of Concern, these earlier studies were very helpful in leading us through a "Time Critical Removal Action" plan, enabling Ayer and Devens to move forward relatively quickly to construct treatment systems to remove PFASs from our drinking water.

I would like to commend our DPW Superintendent, Mr. Mark Wetzel and numerous engineers here at MADEP who provided guidance, technical assistance, and legal support for swift action which enabled our small community to become educated on PFAS, and approve the upfront funding required to move the construction process forward.

With this framework, on behalf of PACE, I will now comment on the Proposed Amendments to regulate PFAS.

COMMENTS.
We appreciate the hard work and dedication by the team MADEP research scientists, engineers, attorneys and other staff members who researched and prepared these proposed regulations, within the context and challenge of rapidly evolving science and with heightened urgency. The impacts of PFASs are serious and concerns are global. The comments below are made within the current scientific understanding and knowledge

1. At this time, we support the proposal to establish the MCL at 20 ppt for the sum of the six listed PFAS and PFOA chemicals. This is consistent with the groundwater GW-1 cleanup standard in the Massachusetts Contingency Plan. Note, however, that and as new epidemiological studies reveal further health impacts the total of 20ppt may need to be reduced.

2. Testing for six of the PFOA/PFOS chemicals is a good start. However, there are 4730 PFAS compounds identified by OECD. As our toxicology knowledge evolves and as new PFAS and PFOA chemicals are identified in drinking water, additional PFAS and PFOA compounds, along with their precursors and daughter products, should be carefully considered for inclusion into the MCL total.

3. We ask that MaDEP closely follow the leading research across the country, and indeed, across the world, at both public and private research organizations, recognizing that extensive, high quality research on PFASs is being done globally. We recommend funding for additional full time staff to accommodate this need.

4. Because of the rapidly changing science and vast amount of research being done on PFAS, we suggest that a review of these regulations be completed, at minimum, every three years in order to be protective of human health and the environment.

5. Increased testing. The saying "We don't know what we don't know" applies here. By way of example, I share with you this classic advertisement in Time Magazine from June 30, 1947, where DuPont and

other chemical manufacturers promoted the wide use of pesticides within homes- on fruits, in the kitchen, in milk:

"DDT is good for me-e-e-e!"[1]

We recommend that these DW regulations mandate Public Water Suppliers to expand their list of PFAS testing beyond the six currently listed to include the ENTIRE LIST of PFAS and PFOA chemicals that labs are capable of testing. [This is currently being done in Ayer and at Devens, and does not add significantly to the cost of the testing already mandated.]

We believe it is prudent for all communities to <u>gather</u> this information now, while it's possible to do so. This will enable scientists to have all the possible data they can, to analyze that data more completely in the future, and to investigate possible synergistic effects of <u>other</u> chemicals inadvertently found in our bodies that may have health impacts. If we don't at least collect this data, we will never be able to go back in time to obtain it.

6. Consumer Notice. We applaud DEPs plan for consumer outreach and education to the general community prior MCL results and notifications. All persons, particularly sensitive populations, nursing mothers, infants and children, etc., those on private wells, We suggest ALSO ensuring that workers employed at "TNCs" (Transient, non-community water systems) be included in this Consumer Notice. Everyone should be made aware of the likely possibility of PFAS concerns overall, and that they can make choices to reduce their exposures in drinking water through filtration systems or use of bottled water.

Notices sent to consumers MUST BE readable and understandable in non-jargon, non-scientific terms, in multiple languages and through multiple formats (in print, electronic, social media, public meetings, etc.). Please ask some of us to help proof read and suggest edits for these notices before you have 10,000 printed!

7. Outreach and Education in the Medical Community. We believe there are gaps In the Medical Field that must be addressed. For example I had a routine visit with my primary physician in December 2019. I told my doctor that I believe I had been exposed to PFAS in my drinking water, and was wondering about possible effects, based on some symptoms I was having. "What is PFAS?" she asked. I have been with this doctor for over 20 years, and fully respect her medical expertise. Just last week, a radiologist I visited had not heard of PFAS before. Early in 2019, my dentist stopped giving out Glide dental floss after I had a conversation about PFAS with him. We recommend a dedicated fund to support educational programs to educate the medical community, particularly in the vicinity of impacted communities.

Additional comment added 2/10/20: Since presenting at the hearing on 1/31/20, I have had an appointment with an Endocrinologist specialist to follow up on thyroid issues I am having. When I stated that I have possibly been exposed to PFAS in my drinking water she said that this "was not a concern as it was not in the medical community at this time" and essentially dismissed my concern as being not relevant. I am very disturbed by this statement. As I seek a new doctor, I ask that MaDEP work closely with the Boards of Health to educate the medical community.

8. Transient, non-community water systems. This ruling requires only one water sample be taken at a TNC. We believe that this is not adequate to prove there is no PFAS exposure for workers at these locations. Please expand the number of samples to insure the results are safe.

9. More Labs. Additionally, dedicated financial resources are needed to provide certified medical labs to perform blood testing, and to be able to interpret the results, recognizing that epidemiological studies are constantly discovering new information.

10. Staggered Implementation. The phased in implementation schedule makes logistical sense- however; many communities have already been exposed to PFAS for many years. Sooner is better. Please emphasize to all communities the advantages of taking early voluntary actions for those smaller communities, or for those likely to be impacted by known sources and for those with sensitive aquifer systems, such as Cape Cod, where there is a sole source aquifer

11. Addressing known sources. These forever chemicals are traveling with the groundwater. Every time it rains, I picture them 'on the move'. In Ayer and on Devens, there are several known 'hot spots' of PFAS. On the Devens Main Post, within 1.5 miles of the Ayer PWS at Grove Pond, studies show **4,160 ppt** [2] north of the Devens Fire Station. At Moore Army Airfield, the highest level so far **is 20,263 ppt.**[3] Groundwater becomes potential drinking water. There is urgency in addressing these hot spots, before they spread through the environment. If rapid remediation is not possible, we urge MaDEP to mandate that impervious layers of clay or plastic cover these hot spots to prevent rainwater infiltration.

References:

1 Smith, Rick and Lourie, Bruce. Slow death by rubber duck: the secret danger of everyday things. Counterpoint: Berkeley CA. 2009. P. 191.

2 Draft site inspection report addendum for per-and polyfluoroalkyl substances (PFAS) at Area of Contamination (AOC) 76- Devens fire department; Former Fort Devens Army Installation, Devens, MA. BERS-Weston Service, JVA, LLC, Golden, CO. April 12, 2018,

3 Area 3 field sampling plan: addendum to remedial investigation work plan for per-and polyfluoroalkyl substances (PFAS); Former Fort Devens Army Installation, Devens, MA. Koman Government Solutions, LLC, Marlborough, MA. Jan. 2020.

From: Susan Phelan <suephelan@comcast.net>
Sent: Wednesday, February 12, 2020 11:33 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Hello-

Attached are my comments on the PFAS MCL draft regulations. Please let me know if you can't access them.

Thanks-

Sue Phelan, Director
GreenCAPE
West Barnstable, MA 02668
508.494.0276
www.GreenCAPE.org

Attachment: GC_PFAS _DEP_MCL reg_comment_Jan2020.pdf

Green CAPE

Cape Alliance for Pesticide Education
PO Box 631
West Barnstable, MA 02668
(508) 362-5927 info@greencape.org
Non-Toxic Strategies for a Sustainable Cape Cod

February 13, 2020

MassDEP/Drinking Water Program
One Winter Street
Boston, MA 02108
Re: PFAS MCL Comments

To Whom It May Concern:

GreenCAPE is an advocacy and education organization founded in 1998 to increase public awareness of the risks of pollutants harmful to health and the vulnerable Cape Cod aquifer-our only drinking water supply. We thank your agency again for earlier opportunities to provide comments on the MCP in a local venue -the Town Hall in Hyannis. This was much appreciated as ours is a community impacted by PFAS from the use of AFFF at a nearby fire training facility and at a municipal airport. We also welcome inclusion in the process for establishing an MCL for PFAS at the stakeholder's table as representatives of a PFAS-exposed community. We would welcome future information and public comment opportunities in a community location at a time convenient for those who have been exposed to PFAS through the public water supply over several decades. Ideally-this would occur in the early evening at a location well known to the Hyannis community such as the town hall on Main St.

Thank you for advancing the PFAS Drinking Water MCL Regulations. We trust that this is only the first volley of regulatory effort on these persistent, bioaccumulative, and toxic perfluorinated chemicals and that DEP will keep tracking the rapid developments in PFAS research to reduce risk and exposure with appropriate updates to the MCL. As encouraging as this regulation is, 20 ppt for 6 PFAS doesn't achieve clean drinking water for Hyannis and other Commonwealth communities, especially for those already exposed to PFAS for several generations. We expect future regulations will be inclusive of more PFAS chemicals since the human body rarely experiences exposure to PFAS as a single chemical. Because the proposed MCL regulates only six out of thousands of PFAS rather than as a class of chemicals, it doesn't account for the toxicity of mixtures.

We were supportive of the earlier addition of Reportable Concentrations (RC) in soil and groundwater and cleanup standards for six perfluoroalkyl substances—Perfluoroheptanoic Acid (PFHpA), Perfluorohexanesulfonic Acid (PFHxS), Perfluorooctanoic Acid (PFOA), Perfluorooctane Sulfonate (PFOS), Perfluorononanoic Acid (PFNA) and Perfluorodecanoic Acid (PFDA) and the associated waste site cleanup standards. We also welcome finalizing the process for establishing an MCL for PFAS. Together these may jump start desperately needed remediation activity in Hyannis and communities beyond.

Our unique condition on Cape Cod -living above a sandy EPA-designated sole-source aquifer with no access to any other source of drinking water, as with similarly sensitive aquifers in the Commonwealth, should be afforded more frequent monitoring as pollution in sandy soils demand urgent attention/action for the welfare of the community and, in our case, our water-dependent tourist economy. USGS reports provide ample evidence that groundwater on Cape can travel up to 3 feet a day in this sandy environment and many water bodies on Cape Cod used for swimming and fishing are fed by groundwater, providing even more opportunities for exposure. Sand allows for rapid percolation and makes no distinction between the legacy PFOS/PFOA and the newer replacements PFAS not addressed in this PFAS MCL.

Many PFAS chemicals have been detected in Hyannis water due to the use of AFFF so, again, it's concerning that only 6 PFAS out of thousands have been addressed in this regulation. If the DEP would reconsider and have the MCL be inclusive of the entire class of PFAS, contaminated sites would be remediated to a better standard, our water would be better protected and blood levels of PFAS would be lower. After PFOS and PFOA were phased out, blood levels in humans declined (NHANES) and this should be the goal with the remaining PFAS. Regulating PFAS as a class would temporarily impact some industries and agriculture but at the end of the process, the health of the people served by your agency must be the imperative. Tackling but a miniscule number of the PFAS compounds-out of thousands- fails to adequately address the enormity and extreme burden those exposed to these forever poisons have and will continue to endure.

At one of two PFAS-contaminated sites in Hyannis, the Barnstable County Fire and Rescue Training Academy (BCFRTA), the soils are already so saturated with a variety of perfluorinated compounds, even rainwater drives multiple PFAS contaminants to the well heads of the public water supply system. PFAS rarely occur on contaminated sites as a single compound -another consideration for regulating them as a class. Fire training at the BCFRTA uses an average of over ½ million gallons per year (in some quarters as high as 378,000 gallons) which complicates tracking of plumes and municipal water treatment. There are excessively high levels of PFAS in Flint Rock Pond which abuts the BFCRTA and the sediments are now thought to be an independent contributor to ongoing groundwater contamination upgradient of the municipal wells. The BCFRTA is a complex site and requires a higher level of remediation based on its location above a sole-source aquifer beneath sand and the municipal public drinking water supply that is downgradient of it.

Again, we continue to encourage the expansion of the MCL to include all PFAS based on recent research in the E.U. and the continued production of related compounds, e.g. GenX, that quickly enter commerce without the requirement of demonstrated safety. As one example of this research: The European Chemicals Agency (ECHA) has recognized HPFO-DA – a fluorinated substance using the so-called GenX technology – as a substance of very high concern (SVHC) due to its probable serious effects on human health and the environment. This decision only adds urgency to scientific alarms about the long-term impacts of fluorinated substances and highlights the need to step up efforts to minimize their use and release. The decision to identify 2,3,3,3-tetrafluoro-2 (heptafluoropropoxy) propionic acid, its salts and its acyl halides (denoted as HFPO-DA) as SVHC was taken unanimously in the ECHA Member States Committee. The Netherlands had proposed for HPFO-DA to be placed on the SVHC list, according to article 57(f) of REACH. In recent years, HPFO-DA has increasingly been used as a replacement for PFOA in the production of high-performance fluoropolymers such as non-stick coatings or resins and exposure to HPFO-DA can be linked to toxicity for the liver, the kidney, the blood, and the immune system, and suspicions of carcinogenicity and endocrine disrupting effects for humans also exist. A class or even a group/subclass approach for PFAS regulation will swiftly reduce exposures and avoid further regrettable substitutions with newer but still harmful products. We will continue to encourage a class-based standard for PFAS as it is more appropriate for swiftly reducing human exposure to a group of related chemicals likely to harm multiple body organs and systems based on their similar chemical structure as well as minimize continual additions of PFAS into commerce. There is precedence for this approach with dioxin regulations.

As the Hyannis community has a growing number of young families, there is concern about potential harm from drinking the water despite the considerable efforts of the Town of Barnstable to install GAC filtration and purchase water from nearby towns to bring the system in to “compliance”. Compliance does not necessarily equate to safety, however. Some studies that have been shared with me by concerned parents and grandparents –
Children’s environmental health -one study found that verbal and non-verbal IQ scores were lower in children with higher prenatal exposure to PFOA and PFOS.
https://www.ncbi.nlm.nih.gov/pubmed/29705692.
Developmental Outcomes p.140 -Supporting Document for Epidemiological Studies for Perfluoroalkyls from ATSDR draft.
https://www.atsdr.cdc.gov/ToxProfiles/tp.asp?id=1117&tid=237
Prenatal exposure to perfluoroalkyl substances, immune-related outcomes, and lung function in children from a Spanish birth cohort study-
https://www.sciencedirect.com/science/article/pii/S1438463918309246 - This longitudinal study suggests that different PFASs may affect the developing immune and respiratory systems differently.
Early life exposures to perfluoroalkyl substances in relation to adipokine hormone levels at birth and during childhood -Findings suggest adipokine hormone dysregulation in early life as a potential pathway underlying PFAS-related health outcomes, and underscore the need to further account for susceptibility windows and sex-dimorphic effects in future investigations. https://academic.oup.com/jcem/advance-article-abstract/doi/10.1210/jc.2019-00385/5520379?redirectedFrom=fulltext
PFOS, PFOA, estrogen homeostasis, and birth size in Chinese infants-- findings suggested that exposure to PFASs could affect estrogen homeostasis and fetal growth during pregnancy and that estrogens might mediate the association between exposure to PFASs and fetal growth. https://www.sciencedirect.com/science/article/pii/S004565351930061X

Considering the above studies and regarding the question of Relative Source Contribution, could the most conservative default assumption of 0.20 of a person’s PFAS exposure from drinking water be sufficiently protective if a fetus has developed in vivo from a maternal line previously exposed to PFAS for more than one generation, and born with an elevated body burden even before exposure to PFAS via lactation and /or contaminated drinking water and PFAS-tainted commercial products? There are MA communities where this pre-natal exposure has occurred over several generations and perhaps the 0.20 RSC might not be reliably protective in these circumstances. In communities of decades long PFAS water contamination, that default value should be reconsidered to offer the strongest protection to the most vulnerable.

Dr. Linda Birnbaum, noted scientist and former director of the National Institute for Environmental Health Sciences, shared research finding pancreatic cancer tumors in mice exposed to very low levels of PFOA and implying that a health protective drinking water standard should be much lower. She cited .1ppt for PFOA alone- which is 700 times lower than the HA level set by the Environmental Protection Agency. While PFOA has already been tied to kidney and testicular cancer, among other diseases, recent research linking PFOA exposure to pancreatic cancer was the basis for the lower number cited. The research was done by the National Toxicology Program- a division of National Institutes of Health. https://factor.niehs.nih.gov/2020/1/science-highlights/pfoa-carcinogenicity/index.htm.

Dr. Birnbaum also shared that the health effects of the 4-carbon short chain PFAS called PFBS were similar to the 8-carbon long chain PFOS. This contradicts industry assumptions of the safety of the short chains- http://blogs.edf.org/health/2019/02/20/potential-biopersistence-short-chain-pfas/. We urge you to take this new data into consideration for the MCL regulation.

On a related note, preliminary research (not yet published, personal communication A. Timme-Laragy) conducted at the Clark Laboratory at UMASS/Amherst with the zebrafish embryo toxicity test (using OECD fish acute embryo toxicity test https://www.oecd-ilibrary.org/environment/test-no-236-fish-embryo-acute-toxicity-fet-test_9789264203709-en which found that the AFFF in the application formula at 3% concentrate in water, (identified as legacy AFFF from the Joint Base Cape Cod and obtained via your agency) has over 300 different PFAS in it. In terms of toxicity, it is about 7-10x more toxic than PFOS alone. This finding accentuates the need for reconsidering the regulation of PFAS as a class as humans experience PFAS as mixtures, not single chemicals. This legacy foam contains at least 300 minus 6 or 284 additional PFAS chemicals which are unidentified at this time and which MA residents could be drinking even if their water system is employing GAC filtration.

Also, of concern is that most of these shorter chain PFAS pass through GAC filtration and our community is unable to find out which PFAS are not being eliminated by the GAC filters and which make it to the tap. Also missing in this regulatory action are the PFAS precursors -the identity of 50% of these precursors is still a mystery and they matter because they eventually become PFOS/PFOA. In addition, PFAS fluorotelomers transform into PFOA/S in the body, so these compounds should also be studied for possible regulatory inclusion. The fluorotelomers biotransform in only a few months and then remain as PFOA/S in the body for many years. Newer AFFF recipes contained more of these after the legacy PFOS/PFOA was removed but they have yet to be proven safer. Internal exposure-based pharmacokinetic evaluation of potential for biopersistence of 6:2 fluorotelomer alcohol (FTOH) and its metabolites-
https://www.sciencedirect.com/science/article/pii/S0278691518300127?via%3Dihub.

For the above reasons, all attempts should be employed to identify the presence of all PFAS and their precursors existing in water or other media that exposes us to PFAS. Method 533 could be an additional means to analyze complex mixtures and complements Method 537.1 by testing for 11 more PFAS, allowing for a total of 29 PFAS to be measured in drinking water. Additionally, the Total Oxidizable Precursor Assay would aid in verifying the storage and migration of precursors in PFAS impacted areas or to verify PFAS treatment effectiveness such as breakthrough of precursors in the effluent of a GAC lead vessel. Traditional PFAS analysis only targets the key analytes and therefore may or may not greatly underestimate the presence of PFAS in the environment. The Total Oxidizable Precursor Assay and the determination Total Organic Fluorine have been suggested as means of exposing these underlying hidden PFAS. Why not employ all analytical methodologies that aid in characterizing and tracking the variety of PFAS that have been released into the environment while providing the best opportunity to keep the public informed of their exposure?

Regarding consumer notification, a more proactive approach would be appreciated by the public when water analysis results are not yet in violation -but PFAS are detected- to allow for sensitive consumers to make their own decision about consumption. Notification should be always be relayed to the public when results greater than the MCL are reported. Waiting for the annual Consumer Confidence Report to obtain this information is inadequate and a web posting on the state website is less than helpful. A press release should be sent to the local newspaper of record and prominently posted on the town's website.

It is unknown whether PFAS chemicals might expose sensitive populations via atmospheric transport. Some studies suggest that incineration of AFFF firefighting foams don't destroy the carbon/fluorine bond because the temperatures and time required are not well maintained or monitored at these facilities. This has been reported to be the case with the Heritage facility in OH where we understand that the AFFF from the MA take-back program was forwarded for destruction. Thus, we oppose MA DEP's practice of incinerating unused firefighting foams currently. The potential exists for the conversion of some of the PFAS into airborne contamination that unintentionally impacts other populations. Until newer technologies are discovered, it would be preferable to store the fluorine foam in a secure facility until methodologies are developed that can destroy it completely. It appears that a number of these technologies are being developed.

We would urge DEP to continue to move forward on monitoring PFAS in other problematic areas such as impaired areas under landfills which may not be lined or where there is reason to suspect the liner has been breached. Additional materials such as biosolids/sludge and effluent from wastewater treatment plants-noting the disastrous results on farms in AZ and ME- require investigation as does the recent popularity of fake turf which utilizes PFAS in its manufacture. Fish and shellfish monitoring should not be delayed, and wild game/birds should be monitored since there are a significant number of subsistence and sport fishermen and hunters on Cape Cod and western MA. Vegetables and fruits, local honey-all local produce grown with water in PFAS impacted communities -all contribute to the dietary intake of individuals who may already have ingested PFAS via their drinking water. Local produce should be analyzed with the goal of lowering the PFAS body burden in communities already exposed through drinking water for decades without benefit of filtration.

Once in the environment, water, and food supply, only the sound management of PFAS has any potential to reduce that risk to human health. Thank you for your perseverance in creating the PFAS MCL regulation and the opportunity for public comment.

Respectfully-

Sue Phelan, Director
GreenCAPE
West Barnstable, MA 02668
508.494.0276
www.GreenCAPE.org

From: Lynn McGregor <lynn.mcgregor@gmail.com>
Sent: Thursday, February 13, 2020 11:05 PM
To: Director-DWP, Program (DEP); Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Commissioner Suuberg and DEP Staff,

Thank you for taking a proactive stance on PFAS contamination in public water supplies in Massachusetts. The proposed rule is a great first step towards ensuring the safety of municipal drinking water in Massachusetts.

I have extensive training in both chemistry and biology, having earned a PhD in chemical biology in 2014 and working since then as a research scientist in drug discovery. Due to the persistent nature of PFAS compounds, I urge you to consider further decreasing the MCL for common PFAS in public drinking water. I am currently pregnant and I both reside and work in Cambridge, where the municipal water is currently just barely meeting the guidelines proposed by the new rule of 20 ppt for a combination of six compounds, so this issue is especially concerning to me. Further, public health experts have proposed a maximum exposure limit of 1 ppt in drinking water and note that infants are singificantly more sensitive to PFAS exposure than adults (PLoS Biol. 2017 Dec; 15(12): e2002855).

It's quite difficult to adhere to that recommendation as marketed filters are only tested for their ability to meet the EPA standard of 70 ppt. I hope that once enough states have adopted more stringent standards, home filters compliant with the more stringent standards will become available. More importantly, I urge you to adopt a standard that provides water of acceptable quality even to sensitive groups such as children and pregnant women, most of whom are likely unfamiliar with the risks associated with PFAS contamination.

Further, I am concerned that the proposed rule only requires testing for PFAS substances which may have already been phased out of use even though replacement perfluoro compounds have been shown to pose similar risks. I urge you to also begin monitoring municipal water for PFAS in current use, such as GenX, PFBS, and other shorter chain PFAS compounds, especially since PFBS has already been detected in the Cambridge finish water and there is evidence that these compounds are more difficult to remove with the activated carbon filters that would likely be used by residents.

Kind regards,
Lynn McGregor

Contact information:
lynn.mcgregor@gmail.com
203-214-7475
301 Huron Ave #2
Cambridge, MA 02138

From: Ostrodka, Lenna <Lenna.Ostrodka@mwraadvisoryboard.com>
Sent: Thursday, February 20, 2020 8:37 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Good morning,

Attached are the MWRA Advisory Board comments from Executive Director Joseph Favaloro on the proposed PFAS MCL for drinking water. Thank you for the opportunity to comment.

Sincerely,
Lenna Ostrodka

Lenna Ostrodka
Community Specialist

617-788-2057

MWRA Advisory Board
100 First Avenue
Building 39, 4th Floor
Boston, MA 02129-2043

Attachment: MassDEP MCL PFAS Comments

Yvette DePeiza
MassDEP
Drinking Water Program, Director
1 Winter Street, 5th Floor
Boston, MA 02108

February 20, 2020

RE: PFAS MCL Comment

Dear Ms. DePeiza,

The MWRA Advisory Board appreciates the opportunity to comment on the proposed amendment to 310 CMR 22.00, Massachusetts Drinking Water Regulations, pertaining to the total Maximum Contaminant Level (MCL) of 20 ppt for six per- and polyfluoroalkyl substances (PFAS). We are in support of the proposed amendment.

As the entity charged with holding the MWRA accountable and representing the interests of 60 communities, the Advisory Board takes matters of drinking water safety seriously. We trust that the 20 ppt MCL is based on sound science, above all aiming to protect Massachusetts residents. We recognize that fully-supplied MWRA water communities are in a particularly favorable position, as MWRA water tested in August 2019 had only trace amounts (or less than 2.27 ppt) of the six PFAS identified in the proposed amendment.

On the other hand, partially-supplied MWRA water communities, along with non-MWRA water communities, face the prospect of costly improvements to lower PFAS levels in their local drinking water systems in order to be in compliance.

We consider the $20 million available through the Clean Water Trust, along with $4 million available to communities for testing, to be an excellent start. However, we urge all levels of government to contribute more resources to help communities, as they simultaneously address lead and copper rule requirements, stormwater needs, and aging water and wastewater infrastructure. The available funding for this “forgotten infrastructure” does not go far enough. We are appreciative of the concern for drinking water safety, but it is clear that Massachusetts communities need more assistance in achieving these requirements.

Thank you again for allowing us to comment on this proposed amendment, and we look forward to continuing the discussion as MassDEP determines other regulations as related to PFAS.

Sincerely,

Joseph E. Favaloro

Joseph E. Favaloro
Executive Director, MWRA Advisory Board

From: Bob Worthley <BWorthley@foxboroughma.gov>
Sent: Friday, February 21, 2020 10:26 AM
To: Director-DWP, Program (DEP)
Subject: Foxborough PFAS Comment Letter

Attached please find the Foxborough Water PFAS Comment Letter.

Thank you for your time and consideration,

Bob Worthley

Attachement: Foxborough PFAS Comment Letter.docx

Board of Water and Sewer Commissioners
TOWN OF FOXBOROUGH
70 ELM STREET
FOXBOROUGH, MASSACHUSETTS 02035

Michael P. Stanton, Chair
Richard M. Pacella, Jr., Vice-Chair
Robert T. Garber, Clerk

Robert B. Worthley
Superintendent
Telephone 508-543-1209
Fax 508-543-1227

February 24, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)

Dear Ms. DePeiza:

The Foxborough Water Department wishes to echo the concerns of, Elizabeth Denly, ASQ CMQ/OE, particularly focusing on the reporting of "J" values. At various meetings on PFAS, representatives of MassDEP have explained that these values are used, because the analyst "knows" that something is there. The inference is that there is a certainty or accuracy to these "J" values; however, they are interpreted differently from analyst to analyst, and laboratory to laboratory, and, therefore, are unreliable and should not be used. After all, is not the concept of a Minimum Reporting Level, that any results below this level are not accurate? Please see Elizabeth's detailed explanation below.

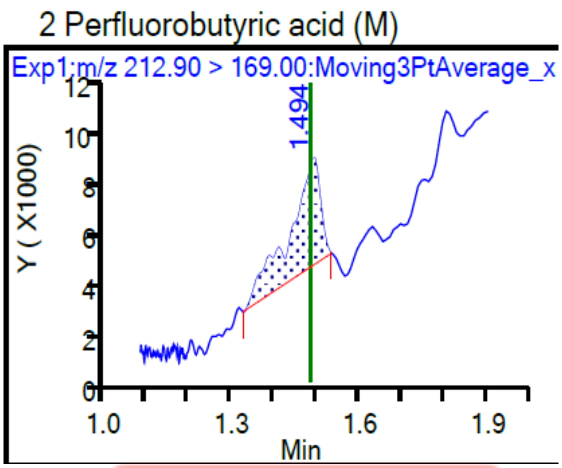
The comments below pertain to the document entitled, *How to Interpret my PFAS Laboratory Report and Understand How my Results Compare to MassDEP's Guideline Levels*, dated January 27, 2020.

- Data Qualifiers – "J" next to the result:
- Currently, MassDEP has requirements for how to deal with "J" values when summing PFAS results. This is concerning for the following reasons:
    - Not all laboratories routinely report "J" values unless requested. In addition, nowhere within EPA Method 537 or within MassDEP documents does it require the reporting of "J" values. Therefore, there will be no consistency to this reporting strategy from lab to lab.
    - MassDEP is unnecessarily confusing the values to be utilized in the summation because of "J" values. The rules currently are as follows:
        - If the J value ≥ 1/3 the MRL, then use ½ the MRL in the summation.
        - If the result is reported as a nondetect at the MRL, then use ½ the MRL in the summation.
        - If the J value is < 1/3 the MRL, then use "0" in the summation.
          Note that "J" values are estimated and when we are at such low concentrations, there is no difference between a "J" value that is <1/3 the MRL or a "J" value that is >1/3 the MRL.

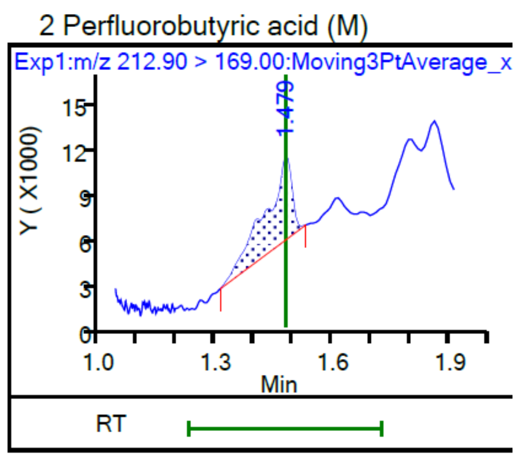
Since the majority of labs are currently able to report MRLs of 2 ng/L for the 6 regulated PFAS, the reporting of J values provides no added benefit and confuses the process. In fact, "J" values for PFAS are specifically unreliable. We have seen too many issues with peak shapes, ion ratios, etc. with "J" values and we also have seen variation in the interpretation of these peaks for "J" values from analyst to analyst within the same laboratory. At these low RLs of 2 ng/L, there really is no need for J values. An example is provided below to demonstrate this.

Here are 2 examples of J values: in the same package it was interpreted differently in 2 samples: **1.** This was reported as a "J" value in 1 sample. **2.** This was in the same data package and was reported as nondetect. If we followed MassDEP rules here, #1 would be reported as 0 ng/L (because this J value is < 1.3 the MRL) and #2 would be reported as 1 ng/L. It would be much clearer to not have the labs report "J" values and use ½ the MRL for nondetect results.

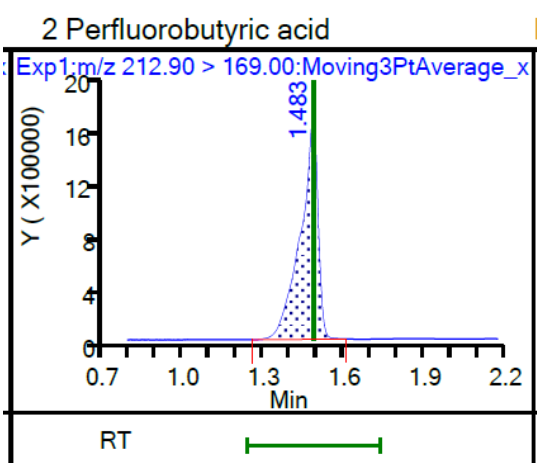
It is clear these are not great peaks and the signal-to-noise at these low concentrations is questionable. The chromatogram underneath (#3) is from a 2.5 ng/L standard, right near the MRL, and the peak shape is dramatically improved when we are at or above the MRL, showing the higher reliability of data at or above the MRL.



1. PFBA: 0.35 J ng/L



2. PFBA: <2.0 ng/L



3. PFBA: 2.5 ng/L

Robert B. Worthley
Water Superintendent
Foxborough Water Department
Foxborough, MA. 02035

From: s.chapnick@comcast.net <s.chapnick@comcast.net>
Sent: Thursday, February 20, 2020 7:24 PM
To: Smith, C.Mark (DEP) <c.mark.smith@mass.gov>
Cc: Locke, Paul (DEP) <paul.locke@mass.gov>; Callahan, Elizabeth.J (DEP) <elizabeth.j.callahan@mass.gov>
Subject: Regulatory Comments - 310 CMR 22.00 for PFAS MCL in Drinking Water

Mark,
Please accept the attached Regulatory Comments on the proposed PFAS MCL in Drinking Water, 310 CMR 22.00.

Thank you for your consideration of our comments.
Best Regards,
Susan

Susan D. Chapnick, M.S.
President & Principal Scientist
New Environmental Horizons, Inc.
2 Farmers Circle, Arlington, MA 02474
781-643-4294
www.neh-inc.com

Attachement: NEH Comments_PFAS DW 310 CMR 22.00_02.20.2020 (1).pdf

NEH Comments on 310 CMR 22: Massachusetts Drinking Water Regulations - PFAS MCL Amendments

NEH respectfully submits the following Comments on the PFAS Maximum Contaminant Level (MCL) Proposed Amendments published 12/27/2019.

310 CMR	NEH Comment
22.02	Reliably and Consistently: definition uses the phrase "wide variations" but does not define "wide." Will this be up to the water supply to define/justify? Recommend guidance be provided for relative percent difference (RPD) or relative standard deviation (RSD) acceptance criteria. For example, may default to EPA DV guidance for acceptable differences in field duplicate RPD – greater than those differences would be considered "wide."
22.02	Reliably and Consistently: definition uses the phrase "analytical result which is close to the MCL" but does not define "close." Will this be up to the water supply to define/justify? Recommend guidance be provided to consider detected concentrations within 2x MCL.
22.07G (3)	"PFAS Detection shall mean a measured concentration of any PFAS in the scope of the analytical method greater than or equal to the analytical laboratory's MRL" – What is the definition of the Minimum Reporting Level (MRL) – other than having to meet the concentration requirement in 22.07G(16)? Is it the low-level in the calibration curve or is it a multiple of the MDL? How should it be derived by the lab analytically?
22.07G (3)	Initial Monitoring. Does "no PFAS" detections only refer to the 6 compounds used to evaluate Total PFAS MCL or can any PFAS compound detection trigger action?
22.07G (3)	"Total PFAS Detection shall mean the sum of the measured concentrations of the PFAS listed in 310 CMR 22.07G(3)" – Therefore, can we assume that non-detects are summed as "0"?
22.07G (7)	PFAS Detections / Confirmatory sample results: what is the criterion for comparing the confirmatory sample result to the initial PFAS detection? Do they have to agree within a reasonable amount (e.g., within a certain RPD)? Or is it enough that a confirmatory sample is detected vs. not detected for PFAS?
22.07G (10)(e) (10)(f)	Total PFAS Compliance Calculations. These sections discuss how to handle results that are reported as detected at less than (<) the MRL. These are commonly referred to as "J" values in the lab, which are reported < sample-specific quantitation limit (or LOQ) but > method detection limit (or LOD). NEH disagrees with the approach of using 1/3 MRL as the criterion for determining if the "J" value should be considered

	as zero or as a detected value in the summation to obtain the total PFAS for compliance. We also disagree with using ½ MRL to replace the numerical value of the "J" result, when it is used in a sum or running average. There is no technical justification that we know of to support using 1/3 MRL, assuming that "MRL" is equivalent to the sample-specific quantitation limit (QL). "J" values below the sample QL are uncertain and often are "negated" (changed to not detected) during data validation. The use of "J" values based on an arbitrary cut-off of 1/3 MRL is unsupported. Furthermore, since "J" values are uncertain, they should not be used at all until after appropriate blank actions (from field blanks and method blanks) have been applied during data review/validation. If the "J" value remains a detect following this blank review, then NEH sees no justification for changing the value to an arbitrary ½ MRL for summations of total PFAS – why not just use the value reported? Both the "J" value reported and ½ MRL are uncertain – we don't see the justification for compounding the uncertainty by changing the reported value to ½ MRL.
22.07G (12)	<u>PFAS Analytical Requirements</u>. Allows the 2 current EPA methods. Does this mean updates to the EPA methods will require another change to these regulations? Can language be added to allow for the use of future EPA drinking water methods for PFAS analysis as long as they meet the sensitivity requirements to support these DW regulations?
22.07G (16)	<u>PFAS Minimum Reporting Levels</u>. "…each individual MRL less than or equal to 0.0000020 mg/L or 2.0 ng/L." Since the MRL is 10x lower than the MCL of 20 ng/L, it is important to understand how the MRL should be determined analytically by the lab (also see comment to 22.07G(3)). If the MRL is a multiple of the MDL or equivalent to the low-level in the calibration curve, then reporting results below the MRL ("J" data) can be done; however, if the MRL is basically the MDL, then reporting results below this level is not technically valid.

From: Denly, Elizabeth <edenly@trccompanies.com>
Sent: Sunday, February 23, 2020 6:04 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

The comments below pertain to the document entitled, *How to Interpret my PFAS Laboratory Report and Understand How my Results Compare to MassDEP's Guideline Levels*, dated January 27, 2020.

1. Data Qualifiers – "J" or "B" next to the result:

- This section states that when results are flagged with "J" or "B", these situations often require resampling. This is not an accurate statement. Please modify this statement to state these situations may occasionally require resampling.
  - When values are flagged as estimated (J), this means the result was detected above the MDL but below the MRL, as the MassDEP document states. This situation will almost never result in a resampling effort.
  - When values are flagged with a "B" indicating the associated PFAS was also detected in the method blank, resampling may only be required if the concentrations detected in samples are close to the blank concentration or if results are close to the action level (or MCL) in this case. It is understood that with drinking water, we need to be a bit more sensitive to the potential for blank contamination.
- This section also states that if a PFAS compound is qualified with a "B", the sample must be recollected and reanalyzed. This seems a bit stringent. In the example given, the result for PFHxS at 2.1 ng/L was flagged with a "B". This indicates a potential high bias and false positive for this PFAS compound. If the total PFAS concentration is still significantly below the MCL of 20 ng/L, there would be no beneficial reason to do the resampling and this may not be a cost effective strategy.

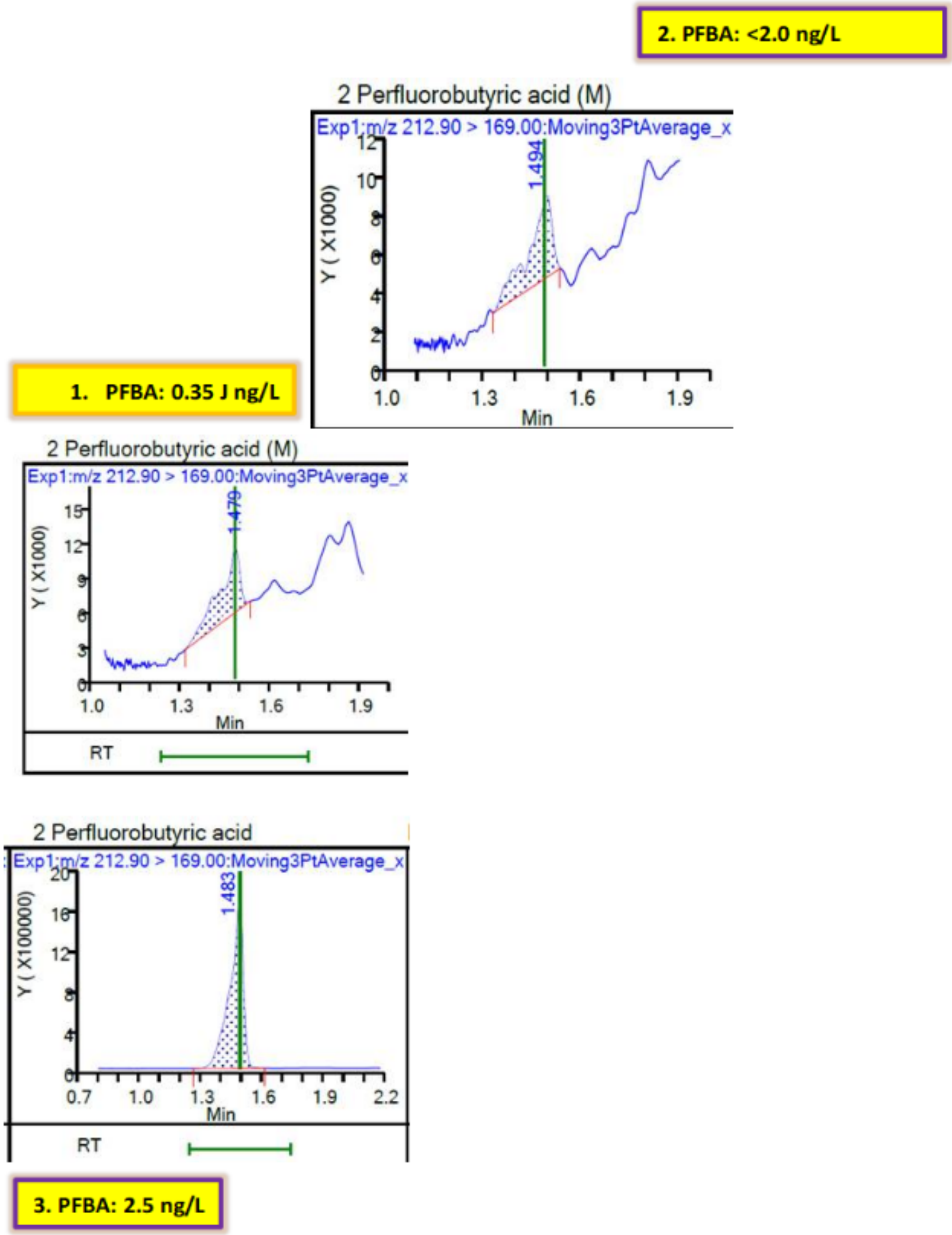
2. MassDEP Lab Reporting Form:
   - Currently, MassDEP has requirements for how to deal with "J" values when summing PFAS results. This is concerning for the following reasons:
     - Not all laboratories routinely report "J" values unless requested. In addition, nowhere within EPA Method 537 or within MassDEP documents does it require the reporting of "J" values. Therefore, there will be no consistency to this reporting strategy from lab to lab.
     - MassDEP is unnecessarily confusing the values to be utilized in the summation because of "J" values. The rules currently are as follows:
       - If the J value ≥ 1/3 the MRL, then use ½ the MRL in the summation.
       - If the result is reported as a nondetect at the MRL, then use ½ the MRL in the summation.
       - If the J value is < 1/3 the MRL, then use "0" in the summation.

       Note that "J" values are estimated and when we are at such low concentrations, there is no difference between a "J" value that is <1/3 the MRL or a "J" value that is >1/3 the MRL.

Since the majority of labs are currently able to report MRLs of 2 ng/L for the 6 regulated PFAS, the reporting of J values provides no added benefit and confuses the process. In fact, "J" values for PFAS are specifically unreliable. We have seen too many issues with peak shapes, ion ratios, etc. with "J" values and we also have seen variation in the interpretation of these peaks for "J" values from analyst to analyst within the same laboratory. At these low RLs of 2 ng/L, there really is no need for J values. An example is provided below to demonstrate this.

Here are 2 examples of J values: in the same package it was interpreted differently in 2 samples: **1.** This was reported as a "J" value in 1 sample. **2.** This was in the same data package and was reported as nondetect. If we followed MassDEP rules here, #1 would be reported as 0 ng/L (because this J value is < 1.3 the MRL) and #2 would be reported as 1 ng/L. It would be much clearer to not have the labs report "J" values and use ½ the MRL for nondetect results.

It is clear these are not great peaks and the signal-to-noise at these low concentrations is questionable. The chromatogram underneath (#3) is from a 2.5 ng/L standard, right near the MRL, and the peak shape is dramatically improved when we are at or above the MRL, showing the higher reliability of data at or above the MRL.



Elizabeth Denly
Program Director – PFAS Group

650 Suffolk Street, Lowell, MA 01854

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LinkedIn | Twitter | Blog | TRCcompanies.com

Please note that our domain name and email addresses have changed

From: Schlezinger, Jennifer J <jschlezi@bu.edu>
Sent: Monday, February 24, 2020 7:06 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Dr. Smith,
Please find attached my comments regarding the proposed PFAS MCL.
Jennifer Schlezinger

Jennifer Schlezinger, PhD
Associate Professor of Environmental Health
Boston University School of Public Health
715 Albany Street, R408
Boston, MA 02118
Phone: 617-358-1708
Email: jschlezi@bu.edu

THINK. TEACH. DO.
FOR THE HEALTH OF ALL.

Attachment: Schlezinger.Comments.PFAS.2020.pdf

Boston University School of Public Health
Department of Environmental Health
715 Albany Street, R408
Boston, Massachusetts 02118
T 617-358-1708
jschlezi@bu.edu

Mark Smith, Sc.D, MS
Office of Research and Standards
Massachusetts Department of Environmental Protection
February 22, 2020

Dear Dr. Smith,

I write in strong support of the Massachusetts Department of Environmental Protection's (MassDEP) derivation of the Maximum Contaminant Level (MCL) for PFAS. I am molecular toxicologist with expertise in PFAS toxicity who has been studying the mechanism of action of several PFAS in cell culture and animal models. Please find below my technical comments as they relate to 1) the selection of animal models as the basis of the points of departure, 2) the assumption of additivity for 6 (six) PFAS, and 3) the half-life based on the weight of evidence.

Please contact me if you need clarification or further information.

Sincerely,

Jennifer J. Schlezinger, Ph.D.

Associate Professor of Environmental Health

Comment 1: <u>MassDEP's use of animal studies to determine RfDs is appropriate and takes advantage of the state of PFAS science.</u> There are always challenges in translating results in animal models to human physiology; however, even liver endpoints in rodent models can provide important information for estimating health protective limits on exposure to PFAS.

- While peroxisome proliferation and hepatocellular carcinoma do not occur in humans exposed to PPARα ligands such as PFAS, hepatosteatosis and subsequent liver enlargement occurs in mice expressing either mouse or human PPARα that have been exposed to PFAS.[1–5] In an exposure scenario that generated an approximately steady state body burden, mice expressing human PPARα mice were more susceptible to hepatic steatosis than mice expressing rodent PPARα.[2] These results are in line with increasing epidemiological evidence of the association between liver dysfunction and PFAS exposure in humans.[6–9] Furthermore, the liver is a critical organ for maintaining cholesterol and lipid homeostasis,[10] and strong epidemiological evidence supports the conclusion that PFAS exposure is associated with cholesterol and lipid dyshomeostasis.[11–22]

- The biological significance of the loss of bone quality induced by PFAS in animal models has been called into question.[23] However, there is strong epidemiological support for bone a target organ of PFAS. First, PFAS have been measured in human bone.[24] Second, PFAS body burden is associated with reduced bone quality in humans.[25–31] What is particularly concerning and supports the use of studies that examine PFAS-induced effects on bone quality in the determination of RfDs is that decrements in bone quality associated with PFAS exposure are being detected in children and adolescents. Maximizing bone acquisition and density in adolescence is critical (i.e., as important minimizing bone loss at menopause) to reducing the risk of osteopenia and osteoporosis.[32–34]

Comment 2: <u>The additivity grouping approach proposed by MassDEP to regulate the six PFAS together is scientifically supported (evidence provided).</u> This approach has been called into question for several reasons, which are not scientifically justified.

- Differences in the half lives of the six PFAS (PFOA, PFNA, PFHpA, PFDA, PFOS, PFHxS) are all within 5-fold (approx. 900-4500 days), with the exception of PFHpA (approx. 300 days). These half-lives are based largely on studies of both occupationally exposed and environmentally exposed individuals in multiple countries.[14,19,35–44] The least robust data are for PFDA, which come from a single study.[19]
- The sex-difference in PFAS elimination in humans is much less prominent than in some animal models (e.g., rats). There is evidence of a longer half-life for several PFAS in men and older women than in young women, as a result of elimination of PFOA via menstruation.[19,45] This is contrast to the dramatically different half lives in female and male rats, which results from differential expression of kidney transporter proteins.[46] Importantly, the RfDs are based on serum PFAS concentrations, rather than administered dose, thus minimizing uncertainties related to variability in pharmacokinetics across sexes and species.
- There are multiple molecular initiating events (MIEs) that are triggered by PFAS, but, they are shared by PFAS examined to date. All six PFAS activate human PPARα in reporter assays and induce PPARα gene expression in human hepatocytes.[47–52] All six PFAS activate CAR-dependent gene transcription in human hepatocytes.[47–49,52] PFAS do not activate CAR in reporter assays because they are indirect CAR activators, thus data from reporter assays should not be used to assess the ability of PFAS to activate CAR.[48] All six PFAS bind to human L-FABP.[53] Last, PFOA and PFOS both downregulate HNF4α in human hepatocytes;[51,54,55] the other PFAS have not been examined for this outcome. It is likely that the carboxylic acids versus the sulfonic acids may favor certain MIEs over others, but, based on the current state of the science, it is appropriate to conclude that the six PFAS are likely to share the spectrum of MIEs.

Comment 3: <u>The half-lives of the six PFAS selected by MassDEP are long and supported by epidemiologic studies</u>.

- The weight of evidence across eleven, population-based studies (cited above), supports the use of a PFOA half-life on the order of 1200 days. The clinical, PFOA exposure in terminally ill patients does not constitute an appropriate or generalizable model for determining the half-life of PFOA in humans.[56]

- Glomerular filtration rate (GFR) and its potential influence on urinary elimination of long chain PFAS is not relevant in humans. The vast majority of elimination of long chain PFAS in humans is biliary, not urinary.[57]

References

1. Nakamura T, Ito Y, Yanagiba Y, et al. Microgram-order ammonium perfluorooctanoate may activate mouse peroxisome proliferator-activated receptor α, but not human PPARα. *Toxicology*. 2009;265(1-2):27-33. doi:10.1016/j.tox.2009.09.004
2. Nakagawa T, Ramdhan DH, Tanaka N, et al. Modulation of ammonium perfluorooctanoate-induced hepatic damage by genetically different PPARα in mice. *Arch Toxicol*. 2012;86(1):63-74. doi:10.1007/s00204-011-0704-3
3. MINATA M, HARADA KH, KÄRRMAN A, et al. Role of Peroxisome Proliferator-activated Receptor-α in Hepatobiliary Injury Induced by Ammonium Perfluorooctanoate in Mouse Liver. *Ind Health*. 2010;48(1):96-107. doi:10.2486/indhealth.48.96
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From: Kirsten King <kirsten@NEWWA.org>
Sent: Wednesday, February 26, 2020 4:51 PM
To: Director-DWP, Program (DEP)
Subject: NEWWA Comment Letter on 310 CMR 22.00

Good afternoon:

Attached are NEWWA's comments on the proposed changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00).

Thank you for the opportunity to share our thoughts.

Respectfully submitted,

Kirsten King
Executive Director
New England Water Works Association
125 Hopping Brook Road
Holliston, MA 01746
P: (508) 893-7979
F: (508) 893-9898
C: (617) 839-2633

Attachment: PFAS_Comment_Letter_MASS_Feb_2020.pdf

New England Water Works Association
a Section of the American Water Works Association

February 26, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)
Via email to program.director-dwp@mass.gov

Dear Ms. DePeiza:

The New England Water Works Association (NEWWA) applauds the MassDEP's diligence in discovering, and ultimately removing, Per- and Polyfluoroalkyl Substances (PFAS) from drinking water. In response to the proposed changes to the Drinking Water Regulations, 310 CMR 22.00, NEWWA would like to submit the below comments, which are also in support of the Massachusetts Water Works Association's (MWWA) comments. NEWWA, along with MWWA, urge MassDEP to consider all comments to the proposed regulatory changes carefully before moving forward with any new rule. NEWWA believes it is critical that any new rule be established utilizing sound science, research, and data.

Water suppliers are charged with protecting public health through compliance with the Safe Drinking Water Act. Through the Third Unregulated Contaminant Monitoring Rule (UCMR3), Per- and Polyfluoroalkyl Substances (PFAS) became a contaminant of heightened awareness not only in drinking water, but in a vast number of everyday products and items humans are exposed to daily (cookware, clothing, cosmetics, housewares, etc.). Research on these compounds—particularly on the toxicity and health effects of PFAS—is ongoing and the scientific understanding of these compounds on human health continues to evolve.

For public health protection, the United States Environmental Protection Agency (EPA) has a rigorous process for evaluating contaminants of concern in drinking water and deciding whether regulation is warranted. EPA has released a National Strategy on PFAS and is working on its implementation. NEWWA joins with MWWA in asking MassDEP to allow EPA to take the lead on addressing the regulation of PFAS, as this is an issue being seen across the country and is not unique to Massachusetts. Following rulemaking protocol from the federal down to the state primacy level is a pattern that should remain consistent for all emerging contaminants. The fact that many states have already taken it upon themselves to establish their own regulations regarding PFAS is not only highly confusing to the general public to be able to understand why levels are different from state to state, but sets a precedent for this same course of action to be taken as future contaminants arise, which will significantly affect the rulemaking process.

With respect to MassDEP's proposal to develop a Massachusetts Maximum Contaminant Level (MMCL) of 20 parts per trillion (ppt) for PFAS which includes six compounds: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA), NEWWA also joins MWWA in asking MassDEP to develop compound-specific standards for each of the PFAS, and not employ a cumulative approach. The compounds should not be combined because of different toxicity endpoints, different uncertainty factors between humans and mammal toxicities, different reference dosages, differences in half-lives, bioaccumulation, etc. There are also treatment and operational considerations that could be more challenging if the compounds are considered cumulatively.

In addition, MassDEP is proposing to mandate electronic reporting of all data submitted to the Drinking Water Program. Electronic reporting should not be mandated until MassDEP can ensure that the state's information technology infrastructure can reliably support such a directive. NEWWA joins MWWA in asking for this requirement to be stricken.

The proposed rules would require monthly monitoring if detections are above 10 ppt, which would greatly affect the capacity as well as budget of some of the smaller systems (and potentially larger ones as well). Given the expensive nature of PFAS sampling, the limited number of laboratories that are able to conduct the proper analysis, staff capacity at both the utility and MassDEP levels to maintain the data, not enough scientific data to determine any acute health affects, and the question as to if the results would vary significantly from month to month, NEWWA joins MWWA in requesting that quarterly sampling be required for these systems detecting more than 10 ppt.

The proposed MMCL compliance calculations, including estimates of analytical results below the Minimum Reporting Level (MRL), are concerning, and NEWWA joins MWWA in requesting this be excluded from any final rule promulgated. A detection below the MRL should not be governed (or calculated) by an arbitrary rule which assumes a certain level exists, as such an interpretation is not based on sound science. Values below the MRL should not be reportable, nor counted towards compliance calculations at these low parts per trillion levels, which are still subject to human as well as instrumental error at such minute amounts. There are also concerns about the legal defensibility of estimating values below the MRL. Violations of the MMCL will most likely prompt a Public Water System to look for a responsible party. If the exceedance of the MMCL includes estimations of results, responsible parties will have grounds to argue that it is not a valid result due to it being below the MRL.

MassDEP should also consider ways to invalidate sample results if the Public Water System demonstrates that results were influenced by products used in the piping or plumbing of the sample location, involved human error, or if confirmatory sample results are markedly different than the initial results. PFAS are popular compounds found in many materials that water suppliers use in their daily operations (Teflon® tape, piping, etc.) – and this should be taken into consideration given the infinitely small levels suppliers are being asked to measure these compounds at.

NEWWA supports MWWA's appreciation that MassDEP is allowing Public Water Systems to submit previously collected data in order to forgo some of the future sampling. We also agree it is important to have waiver provisions and regulatory flexibility related to monitoring if there are emergency, operational, or lab capacity issues which would preclude such monitoring. NEWWA joins MWWA in supporting these provisions in the proposed regulation.

The below implementation challenges facing Public Water Systems should be addressed by MassDEP before finalizing and implementing a MMCL. These include:

- The complexities, timing, and cost of designing, permitting, and constructing treatment systems needs to be factored into MassDEP's timeline for enforcing the standards. Will funding be made available to systems for testing as well as system upgrades?
- The existing timeframes and statutory constraints on being able to quickly procure goods, services, and equipment needs to be evaluated and resolved. MassDEP should work with the Operational Services Division to add necessary services and common treatment components to the state bid list.
- MassDEP must provide the appropriate risk communication tools so that Public Water Systems have the information necessary to communicate with the public, especially if consumers have health questions or concerns. This risk communication guidance should also include reasoning as to why the MassDEP regulations will differ from the federal, as well as other states. This information will be needed to help lessen confusion the general public will certainly have from the inconsistencies seen between the federal level and states.
- MassDEP should ensure that the language in the "Consumer Notification" it intends to require is specific to the sensitive subpopulations that it is most concerned with so that it does not overly alarm the general public.
- MassDEP must provide context to relative exposures of PFAS in drinking water versus all other exposure points (consumer products, food, air, etc.). If MassDEP

only concentrates on regulating PFAS in drinking water, it may be giving consumers a false impression they are protected. There are many other sources of PFAS exposure in consumer products as well as food, including detections at even higher levels than what is found in drinking water. If MassDEP does not address all these other exposures, intended public health protection will not be achieved. This information should also be placed on the homepage of the MassDEP website to include ALL routes of exposure, as well as a graph of what percentage is from consumer products, water, air, environment, etc. This information will be critical for proper public education.

- Guidance must be provided to the public and/or sensitive subpopulations on the appropriate "PFAS-free" alternative water supply options (i.e. bottled water and appropriate Point of Use Filters).
- A definitive timeline must be set by which MassDEP's Bureau of Waste Site Cleanup will launch investigations into the source(s) of contamination of the drinking water to identify responsible parties.
- The commonwealth must identify additional grant funds to assist Public Water Systems in paying for treatment of their drinking water.
- MassDEP must provide the appropriate technical and compliance assistance to help Public Water Systems comply with the new rule.

Thank you for the opportunity to provide these comments. Public water suppliers understand the importance of safeguarding the drinking water that reaches their customers, while complying with Safe Drinking Water Act requirements and protecting public health. Water suppliers work hard each day to meet these goals and satisfy their customers' expectations. As we have all come to be keenly aware, the issue of emerging contaminants presents a huge challenge. Compliance with regulatory standards will fall on water systems and MassDEP has an obligation to determine what the real human risk exposure is, and then, when and if the science dictates, move toward standards that will achieve desired public health outcomes. As outlined in this letter, there are still many outstanding issues that need to be addressed before moving forward with these new regulations.

Sincerely,

Kirsten King

Kirsten King
Executive Director

From: Alex P <dravidian@clerk.com>
Sent: Thursday, February 27, 2020 5:35 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

It is unacceptable that Massachusetts communities are at risk of chronic poisoning by the toxic chemicals known as PFAS. Especially as the parent of a young child, I thank you for your diligent efforts to address this urgent matter.

The Commonwealth needs to lead the nation on this. I urge you to consider a maximum contaminant level (MCL) of 1 ppt for total PFAS, and include many more of the PFAS family than the six currently under consideration, including all others besides these six that have been shown to damage public health as well. As you know well, PFAS cause extremely serious health problems, including cancer, and they are dangerous even in minute amounts. With thousands of PFAS chemicals, we cannot afford to regulate them one at a time.

Thank you again for your work to set these rules. I hope you will act to set an MCL of 1 ppt for as many PFAS chemicals as possible- while 20 ppt is an improvement, it is insufficient- and 1ppt is the standard suggested by many experts that would truly protect our communities. In setting policy for the years to come, if there is ANY uncertainty about toxicity at the 20 PPT level, Massachusetts should err on the side of protecting public health and act according to the Precautionary Principle.

Sincerely,

Alex Papali
Jamaica Plain, MA
857 719 8914

From: Don Keeran <dkeeran@apcc.org>
Sent: Thursday, February 27, 2020 4:22 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Please see the attached comments on the proposed PFAS MCL regulations.

Please feel free to contact me if you have any questions.

Sincerely,

Don Keeran
Assistant Director
Association to Preserve Cape Cod
508-619-3185 Ext. 4
Visit us at www.apcc.org

Attachment: PFAS comments_APCC_2020-2-28.pdf

APCC
Association to Preserve Cape Cod
Preserving the Very Nature of Cape Cod

February 28, 2020

Martin Suuberg, Commissioner
Massachusetts Department of Environmental Protection
c/o MassDEP Drinking Water Program
1 Winter Street, 5th Floor
Boston, MA 02108

RE: Comments on Proposed PFAS MCL

Dear Commissioner Suuberg:

The Association to Preserve Cape Cod (APCC) submits comments on proposed new regulations that establish a Total Per- and Polyfluoroalkyl Substances (PFAS) Maximum Contaminant Level (MCL) of 20 parts per trillion (ppt) for six PFAS contaminants: Perfluorooctane Sulfonic Acid (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorohexane Sulfonic Acid (PFHxS), Perfluorononanoic Acid (PFNA), Perfluoroheptanoic Acid (PFHpA) and Perfluorodecanoic Acid (PFDA).

Founded in 1968, APCC is the leading regional nonprofit environmental advocacy and education organization on Cape Cod. Supported by thousands of members from every Cape Cod town, APCC's mission is to promote policies and programs that foster the preservation of the Cape's natural resources. APCC focuses its efforts on the protection of groundwater, surface water, and wetland resources, preservation of open space, the promotion of responsible, planned growth and the achievement of an environmental ethic.

APCC commends MassDEP in taking action to establish a drinking water standard for PFAS. The prevalence and persistence of PFAS in the environment, coupled with the mounting evidence linking these chemicals to a suite of serious human health issues, requires the creation of effective regulations to ensure that public drinking water supplies are adequately monitored and, if necessary, treated. It is also imperative that the public be informed of ongoing monitoring results and alerted in a timely manner if PFAS MCLs are exceeded. Specifically, APCC provides comments on the following points.

Mandatory Monitoring

The threat PFAS poses has been well-publicized in the Cape Cod region in recent years, primarily from the PFAS contamination of the water supply in Hyannis, as well as a PFAS plume detected in the town of Mashpee. PFAS contamination has also been documented in other Massachusetts communities. Given the known cases of contamination and the likelihood of presently undetected PFAS contamination occurring in other locations, APCC strongly supports the proposed requirement that all water supply operators conduct sampling to monitor for the presence of PFAS, and that such sampling occur on a regular basis.

Total PFAS MCL

APCC supports the proposed regulation requirement that PFAS levels be measured as a Total PFAS MCL by calculating the combined sum of the concentrations of each contaminant listed in the regulation, as opposed to measuring and assessing the potential health threat of each PFAS chemical level individually. Unless future science proves differently, APCC believes approaching PFAS contamination as a cumulative risk is the most prudent method for assessing potential public health threats.

Response to MCL Exceedance

If a Total PFAS MCL exceedance occurs, the proposed regulations require a water supply operator to report the findings to MassDEP and provide notice to all persons served by the affected public water system "in accordance with 310 CMR 22.16, and… comply with the requirements of 310 CMR 22.03(14) and such other applicable provisions of 310 CMR 22.00." These above-mentioned existing regulations specify that the water supply operator "take appropriate actions" to reduce the level of contaminant concentrations to safe levels and to "provide public notification" regarding the contaminant level exceedance. APCC believes these requirements do not go far enough in protecting public health if sampling reveals an exceedance of the Total PFAS MCL. APCC recommends the new regulations require public water system operators, when providing public notification of the MCL exceedance, also be required to clearly communicate to all consumers using every practical means that they should not drink the contaminated water until corrective measures successfully bring PFAS levels into compliance.

Safe Levels and Regulated PFAS

A comparison of PFAS drinking water standards established by other states shows a noticeable discrepancy among those states in what is considered a safe level, as well as in the group of PFAS compounds selected for regulation. Many of the states have established safe level standards well below the U.S. Environmental Protection Agency's PFOA and PFOS Lifetime Drinking Water Health Advisory level of 70 ppt. A number of those states have established levels that are also below the 20 ppt standard proposed by MassDEP. At the same time, many state standards, including the 20 ppt level proposed by MassDEP, are well above the maximum levels recommended in some recent scientific analysis. APCC is aware that the science around safe levels for PFAS continues to evolve. Ongoing scientific evaluation of PFAS toxicity may very well lead to a definitive determination that even lower safe exposure level standards are warranted. APCC recommends that MassDEP commit itself to being responsive to emerging science on this issue and to revisiting the appropriate MCL for PFAS—as well as potentially expanding the number of PFAS chemicals covered by the regulation—as more is understood about these contaminants.

Conclusion
Establishing drinking water standards for PFAS is a critically important step in the effort to protect public health and the environment from these harmful contaminants, and MassDEP is to be congratulated for bringing proposed regulations forward. The regulations need to ensure that water supply operators provide the public with timely warnings about PFAS health risks and that swift action is taken to remedy any Total PFAS MCL exceedances. APCC also urges MassDEP to continue its assessment of PFAS, and to refine the state's PFAS regulations as necessary to reflect the best available science.

Thank you for the opportunity to provide comments.

Sincerely,

Andrew Gottlieb
Executive Director

From: DiMartino, Donald <DDiMartino@bellinghamma.org>
Sent: Thursday, February 27, 2020 2:47 PM
To: Director-DWP, Program (DEP)
Cc: MWWA - Jennifer ; Fraine, Denis; Seariac, Chris; Riedle, Jesse; Inacio, Tim; Degnan, Tom
Subject: Comments on PFAS Regulations

Donald F. DiMartino
Bellingham DPW Director
26 Blackstone Street
Bellingham, MA 02019-1602
Phone - 508-966-5813
Fax - 508-966-5814

Attachment: Bellingham PFAS Reg Comments 20200227.pdf

TOWN OF BELLINGHAM

OFFICE OF THE
DIRECTOR OF THE DEPARTMENT OF PUBLIC WORKS
26 BLACKSTONE STREET
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February 27, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)
Via email to program.director-dwp@mass.gov

Dear Ms. DePeiza:

I wish to submit the following written comments to the Massachusetts Department of Environmental Protection (MassDEP) on proposed changes to the Drinking Water Regulations, 310 CMR 22.00.

My greatest concerns are the general oned.

If I understand it correctly, the proposed Massachusetts MCL of 20 ppt is greater than three times more conservative than MCL's being considered by the USEPA. The Mass MCL adds the totals from six PFAS; the USEPA is currently proposing a level of 70 ppt as the site cleanup standard determined by adding two PFAS. This information is published in the 2/26/2020 EPA PFAS Action Plan Update.

Why does Massachusetts feel it necessary to abandon the standard procedure of adopting drinking water regulations and set an MCL in advance of the EPA completing the typical process? I do not have the knowledge, ability, or desire to argue against the Mass Office of Research and Standards and the legitimacy of 20 ppt total of six PFAS. I hope that this is not some form of knee jerk reaction triggered by publicized contamination events near chemical manufacturing facilities in other parts of the country.

Bellingham is embarking on a very costly effort to treat our water to meet the proposed Mass MCL. We have results that are just over the Mass MCL. The addition of treatment to reduce customer exposure is preliminarily estimated to cost $5.0 million for design, permitting, piloting, and construction, and will increase the annual water system operating budget by 10%. If the EPA eventually promulgates a regulation with an MCL just 25% higher than the Mass MCL, we will have imposed a significant and then arguably unnecessary expense on our rate payers. Yes, we will have made our drinking water better but at a huge price.

My understanding is that many PWS preliminary results are not unlike what Bellingham is experiencing. We are not right next to an airport or firefighting training school yet are getting results greater than the proposed Mass MCL. At some point there should be cost benefit analysis and that should be considered before regulations are adopted. I feel MassDEP does not yet have a handle on the cost that this regulation will impose and should postpone any action until most, or all, community public water suppliers in the State have completed preliminary testing. I commend the State on trying to set up free testing for PFAS, but hope these regulations get delayed until results give State officials a clear understanding of the financial impacts.

I have several comments regarding the clarity of the draft regulations.

The accepting of only samples at entry point (EP) when all sources are operating will place additional operational requirements on public water supply systems like Bellingham. We have many wells some of which are shut down for long periods during time of low demand to reduce treatment costs and comply with water management act withdrawal limits. We have also learned the PFAS level may be higher in wells that are not run continuously. We can fire up a well to get a representative EP sample, but the results may skew the actual contamination levels.

The requirements regarding the quantity of sampling is very important in budgeting to perform water quality analysis that costs $500 per site (sample plus field blank at each sampling site). Increases in sampling frequency, expansion of sampling requirements, when confirmatory sampling is required, are all factors that could blow a water suppliers budget very quickly.

The frequency of source sampling is very confusing. There is a lot of text on "detection" and then "results >10 ppt" and how results effect monitoring schedules.

It is not clear, but seems confirmatory samples are required for every detection regardless of the PFAS total results.

Source sampling is barely touched on. It appears all sources must be sampled if a manifolded EP sample yields a detection. Is that one sample from the source to see which has the PFAS or does that become a monthly or quarterly required monitoring along with the EP? Is a confirmatory sample required after every source sample or not at all or only if there is detection or if results are >10 ppt?

I would hope some better formula can be devised then taking results below the accepted detection limit and changing it to zero or 0.5 of the recording limit. It took me several hours and careful review of the draft regulations and fact sheets to wrap my head around the process to determine our results. I dread trying to explain it to customers and commissioners.

From my early days as a drinking water professional I had a fear that we are not far from throwing our hand up in defeat and inform all water consumers that the tap water is not 100% safe to drink. The new asbestos (PFAS) make me concerned as to what is next and when. It is very disheartening and sounds defeatist, which I am not, but we simply cannot provide **pure** water. We have less than perfect acquirers and distribute the water through ancient pipes.

I am a member of Massachusetts Water Works Association (MWWA) and I support the comments that are being submitted by MWWA and I am sure reiterated by many members. I don't feel a need to restate them here. Many of my comments cover the same topics. My comments are Bellingham specific. That is what I am closest too and feel most strongly about.

Thank you for the opportunity to provide these comments. I urge the MassDEP to consider a step back until a lot more information is available and the regulations get revised to make many sections and procedures clearer

Sincerely,

Donald F. DiMartino
Bellingham DPW Director

CC: Town Administrator Denis Fraine
Jennifer Pederson, MWWA

From: Charles Estabrook <cestabr@bu.edu>
Sent: Thursday, February 27, 2020 9:33 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

To Whom it May Concern,

I have attached a copy of my comments on the proposed PFAS MCL regulations.

Sincerely,

Charles Hill Estabrook

Attachment: Estabrook_PFASComments_Final.docx

Charles Hill Estabrook 02.23.2020

Elizabeth Callahan
Massachusetts Department of Environmental Protection

RE: Proposed PFAS drinking water standards (310 CMR 22)

Ms. Callahan,

I am writing first and foremost to express my support for this new set of regulations. The substances regulated under this new regulation pose a threat to public health and must be monitored. Their presence in the public water supply is a concern and the general public should be aware of their presence, the levels in which they are present, and the threat that they pose to individuals who ingest them.

The science that you are using in support of the derivation of the MassDEP PFAS MCL is based on science that consistently shows that the long chain PFAS have long half-lives. I have concerns about the validity of some of the "science" that has been used recently to discredit these regulations. Recent attempts to regulate PFAS have been met with resistance from regulated entities. One study that has been heavily relied on in recent attempts to relax regulatory efforts is *Stochastic Pharmacokinetic-Pharmacodynamic Modeling for Assessing the Systemic Health Risk of Perfluorooctanoate (PFOA)* by Convertino et. al.

The study involved the administration of large doses of PFOA to 49 advanced stage cancer patients. It was an open-label, non-randomized study that took place from 2008-2011.[1] It is impossible to describe the study without immediately encountering major flaws which should disqualify it from serious consideration for regulatory purposes. The ethical concerns of administering a known toxicant in large quantities to anyone, regardless of health status, are obvious. The exclusion criteria required that the patients have solid tumors refractory to available treatments,[2] raising questions about therapeutic

[1] Convertino et. al., (2018) p. 294
[2] Convertino et. al., (2018) p. 294

misconception. Furthermore, as the study itself admits PFOA is considered a possible carcinogen by the International Agency for Research on Cancer (IARC).[3] This makes it extremely unlikely that PFOA would ever be seriously considered as a chemotherapeutic agent.

Industry representatives that seek to "lessen" the toxicity of these chemicals are attempting to extrapolate the shorter half-life of PFOA to cover the general population. The idea that test results from a non-randomized study of advanced stage cancer patients that did not include a control could even be applicable to other similar cancer patients is laughable. The idea that anything about how PFOA acts in the bodies of otherwise healthy individuals from this study is one that would be hard – if not impossible – to make in good faith.

The study was also conducted in such a way as to not address some of the more worrisome effects of PFOA. Studies have shown that exposure to PFAS and PFOA may cause problems with brain development.[4] In a clinical trial such as this one there is no ethical way to study the effects of these chemicals on brain development; however, there is no argument to be made that justifies simply ignoring such concerns. The supporters of this study claim that it shows that the regulation of PFAS and PFOA to the levels currently being discussed is an overreaction, but they fail to offer any evidence, flawed or not, to counter the claims of developmental effects of PFOA.

This study has been used several times by individuals looking to stymie the implementation of drinking water standards such as the one MassDEP has put forth.[5] I am unsure as to whether or not this study has been cited in any of the comments regarding the MassDEP drinking standards, but given the history of its use I feel that it is likely that it will be. By nature of the flawed design of the study its results are

[3] Convertino et. al. (2018) p. 294
[4] Johansson, Eriksson, & Viberg (2009)
[5] Lerner (2019)

not applicable to any real-world scenarios and therefore any use of this study as a foundation for arguments against PFAS drinking standard must not be taken seriously.

MassDEP and all others involved are doing important work in the advancement of these standards. Access to clean and safe drinking water must be provided for all residents and working to increase monitoring our water supply for these dangerous chemicals is necessary. This regulatory measure represents a step in the correct direction but should under no circumstance be the final step in providing safe water for Massachusetts residents.

Sources:

Convertino, M., Church, T. R., Olsen, G. W., Liu, Y., Doyle, E., Elcombe, C. R., Barnett, A. L., Samuel, L. M., MacPherson, I. R., & Evans, T. R. J. (2018). Stochastic Pharmacokinetic-Pharmacodynamic Modeling for Assessing the Systemic Health Risk of Perfluorooctanoate (PFOA). *Toxicological Sciences*, *163*(1), 293–306. https://doi.org/10.1093/toxsci/kfy035

Johansson, N., Eriksson, P., & Viberg, H. (2009). Neonatal exposure to PFOS and PFOA in mice results in changes in proteins which are important for neuronal growth and synaptogenesis in the developing brain. *Toxicological Sciences: An Official Journal of the Society of Toxicology*, *108*(2), 412–418. https://doi.org/10.1093/toxsci/kfp029

Lerner, S. (2019, August 12). Industry Cites 3M Research on Cancer Patients Exposed to PFOA to Claim the Chemical Isn't So Bad. *The Intercept*. https://theintercept.com/2019/08/12/3m-cancer-patient-study/

From: Read, Connor <CRead@easton.ma.us>
Sent: Thursday, February 27, 2020 9:18 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments - Town of Easton

Good Morning,

Attached please find the Town of Easton's comments regarding the proposed PFAS MCL. Thank you for your attention to these comments and for the opportunity for communities to provide feedback. Contact information for my office is available below.

Sincerely,

Connor Read
Town Administrator
Town of Easton
136 Elm Street
Easton, MA 02356
T: (508) 230-0510
www.easton.ma.us

Attachment: 2020.02.27.Easton.DEP.PFAS.MCL.Comments.pdf

TOWN OF EASTON
MASSACHUSETTS

February 27, 2020

ATTN: Drinking Water Program Director
Massachusetts Department of Environmental Protection
1 Winter Street, 5th Floor
Boston, Massachusetts 02108

Re: Massachusetts Drinking Water Regulations - Proposed PFAS MCL

In response to the proposed amendments dated December 27, 2019, to 310 CMR 22.00, Massachusetts Drinking Water Regulations, for proposed new regulations establishing a Total Per- and polyfluoroalkyl substances (PFAS) Maximum Contaminant Level (MCL) of 20 parts-per-trillion (PPT), the Town of Easton is pleased to submit the following comments for the Massachusetts Department of Environmental Protection's consideration.

EASTON BACKGROUND

The Town of Easton is a community of approximately 23,257 located 30 minutes south of Boston. One of the Commonwealth's first Community Preservation Act Communities, Green Communities, and Housing Choice Communities, Easton prides itself on proactive planning and thoughtful conservation and preservation of our many wonderful communal, historical, and environmental resources while striving to create a welcoming community affordable to its current and future residents. Easton's Water Division proudly supplies over 7,500 customers with award winning water quality and service. The Department of Environmental Protection (DEP) has recognized the same and awarded the Easton Water Division the "Public Water System Award" for outstanding performance for 21 of the previous 28 years, including in 2018 and 2019.

PFAS Testing in Easton

In May 2019, as part of well permitting for an existing well supply, the DEP requested that the Water Division test for PFAS on the PPT scale, many months prior to DEP's publication of draft rules incorporating comparable standards on December 27, 2019. To our surprise, six of our seven wells registered PFAS on this scale (Easton had tested during USEPA UCMR3 and received "no detect" on those part-per-billion scale tests[1]). Easton was also surprised to learn that the vast majority of our peer public water systems (PWS) in the Commonwealth had not at that

[1] According to the DEP PFAS website, "…158 public water systems serving more than 10,000 people and 13 smaller systems were required to test for six PFAS chemicals as part of EPA's third round of the Unregulated Contaminant Monitoring Rule (UCMR3). PFAS was detected at nine Massachusetts drinking water sources above EPA's specified reporting limits." Accessed at: https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas

time (nor at the time of these comments) had occasion to conduct PFAS tests on the PPT scale[2]. We were further surprised that, despite the lack of even a draft DEP PFAS drinking water standard at that time; the lack of equitable and comparable testing standards for the vast majority of our peers; coupled with the fact that Easton's PFAS tests registered below the existing United States Environmental Protection Agency (USEPA) Lifetime Health Advisory (LHA) and the DEP 2018 Office of Research and Standards Guidelines (ORSG) level of concern of 70 PPT[3]; that DEP suggested Easton publish these early test results before specific regulatory standards or corrective actions were established. Nonetheless, the Easton Water Division prides itself on proactivity and responsibility and thereafter worked with DEP to publish and publicly review this information with the community.

Since that time, working collaboratively with the DEP, Easton has published its test results, posted notices online, conducted public, televised meetings with the DEP to educate the public to the status of our current PFAS testing, implemented a home-PFAS-filter rebate program, and submitted capital funding requests for PFAS engineering studies to begin in the coming fiscal year[4]. Easton strives to be proactive, responsive and responsible to our community, and we appreciate that the DEP partnered with us during 2019 to support that process despite the lack of a draft or final PFAS regulation at that time.

EASTON COMMENTS IN RESPONSE TO THE PROPOSED AMENDMENTS TO 310 CMR 22.00 MASSACHUSETTS DRINKING WATER REGULATIONS DATED DECEMBER 27, 2019

The Town of Easton does not dispute the authority of the Department of Environmental Protection to promulgate amendments to the Massachusetts Drinking Water Regulations, including the proposed rule (hereinafter "proposed rule") for a PFAS MCL; nor does the Town seek to comment on the methods utilized by DEP to arrive at the 20 PPT MCL for the proposed rule. The Town commends DEP for their continued stewardship of the Commonwealth's public water supply as well as for DEP's proactivity in this field of emerging water supply management.

However, due to our early testing completed last year, well in advance of the earliest proposed implementation of mandatory testing for PWSs in the Commonwealth (April 2020[5]), Easton has unique experience with the emerging field of PFAS regulation, as well as a comparatively advanced understanding of possible cost imposed by the proposed rule, that we believe are of critical interest to DEP, the Commonwealth of Massachusetts and all of its residents. While

[2] According to the Massachusetts EEA Data Portal, 35 Community Water Supplies of 521 in Massachusetts have tested for PFAS. Data accessed: https://eeaonline.eea.state.ma.us/portal#!/search/drinking-water

[3] See "PFAS levels of concern" history at DEP PFAS website: https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas

[4] See Easton Water Division PFAS information page for notices and rebate program: https://www.easton.ma.us/departments/dpw/water_division/pfas_information.php
See Easton Community Access Television for November 18, 2019 Meeting of Easton Water Commissioners and DEP: https://www.eastoncat.org/easton-select-board/select-boardwater-commissioners-111819-sel-pt-2

[5] See DEP Summary of Proposed Regulations and Note to Reviewers 310 CMR 22.00: Drinking Water Regulation at: https://www.mass.gov/doc/310-cmr-2200-summary-of-proposed-regulations-and-note-to-reviewers/download

certain PWSs may be able to blend water sources or disable isolated wells to achieve an aggregate PFAS PPT levels of <20 PPT, the geolocation of Easton's >20 PPT wells will likely necessitate the construction of one or more costly water filtration and treatment facilities. **Easton's current cost estimate of a treatment solution is approximately $10 million, which will necessitate multiple years of double-digit percent increases to our water rates**.

Financial Impacts of Proposed Rule in Easton

The Town commends our legislative partners and leaders around the Commonwealth for their foresight in allocating $24M in supplemental FY2019 funding for PFAS related items[6]. In broad strokes, costs resulting from the proposed rule fall under one of three categories (from least costly to greatest): testing, design, or construction. Unfortunately, based on current guidelines provided to Environmental Partners from DEP representatives this February, it is our understanding that access to these funds is highly conditional and will, largely, not supplement or offset Easton's multimillion dollar local burdens resulting from the proposed rule:

> **Testing –** Reportedly, the immediate priority from DEP for direct financial support being offered is for preliminary testing, which Easton has already completed and will no longer qualify for. *Accordingly, Easton will own a new annual testing cost of approximately $36,000.*
>
> **Design –** Reportedly, DEP is considering supporting design costs in the future (date unknown), but only after PWSs start testing (mandatory testing does not impellent in all communities until October 2021 based on the proposed rule). *Because Easton is well ahead of the mandatory testing time period, and because Easton wishes to be proactive in our design of solutions, we have programmed capital funding for the fiscal year beginning July 1, 2020 and are, therefore, unlikely to qualify for state financial assistance for design.*
>
> **Construction -** The SRF funds for construction will be borrowed dollars, rather than grants or direct financial support. Easton has made great use of SRF funding for wastewater and other infrastructure needs and will assess the relative benefit of possible SRF borrowing for future treatment plant construction. *Although SRF loans typically offer advantageous interest rates, these borrowed funds must be repaid and that cost will be borne by the homeowners, businesses and ratepayers of Easton.*

Based on current information, the FY2019 supplemental PFAS funding appears to be of little material benefit to Easton. Accordingly, we are advancing local funding options. Easton has programmed approximately $100,000 in capital funding for a PFAS preparedness and treatment engineering study for FY2021. We anticipate that this study may recommend the construction of a treatment plant in the area of $10 million, which will necessitate multiple years of double-digit percent increases to our water rates.

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[6] See Massachusetts Municipal Association News "Gov. signs FY19 closeout budget with funding for municipal accounts" at: https://www.mma.org/gov-signs-fy19-closeout-budget-with-funding-for-municipal-accounts/

Policy and Planning Impacts of Proposed Rule in Easton

Easton is in a unique position in relation to the ongoing development of a PFAS MCL. A community that prides itself on proactivity, responsiveness and responsibility, we have moved expeditiously to respond to the proposed rule, prior to final rule making and well in advance of the vast majority of our peers, yet also find ourselves largely disqualified from any meaningful financial support from the existing PFAS funding from the Commonwealth. Easton is one of the relatively few cities or towns familiar with the proposed rule's PPT scale and 20 PPT standard able to submit comments during the proposed rule comment period. In fact, data current through February 12, 2020 on the DEP and Executive Office of Energy and Environment (EEA) data portals suggest that nearly 90 percent of public water supplies have not tested for PFAS on the PPT scale[7]. The comment period closes on February 28, 2020, before hundreds of communities have tested for PFAS, thereby making it unlikely or impossible for those communities to respond to the proposed rule with any meaningful understanding of the financial, operational, and policy impacts of the rule on their public water supplies and consumers.

Faced with a proposed rule focused on protecting public health, coupled with advanced knowledge of our test results months or years before our peers are subjected to the same strict standard, we find ourselves with only two difficult choices;

proactively fund the design and construction of water treatment solutions using local funds at great cost to our homeowners, businesses and rate payers,

-or-

wait for the proposed rule to go into effect around the Commonwealth in hopes of future financial support from the state thereby delaying design and construction of a treatment solution that, according to the proposed rule, is warranted to protect the health of our citizens.

Easton's Water Division strives to provide high quality water and service to our customers, as the DEP has repeatedly recognized, and so we will proceed with our local planning for design and construction, at great local expense, without delay.

Applicability of Easton's Comments to Commonwealth
Unfunded Liabilities of Unknown Scope and Scale for Public Water Suppliers and Consumers

Data published on the DEP PFAS website as of February 12, 2020 list 21 PWSs who "detected PFAS over 20 PPT in finished water," of which only eight have been able to reduce PFAS below 20 PPT in their distribution system[8]. The Massachusetts EEA portal indicates that 35-57 PWSs, only 7-11 percent of all PWSs in Massachusetts, have tested for PFAS on this scale (variance depends on whether sample includes only "community water supplies" or all types of supplies). The current results available to the public indicate that, of the 35-57 PWSs who have tested for PFAS on the PPT scale, 21 have registered above the proposed 20 PPT, and 13 of those,

[7] According to Massachusetts EEA Data Portal, 35 Community Water Supplies of 521 in Massachusetts have tested for PFAS. Data accessed: https://eeaonline.eea.state.ma.us/portal#!/search/drinking-water

[8] See "PFAS detected in drinking water supplies in Massachusetts" section of DEP PFAS website: https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas

including Easton, are still in the process of determining corrective action, presumably because an immediate action such as blending sources is not available. These data indicate that 39-57 percent of Public Water Supplies tested thus far have PFAS above the proposed 20 PPT MCL, and that a significant portion of those lack immediate corrective action opportunities.

The size, scope and complexity of public water systems vary widely, but if Easton's experience is in any way transferable to our peers once mandatory testing begins, the proposed rule may render up to 297 PWSs in violation of the 20 PPT MCL and could catalyze a multi-hundred million or even billion dollar unfunded infrastructure crisis as water suppliers scramble to design and construct costly water filtration and treatment plants upon finding themselves in violation of the new, stricter standard, with nearly 90 percent of suppliers having not yet tested under such a standard to date[9]. Due to the proposed rule's rapid implementation beginning in April 1, 2020, only one month after the comment period ends, DEP, the Commonwealth, and all of its residents will likely only learn the full cost of the proposed rule once it is already in effect and water suppliers are in violation.

Absent significant funding from the Commonwealth, the costs to water suppliers could be devastating. The debt service costs for these large investments will likely necessitate substantial user-fee increases for water customers around the Commonwealth, exacerbating a well-documented affordability crisis for residents of Massachusetts that the Baker Administration has striven to combat through numerous policy initiatives, including the Housing Choice program which Easton has been recognized for. The proposed rule appears likely to create unfunded liabilities of unknown scope and scale for public water suppliers and consumers.

Easton Comments

In consideration of the foregoing, the Town of Easton respectfully submits the following specific comments for consideration:

- Expand eligibility of existing FY19 supplemental PFAS funding to include direct financial support for engineering and design, not just testing.

- Advocate to legislature for continuous PFAS funding appropriations and/or borrowing authorizations to make direct funds / grants available to cities and towns for construction, rather than only SRF loans.

- Prioritize funding for communities like Easton which have demonstrated a proactive and achievable corrective action plan.

- Support appropriate Commonwealth regulatory agency review and possible regulation of PFAS *and* PFAS alternatives (of which there are thousands) in manufacturing if such regulatory activity could reduce the prevalence of these compounds in consumer products

[9] Estimated impacted PWSs based on assumption that mandatory testing would yield comparable frequency of >20 PPT PFAS detect levels to current testing outcomes (39-57 percent).

which are reasonably expected to contribute to PFAS contamination in public water supplies and/or reduce the likelihood of a regulatory-catch-up dynamic where DEP and PWSs are forced to continually revise and expand upon the proposed rule as PFAS manufacturers simply adjust their supply to a comparable PFAS alternative which is not regulated.

- Encourage interagency cooperation to identify and, if appropriate, reduce and/or eliminate PFAS products from Commonwealth agency use which may be reasonably expected to impact water resources or finished public water supplies.

- Understand that, should a stricter standard than 20 PPT, or an expanded list of combined PFAS/PFOAs or chemicals of comparable composition be added to the proposed sum of six PFAS now or in the future, that PWSs will find themselves responding to one set of rules only to possibly fail to meet future, broader standards and that the financial impact to communities would, absent substantial direct financial support from the state, be devastating[10].

- USEPA states that there are "limitations and uncertainties" pertaining to the PFAS removal treatment technologies currently available[11]. Treatment and disposal techniques vary in capital and operating cost and effectiveness based on multiple factors including which type of PFAS is being filtered. To the extent possible, DEP should make available technical resources to guide and recommend best practices for future PFAS filtration and treatment technologies, particularly as it pertains to effective removal processes (granular activated carbon and others) and disposal of PFAS waste following removal.

- Make available technical resources to assist PWSs and localities regarding alternative products to substitute PFAS chemical compounds, if their use is reasonably expected to impact water resources or public water supplies, such as fire foam, and make funding available to effectuate the replacement of such supplies.

- Continue to provide public information regarding the latest PFAS research and regulatory processes on centralized DEP page.

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[10] According to testimony before the *Senate Committee on Homeland Security and Governmental Affairs, Subcommittee on Federal Spending Oversight and Emergency Management* delivered by *Linda S. Birnbaum*, Ph.D., D.A.B.T., A.T.S., *Director, National Institute of Environmental Health Sciences and National Toxicology Program National Institutes of Health,* dated September 26, 2018, "PFAS are among some 4,700 manmade chemicals" of comparable composition. Testimony accessed here: https://www.niehs.nih.gov/about/assets/docs/hearing_on_the_federal_role_in_the_toxic_pfas_chemical_crisis_508.pdf

[11] See USEPA Announcement of Preliminary Regulatory Determinations for Contaminants of the Fourth Drinking Water Contaminant Candidate List, February 2020. Accessed at: https://www.epa.gov/sites/production/files/2020-02/documents/ccl_reg_det_4_preliminary_frn.webposting.pdf

The Town of Easton commends the Massachusetts Department of Environmental Protection for their continued stewardship of the Commonwealth's public water supply as well as for its proactivity in this emerging field of water supply management. These comments are not a request by the Town for delay or cancellation of the proposed rule, nor are they a challenge to the regulatory authority or scientific veracity of the proposed MCL. However, our advanced knowledge of the possible costs of the proposed rule's stricter standard, coupled with the fact that the vast majority of our peers have not conducted a single test using this standard and therefore are unable to quantify or plan for possible financial impacts or submit specific comments related to such impacts during the proposed rule comment period, compels Easton to submit the above concerns and comments. The Town of Easton appreciates the opportunity to provide comments on this important proposed rule and thanks the Department of Environmental Protection for its consideration.

Respectfully,

Connor Read
Town Administrator

From: Latsko, Ellen <elatsko@bu.edu>
Sent: Thursday, February 27, 2020 12:39 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Good afternoon,

Attached is my comment regarding PFAS MCLs.

My contact information is:
Ellen Latsko
49 Gardena St, #2
Brighton, MA 02135
elatsko@bu.edu
(216) 773-2148

Thank you,
Ellen

Attachment: Latsko_PFASComments_Final.pdf

Elizabeth Callahan
Massachusetts Department of Environmental Protection
1 Winter Street
Boston, Massachusetts 02108

RE: Revisions to the Massachusetts Contingency Plan (MCP, 310 CMR 40.0000) to set a maximum contaminant level (MCL) for per- and polyfluoroalkyl substances (PFAS)

Dear Ms. Callahan:

As a resident of Brighton, Massachusetts, and a master of public health candidate at Boston University School of Public Health I am writing to comment on the proposed revisions to the Massachusetts Contingency Plan (MCP) - specifically the regulation that would set the maximum contaminant level (MCL) for perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorodecanoic acid (PFDA), perfluoroheptanoic acid (PFHpA), perfluorohexane sulfonic acid (PFHxS), and perfluorononanoic acid (PFNA) combined to 20 nanograms per liter. I strongly support this revision, but also believe that the language regarding Consumer Notice (Consumer Confidence Reports and more) could be strengthened. As someone who lives in and drinks the water of Massachusetts, I am concerned for my health as well as my neighbors' health. Setting a more stringent state MCL for per- and polyfluoroalkyl substances (PFAS) is a health protective measure that I am glad to see my state taking the lead on.

According to the Agency for Toxic Substances and Disease Registry (ATSDR), PFAS interfere with hormones and the immune system, and may increase the risk of certain cancers (ATSDR, 2018). These are serious health effects that residents should know about, through appropriate communications, and be protected from, through appropriate laws and policies.

While the Safe Drinking Water Act (SDWA) gives the federal Environmental Protection Agency (EPA) authority to set national standards for public drinking water, EPA works with and ultimately relies on states to enforce drinking water standards, and set stricter standards as needed. MassDEP's plan to create a PFAS MCL lower than what has been proposed by EPA through their health advisory accounts for a growing body of literature documenting adverse health effects at lower levels than previously considered (ATSDR, 2018). It is essential for the health of residents of Massachusetts. This is particularly true because PFAS have been used in many consumer products for decades, and because PFAS are known to bioaccumulate, thus increasing the risk posed to human health.

It is encouraging to see that the proposed modification requires that all consumers potentially affected by PFAS detection in a Public Water System be notified within 30 days of the results of testing, and that notification must include a description of health effects. This Consumer Notification requirement could further be strengthened by requiring two types of translation. The first: translation into languages appropriate to the affected community, if it is known that a high proportion of the population is English isolated. The second: translation into language easily understood by residents unfamiliar with legal and scientifically technical language. These stipulations will ensure that the Consumer Notification is a truly effective measure.

Sincerely,

Ellen Latsko

Master of Public Health Candidate
Boston University School of Public Health
elatsko@bu.edu

References:

Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological profile for Perfluoroalkyls. (Draft for Public Comment). In: U.S. Department of Health and Human Services PHS, editor. Atlanta, GA2018.

From: cosimo@mbcc.org <cosimo@mbcc.org>
Sent: Thursday, February 27, 2020 11:37 AM
To: Director-DWP, Program (DEP)
Subject: Mass Breast Cancer Coalition comments on PFAS MCL regulations

Please find attached a letter from Massachusetts Breast Cancer Coalition regarding the proposed MCL regulations.

Thank you.

Cheryl Osimo
Executive Director
Massachusetts Breast Cancer Coalition
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Massachusetts Breast Cancer Coalition is dedicated to preventing environmental causes of breast cancer through community education, research advocacy, and changes to public policy.

Attachment: MassDEP Final Comments.docx

MASSACHUSETTS BREAST CANCER COALITION

February 26, 2020

Commissioner Martin Suuberg
Massachusetts Department of Environmental Protection
One Winter Street, 2nd floor
Boston, MA 02108

Dear Commissioner Suuberg,

Massachusetts Breast Cancer Coalition (MBCC) applauds the Massachusetts Department of Environmental Protection for adopting an enforceable standard for PFASs in groundwater at contaminated sites in order to protect drinking water quality. MBCC is also pleased to see that MassDEP has proposed a drinking water standard that is also enforceable and is stricter than the national lifetime health advisory put forth by the United States Environmental Protection Agency.

MBCC continues to be deeply concerned about the serious health risks to Massachusetts residents from exposure to PFAS chemicals. We are encouraged by MassDEP's approach for the proposed standard that includes the concentrations of PFOS, PFOA, and four additional PFAS compounds, as this approach recognizes the extreme persistence of PFAS compounds as a class. However, MBCC continues to be concerned that there are many more PFASs beyond these six compounds that also need to be addressed.

We know that scientists have determined that PFAS as a class of chemicals are both extremely persistent and mobile. It is because of these characteristics that MBCC urges MassDEP to consider additional approaches that will address PFAS as a class, in addition to this important first step of developing a standard to limit PFOS, PFOA, and other closely related compounds. Additionally, we know that scientists' understanding of the effects of PFAS on the human body is continually evolving. With more and more information, scientists are discovering that there are health impacts at lower levels of exposure. Therefore, MBCC also urges MassDEP to be vigilant in making sure that its regulations and standards keep pace with emerging science.

MBCC believes that by casting as broad a net as possible when considering PFAS and ensuring that regulations reflect the most up-to-date research, the health of Massachusetts residents will be best protected.

Thank you for the opportunity to provide comments on the draft regulatory proposal.

Sincerely,

Cheryl Osimo

Cheryl Osimo
Executive Director

From: Jennifer Pederson <jpederson@masswaterworks.org>
Sent: Thursday, February 27, 2020 9:26 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Please see MWWA's attached written comments on MassDEP's proposal to create an MCL for PFAS. Thank you for the opportunity to comment.

Jennifer A. Pederson
Executive Director
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Acton, MA 01720
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Email: jpederson@masswaterworks.org

Attachment: MWWA Written Testimony on PFAS MCL, 310 CMR 22, FINAL 2-27-20.pdf

mwwa
massachusetts water works association

www.masswaterworks.org

February 27, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)
Via email to program.director-dwp@mass.gov

Dear Ms. DePeiza:

Massachusetts Water Works Association (MWWA) is submitting the following written comments to the Massachusetts Department of Environmental Protection (MassDEP) on proposed changes to the Drinking Water Regulations, 310 CMR 22.00. MWWA is a non-profit membership organization representing over 1,300 drinking water professionals throughout the Commonwealth of Massachusetts. MWWA members are committed to protecting public health and providing a safe and sufficient supply of drinking water to consumers.

Our Public Water Systems are operated by licensed professionals who work each day to provide this essential service at a reasonable cost. Like other sectors of government, our Public Water Systems are facing resource challenges at a time when regulatory requirements are increasing, infrastructure is aging, and revenues are declining. Despite these resource constraints, Massachusetts' Public Water Systems still must meet their mandate and duty to provide clean, safe drinking water and to protect public health. We are proud of the work that our Public Water Systems in Massachusetts are doing, and it is reflected in their excellent compliance as tracked by the U.S. Environmental Protection Agency (EPA). In the 4th quarter of Fiscal Year 2019, **94.4% of community water systems met all applicable health-based standards**.

water works pride
massachusetts water works association | po box 1064, acton, ma, 01720 | 978 263-1388 | (fax) 978 263-1376

MassDEP is proposing a Massachusetts Maximum Contaminant Level (MMCL) of 20 parts per trillion (ppt) for Per- and Polyfluoroalkyl Substances (PFAS), which includes six compounds: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA). MWWA is resubmitting many of the same comments we made during the public comment period when MassDEP proposed changes to the Massachusetts Contingency Plan (MCP) regulations, as they remain relevant to MassDEP's proposal to create an MMCL.

MassDEP states in its summary of the proposed regulations that it is proposing this MMCL under Massachusetts General Law, Chapter 111, section 160 and further states that *"Primacy agencies may establish lower numerical limits for regulated contaminants or promulgate standards for unregulated contaminants using state law authority. MassDEP is not required to adhere to federal rulemaking procedures in promulgating state standards more stringent than the 'floor' set by federal law."* MWWA wants to be very clear that protection of public health is the core mission of all our members. To this end, water system managers and operators must ensure compliance with the Safe Drinking Water Act requirements. MWWA supports the development of an appropriate Federal MCL for PFAS if the process follows federally proven and established, transparent, science-based health standards and takes into consideration available analytical methods, reasonable sampling protocols, appropriate sample result analysis, viable treatment options, full consideration of a cost benefit analysis, scientifically proven health effects, and sufficient due process for stakeholders. We are concerned that MassDEP's process of creating an MMCL is not as robust as the federal process.

It is premature to be moving ahead with regulatory standards before there is a better understanding of expected background levels and sources, an understanding of the prevalence of PFAS in the Commonwealth, and most importantly, a better understanding of the real potential human health impacts at the low levels that are being detected and potentially regulated in drinking water within Massachusetts. There is anecdotal evidence that PFAS is being found at levels of "concern" in surface waters, groundwaters and soils throughout Massachusetts. There was a recent study of rainwater by the National Atmospheric Deposition Program and the highest total concentration of PFAS was nearly 5.5 ppt in a single sample from Massachusetts. MWWA is concerned that if we only concentrate on regulating PFAS in drinking water, we may be giving consumers a false impression they are protected, when in fact, there are many other sources of PFAS exposure in consumer products and food, being detected at even higher levels than what is found in drinking water. If we are not addressing all these other exposures, intended public health protection will not be achieved.

Before regulating these compounds through an MMCL, MassDEP needs to have a much more comprehensive database of occurrence, in addition to data on human health effects and at what levels those health effects occur. It would be irresponsible to move forward with regulating PFAS at exceedingly low concentrations without knowing the likelihood of it being detected and requiring subsequent response actions. MWWA had recommended at the last PFAS stakeholder meeting, that MassDEP begin sampling the groundwater wells in the climate response network used by the MA Department of Conservation and Recreation. Many of these wells have been termed “unimpacted” and would be a good place for MassDEP to begin their data collection. While MassDEP acknowledged in their response to comments on the MCP regulations that they would consider the suggestion, MassDEP has yet to move forward with this commonsense analysis.

PFAS is an example of an emerging and unregulated contaminant which poses daunting challenges for Public Water Systems on every conceivable front, including, but not limited to: the introduction of unfamiliar and unforgiving sampling protocols; a paucity of reliable analytical resources; water treatment uncertainties; residuals disposal challenges; and most notably, unprecedented cost, funding, and risk communication obligations. Despite the existence of only a “non-enforceable” Health Advisory Level, recently lowered from 70 ppt to 20 ppt, for PFAS, there are several Public Water Systems which have detected these compounds and are voluntarily conducting emergency public notification and outreach efforts, as well as multi-million-dollar mitigation activities. These systems have grappled with provision of alternative drinking water methods (i.e. provision of bottled water, point of use treatment…). They have greatly accelerated planning, design, permitting, procurement, and construction required to proceed with rapid installation of expensive treatment systems capable of consistently achieving PFAS levels below 20 ppt. These Public Water Systems and their consulting engineers are to be commended for all they are doing to address the challenges posed by an unregulated contaminant and for providing transparent communications to their customers in light of evolving scientific discovery and real-time regulatory oversight. It remains to be seen if these herculean efforts will represent the exception or the rule for water suppliers across the Commonwealth.

MWWA has considerable experience in evaluating and commenting on proposed initiatives under the Safe Drinking Water Act, MassDEP drinking water regulations and policies, Water Management Act regulations and guidelines, drought management and more recently on Conservation Law Foundation’s Petition for Rulemaking on PFAS Treatment Techniques and on the MCP regulations. We embrace our role as a stakeholder in the MMCL development process and on Representative Hogan’s proposed PFAS Task Force. MWWA and its members are very comfortable offering our expertise and opinions as they relate to the very real impact that new drinking water standards will have on our operations and related services. However, our ability to offer comments and opinions on more nuanced toxicological principles is well beyond our area of expertise. As we are becoming increasingly aware of the impact and importance that this specific standard-setting process will have on our industry, we have reached out to scientists, toxicologists, risk assessors, LSPs, and engineers for a better understanding of some of the underlying public health issues. Specifically, we have reached out to experts from Sanborn Head & Associates, Green Toxicology and the several of the engineering firms that have been working on PFAS treatment for the impacted municipalities. We have reviewed their assessments and believe that we all would be well served if MassDEP not only acknowledged these compelling comments, most notably those comments submitted by GZA, Sanborn Head & Associates and Green Toxicology during the MCP process, but directly addressed them before establishing any standard. Based upon our assessment of their work, we are very concerned that any standard established based upon the "abundance of caution" principle will not only be overly conservative, but given the very real and practicable impacts that we can anticipate within the drinking water industry, would be untenable and irresponsible. MWWA also understands from MassDEP's Technical Support document that there was a cut-off date for information used in the analysis to determine groundwater and drinking water values. MWWA is attaching a paper[1] released online in October of 2019 and published in February 2020 in *Toxicology in Vitro* we believe should be reviewed by the Office of Research and Standards.

PFAS is not just a potential concern in Massachusetts; it is a national issue. PFAS is not just a drinking water issue; it requires a comprehensive approach to address air, food, consumer product sources, and the many other exposure pathways. Costs of mitigation and management across all these sectors are expected to be formidable. For drinking water alone, we are seeing costs in the multi-millions of dollars per Public Water Supplier[2]. Research, particularly on toxicity and health effects is ongoing and the scientific understanding of these compounds on human health, continues to evolve. Even while human health toxicity uncertainties exist, significant investments are being made by many communities to install treatment systems to remove PFAS compounds. For these reasons, it is important that any PFAS related regulatory initiatives undertaken by MassDEP utilize a deliberative approach based on sound science, rather than a reactionary move fueled by public perception.

<u>Proposed Development of an MMCL:</u>

With respect to establishing an MMCL, MWWA firmly believes that any new drinking water standard must be developed through a transparent process that:

- Follows a clearly documented and transparent legal process
- Relies on a strong scientific foundation, which includes studies that are peer-reviewed, comprehensive, repeatable, and openly debated
- Involves key stakeholders, including those with differing views
- Evaluates the cost-benefit of the proposal, and
- Evaluates the effectiveness of the regulatory action in achieving better health outcomes

The EPA is responsible for oversight of the Safe Drinking Water Act and is tasked with setting drinking water quality standards on a national basis. MassDEP has been delegated the authority (otherwise known as primacy), to oversee the Safe Drinking Water Act in Massachusetts. The issue of emerging contaminants is one to which EPA pays close attention. For public health protection, EPA has a rigorous process for

[1] See Appendix E: Behr, A., Plinsch, C., Braeuning, A., Buhrke, T. 2020, Activation of human nuclear receptors by perfluoroalkylated substances (PFAS), Toxicology in Vitro: https://doi.org/10.1016/j.tiv.2019.104700

[2] MWWA is attaching summaries of costs incurred by Public Water Systems currently addressing PFAS contamination of their drinking water supplies – see Appendix A.

evaluating contaminants of concern in drinking water and deciding whether regulation is warranted. EPA employs experts who derive protective health-based standards (e.g., toxicologists and health risk assessors), economists who produce cost and benefit analysis, and chemists and engineers who can determine lab and treatment capabilities.

EPA regularly mandates water systems of a certain size to test for substances on their Contaminant Candidate List (CCL) through the Unregulated Contaminant Monitoring Rule. This process allows EPA to assess the prevalence of a substance throughout the country. There were several PFAS substances included in the latest rounds of the UCMR sampling (UCMR 3 and 4) and several more are proposed for UCMR 5.

EPA has already completed a PFAS Action Plan[3] which outlines the concrete steps the agency is taking to address PFAS and protect public health. This plan:

- *Demonstrates the agency's critical national leadership by providing both short-term solutions and long-term strategies to address this important issue.*
- *Provides a multi-media, multi-program, national research, and risk communication plan to address this emerging environmental challenge.*
- *Responds to the extensive public input the agency has received over the past year during the PFAS National Leadership Summit, multiple community engagements, and through the public docket.*

In fact, on February 20, 2020, EPA took the next step in its plan and proposed its preliminary national drinking water regulatory determination to regulate PFOA and PFOS. The American Water Works Association and the National Association for Water Companies both advocate for an MCL to be developed by EPA at the National level and not at the state level.

As we stated earlier in our comments, setting drinking water standards involves a multi-step process. The toxicity level (in particular, with respect to humans) of the substance or contaminant must be determined. The prevalence of the substance must be evaluated. The ability to reliably detect and quantify the substance must be determined. The feasibility of treating to remove the substance must be evaluated. The cost to the affected parties must be assessed. The benefits to the environment and human health of reaching the standard must be quantified.

MWWA has always believed that it is in the best interest of the public for EPA to take the lead on setting health-based drinking water standards, so there is a consistent protocol and messaging for all water suppliers across the nation. In the past, Massachusetts has imposed regulatory controls on Perchlorate and Manganese before the national process was complete. Jumping out ahead of the EPA puts Massachusetts water suppliers in the untenable position of complying with standards of uncertain value and places a burden on the water suppliers and their customers before the public health benefits have been completely evaluated. Perchlorate is a perfect illustration of this;

[3] https://www.epa.gov/sites/production/files/2019-02/documents/pfas_action_plan_021319_508compliant_1.pdf

just last year EPA published a proposed standard for public comment which is significantly higher than the MMCL established back in 2003. When states act independently and have differing standards for particular substances, it causes confusion and concern among the public, and undermines public confidence. It is critical that MassDEP understand PFAS at the levels being discussed; it will have an enormous financial impact on the entire state, both public and private sectors. MWWA urges MassDEP not to act based on what other states may do. Further, MassDEP should not apply an excessive conservative factor to a number not supported by sound science. Even though MassDEP states that they do not have to consider the same criteria in establishing an MMCL, MWWA believes it is critical that MassDEP consider the same components that EPA considers in its process. **MWWA suggests that MassDEP closely follow the EPA process on PFAS and implement standards only after the scientific and public health merits of doing so have been methodically and carefully considered.**

Recognizing that MassDEP will likely move forward, despite MWWA's stated concerns regarding the process and proposed overly conservative standards, we offer the following specific comments on the proposed regulations:

22.02: Definitions: Given the importance of certain terms that appear either in the regulations, or which were central concepts in the development of the proposed MMCL, MWWA believes that it is important for MassDEP to add definitions for the following:

- Consumer Notification
- PFAS Detection
- J-Value
- Method Detection Limit
- Sub-chronic Exposure

MWWA suggests that MassDEP change the proposed definition of Minimum Reporting Level (MRL) to mimic what is found in the EPA method 537.1: "Minimum Reporting Level (MRL) – The minimum concentration that can be reported as a quantitated value for a method analyte in a sample following analysis. This defined concentration can be no lower than the concentration of the lowest calibration standard for that analyte and can only be used if acceptable QC for this standard are met. A procedure for verifying a laboratory's MRL is provided in [EPA Method 537.1], Section 9.2.6."

22.03: Compliance: MassDEP is proposing to amend section (13) to mandate electronic reporting by Public Water Systems. MWWA questions whether the Commonwealth's Information Technology (IT) infrastructure is adequate to support mandatory electronic reporting. We often hear from our members and their independent contract laboratories that there are technical glitches in the uploading of data. Electronic reporting should not be mandated until MassDEP can ensure that the infrastructure can reliably support such a directive. We do not feel the state is there yet; therefore, we ask that this requirement be stricken.

MWWA also believes there needs to be consistency with how the state is displaying drinking water quality data on the Energy and Environmental Affairs Data Portal. We note that as of February 24, 2020, the data for PFAS now appears to be presented in parts per trillion where previously it was displayed as parts per billion. The data portal does not note what units it is displaying in the results column. This should be corrected, and the state should include that information to provide the appropriate context to the results.

<u>22.07G (2) Special Applicability for Transient, Non-community Water Systems:</u> MassDEP is requiring TNC systems to take one sample at each entry point by September 30, 2022, yet in the presentation at the public hearing, MassDEP stated that the MMCL does not apply to TNCs. MWWA questions why TNC systems would be subject to sampling but not the MMCL? If MassDEP is so concerned about sensitive populations' sub-chronic exposure to drinking water above 20 ppt, then MWWA believes that standards should also apply to TNCs where the employees could be drinking the water every day. More importantly, MWWA wonders why the state is not moving forward with regulations (under the appropriate regulatory authority, if not MassDEP) to require testing of private wells. The inhabitants of a home drinking water from a private well are doing so in the same manner as customers on a Public Water System. If PFAS is as critical as MassDEP is suggesting, we think that the state should be as concerned about private well owners as customers on a public supply and find the appropriate mechanisms to make well owners aware of PFAS.

<u>22.07G (3) Total PFAS MCL</u>: MassDEP states *"PFAS Detection shall mean a measured concentration of any PFAS in the scope of the analytical method greater than or equal to the analytical laboratory's MRL."* Yet, in section 22.07G (10)(f) there is a contradiction when MassDEP states that for compliance determinations *"if an analytical result is equal to or greater than one-third of the MRL but less than the MRL, then the Running Quarterly Average shall be calculated using one-half of the MRL as the concentration for that PFAS."* We believe the language in 22.07G (3) that a detection is greater than or equal to the MRL is appropriate, but we also believe it needs to be more narrowly defined to detections of the proposed six regulated compounds, and not any PFAS detected within the scope of the method. We will expound upon our concerns about detections below the MRL later in our comments, but just so that we are clear, MassDEP should only be considering detections of PFAS equal to or greater than the MRL.

MWWA concludes that a MMCL of 20 ppt for the sum of six compounds is not appropriate. Instead, MassDEP should develop compound-specific standards for each of the PFAS compounds and not employ a cumulative approach. The compounds should not be combined because of different toxicity endpoints, different uncertainty factors between humans and mammal toxicities, different reference dosages, differences in half-lives, bioaccumulation, etc. We are further concerned with suggestions by other groups that the standard should be set at 1 ppt. Such a suggestion is not practical, as that is below some of the analytical detection limits and cannot even be practically achieved for most of the compounds.

At 20 ppt as a sum of six PFAS, the proposed MMCLs, are significantly lower than the Lifetime Health Advisory (LHA) issued by the EPA in 2016. The EPA has stated more than once that the LHA is considered a “safe level” and that concentrations below 70 ppt are not of concern based on their review of the available health studies. In addition, an LHA is defined as the level which does not result in *“any adverse noncarcinogenic effects for a lifetime of exposure”* (EPA, 2018, 2018 Edition of the Drinking Water Standards and Health Advisors, EPA 822-F-18-001). Further, the LHA document states that the LHA is protective of cancer effects for PFOA and PFOS (EPA, 2016, Drinking Water Health Advisory for PFOA, EPA 822-R-16-003; EPA, 2016 Drinking Water Health Advisory for PFOS, EPA 822-R-16-004). Therefore, any level below 70 ppt for drinking water standards is unnecessarily below the “safe level” established by the EPA in the LHA.

Most troubling to MWWA is the way MassDEP is proposing to look at the analytical data below the MRL. By treating values below the MRL as ½ the MRL and by adding in non-detects at half reporting limits if a J-value for each compound is detected above 1/3 the MRL is inappropriate. This approach is unprecedented, and to the best of our knowledge, no other state regulating PFAS in drinking water is interpreting the data in this way. Such an interpretation could push a system to automatically reach 6 ppt, when it would otherwise be considered non-detect. By summing the compounds, the potential for drinking water being out of compliance for the presence of individual PFAS in single-digit levels may require many more municipalities to install treatment systems than one may expect, especially considering PFAS levels in the Commonwealth’s drinking water are not known. In the UCMR 3 study completed by EPA in 2016, less than 1% of public drinking water systems (serving more than 10,000 customers) had PFOA (0.3%) or PFOS (0.9%) at concentrations above the LHA of 70 ppt. However, review of the same data shows many more water systems above 20 ppt for PFOA and 40 ppt for PFOS (the reporting limits in the UCMR 3 study) with 2.4% for PFOA and 1.9% for PFOS. A lower limit of 20 ppt substantially increases the number of water systems that will be required to treat to standards that are lower than the LHA which EPA states is protective for both non-cancer and cancer effects, significantly increasing the cost of response actions but providing no additional benefit. Further, since the UCMR 3 reporting limit for PFOS was higher than the proposed MMCL of 20 ppt, the percentage of water systems above 20 ppt for PFOS would be expected to be even higher, further increasing costs to water systems and their customers without providing any additional benefit.

A cumulative-regulatory approach also ignores the complexities of selecting, implementing and operating the appropriate and affordable PFAS treatment solutions. There are a limited number of drinking water treatment technologies that are known to be effective for PFAS removal. However, there is no one-size-fits-all solution. Depending on several site-specific factors, such as the levels and types of PFAS present in water, general water quality, and existing treatment processes, treatment technologies may show different removal effectiveness depending on several factors, such as the carbon chain length and attached functional group.

If a cumulative approach is taken by MassDEP, the potential for drinking water being out of compliance for the presence of individual PFAS in single-digit levels may also impose significant operational challenges for running PFAS treatment systems. Increased spent adsorptive media will be generated requiring disposal or incineration. With adsorptive media technologies that are commonly used for PFAS treatment, such as granular activated carbon (GAC) and anion exchange (AIX) resin systems, water is sampled from the different media bed depths to detect a breakthrough of PFAS, along with monitoring of the finished water level. When the breakthrough of the media is approaching the PFAS limit, the system requires a change-out with new media. Media change-outs are costly (although hopefully infrequent in well-designed systems), and therefore should be based on accurate analytical results. MWWA is concerned that low parts per trillion accuracy will be difficult to achieve and may cause inefficient use of resources such as requiring an excessive number of PFAS samples to ensure accurate results.

MWWA also notes that MassDEP has not provided sufficient information to be regulating PFHpA at this time. During the MCP regulatory process MassDEP admitted that there is a dearth of toxicity, epidemiology and pharmacokinetic data on PFHpA and PFDA. MassDEP should wait until the appropriate information is available before deciding to regulate this compound.

It is also important to note that advances in analytical techniques have allowed laboratories to detect substances at lower and lower levels. Substances found at low levels do not always correlate to health impacts. There needs to be robust toxicological and epidemiological studies conducted on the human health impacts of PFAS at the levels being detected. MWWA urges MassDEP to conduct a thorough evaluation of existing toxicological studies and perhaps fund future studies to better understand how these proposed levels specifically impact human health.

22.07G (5) Initial Monitoring: In section (5)(b)(1) MassDEP states that each sample shall be collected in the first month of every quarter. MWWA is concerned that this will potentially create a capacity issue with laboratories which could jeopardize sample hold times. MWWA understands that temperature and hold times could potentially cause precursors to oxidize into PFAS compounds and that has the potential to impact PFAS results. MassDEP should amend the regulations to allow sampling at any time within the quarter to minimize laboratory backlogs.

In section (5)(b)(1)(a) MWWA appreciates that MassDEP is staggering the implementation of the monitoring. However, MassDEP is proposing that systems greater than 50,000 begin monitoring by April 1, 2020. This deadline is unrealistic given the time it will take for MassDEP to promulgate a final rule. Furthermore, budgets for this fiscal year are already set. The testing costs are not insignificant and Public Water Systems need adequate time to factor increased laboratory costs into their budget. MWWA requests that the initial sampling deadline be moved to July 1, 2021 to give time for appropriate municipal budgeting cycles. In section (b)(1)(b) water systems between 10-50,000 should be given to October 1, 2021 to commence initial sampling.

In section (5)(b)(2)(c), MassDEP speaks to reactivation of an existing source; MassDEP needs to clarify what they mean by "existing source." Does this mean that when a seasonal source goes back online it will need to be sampled? What about reactivation of an inactive source? What if a well is not operating during the first month of the quarter, would the water system have to monitor as soon as it is turned on, or wait until the first month of the next quarter?

In section (5)(c), MassDEP is providing the opportunity for a waiver; MWWA supports the ability for a Public Water System to apply for a waiver from subsequent sampling if initial sampling is below the MRL. MWWA requests that MassDEP outline the criteria for the waiver so it will be clear what data will be required and what the evaluation criteria will be.

<u>22.07G (6) Routine Monitoring</u>: In section (6)(3)(b), MassDEP should amend the language to say, "proximity of the Public Water System or its sources of water to **<u>obvious</u>** sources of contamination…."

<u>22.07G (7) PFAS Detections</u>: In section (7)(b), MWWA requests MassDEP amend this language to state that "Any PFAS detection above the MRL…"

In section (7), MWWA believes that field blanks should be extracted at the same time as the initial sample (not just after a detection). Given the ubiquitous nature of PFAS in consumer products, the potential to contaminate a sample is greater. Field blank data will be critical to ensure the sample has not been contaminated.

In section (7)(c) Confirmatory Sampling, MWWA notes that MassDEP is silent on the issue of what happens if a confirmatory sample result deviates from the initial sampling. There are sensitivities to collecting PFAS samples and until water systems become comfortable with these new sample techniques, the opportunity for sample error is greater. We understand that MassDEP intends to average initial sample results with confirmatory results and we are concerned that this might cause a system to trip the MMCL if the initial results were not representative of the water being delivered to customers. MWWA contends that if the initial sample results deviate by more than a certain percentage (say more than 20%) from the confirmatory sample then an additional confirmatory sample should be collected. Compliance would then be based on an average of the two samples with the most similar results (i.e., out of the initial, confirmatory #1 and confirmatory #2). If none of the samples fall within the designated percent deviation (20%) then MassDEP and the Public Water System should consult to determine a possible cause for the variation and develop a plan to resolve the issue. MassDEP should then invalidate the entire previous sample set.

We also note that water systems might realize after an initial result that plumbing materials or other treatment-component contributions might have impacted the sample results. They may want to make plumbing modifications before a confirmatory sample is taken. MWWA contends that if corrective action is taken, then the second sample should be called a new initial sample and the original initial sample should be invalidated.

Given that there could be issues which preclude a confirmatory sample from being taken within two weeks (such as needed corrective action on a sample tap), MWWA suggests that MassDEP strike the two week requirement for obtaining confirmatory samples or add language which states “unless otherwise waived by MassDEP.”

In section (7)(d) Source Sampling, MassDEP states that **any** detection would trigger source sampling. MWWA believes this is unnecessary and suggests that MassDEP put a threshold of at least 10 ppt before source sampling is required. MWWA also wants language to clarify that the trigger for source sampling is if one, or a combination, of the **proposed regulated** compounds is detected at least above 10 ppt.

MWWA questions how MassDEP will deal with manifolded sources. Will each well have to be sampled or will multiple sources manifolded together allowed to be sampled as one compliance point? Many systems have multiple sources manifold into one treatment plant, and it would be quite costly to have to sample each individual source upon any detection.

In section (7)(e) Consumer Notice, MWWA notes that MassDEP may be calling it a “consumer notice,” but it will have the same effect as doing formal Public Notice. MassDEP is essentially setting a new Public Notice requirement which does not comport with the notification required under any other drinking water standard. The general public may be unnecessarily alarmed when they get such a notice when MassDEP has stated that their concern is with sub-chronic exposure by sensitive subpopulations. In section (7)(e)(4), MWWA requests MassDEP amend the language to state that the notice specifies the concerns for PFAS levels at 20 ppt relate only to the sensitive subpopulations.

In section (7)(e)(5)(a), MWWA suggests that after the initial notice to the public, the Public Water System should only have to provide subsequent notice in the Consumer Confidence Report. It could take some time for the Public Water System to bring treatment online and remailing quarterly notices could become quite expensive. As a compromise, perhaps the Public Water System could provide quarterly updates on their, or the Town’s, website as to the progress of their efforts to reduce PFAS concentrations in their water.

22.07G (8) Increased Monitoring Frequency Following PFAS Detection: In section (8)(a) Monthly Monitoring, MassDEP is requiring monthly monitoring if detections are above 10 ppt. MWWA contends that monthly monitoring at 10 ppt is unnecessary, and requests MassDEP remove this requirement. PFAS sample costs are high and MWWA questions whether the results would vary significantly from month to month. MWWA suggests that for systems over the MCL, quarterly sampling should be enough. MWWA also believes that the increased monitoring frequency should relate only to those regulated compounds and not any compound detected within the scope of the method.

In section (8)(c), MassDEP should provide a simplified flow chart for Public Water Systems to refer to in order to better understand the monitoring requirements.

<u>22.07G (9) Invalidation of PFAS Samples</u>: MassDEP is proposing a provision to invalidate results, but it appears that will only be driven if there are issues with a lab's quality assurance data. MWWA requests that MassDEP also provide a provision to invalidate results if the Public Water System demonstrates that sample results were influenced by products used in the piping or plumbing of the sample collection point (i.e. Teflon tape or well construction materials), or other documented sampling errors. This would be consistent with the provision in the Drinking Water Regulations to invalidate Total Coliform samples when the *"…sample resulted from a domestic or other non-Distribution System plumbing problem…"* As previously stated, MWWA believes that if initial sample results deviate by a certain percentage (e.g. 20%) from the confirmatory sample, then a second confirmatory sample should be collected and the two most similar results of the three samples should be averaged.

<u>22.07G (10) Total PFAS Compliance Calculations</u>: As we stated above, MWWA does not agree with MassDEP's proposed analysis of the analytical results in section (f), regarding results between 1/3 of the MRL and the MRL. As we stated in our edit to the MRL definition, EPA's method 537.1 itself suggests that results below the MRL are not quantifiable and thus are estimated. It is also unclear to MWWA if labs even store the data that is required on MassDEP's reporting form; if not, manual calculations by laboratory staff has the potential to introduce human error into the reporting.

MWWA believes that anything detected below the MRL should not be governed by an arbitrary rule assuming a certain level exists; such an interpretation is not scientific. Values below the MRL should not be reportable nor counted towards compliance calculations at these low parts per trillion levels. Doing so defeats the very purpose of an MRL which is to assure that only truly valid data is accepted. This strange approach to compliance calculation will become even more problematic in the future as additional PFAS compounds are inevitably added to the MMCL regulated list. When there are 25 PFAS compounds regulated under a total limit of 20 ppt then a water system could violate the MMCL without having a single detect above the MRL.

MWWA also questions the legal defensibility of estimating values below the MRL. Violations of the MMCL will most likely prompt the Public Water System to look for a Responsible Party. If the exceedance of the MMCL includes estimations of results, Responsible Parties will have grounds to argue that it is not a valid result because it is below the MRL.

We also note that there seems to be additional interpretation in MassDEP's Guidance *"How to Interpret my PFAS Laboratory Report and Understand How my Results Compare to MassDEP's Guideline Levels"* that is not contained in the proposed regulation. The footnote on Table 4 shows that MassDEP is considering any result noted below the MRL as ½ the MRL (pasted below and highlighted in yellow). MWWA urges MassDEP to revise this guidance so that all detections noted below the MRL be considered zero for compliance determinations.

Example Table 4 – Compliance Determination for < MRL Result, But Total < ORSG

PFAS	Results, ppt	Qualifier	MRL	Value Used in Summation	MassDEP ORSG Guideline	Greater than ORSG?
PFDA	**8.0**		5	8.0	20	N
PFHpA	**20.4**		5	20.4	20	Y
PFHxS	**3**	**J***	5	2.5	20	N
PFNA	<MRL*		5	2.5	20	N
PFOS	**14.6**		5	14.6	20	N
PFOA	**29.0**		5	29.0	20	Y
PFHxA	**21.2**		5			
			TOTAL	**77.0**	20	Y

This compound is not one of the six PFAS in the MassDEP Guideline and therefore not part of the sum

Each of these six individual concentrations is subject to the 20 ppt guideline.

The sum of concentrations of the 6 compounds is **77.0** ppt which is greater than the MassDEP guideline limit of 20 ppt.

* MassDEP uses ½ MRL. The MRL in this example is 5, therefore 2.5 is used in the calculation for Table 4.

<u>22.07G (12) PFAS Analytical Requirements</u>: In Section (a) MassDEP states that the methods of analysis shall be either EPA's approved Method 537 or Method 537.1. MWWA notes that EPA has just approved a new method, 533. MassDEP's own website suggests 533 is acceptable[4]. MassDEP should include Method 533 in this section and we also suggest adding language to allow Public Water Systems to use any EPA methods that may be approved in the future. If MassDEP limits analysis to just 537 and 537.1 then the regulations will be outdated when, and if, EPA approves new methods.

[4] *"Drinking water samples must be analyzed for PFAS by labs using EPA Methods: 533, 537 or 537.1. The MassDEP Division of Environmental Analysis is establishing a certification process for laboratories using these Methods."* https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#laboratories,-testing-and-sample-collection-

MWWA also believes that this section should state that field blanks should be extracted by the laboratories at the time that the samples are extracted so that the instrumentation conditions are consistent for both the sample and field blank extraction.

<u>22.07G (13) PFAS Reporting Requirements:</u> This should be clarified to state all samples from source waters or entry points should be submitted, but that other samples that Public Water System takes for sentinel monitoring, process optimization or investigatory purposes within the watershed, do not need to be submitted to the Drinking Water Program.

<u>22.07G (14) Use of Previously Collected PFAS Data:</u> MWWA appreciates that MassDEP is allowing Public Water Systems to submit previously collected data; we feel that is appropriate.

MassDEP is requiring labs to report a minimum level of 2 ppt. Given that sample costs are high, MWWA hopes that MassDEP will allow previous results to be included even if labs were not able to report to 2 ppt.

<u>22.07G (15) Monitoring Schedules:</u> MWWA is pleased that MassDEP has included this provision related to monitoring if there are emergency, operational or lab capacity issues which would preclude such monitoring.

MWWA is concerned that labs will be inundated with samples at the start of each compliance quarter. As stated in our comments above, MassDEP should consider staggering the samples throughout the quarter to prevent this from occurring.

<u>22.07G (16) PFAS Minimum Reporting Levels</u>: MassDEP is suggesting that laboratories should be capable of identifying a MRL at 2.0 ppt for each compound. MWWA is quite concerned about analytical controls and capabilities to reliably and accurately quantify the compounds when looking at very low parts per trillion. MWWA notes that MassDEP's own lab cannot yet report to this level. EPA Method 537 states *"Single laboratory LCMRLs for analytes in this method range from 2.9-14 ng/L"*; this is obviously above 2.0 ppt and therefore it seems contradictory that MassDEP says this is an approved method when the low end of the method range is 2.9 ppt. Method 537.1 states *"Single laboratory LCMRLs for analytes in this method range from 0.53-6.3 ng/L."* Method 533 Table 7 shows Calculated LCMRLs between 1.4-16 ng/L. In previous documents, MassDEP was suggesting that labs be able to detect at an MRL of 5 ppt or lower, MWWA suggests that MassDEP amend the language to be 5 ppt instead of 2 ppt. MassDEP should also research the normal deviation in analytical accuracy. MassDEP could obtain split samples (three) of the same source, and then analyze the samples at three separate labs to determine if there is any deviation in testing results.

<u>22.16 Table 7, Standard Health Effects Language for Public Notification</u>: The proposed language needs to be amended. Rather than "Some people," MassDEP should be

explicit about the sensitive populations they are concerned about so the general population will not be overly alarmed.

<u>22.16A(27)(a) Table 1: Regulated Contaminants Chart</u>: MassDEP has stated that a "detection" is a result above the MRL, however compliance with the MMCL is determined by looking at concentrations that are also estimated below the MRL. We believe it is appropriate to only count detections above the MRL. We presume that Public Water Systems will be listing the individual compounds in the regulated table and not just summing and reporting on one line that says Total PFAS. If this is the case, we want to provide a scenario to justify why we feel it is inappropriate to include estimates below the MRL. It is conceivable that a Public Water System might have two compounds of the six that are regulated, where estimated values are assumed (say 1 ppt each, which is ½ of the MRL of 2ppt); they may have four others which are detected above the MRL. If the estimated and above MRL values total 20 ppt they will have violated the MMCL. In the CCR they would be stating that they are in violation of the MMCL, but the table will only show the four compounds detected above the MRL (say they total 18 ppt). Customers may question how a system is out of compliance with the MMCL of 20 ppt even though their values by looking at the chart only add up to 18 ppt. This will create a communication issue for the Public Water System and could cause their customers to question the credibility of the water supplier if the numbers don't add up. It is unjust and unfair to bring this type of situation upon Public Water Systems and their customers.

For the language in the column "*Major Sources in Drinking Water*," MassDEP should include consumer products and septic systems in the list of potential sources of contamination, and should urge customers to be mindful of the products they use in their homes that could contribute to PFAS contamination of the environment, in general, and their water supply, in particular. The language might also indicate that contamination could be coming from any number of sources or contributions that cannot be specified due to the ubiquitous nature of the compounds.

For the Health Effects language, MWWA suggests modifying the language to state that potential adverse conditions are based on studies performed on lab rodents and there are still ongoing studies looking at human health. We understand that our suggested edits might not fit neatly into a table format, but the information is important to communicate and so a note could be put in the table to see the information below the table for more comprehensive explanation.

<u>22.16A(27)(a) Table 2: Unregulated Contaminants Chart</u>: MWWA questions whether MassDEP will require Public Water Systems to put these detections in the CCR. Since, different EPA methods are looking at different contaminants, shouldn't this list include all the contaminants being analyzed by any of the current EPA methods? MWWA is concerned that questions will be raised by the public regarding results of PFAS compounds that are unregulated. MassDEP should provide clear language and talking points to the Public Water Systems so they will know how to respond to customer questions about detections of unregulated compounds.

Implementation Considerations:
MassDEP needs to carefully consider implementation challenges for Public Water Systems caused by regulatory efforts related to PFAS. MWWA is not sure that MassDEP has put enough time into this effort before moving forward with the regulations. If there is not adequate consideration regarding the handling of these implementation challenges, public confidence in drinking water could be jeopardized. **MassDEP must address these challenges before finalizing the rule.**

PFAS requires unique sampling protocols that are much more sensitive to prevent cross-contamination. Our water systems have been told that they must take precautions such as avoiding use of sharpie markers, do not wear waterproof clothing, do not use fabric softener on clothing to be worn in field, do not use cosmetics, moisturizers, hand cream, or other related products the morning of sampling, do not use plastic clipboards, etc.... All these precautions cause us to believe that samples may easily be contaminated. As stated above, MassDEP must have protocols in place to invalidate samples that may be triggered by human error. MWWA understands that MassDEP is planning some training on proper sampling and we urge them to continue to provide the appropriate technical assistance and outreach to Public Water Systems once the rule is implemented.

Water sources are not quickly or easily developed, treated, or replaced. It is getting more difficult to find suitable sources of new supply and the process of permitting them is complex[5]. There may be potential high-quality groundwater sources, such as areas within state forests. However, current policies of MassDEP regarding source protection and of MA Department of Conservation and Recreation regarding recreational access, make it almost impossible to pursue their development. We urge MassDEP and MA DCR to begin thinking about overcoming these obstacles so that Public Water Systems have increased access to potential new sources of supply. MassDEP should also evaluate policies regarding development of sources on, or near, other state-owned land. This evaluation should look at not only the location of sources, but also if protection zones would encroach on the boundaries of state land. There may also be land currently protected for other uses or purposes that could be suitable for water supply development or that may be needed to locate PFAS treatment facilities.

There is significant engineering effort and cost that goes into selection of the appropriate treatment technologies for a given water system. Site-specific testing, either bench-scale or pilot-scale, that evaluates the effectiveness of the treatment technologies with the actual contaminated water conditions and the follow-up cost analysis are critical for 1) identifying the appropriate treatment solution for that specific water and existing treatment processes; 2) selecting the cost-effective alternative; and 3) identifying and avoiding any potential unintended consequences that are inherently possible when any new water treatment process is added (e.g. although this is a very infrequent occurrence, coal-based carbon has been observed to release arsenic under

[5] Please see Appendix B which MWWA believes captures the typical timeline of new source approval under normal circumstances.

certain water conditions). While such testing provides critical design parameters and potentially cost-saving measures, it takes time. Designing and building permanent PFAS treatment facilities – assuming timely approval from MassDEP, and local permitting – can be a lengthy process[6]. Renting temporary treatment equipment not only is very costly but also takes time. These challenges should be considered in MassDEP's timeframe for enforcing PFAS standards. It is also recommended that MassDEP streamline its new technology review process to more quickly grant approvals.

If a Public Water System must install treatment to address PFAS in their drinking water, it may cause the classification of their system to change, necessitating higher-grade licensed operators. Operators sitting for higher-grade licenses have course requirements before they can even sit for the exams. MassDEP must recognize that this will cause staffing issues and will need to provide compliance forbearance and flexibility for the operators to obtain the necessary licenses.

MassDEP has urged Consumer Notification (aka Public Notice) in communities where the PFAS levels are above 20 ppt. In these notices the MassDEP language suggests that consumers in sensitive populations use alternative sources of water, yet there is very little guidance given as to what alternatives are guaranteed to be "PFAS-free." The guidance on MassDEP's own website regarding Point of Use filters states *"Filters certified by NSF have been demonstrated to be effective in removing two of these compounds, PFOS and PFOA, to below the USEPA Health Advisory of 70 parts per trillion (ppt). Many of these filters will likely be able to reduce PFAS levels to well below 70 ppt, however MassDEP has no independently verifiable monitoring results demonstrating this performance. If you chose to install a filter, you should check to see if the manufacturer has monitoring results demonstrating that the device can reduce PFAS to below your level of concern."* We believe that it is very confusing to the public to be told to seek alternative supplies, yet there is not definitive information provided to them. When MassDEP rolls out the new rule, they should provide clear cut guidance to the public. MassDEP should also begin a process to certify Point of Use Filters for PFAS removal if the agency is going to suggest this approach as an alternative. The public deserves to have the information needed to make informed decisions and not be at the mercy of the water filter dealers.

In some instances, Massachusetts Public Water Systems have been advised to take sources out of service so that finished water is below the ORSG; this will not be possible for most water systems. Some water systems have limited sources and those sources may be constrained by other regulatory programs, such as the Water Management Act. Flexibility for limited use of impacted sources during peak demand periods may be necessary for public safety (adequate pressure and fire protection) or to maintain reasonable operating costs while permanent solutions are implemented. Interconnections with neighboring communities to provide an alternative water source may pose challenges in terms of cost and time required to design, permit and construct

[6] See Appendix C which MWWA believes captures the typical timeline for brining treatment online under normal circumstances.

the needed infrastructure, as well as potential incompatibility with that water[7]. It is important to note that there are many water systems in the state where interconnections or participation in regional supplies will just not be possible.

MWWA has been told by MassDEP staff that when a Public Water System detects PFAS in the drinking water above the MMCL, MassDEP will initiate an investigation into the potential sources of contamination and the identification of potentially responsible parties. MWWA believes this process should be codified in the regulations (really this should apply to any contaminant, not just PFAS). MWWA is concerned that the Bureau of Waste Site Cleanup will be overwhelmed with this work and it will take longer for these evaluations to happen. The public will want answers in a timely manner. MassDEP needs to set a definitive timeline by which they will start the investigation. MassDEP also needs to ensure adequate staffing levels in both the Drinking Water Program and in the Bureau of Waste Site Cleanup to implement the new rules, and to provide for investigations, training, and technical assistance.

MassDEP also needs to figure out how they will address cleanup sites which are currently regulated under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The absence of federal standards for PFAS creates complexities for those water systems who detect PFAS above an MMCL and have CERCLA sites in proximity to their sources. If PFAS is as critical as MassDEP is suggesting, we think that MassDEP should assert their authority to enforce the state standards at CERCLA sites.

MWWA also believes that MassDEP needs to evaluate how other regulatory programs under their control (i.e. Landfills, Air Emissions) intersect with the Drinking Water MMCL. In other states, air deposition from industrial processes have contributed to groundwater contamination; will MassDEP be looking at PFAS standards for air emissions?

MWWA is also concerned that Public Water Systems may face procurement challenges when new drinking water standards for PFAS are put in place. MassDEP needs to give some consideration as to whether statutory changes are needed to enable water systems to more quickly procure treatment technologies or if procurement thresholds need to be raised to avoid prolonged bidding processes. MWWA is also concerned that certain treatment components may become harder to procure if demand for treatment across the nation increases. The state may consider whether it should make some bulk purchases and stockpile certain common treatment equipment so that components will be more readily available to water systems if needed, or MassDEP must allow a reasonable amount of time for water systems to fund and procure treatment (if required). MassDEP should evaluate what services or equipment could be added to the state bid list – including laboratory services and adsorptive media disposal services – to help Public Water Systems more efficiently procure these services.

[7] See Appendix D which outlines challenges and considerations with interconnections.

MWWA would also like to reiterate a concern we raised more than one year ago when the CLF petition to regulate PFAS was initially filed. **<u>It is imperative that the Commonwealth immediately develop a communication strategy so that water suppliers are not left on their own to individually figure out how to handle the risk communication.</u>** Thus far there have been many questions raised by residents at public forums in the communities grappling with PFAS contamination, especially about potential impacts to health, with very few direct answers from MassDEP and the Massachusetts Department of Public Health. MassDEP must be better prepared to answer questions and address mounting fears of residents, and to assist Public Water Systems which are often the first responders for questions from their customers. We also believe that there needs to be more communication by the state to consumers regarding the other routes of exposure; it does a disservice to the public if the state focuses on drinking water to the exclusion of other, perhaps more important, and higher PFAS contributions to one's body (e.g. consumer products, food).

Finally, MWWA strongly encourages MassDEP to establish and maintain communications with Administration and Finance, the Clean Water Trust, and the Legislature regarding how to provide more funding to communities facing PFAS contamination. There must be committed attention not only to the initial capital costs that Public Water Systems will incur to install treatment, but also ongoing operations and maintenance costs such as costs for sampling, operation, and maintenance of the treatment system. In some situations, the responsible party may pay for the capital costs. In most cases, municipalities will need to front the costs and chase the responsible part(ies) for reimbursement. It is likely that many contaminated water supplies may not have an easily identifiable source or responsible party. Who will be responsible for these ongoing costs? Ratepayers should not have to bear this burden for harms caused by others.

In 2014, the Legislature provided authorization within Chapter 259 of the Acts of 2014 for MassDEP to administer a matching grant program for Public Water Systems who wish to connect to the Massachusetts Water Resources Authority or other regional supplies, yet funds have never been appropriated. MWWA requests that MassDEP petition Administration and Finance and the Legislature to appropriate funds beginning in the next fiscal year to implement such a matching grant program.

Thank you for the opportunity to provide these comments. As mentioned previously and throughout this letter, public water suppliers understand the importance of ensuring that the drinking water that reaches their customers meet Safe Drinking Water Act requirements and protect the public health. Water suppliers work hard each day to meet these goals and satisfy their customers' expectations. As we have all come to be keenly aware, the issue of emerging contaminants is a huge challenge. Our members will be tasked with meeting any and all regulatory requirements and standards; therefore, MassDEP has an obligation to determine what the **real** human risk exposure is, and then, when and if the science dictates, move towards standards that will achieve desired public health outcomes. EPA has its national strategy for PFAS and MWWA recommends and encourages MassDEP to participate in that process. We look forward to working collaboratively with MassDEP to ensure continued protection of public health.

Sincerely,

Jennifer A. Pederson
Executive Director

Enclosures

cc: Martin Suuberg, Commissioner, MassDEP
Stephanie Cooper, Deputy Commissioner, MassDEP
Kathleen Baskin, Assistant Commissioner, MassDEP
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APPENDIX A
Costs incurred by Public Water Systems for PFAS

(Please note: these figures might not be exhaustive; they do not include water department staff time; they do not include operations and maintenance expenses which will be incurred going forward; Also, some of these costs may have been reimbursed by responsible parties)

Aquarion Water Company (Millbury) –Total = $58,800 (as of February 2020)

Ayer Water Department – Total =$4.9 million (as of January 2020)

Devens Water System - Total =Approximately $2 million (as of February 2020)

Hudson Water System – Total =$2.5 million (as of February 2020)

Hyannis Water System – Total =$18.6 million (as of December 2019)

Littleton Water Department – Total= $33,700 (as of January 2019)

Westfield Water System – Total =Approximately $7 million (as of February 2020) It is also estimated Westfield will need approximately $13 million more for construction of the permanent treatment for wells 1&2

APPENDIX B

Summary of Massachusetts DEP New Source Approval Process:

Activities, Regulatory Requirements, Timeframes, and Costs

The following is a summary of activities, timeframes, regulatory requirements and costs typical for the development of new sources of municipal groundwater supply in Massachusetts. However, all new source approvals present a unique set of circumstances. The summary is not intended to cover all eventualities.

Activity	Time Frame	Regulatory Requirements/Approvals	Public Notification Requirements	Typical Costs
Test-Well Investigation	6 – 18 months	None		\$50,000 – \$200,000
New Source Approval:				
Request Site Exam/Pumping Test Proposal	3 – 6 months	DEP Drinking Water Program	MEPA - Early Notice Environmental Monitor	
Conduct Pumping Test	3 – 6 months	Conservation Commission		
New Source Final Report	3 - 6 months	DEP Drinking Water Program		
Total NSA Process	9 – 18 months			\$150,000 - \$400,000
NSA Related Permitting (Prep. Only):				
WMA Permit/Amendment	2 months	DEP Water Management Program		\$10,000
Inter Basin Transfer	2 months	DCR/WRC		\$10,000
ENF/EIR	2 – 12 months	MEPA, NHESP		\$10,000 - \$100,000
Local: NOI, RDA, Cape Cod DRI etc.		Conservation Commission		\$10,000
Regulatory Approvals:				
New Source Approval	3 – 12 months	DEP Drinking Water Program		
WMA Permit/Amendment	3 – 12 months	DEP Water Management Program	Local Newspaper, Abutters, Abut. to Abut.	

Inter Basin Transfer	3 – 12 months	DCR/WRC	Public Hearings	
ENF (assume no EIR)	2 months	MEPA	Env. Monitor, Local Newspaper, Abutters	
EIR/DRI	6 - 12 months	MEPA, Cape Cod Commission	Env. Monitor, Local Newspaper, Abutters	
Design/Bid/Construct Permanent Wells	9 – 15 months	DEP, Conservation Commission	Local Newspaper	$100,000 - $500,000
Design/Bid/Construct Pumping Facilities	12 – 18 months	DEP, Conservation Commission	Local Newspaper	$1 - $3M
Land Acquisition	1 year	DEP		$0 - $1M, or more
TOTALS	3 – 5 YEARS			$1.5 - $5M

Other Notes:

- Activity: These same activities may also be required for replacement well sources. Does not include activities related to water treatment (e.g., filtration).
- Time frames: Delays can occur due to PWS priorities, availability of funding, extended regulatory approvals, public involvement.
- Regulatory Requirements: Local Conservation Commission may also require permitting of activities near wetlands.
- Costs: Based on recent projects (since about 2015).

Prepared By: D DeNatale, AECOM; Maura Callahan, Kleinfelder, December 2019

APPENDIX C
Treatment Planning, Design, Permitting, and Construction Timeline

The following is the expected timeline for planning, design, permitting, procurement, and construction of a PFAS treatment system once PFAS is detected in a public water supply and the system commences an alternatives evaluation leading to the selection of treatment. This timeline represents the typical "normal" process based on MassDEP regulatory requirements and the Commonwealth's procurement requirements for a treatment system that also requires a separate building. You will see that the total duration could be anywhere from 2.25 to 3.67 years if everything goes according to plan. It is important to note that this is how long a Public Water System could potentially be out of compliance with the proposed MMCL before treatment is completed.

Activities and Timeline for PFAS Treatment	**Scenario: PFAS found in a source > ORSG and/or > proposed MMCL. Treatment required.**	**Total Duration: 27 to 44 months (2.25 to 3.67 years)**
This does not include identification of contamination source or responsible party.		
Task/Activity	**Comments**	**Duration**
Phase 1: Study/Evaluation of Problem	Identify the problem, identify alternatives, evaluate alternatives, make recommendations, prepare cost estimates.	2 to 4 months, depending on the availability of funding. Add 3 to 6 months if funding must be obtained at Town Meeting.
Obtain Funding for Engineering Study	If borrowing required, requests for capital funds usually required Town Meeting vote, spring or special in the fall.	
Prepare RFP for Engineering Study	Most municipalities required to solicit proposals for engineering work. Could save time if Study, pilot study, design, permitting, procurement, construction, and start-up are all included in initial RFP.	
Select Engineer	If RFP is required.	
Complete Alternatives Analysis:	If treatment is recommended, then proceed with pilot study. Recommendations should also include ballpark cost estimates for future work.	

Phase 2: Pilot Study	Development of study scope, completion of study, documentation of study, DEP Review/Approval.	5 to 7 months depending on need for funding and RFP for engineering services.
Obtain funding for Pilot Study	May require approval at Town Meeting.	
RFP for Pilot Study	Most municipalities required to solicit proposals for engineering work.	
DEP Pilot Study Proposal	Assuming only 1 season is required.	
DEP Review/Approval of Pilot Study Proposal	Assuming only 1 season is required.	
Conduct Pilot Study	Assuming only 1 season is required.	
Submit Pilot Study Report	The study should include recommended engineering design parameters and capital cost estimate (for at least the next engineering phase).	
DEP Review/Approval of Pilot Study Report	Pilot study report becomes the basis of design for any treatment systems.	
Phase 3: Design and Permitting	Need to incorporate time for Owner review of design concepts and features.	6 to 9 months total, depending on scope. Duration of design work depends on required treatment. Assumes funding required for Design services. Worst case scenario assumes a new building is required. Many unknowns associated with residuals handling.
Obtain funding for Design and Permitting	May require approval at Town Meeting.	
RFP for Design/Permitting Engineer	Most municipalities required to solicit proposals for engineering work.	
Select Engineer for Design/Permitting	If RFP is required.	
Contract Negotiations/Sign Agreement, NTP		
A. Design		

Phase 1: Conceptual Design	25% design phase.	
Site Selection		
Site Layout		
Equipment Sizing		
Process Diagrams		
Owner Review of Plans		
Phase 2: Design Development (50% Design)	Brings the design to 50%. All systems defined.	
Site and Civil Plans		
Process Mechanical Plans		
Instrumentation (SCADA)		
If New Building		
Structural/Architectural		
Electrical		
HVAC		
Plumbing		
Security		
Owner Review of Plans		
Phase 3: Final Design (100% Design)	Design completion, all disciplines. Ready to bid/procure.	
Project Plans		
Project Specifications		
Final Cost Estimate		
B. Permitting	Required.	
DEP Review (Design Plans and Specs)	If site work near wetlands	
Local Notice of Intent	Depends on design scope.	
Local Planning Board (if required)	Depends on design scope.	
MEPA ENF/EIR (if required)	Depends on design scope.	
NESHP (if required)	Depends on design scope.	
NPDES (if required)	Depends on design scope.	
UIC (if required)	Depends on design scope.	
C. Funding for Construction	If additional funds required for construction and borrowing is required, then funding approval may require another Town Meeting if funds not already	

	obtained or cost estimate exceeds initial funding amount.	
Phase 4: Bidding (Procurement)	Complexity of procurement depends on complexity of design and anticipated construction costs.	2 to 3 months, depending on the scope of the project. Add another month if filed sub-bids are required.
Bid Advertisement		
Solicit Bids (Plans and Specifications)		
Open and Evaluate Bids		
Notice of Award		
Execute Contracts (bonds & insurance)		
Additional Time if Filed Sub-Bids Required		
Phase 5: Construction	Complete construction and commissioning of the treatment facilities.	1 to 1.5 years, depending on the scope and complexity of the construction project. Additional time may be required based on winter conditions and equipment lead time.
Project Submittals		
Equipment Order/Delivery	Wildcard. Equipment/material lead time could be extended based on demand and availability of stock/materials/equipment.	
Site Work	Add time if winter work required.	
Building Envelope		
Building Systems		
Process/Mechanical	Duration depends on complexity	
Equipment Installation		
Start-Up and Testing		2 to 4 weeks
Training O&M Manual		1 to 2 weeks
Commissioning		1 to 2 weeks
Record Drawings	After system placed into service.	

APPENDIX D

Summary of Interconnection Process:

Activities, Regulatory Requirements, Timeframes, and Costs

As the move to regulate PFAS in drinking water in Massachusetts has commenced, a number of Public Water Systems have needed to confront the issue due to PFAS detections from voluntary or past regulatory testing. One option for systems with detects at levels of concern is to utilize an alternate source of water obtained through interconnections with neighboring water systems. While this may be a viable and reasonable option, the use of interconnections as a short or long-term solution to PFAS contamination is not a simple alternative and is beset with issues and concerns.

How quickly an interconnection can be activated and used to replace a PFAS contaminated source is very dependent on site-specific issues. The table below summarizes some of the circumstances that are present and the impact on activation timelines. This summary is not all inclusive; there are numerous combinations of situations that influence the time it would take to activate an interconnection.

Situation	Activation Timeframe
Existing interconnection that is frequently used, has a current use agreement or understanding, does not require any regulatory approvals and has working infrastructure	Hours
Existing interconnection that is infrequently used, lacks a current agreement, does not require any regulatory approvals and has damaged or non-working infrastructure (valves, meters)	Days to weeks
Existing interconnection that is infrequently used, lacks a current agreement, requires regulatory approvals and has damaged or non-working infrastructure (valves, meters)	Weeks to months or even years
New interconnection with minor infrastructure upgrades (pipe, valves, vault, meter), regulatory approvals and agreement needed	6 months-2 years
New interconnection with major infrastructure upgrades (pipe, valves, pump station, storage tank, pressure reducer, vault, SCADA), multiple regulatory approvals, agreements	1-5 years

Factors that need to be considered in development of the interconnection option include:

- Getting Local Approvals
  - Both the supplying system and the receiving system need to agree to make the interconnection option viable. That process of agreement may involve town meeting, city council approval, votes of District commissioners or other formal authorization following a legally established procedure. Approvals by legislative bodies may only happen at certain times, thus subjecting the interconnection activation to schedules driven by other parties and/or statutes.
  - Prior to any formal votes or approval actions, the interconnection concept would have to be at least partially developed. That planning process would need to involve engineers from both sides along with directors, commissioners and upper management. The planning process along with preliminary design, authorization to proceed, budget approvals, regulatory guidance and creation/approval of an intermunicipal or inter-district water supply agreement could take 1-3 years (or more).
  - Historical relationships between the supplying system and the receiving system play a critical role in creation of a viable interconnection. It is not unusual for there to be "bad blood" between the two sides that stems from some perceived transgression which occurred decades earlier. Sometimes those ill feelings resurface and prevent an otherwise viable interconnection from being developed.

- Regulatory matters and state approvals
  - Prior to construction and activation of a new interconnection and in some cases use of an existing interconnection, a number of regulatory hurdles must be overcome. These include:
    - Drinking water approvals from MassDEP-the drinking water program would need to review and approve a new interconnection and may have some say in approving use of an existing interconnection.
    - Water Management Act-How an interconnection impacts an existing WMA permit needs to be well understood. This is especially the case for the supplying system as the added demand may impact permitted withdrawal volumes, potentially push a withdrawal above its baseline or even result in a permit exceedance. If mitigation becomes necessary, the supplying system needs to understand who would be responsible for mitigation and include appropriate language in an interconnection

agreement. The supplying system also needs to know how much of its permitted (or registered) withdrawal remains after providing water to a PFAS impacted system and whether that remaining volume is sufficient to allow for growth within the supplying system

- Interbasin Transfer Act-The Interbasin Transfer Act (IBTA) may apply to a new or existing interconnection if the source water is in a different river basin than the receiving system or if the receiving system's wastewater is discharged to a river basin different than the supply system's source water. IBTA approvals are through the Water Resources Commission (WRC) and typically involve multiple meetings with IBTA staff to identify and resolve issues before a hearing with the WRC.
- Wetlands Protection Act-For interconnections requiring new infrastructure near wetlands and other water resources, a filing with the local Conservation Commission would be needed. This process typically includes a public hearing followed by issuance of an Order of Conditions. The entire process could take two months or more.
- MEPA Filing-If the interconnection trips certain thresholds, an Environmental Notification Form (ENF) would have to be filed. That could potentially be followed by preparation of an Environmental Impact Report (EIR). The ENF could take 3-6 months while the EIR could take 6 months to 2 years. Public meetings and site visits would also be part of this process.
- Procurement-Purchasing and installing materials and equipment needed for a viable interconnection will typically involve procurement under Massachusetts law. Most often equipment and services will need to be bid, usually after design and preparation of specifications by a consulting engineer. The procurement process adds time to the overall development of the interconnection and the process can be further delayed through litigation brought by parties who are dissatisfied with the bid outcome.

- Technical/engineering concerns
  - Water pressure at the interconnection will, in part, determine the need for pumping. If the receiving system needs to pump water into parts of its system the design, construction and operation of the system will be much more complex and costly.
  - Available flow rates, in addition to pressure, will drive complexity and costs for the receiving system. Distribution system design (pipe size, storage) is

generally driven by fire flows. While pressures at the interconnection may be adequate, existing pipe size and condition in both the supplying system and receiving system may be flow limiting. Extensive water main upgrades may be required in order to meet both water use needs and fire flows in the receiving system and prevent low pressures and system disruptions (Rusty water, main breaks) in the supplying system.

  - The supplying system needs to determine whether it has the physical capacity to supply the volume requested by the receiving system. This is a matter of water source capacity (well pumping rates, surface water and treatment facility capacity) and transmission capabilities (pumping stations and storage) along with regulatory limits on available volumes (WMA).
  - The physical interconnection needs to be considered in terms of pipe size, materials, valves, metering, meter vault, SCADA controls, chemical injection (disinfection, corrosion control), alarms and pumping stations. Having the space to construct the needed infrastructure is also critical. Land acquisition and/or easements may be necessary to actually build the interconnection.

- Water Quality concerns
  - Using an interconnection between two water systems is not as simple as opening a valve if impacts on water quality for the receiving system are not well understood.
    - Conflicting water chemistry-Treated water from the supplying system may not be compatible with the water in the receiving system. This could result is precipitation of iron or other elements that causes discoloration. Worse yet, corrosive water from the supplying system could cause lead and copper to leach from pipes, services and plumbing in the receiving system, as occurred in Flint, MI.
    - Poor water quality at periphery of supplying system-Interconnections are often located at the periphery of the supplying system where water age can increase the likelihood of water quality problems including bacterial growth, low disinfectant residuals, elevated iron, elevated disinfection byproducts, tastes and odors. Eliminating elevated PFAS in exchange for elevated THMs or HAAs or generally poor water quality would not be a desired outcome of an interconnection that may have already contributed to higher water rates.
    - Public perception-Customers in the receiving system may not be pleased to receive water with high dissolved solids, poor taste, high

chlorine levels and discoloration that comes through the interconnection. While the new supply may meet all water quality standards, it may not meet with satisfaction from the customers who use it. This is especially true if the receiving system had previously had soft, surface water and will now get hard, groundwater with high dissolved solids.

- Costs
    - There are many cost factors that need to be considered, including but not limited to the following:
        - There may be substantial buy in fees.
        - Utilities may have to payer higher per unit charges than if they were utilizing their own supply.
        - There may be emergency use surcharges.

APPENDIX E

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Activation of human nuclear receptors by perfluoroalkylated substances (PFAS)

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ABSTRACT

Perfluoralkylated substances (PFAS) such as perfluorooctanoic acid (PFOA) or perfluorooctanesulfonic acid (PFOS) are used to produce, *e.g.*, surface coatings with water- and dirt-repellent properties. These substances have been shown to be hepatotoxic in rodents, and the mechanism of action is mostly attributed to the PFAS-mediated activation of the peroxisome proliferator-activated receptor alpha (PPARα). In the present study, we investigated by using luciferase-based reporter gene assays whether PFOA, PFOS and six alternative PFAS can activate, in addition to PPARα, eight other human nuclear receptors. All tested PFAS except for perfluorobutanesulfonic acid (PFBS) were able to activate human PPARα. Perfluoro-2-methyl-3-oxahexanoic acid (PMOH) and 3H-perfluoro-3-[(3-methoxypropoxy) propanoic acid] (PMPP) were weak agonists of human PPARγ. The other human nuclear receptors (PPARδ, CAR, PXR, FXR, LXRα, RXRα and RARα) were not affected by any PFAS tested in this study. Although PMOH was more effective than PFOA in stimulating PPARα in the transactivation assay, it was less effective in stimulating PPARα-dependent target gene expression in human HepG2 hepatocarcinoma cells. Notably, any effect observed in this *in vitro* study only occurred at concentrations higher than 10 µM of the respective PFAS which is in all cases several magnitudes above the average blood concentration in the Western population. Thus, the results suggest that nuclear receptor activation may only play a minor role in potential PFAS-mediated adverse effects in humans.

1. Introduction

Perfluoroalkylated substances (PFAS) are man-made fluorinated chemicals that have been widely used for the fabrication of water- and dirt-repellent coatings in many industrial applications and numerous consumer products. As a result of their high thermal and chemical stability, PFAS persist in the environment and are well-known global contaminants of wildlife and the environment (Fromme et al., 2009; Lau et al., 2007). The most prominent PFAS are perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). Both substances have been identified in dust, soil and ground water (Björklund et al., 2009; Murakami et al., 2009; Stahl et al., 2009; Zareitalabad et al., 2013) as well as in human blood serum, lung, liver and breast milk (Apelberg et al., 2007; Maestri et al., 2006; Olsen et al., 2003; Völkel et al., 2008). After resorption into the blood stream, PFAS bind to serum albumin which leads, along with slow elimination rates, to high serum half-lifes in the human body, *e.g.* 3.8 years for PFOA and 5.4 years for PFOS (Olsen and Zobel, 2007). In animal studies, PFOA and PFOS exposure resulted in immunotoxicity, neurotoxicity, developmental toxicity and hepatotoxicity (Abbott et al., 2009; Fuentes et al., 2007; Lau et al., 2007; Lau et al., 2004). Regarding hepatotoxicity, both substances have been shown to induce hepatocyte peroxisome proliferation, liver hypertrophy, vacuolization and hyperplasia (Berthiaume and Wallace, 2002; Cui et al., 2009; Kennedy et al., 2004). At the molecular level, most of these effects are associated with a PFOA- and PFOS-mediated activation of peroxisome proliferator-activated receptor alpha (PPARα) which is a member of the nuclear receptor family and plays a crucial role in the regulation of lipid metabolism, cellular growth and differentiation. Studies with *Ppara*-knockout mice revealed that PFOA and PFOS exert their adverse effects also *via* PPARα-independent mechanisms by activating other nuclear receptors such as the constitutive androstane receptor (CAR) (Rosen et al., 2008a; Rosen et al., 2008b) or the pregnane X receptor (PXR) (Bjork et al., 2011; Zhang et al., 2017). Regarding adverse effects of PFOA and PFOS in humans, a recent EFSA scientific opinion has identified increased serum total cholesterol levels as the most critical effect induced by both substances (EFSA, 2018). Moreover, a decrease in antibody response at vaccination in children was observed for PFOS (EFSA, 2018). EFSA risk assessment was based on human epidemiological data rather than on data derived from animal studies, and the molecular initiating events that lead to the observed effects in humans are currently under debate. Some of them – in particular those related to a deregulation of lipid and cholesterol

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metabolism – may be associated with PFOA and/or PFOS-mediated activation of different nuclear receptors in human liver.

Due to their persistence in the environment and the reported epidemiological observations in humans, the usage of PFOS for industrial applications was restricted in 2009 (Stockholm Convention, 2009), and a restriction program for PFOA was initiated (REACH, 2017). Therefore, the industry strives to replace PFOA and PFOS by alternative PFAS with either a shorter carbon chain length or a slightly modified structure. Most of these substitutes have a higher elimination rate, and they are also considered to be less toxic in comparison to PFOA and PFOS. However, there are only few toxicological data available for these substitutes, in particular regarding adverse effects in humans.

In the present study, we have characterized the capacity of PFOA, PFOS and six alternative PFAS to activate different human nuclear receptors, in order to provide a comprehensive analysis of possible molecular initiating events of this class of substances that may lead to adverse outcomes in humans *in vivo*.

2. Materials and methods

2.1. Chemicals and plasmids

Perfluorooctanoic acid (PFOA), perfluorohexanoic acid (PFHxA), perfluorobutanesulfonic acid (PFBS) and perfluorobutanoic acid (PFBA) were purchased from Sigma-Aldrich (Taufkirchen, Germany). Perfluorooctanesulfonic acid (PFOS) was obtained from ABCR GmbH (Karlsruhe, Germany), ammonium perfluoro(2-methyl-3-oxahexanoate) (PMOH) from Apollo Scientific (Cheshire, UK), perfluorohexanesulfonic acid (PFHxS) from Th.Geyer GmbH (Renningen, Germany) and 3H-perfluoro-3-[(3-methoxypropoxy) propanoic acid] (PMPP) from Campro Scientific (Berlin, Germany). The chemical structures of these eight PFAS are available in Fig. S1 in a recent publication by Behr et al. (2018). All other chemicals were purchased from Sigma-Aldrich (Taufkirchen, Germany) at the highest available purity.

Plasmids pGAL4/DBD-CAR/LBD(+3aa) (Kanno and Inouye, 2010), pGAL4-hPPARα-LBD, pGAL4-hPPARγ-LBD and pGAL4-hPPARδ-LBD (Kliewer et al., 1997) were kindly provided by Dr. Yuichiro Kanno (Toho University, Funabashi, Japan) and Dr. S. Kliewer (University of Texas Southwestern Medical Center, Dallas, USA). Plasmids pGAL4-FXR-LBD, pGAL4-LXRα-LBD (Luckert et al., 2018), pGAL4-$(UAS)_5$-TK-Luc, pGAL4-PXR-LBD, pcDNA3-Rluc (Luckert et al., 2013) and pCMX-GAL4-hRARα and pCMX-GAL4-hRXRα (Forman et al., 1995) were described previously.

2.2. Cell culture conditions

HEK293T cells and HepG2 cells (European Collection of Cell Cultures, Porton Down, UK) were cultivated in Dulbecco's modified Eagle's medium (DMEM; PAN Biotech) supplemented with 10% (*v*/v) fetal bovine serum (FBS; PAN Biotech), 100 U/mL penicillin and 100 µg/mL streptomycin (Capricorn Scientific, Ebsdorfergrund, Germany) at 37 °C in a humidified atmosphere containing 5% CO_2. The cells were seeded at a density of 2×10^4 cells/well on 96-well plates for reporter gene assays or cytotoxicity assays, or at a density of 3×10^5 cells on 12-well plates for gene expression analysis.

2.3. Cytotoxicity assay

The cytotoxicity of the tested chemicals was determined by using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) assay as described previously (Scharmach et al., 2012). Three individual experiments were performed with four replicate wells per condition. In each experiment, 0.01% Triton X-100 served as positive control.

2.4. Luciferase reporter gene assay

The expression plasmids (hCAR, hFXR, hPXR, hLXRα, hRXRα, hRARα, hPPARα, hPPARγ, hPPARδ) are based on a fusion construct of a GAL4-dependent DNA-binding domain and a ligand-binding domain of the respective nuclear receptor. HEK293T cells were transiently transfected with the expression plasmid and co-transfected with the GAL4-dependent luciferase reporter plasmid pGAL-$(UAS)_5$-TK-luc and the *Renilla*-luciferase construct pcDNA3-Rluc for normalization by using the TransIT-LT1 transfection reagent (Mirus Bio, Madison, USA) according to the manufacturer's protocol. Following transfection, cells were exposed to various concentrations of the test compounds for 24 h. An appropriate positive control was included for each reporter gene assay (see Table 2). Luciferase activity was analyzed as previously described (Hampf and Gossen, 2006). Three individual experiments were performed with four replicate wells per condition.

2.5. Gene expression analysis

HepG2 cells were incubated with different concentrations of the respective test substance for 24 h. Cells were washed twice with ice-cold PBS and RNA was extracted using the RNeasy Mini Kit (Qiagen, Hilden, Germany) following the manufacturer's protocol. Total RNA was quantified with a spectrophotometer (Nano Drop 1000; Nanodrop Technologies, Wilmington, USA). For cDNA synthesis, the High Capacity cDNA Reverse Transcription Kit (Applied Biosystems, Foster City, USA) was used. Real-time quantitative PCR (qPCR) was performed on a LightCycler96 system (Roche, Mannheim, Germany) using Maxima SYBR Green/ROX qPCR Master Mix (Fermentas, St. Leon Rot, Germany) and the primers listed in Table 1. The following thermal conditions were used: 15 min at 95 °C, followed by 40 cycles of 95 °C for 15 s, 1 min at 60 °C, and a final step of 60 °C for 15 min. PCR products were verified by melting curve analysis. Relative changes in mRNA transcription levels were quantified by using the $2^{-\Delta\Delta Ct}$ method (Pfaffl, 2001)

Table 1
Primers used in this study.

	Primer sequence (5′–3′)	
	Forward	Reverse
ACOT1	TGGAAGGACCTGACCAGAAG	ATGATCTGGGGCTTTCTCCT
ACOX1	CTGAAGGCTTTCACCTCCTG	GGCAGGTCGTTCAAATAGGA
APOA1	GTGACCTCCACCTTCAGCA	CCAGATCCTTGCTCATCTCC
CPT1A	CAAGGACATGGGCAAGTTTT	AAAGGCAGAAGAGGTGACGA
CYP2B6	TTCCTACTGCTTCCGTCTATCAAA	GTGCAGAATCCCACAGCTCA
CYP7A1	GACACACCTCGTGGTCCTCT	TTTCATTGCTTCTGGGTTCC
FABP1	CAAGTTCACCATCACCGCTGGGTC	TCATTGTCTCCAGCTCACATTCCTC
GAPDH	ATTTGGCTACAGCAACAGGG	CAACTGTGAGGAGGGGAGA
HMGCS2	GTAGCCCCATAAGCATCAGC	TAGCACCATAAGCCCAGGAC
PLIN2	ACTGGCTGGTAGGTCCCTTT	GTCTCCTGGCTGCTCTTGTC
PPARA	ATCCCAGGCTTCGCAAACTT	CATGGCGAATATGGCCTCAT

normalized to *GAPDH*. Three individual experiments were performed.

2.6. Statistics

To examine significant differences between control group and treatment groups, one-way analysis of variance (ANOVA) was performed followed by Dunnett's *post-hoc* test. Concentration-response curves and the EC_{10} value were calculated by using the 4-parameter logistic (4PL) equation. The criteria for statistical significance were $p < .05$, $p < .01$ and $p < .001$ leading to the caption *, ** and ***, respectively.

3. Results

Luciferase-based reporter gene assays were employed to examine the impact of different PFAS on the activation of a number of human nuclear receptors that have a function in the regulation of lipid metabolism or xenobiotic metabolism. All PFAS were tested up to a concentration of 100 µM that was shown to be non-cytotoxic in HEK293T cells in a previous study (Behr et al., 2018). The results of the reporter gene assays are summarized in Table 2. Except for PFBS, all PFAS activated PPARα to a different degree. Notably, the PFAS harboring a carboxylic acid as a functional group showed a higher potential to activate PPARα than the PFAS with a sulfonic acid. PFOS and PFHxS showed slight 1.8-fold ($p < .001$) PPARα activation only at the highest test concentration of 100 µM whereas the PFAS with a carboxylic acid activated PPARα also at lower concentrations and in a concentration-dependent manner (Fig. 1A). As an example, PFOA significantly induced PPARα activation at a concentration of 50 µM (1.8-fold; $p < .001$) and PMOH already at a concentration of 25 µM (7.0-fold; $p < .001$). In addition to PPARα activation, only PMOH and PMPP were also capable of a weak activation of human PPARγ to a level of 2.4-fold ($p < .001$) and 1.8-fold ($p < .001$) at the highest test concentration of 100 µM (Fig. 1B). None of the eight PFAS tested in this study was able to activate the human variants of CAR, FXR, LXRα, PPARδ, PXR, RARα or RXRα in comparable reporter gene assays (Table 2).

In our analysis, PFOA and PMOH showed the strongest effect on PPARα activation. As PMOH which is also known under its commercial name “GenX” is being used as a PFOA replacement in several industrial applications, these two substances were comparatively examined in more detail. Reporter gene assays for PPARα activation were repeated for these two substances by using a broader concentration range up to 250 µM that has been shown to be non-cytotoxic in HEK293T cells (Behr et al., 2018). Concentration-response curves were calculated and values for an effective concentration of 10% (EC_{10}) were determined relative to the activation induced by the positive control GW7647. PFOA stimulated PPARα to a level of 10% at a concentration of 50 µM whereas a comparable PPARα activation was induced by PMOH already at a concentration of 5 µM (Fig. 2). At the highest test concentration of 250 µM, PFOA activated PPARα to a level of about 60% relative to the positive control whereas PMOH stimulated PPARα to a level of about 90%. Thus, PMOH seemed to be more potent than PFOA regarding activation of human PPARα.

To examine downstream effects of PFOA- and PMOH-mediated PPARα activation, gene expression analysis was conducted for a number of well-characterized PPARα target genes by using the human hepatocarcinoma cell line HepG2 as an *in vitro* model for human hepatocytes. HepG2 cells were treated with up to 250 µM of PFOA or PMOH as this concentration proved to be non-cytotoxic in HepG2 cells for both substances (Fig. 3). The results of the gene expression analysis are summarized as a heat map in Fig. 4. The PPARα agonists GW7647 and WY14,643 stimulated expression of *CPT1A*, *HMGCS2*, *FABP1* and *PLIN2*, however, GW7647 was more potent in the activation of these target genes in comparison to WY14,643. For instance, there was an 8-fold ($p < .001$) increase in *CPT1A* gene expression induced by GW7647 whereas WY14,643 stimulated *CPT1A* gene expression only to a level of 3.7-fold ($p < .001$). There was no induction of *ACOT1* and *ACOX1* gene expression by these two PPARα agonists. Expression of *APOA1* and *CYP2B6* was slightly induced by GW7647 to a level of 1.4-fold ($p < .05$) and 3.3-fold ($p < .05$), respectively, and gene expression of *CYP7A1* was marginally decreased (0.62-fold; $p < .01$) by WY14,643. Expression of *PPARA* itself was also not affected by the PPARα agonists. Compared to the PPARα agonists, PFOA displayed similar effects on the expression of the selected PPARα target genes (Fig. 4). At the highest test concentration of 250 µM, PFOA induced gene expression of *CPT1A* (6.5-fold; $p < .001$), *CYP2B6* (11.2-fold; $p < .001$) and *PLIN2* (20.7-fold; $p < .001$), but had no effect on *ACOT1*, *ACOX1*, *FABP1* and *PPARA* gene expression. *APOA1* (0.59-fold; $p < .05$) and *CYP7A1* (0.22-fold; $p < .001$) gene expression was decreased by PFOA, and there were inconsistent effects on *HMGCS2* gene expression. Compared to PFOA, PMOH only had marginal effects on PPARα target gene expression. At the highest test concentration of 250 µM, PMOH slightly stimulated *CPT1A* (1.7-fold; $p < .001$), *HMGCS2* (2.8-fold; $p < .001$) and *PLIN2* (1.4-fold; $p < .01$) gene expression, but had no impact on the expression of the other PPARα target genes (Fig. 4). Thus, although PMOH seemed to be a more potent PPARα agonist than PFOA (Fig. 2), this substance displayed much weaker downstream effects regarding PPARα-dependent gene expression than PFOA (Fig. 4).

4. Discussion

Amongst other adverse outcomes, PFOA and PFOS have been shown to be hepatotoxic in rodents. Numerous animal studies have revealed that repeated doses of PFOA or PFOS induce peroxisome proliferation in hepatocytes followed by hepatocyte vacuolization and hyperproliferation, liver enlargement and hypertrophy (Cui et al., 2009; Kennedy et al., 2004; Wolf et al., 2008b). At the molecular level, these adverse effects have been attributed to the PFOA- and PFOS-mediated activation of the nuclear receptor PPARα. A few studies indicate that PFOA and PFOS may exert their adverse effects independently from PPARα activation. Studies with *Ppara*-knockout mice showed that other nuclear receptors such as CAR (Rosen et al., 2008a; Rosen et al., 2008b) or PXR (Bjork et al., 2011; Zhang et al., 2017) may be additional targets of PFOA and PFOS. The relevance of these additional targets in particular

Table 2
Summary of PFAS-mediated effects on human nuclear receptor activation.

	Positive controls		PFOA	PFOS	PMPP	PMOH	PFHxA	PFHxS	PFBA	PFBS
hCAR	+ + +	10 µM CITCO	–	–	–	–	–	–	–	–
hFXR	+ + +	10 µM GW4064	–	–	–	–	–	–	–	–
hLXRα	+ + +	10 µM GW3965	–	–	–	–	–	–	–	–
hPPARα	+ + +	1 µM GW7647	+ + +	+	+ +	+ + +	+ +	+	+ +	–
hPPARδ	+ + +	1 µM GW501516	–	–	–	–	–	–	–	–
hPPARγ	+ + +	10 µM troglitazone	–	–	+	+	–	–	–	–
hPXR	+ + +	10 µM SR12813	–	–	–	–	–	–	–	–
hRARα	+ + +	100 nM AM580	–	–	–	–	–	–	–	–
hRXRα	+ + +	100 nM CD2608	–	–	–	–	–	–	–	–

- < 1.5-fold change; + > 1.5-fold change; + + > 2.5-fold change; + + + > 5.0-fold change.

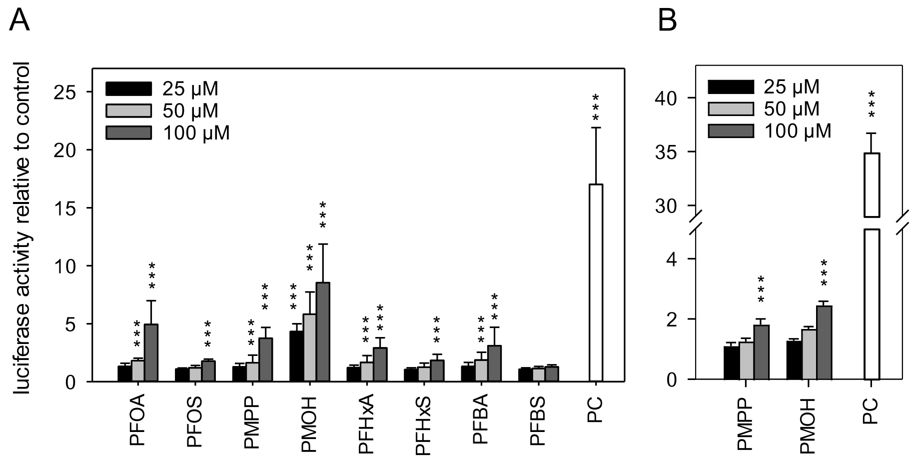

Fig. 1. Nuclear receptor activation by PFAS. HEK293T cells were transfected with either (A) pGAL4-hPPARα-LBD (PPARα expression plasmid) or (B) pGAL4-hPPARγ-LBD (PPARγ expression plasmid), the reporter plasmid pGAL-(UAS)$_5$-TK-luc and the *Renilla*-luciferase construct pcDNA3-Rluc for normalization purposes. Receptor activity was measured after 24 h of treatment with various PFAS concentrations. Cells treated with 1 µM GW7647 served as positive control (PC) for PPARα, and cells treated with 10 µM troglitazone served as positive control for the PPARγ reporter gene assay. Values were normalized to *Renilla reniformis* luciferase activities and compared to untreated cells. Data are presented as mean + SD. *** $p < .001$, one-way ANOVA with Dunnett's *post-hoc* test.

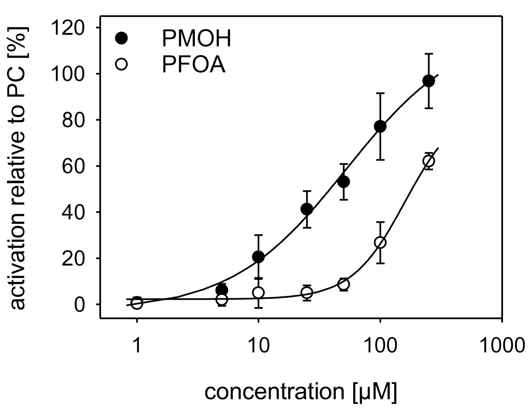

Fig. 2. Concentration-response curves for PPARα activation by PMOH and PFOA. HEK293T cells were co-transfected with plasmids pGAL4-hPPARα-LBD, pGAL-(UAS)$_5$-TK-luc and pcDNA3-Rluc. Luciferase activity was measured after 24 h of treatment with various concentrations of PMOH or PFOA. Cell treated with 1 µM GW7647 served as positive control. Values were normalized to *Renilla reniformis* luciferase activities and compared to untreated cells. Relative activity was calculated in relation to the induction by the positive control (set to 100%).

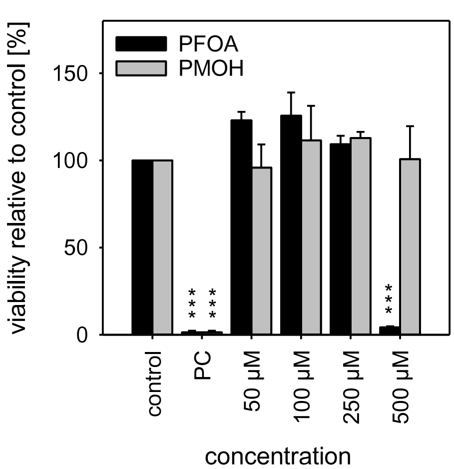

Fig. 3. Cytotoxicity of PFOA and PMOH in HepG2 cells. The cells were exposed to various concentrations of PFOA or PMOH for 24 h, and cellular viability was measured using the MTT assay. Viability is represented as percentage, compared to untreated cells (control) set to 100%. In each experiment, Triton X-100 (0.01%) served as positive control (PC). Data are presented as mean + SD. *** $p < .001$, one-way ANOVA with Dunnett's *post-hoc* test.

in relation to the strong activation of PPARα by PFOA and PFOS, however, is still under debate.

PFOA and PFOS have also been shown to activate the human PPARα. These two substances, however, seem to be much weaker agonists of human PPARα compared to rat or mouse PPARα (Bjork et al., 2011; Takacs and Abbott, 2006; Vanden Heuvel et al., 2006; Wolf et al., 2008a). Moreover, PPARα has been shown to display a low expression level in human liver in comparison to rodents (Palmer et al., 1998). Thus, the relevance of PPARα activation by PFOA and PFOS for their adverse effects in humans is being doubted. In this context, the question arises whether or not PFOA and PFOS may have the capacity to activate human nuclear receptors other than PPARα. Furthermore, little data regarding nuclear receptor activation is available for alternative PFAS that are being used as replacements for PFOA and PFOS. Here we present the first comprehensive study on PFAS-mediated activation of human nuclear receptors with a focus on those nuclear receptors being involved in lipid metabolism and xenobiotic metabolism.

According to our *in vitro* data, human PPARα was activated by all PFAS examined in this study except for PFBS. The specificity of PPARα activation was not evaluated. Notably, the PFAS with a carboxylic acid had a stronger agonistic potential compared to the PFAS with a sulfonic acid. This finding is in line with the data reported by Takacs and Abbott (2006) and Wolf et al. (2008a). In addition to the observed PPARα activation, only two alternative PFAS (PMOH and PMPP) displayed weak activation of PPARγ. In previous studies, it seemed that PFOA and PFOS predominantly activate the alpha isoform of PPAR rather than the gamma or delta isoform (Buhrke et al., 2013; Maloney and Waxman, 1999; Takacs and Abbott, 2006). In contrast, Zhang et al. (2014) reported that a number of different PFAS were able to activate human PPARγ. The differences could be due to the usage of a different cell line and the additional transfection with a PPARγ expression construct in the Zhang study. Except for PPARα and PPARγ, none of the tested PFAS activated any other human nuclear receptor according to our *in vitro* data. These results are in line with the few data available so far. Abe et al. (2017) reported that PFOA did not activate human CAR, and Vanden Heuvel et al. (2006) showed that PFOA and PFOS were not able to activate human LXRα and human RXRα.

Regarding PPARα activation, our data indicate that PMOH is a more potent agonist than PFOA. For the analysis of downstream effects, we focused on the impact of these two substances on the expression of PPARα–dependent target genes. PPARα–dependent gene expression in HepG2 cells has been examined in detail in previous studies (Hsu et al., 2001; Rakhshandehroo et al., 2010; Tachibana et al., 2005). In our own study, gene expression analysis revealed that PMOH is less effective than PFOA in stimulating expression of PPARα-dependent genes in HepG2 cells. PMOH might be a better ligand to interact with the ligand-binding domain of human PPARα compared to PFOA, as this

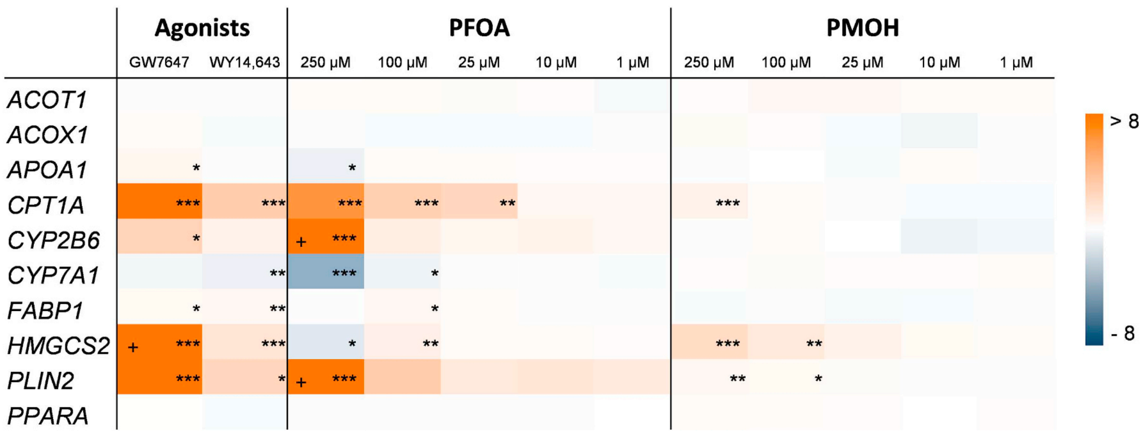

Fig. 4. Gene expression analysis of PPARα target genes. HepG2 cells were exposed to various concentrations of PMOH or PFOA for 24 h. Untreated cells served as control. Cells treated with 1 µM GW7647 or 10 µM WY14,643 served as positive controls. mRNA levels were normalized to *GAPDH*. Fold changes relative to untreated cells (mean of three individual experiments) are presented in the heat map. Values exceeding the color scale are marked with "+". *** $p < .001$, ** $p < .01$, * $p < .05$, one-way ANOVA with Dunnett's *post-hoc* test.

interaction is the basis for the readout of the artificial transactivation assay that is based on the yeast Gal4 system. Gene expression analysis, on the other hand, depends – in addition to the binding of PMOH or PFOA to the PPARα ligand-binding domain - on the entire functional PPARα transcription factor including the interaction of PPARα with additional cofactors and the interaction of the PPARα DNA-binding domain with the promoter regions of the PPARα target genes. Thus, PMOH might be a better ligand to PPARα than PFOA, but this interaction does obviously result only in a weak regulation of PPARα–dependent target genes. According to a few animal studies, PMOH has the potential to induce gene expression of PPARα-dependent target genes (Conley et al., 2019; Wang et al., 2017), and the results of some animal studies indicate that PMOH is able to activate PPARα, based on toxicological effects of PMOH in rodents which are similarly provoked by PPARα agonists (Beekman et al., 2016; Haas, 2008, 2009). In these studies, however, there was no direct comparison between PFOA and PMOH regarding their impact on PPARα activation. To the best of our knowledge, the present study is the first study that directly compares the impact of PFOA and PMOH on PPARα-dependent gene expression in human hepatocytes.

In rodents, numerous studies have revealed that repeated doses of 1 mg/kg b.w./day or below of either PFOA or PFOS led to several adverse effects on the immune system, the nervous system and the liver and had an impact on reproduction and development (summarized by EFSA, 2018). In rats, repeated doses of, *e.g.*, 5 mg/kg b.w./day resulted in blood concentrations of 39.2 µg/mL for PFOA and 72 µg/mL for PFOS (Cui et al., 2009) which is in the range of about 100 µM for both substances. This is exactly the range in which all PFAS-mediated effects regarding nuclear receptor activation occurred in the present *in vitro* study. With respect to human exposure, however, a level of 100 µM is several magnitudes above the blood serum levels reported for the general population. In Western countries, cohort studies have revealed that blood serum levels of PFOA and PFOS are in a range of about 10 nM and 20 nM, respectively (Calafat et al., 2006; Calafat et al., 2007; Kato et al., 2011). Blood serum levels of the other PFAS examined in our study are in a range of 1 nM or even below (Fromme et al., 2017; Gebbink et al., 2015). Thus, the results of the present study put some doubt on the hypothesis that nuclear receptor activation may be relevant for potential adverse effects of PFAS in humans. According to the recent EFSA scientific opinion (EFSA, 2018), an increased cholesterol blood serum level has been identified as the most relevant critical effect of PFOA and PFOS in humans. It is known that agonists of PPARα have an impact on lipid metabolism and fatty acid oxidation, and that cholesterol metabolism and bile acid synthesis is regulated by PPARs (Li and Chiang, 2009). The underlying mechanisms for the epidemiological observation that PFOA and PFOS may induce hypercholesterolemia in humans are still unknown, and further studies will have to be conducted to elucidate the molecular initiating events triggered by PFAS that may finally lead to adverse effects in humans.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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From: Paige Brochu <pbrochu@bu.edu>
Sent: Thursday, February 27, 2020 11:44 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear MassDEP,

Please see attached document for my comments regarding the PFAS MCL.

Thank you for your time and consideration.

Best,
Paige Brochu

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Paige Brochu, MS
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Attachment: PFAS_MCL_Comments_PaigeBrochu.pdf

Elizabeth Callahan
Acting Division Director
Policy and Program Development
MassDEP Bureau of Waste Site Cleanup
1 Winter St., Boston, MA, 02108

February 27, 2020

Re: Massachusetts Contingency Plan ("MCP", 310 CMR 40.0000)

The proposed revisions and changes to the Massachusetts Contingency Plan (MCP) that include standards for per- and polyfluoralkyl substance (PFAS) are necessary to not only improve public health but protect it as well, especially for our most vulnerable and sensitive populations, children and pregnant women. This proposed standard is vital due to the vast ways in which the public are already exposed to PFAS by way of using consumer products and within our environment, therefore if we are able to regulate the potential exposure to PFAS through drinking water, then this is <u>imperative</u> to protect public health (ATSDR, 2018). Multiple PFAS are present in drinking water samples collected in MA pointing to the public being exposed to a mixture of PFAS rather than one at a time. One recent example is from the Cambridge Water Department that reported 6 PFAS detected in their water as of January 20, 2020 (CWD, 2020). Similar to the Cambridge Water Department, multiple other towns across the state including Ayer, Hudson, Westfield, Barnstable, and Braintree detected multiple PFAS in their PWS as well (MA EEA, 2018).

I support the proposed standard requiring the sum of the included PFAS (PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA) not to exceed 20ppt. To support this new regulatory standard I have provided the following evidence:

1. <u>Cumulative approach to regulate PFAS in drinking water is consistent with USEPA's additive approach of the Health Advisory (HA) for PFOA and PFOS.</u> In 2016, the USPA updated their HA for PFOA and PFOS in drinking water stating that when PFOA and PFOS are both detected in drinking water, the **combined** concentrations should not exceed the 70ppt health advisory level. This HA was based on peer-reviewed studies focused on the health effects of PFOA and PFOS in animals and epidemiologic studies of human. Similar physical structures, properties, and adverse health effects and target organs were the main reasons for this additive HA approach (USEPA, 2016a, 2016b, and 2019). *Because the USEPA HA is not an enforceable drinking water standard, the proposed additive standard is crucial.*

2. <u>Similar additive method used in Connecticut and Vermont supported by the National Toxicology Program</u> (NTP, 2018). The Connecticut Department of Health issued a drinking water Action Level in 2016 that used the same level as USEPA, 70ppt, but included 5 FPAS (PFOA, PFOS, PFNA, PFHxS, and PFHpA) to the combined target concentration of 70ppt (CT DPH, 2017). Similarly, in Vermont, Governor Scott signed Act 21 (S.49) to regulate PFAS levels in drinking water and outlined a response plan to combine PFAS levels exceeding 20ppt (VT LEG 2019). The Vermont Department of Environmental Conservation also implemented an interim drinking water standard of 20ppt for the combined levels of PFOA, PFOS, PFHxS, PFNA, and PFHpA (VTDEC 2020). *Creating a drinking water standard that focuses on the combined level of PFAS contaminants is already being adopted by other states.*

3. <u>Treating 6 PFAS as a group is appropriate due to similar: chemical structure, critical endpoints, and persistence in the body.</u> The additive approach considers the multiple PFAS to be equipotent which is an assumption that is supported by data from National Toxicology Program

reporting that the potency of these PFAS overlap across multiple endpoints (NTP, 2018). These 6 PFAS are all long-chains and therefore are thought to have similar toxicokinetics from half-lives to absorption, distribution, and elimination from the body. Though data on PFDA are sparse, the main exposure routes are similar to PFOA and PFOS with ingestion and inhalation predominating. Additionally, animal toxicity studies show that PFDA reaches the same target organs (liver, kidneys, serum) as PFOA and PFOS. Like PFOA and PFOS, PFDA may reach the developing fetus through placental transfer (European Chemicals Agency, 2016). Although not as well studied as PFOA and PFOS, PFHpA is reported to have similarly long half-life in mammals to that of PFOA (NICNAS, 2015; Russell et al., 2015). *In general, the serum half-lives of these 6 PFAS are similar with overlapping ranges, these are all long chain PFAS, very persistent in the environment and the main route of exposure is oral (including drinking water) and inhalation (ATSDR, 2018; Li et al., 2018; Bennett et al., 2015; Zhang et al., 2013).*

<u>Statement of Relevant Expertise:</u>
I am a current doctoral student in the Environmental Health Department at Boston University School of Public Health (BUSPH). During my Master's in Environmental Health and Data Analytics at BUSPH, I worked on drinking water contaminants in Public Water Systems in Massachusetts, focused on 2015 data from the Environmental Working Group. Before furthering my education at BUSPH, I worked as a Geographic Information Systems Intern at the Vermont Department of Health within their Health Surveillance department but working closely with the Environmental Health division.

Sincerely,

Paige Brochu

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From: sosborne@osd-ec.com <sosborne@osd-ec.com>
Sent: Thursday, February 27, 2020 4:25 PM
To: Director-DWP, Program (DEP)
Cc: DePeiza, Yvette (DEP)
Subject: PFAS MCL Comments

Greetings Yvette,

Thank you and Kathy for taking the time to update the Safe Drinking Water Act Assessment Advisory Committee on PFAS training and to respond to our questions and concerns regarding the draft regulations.

The concerns that I raised during last week's meeting and a few others are included in the attached letter.

Regards,

Sean D. Osborne, PE |Principal | ***OSD Engineering Consultants***
58 Medford St, Suite LL1 | Arlington, MA 02474 |P: 781-538-4636 | C: 781-454-5271 | F: 781-538-4637

Attachment: OSD PFAS Comment Letter_MCL 310 CMR 22.pdf

February 27, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)
Via email to program.director-dwp@mass.gov

Dear Ms. DePeiza:

I am a civil engineering consultant and wish to submit the following written comments to the Massachusetts Department of Environmental Protection (MassDEP) on proposed changes to the Drinking Water Regulations, 310 CMR 22.00.

As a consultant, I support public water systems and water supply professionals across the Commonwealth. I take my role in the protection of public health very seriously, as do our clients. Water system managers and operators work hard to provide clean, safe drinking water and to ensure that they are complying with the many Safe Drinking Water Act requirements.

With respect to MassDEP's proposal to develop a Massachusetts Maximum Contaminant Level (MMCL) of 20 parts per trillion (ppt) for PFAS which includes six compounds: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA), I would ask MassDEP to develop compound-specific standards for each of the PFAS compounds and not employ a cumulative approach. The compounds should not be combined because of different toxicity endpoints, different uncertainty factors between humans and mammal toxicities, different reference dosages, differences in half-lives, bioaccumulation, etc. There are also treatment and operational considerations that could be more challenging if the compounds are considered cumulatively.

MassDEP is considering requiring monthly monitoring if detections are above 10 ppt. I am not convinced that monthly monitoring should be required at 10 ppt. In addition, I am not convinced that monthly monitoring is feasible at any level of detection. The PWSs with which I work, report that the labs have taken 3 to 6 weeks to provide results. Monthly monitoring will not allow the PWS to take a confirmation sample or to take additional samples after finding a potential PFAS source in the sampling line. PFAS sample costs are high and I question whether the results would vary significantly from month to month to warrant the additional sampling. For systems over the MMCL, quarterly sampling should be enough and is more feasible.

I have strong concerns about MassDEP's proposed MMCL compliance calculations including estimates of analytical results below the Minimum Reporting Level (MRL) and I urge MassDEP to exclude this from any final rule promulgated. Any detection below the MRL should not be governed by an arbitrary rule assuming a certain level exists; such an interpretation is not scientific. Values below the MRL should not be reportable, nor counted towards compliance calculations at these low parts per trillion levels. Allowing for estimates of analytical results below the MRL to be included in the compliance calculations has dubious health benefit and is detrimental to the capacity of many PWSs to address previously identified system vulnerabilities. Many small and medium utilities do not have the financial flexibility to increase their O&M budget because these 'J' values have put the cumulative value above 10 ppt. Similarly, many small and medium utilities do not have the financial flexibility to increase their CIP budget because these 'J' values have put the cumulative value above 20 ppt. This could lead to delay in previously identified critical O&M and capital projects. In turn, this could lead to increased vulnerabilities to acute public health contamination.

MassDEP is proposing to mandate electronic reporting of all data submitted to the Drinking Water Program. Electronic reporting should not be mandated until MassDEP can ensure that the state's information technology infrastructure can reliably support such a directive. I ask for this requirement to be stricken.

I also believe that MassDEP needs to consider ways to invalidate sample results if the Public Water System demonstrates that results were influenced by products used in the piping or plumbing of the sample location, involved human error, or if confirmatory sample results are markedly different than the initial results.

I am concerned that MassDEP is considering removing the leading zeroes from the public reporting. My experience with Consumer Confidence Reports leads me to conclude that removing the leading zeroes will confuse the public and make it harder for operators to communicate with their customers. The leading zeroes should stay so that the public can differentiate between ppm, ppb and ppt.

This leads to my final concern – public education and outreach. MassDEP's webpage does a good job of discussing PFAS in drinking water and wastewater and in firefighting foam. I suggest that information and links be added to describe the presence of PFAS in consumer goods and the relative risks of exposure to PFAS from swimming pools to drinking water to nonstick cookware, carpets, and easy-glide floss. The outreach documents should also better indicate which populations are at risk and better indicate how the assumed health impacts are impacted by water consumption versus exposure from baths and showers.
Thank you for the opportunity to provide these comments.

OSD Engineering Consultants

Regards,

Sean D. Osborne, PE
Principal

From: Nessa Horewitch Coppinger <NCoppinger@bdlaw.com>
Sent: Friday, February 28, 2020 3:40 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Please find attached 3M's comments on the proposed PFAS MCL.

Thank you,

Nessa Horewitch Coppinger
Principal

Beveridge & Diamond

1350 I Street, NW, Suite 700 ~ Washington, DC 20005 ~ bdlaw.com
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Attachment: 2020-02-28 3M Massachusetts PFAS MCL Comments.pdf

Oyebode A. Taiwo
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February 28, 2020

To Whom It May Concern:

3M PFAS MCL Comments

The 3M Company (3M) appreciates the opportunity to review and provide comments on the proposed PFAS MCL Amendments to 310 CMR 22.00. As a science-based company, 3M has significant concerns with the proposed MCLs, as they do not reflect the best available science regarding these substances. In addition, we are concerned that MassDEP is merely going through the motions of rulemaking and is not undertaking the critical evaluation of science and public comments necessary for rulemaking. The proposed MCL is identical to the cleanup standard established in December 2019 for groundwater under the state cleanup law referred to as Chapter 21E, the technical support document is the same for both rulemakings despite their different purposes, and, as currently proposed, the rule anticipates implementation by the regulated community one month after comments on the draft MCL are due. All of these factors suggest MassDEP intends to adopt the MCL as proposed regardless of any comments received.

I. MassDEP's Toxicity Assumptions Are Unfounded

The technical support document PFAS: An Updated Subgroup Approach to Groundwater and Drinking Water Values (Technical Document) underlying the proposed PFAS MCL Amendment is replete with unscientific assumptions and errors in data comparison. For example, MassDEP's approach to perfluorhexanesulfonic acid (PFHxS) rests on faulty data comparisons, inconsistent conclusions, and flawed assumptions. Section 3.1 of the Technical Document acknowledges that there is "more limited available data to support derivation of candidate RfDs" for PFHxS as compared to PFOA and PFOS. Nonetheless, MassDEP claims that because the RfD for PFHxS overlaps the "range of values derived for PFOA and PFOS," the majority of RfDs derived for PFHxS are "within 2-fold of the RfD" for PFOA and PFOS," and the differences are "within the range of uncertainty inherent in all RfDs," its decision "to include these compounds in an equipotent subgroup" is appropriate.

First, MassDEP claims to use "toxicologically similar chemicals as surrogates for less studied members of the PFAS subgroup." In so doing, MassDEP assumes PFHxS is "equipotent" to PFOA and PFOS despite the fact that it has a different chain length, different physical properties (such as solubility), and different functional groups (carboxylate versus sulfonate). Any one of these differences is sufficient to call into question an assumption of similar toxicity values. Given all of these differences, however, it is patently clear that such an assumption is devoid of scientific merit.

Second, MassDEP not only ignored the significant differences between PFHxS and PFOA and PFOS, but compounded the error by ignoring differences in the RfD for PFHxS it relies on from Minnesota. MassDEP claims to rely on the RfD Minnesota derived for PFHxS but ignores the fact that there is a three fold difference between the Minnesota RfD for PFHxS and PFOS. In other words, Minnesota's RfD for PFHxS is three times higher than its RfD for PFOS, but MassDEP obfuscates that difference by stating that because the difference falls within the enormous range of values across compounds, which varies by 10 fold, it's conclusions are reasonable.

MassDEP committed similar errors for other PFAS in the Technical Document. The Technical Document notes that, for perfluoroheptanoic acid (PFHpA), "no agency has derived a compound specific toxicity value due to a lack of toxicity data." Despite this lack of data, the MassDEP Office of Research and Standards (ORS) concluded it is appropriate to consider PFHpA to be "equipotent" to PFOA based on "read-across" even though "toxicity data are not available to assign a compound specific or relative potency value for PFHpA *or to conclude that it is toxicologically dissimilar to the other compounds* in the subgroup." (emphasis added). It is not scientifically sound to rely on a lack of information that a compound is toxicologically *dissimilar* when there is likewise no information that the compound is toxicologically *similar.* MassDEP should not simply assume a toxicological profile for a compound, as it appears to do here for PFHpA.

Similar to its approach with PFHpA, MassDEP has applied a "read-across" approach for perfluorodecanoic acid (PFDA) since toxicity values have not been derived by other agencies for PFDA. MassDEP simply states that PFDA "shares similar toxicity endpoints and potencies with the other compounds in the subgroup" and, therefore, concludes that it is appropriate to rely on information from other substances "that have been more extensively studied to estimate the toxicity of less studied targeted substances. . . ." But, the same document acknowledges that "[t]he available data on PFDA toxicokinetic behavior and toxicity is sparse" and that the RPF calculations for PFDA are based, in part, on "read-across from the questionable PFNA value and therefore does not provide reliable evidence of different potencies." As with PFHpA, it is inappropriate to assume a toxicological profile for PFDA where data is lacking or unreliable.

In addition, this "read-across" approach deployed by MassDEP in the absence of data is at odds with other statements in the same document claiming that it is appropriate to apply a standard to the six compounds included in the proposed standard "as a group." MassDEP reached that conclusion "based on consideration of similarities in chemical structure; overlap in toxicity values derived by various agencies; similarity in toxic responses; prolonged serum half-lives; and evaluation of relative potencies." But, MassDEP simply assumed toxicity similarities for at least three of the six substances it aims to regulate. This approach layers assumptions and uncertainty factors on top of each other numerous times to reach a conclusion that is not supported by any science cited by the agency.

II. The similarities among the six PFAS are insufficient to support a combined standard

MassDEP has made a series of assumptions that lack scientific rigor and result in an overly conservative MCL. For example, when MassDEP established the ORSG of 70 ppt for drinking water for perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), PFHxS and PFHpA, it "extended the United States Environmental Protection Agency (USEPA) toxicity values (reference doses or RfDs), Health Advisories (HA) for drinking water and additive toxicity approach for PFOA and PFOS to this subgroup." In other words, MassDEP took EPA's health advisory level for PFOA and PFOS combined and extended it to include three additional substances based largely on assumptions of similarities. There is no scientifically sound basis to assume two of those five substances shares toxicity characteristics with the other substances in MassDEP's subgroup.

After "extending" EPA's health advisories to additional substances, including one for which there is a "dearth" of toxicity data, MassDEP has now added an additional substance (PFDA) for which it lacks toxicity data and added an additional uncertainty factor. The basis MassDEP identified for adding an additional uncertainty factor, that there is "considerable and convincing evidence associating exposures to these compounds with adverse responses in laboratory animals at levels of exposure lower than those relied upon by USEPA in its 2016 RfD derivations for PFOS and PFOA." But this is not a basis to add an uncertainty factor given the extensions and assumptions MassDEP has already relied upon and the addition of four other substances to a total value based on EPA's assessment for two substances.

III. There are numerous issues with the proposed implementation and applicability of the rule

First, MassDEP indicated during a February 20, 2020 "listening session" that the April 1, 2020 implementation date is a "placeholder." The regulated community and the public has not been properly informed that the implementation date is a placeholder. MassDEP must leave a sufficient amount of time from the end of a comment period until final proposal of a rule and then implementation.

Second, MassDEP should not use the same assumptions of water intake for non-transient non-community (NTNC) and Community water systems. Using the same water intake assumptions for both types of public water systems results in double counting water intake for individuals who rely on a Community water system for residential consumption and a NTNC water system for the work day, for example. This assumption alone results in an overly conservative MCL may be 100% higher than necessary. MassDEP recognized the importance of considering the relative contribution from the type of water system and determined that an MCL for transient non-community (TNC) water systems should be separately evaluated. MassDEP failed, however, to evaluate the relative contribution between NTNC and Community water systems.

Finally, proposed Section 310 CMR 22.07G(3) would require a level of precision that is not supportable by the science. This section requires calculation of the Running Quarterly Average by rounding to two significant figures when available science, as acknowledged by

MassDEP on page VI of its Technical Support Document, only allows for rounding to one significant figure.

3M appreciates the opportunity to provide comments on the proposed rule. Thank you for your consideration.

Regards,

Oyebode A. Taiwo, MD, MPH

From: Risotto, Steve <Steve_Risotto@americanchemistry.com>
Sent: Friday, February 28, 2020 4:05 PM
To: Director-DWP, Program (DEP)
Subject: ACC comment on proposed drinking water regulations for PFAS

All –

The American Chemistry Council's comments on the proposed MCLs for 6 PFAS are attached.

Steve

Stephen P. Risotto
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(202) 249-6727 (voice)
(571) 255-0381 (mobile)

Attachment: ACC comment on MassDEP MCL proposal for 6 PFAS.pdf

BY ELECTRONIC MAIL

February 28, 2020

Mr. Martin Suuberg
Commissioner
Massachusetts Department of Environmental Protection
1 Winter Street
5th Floor
Boston, MA 02108

Re: Proposed amendments to 310 CMR 22.00, MA Drinking Water Regulations, to establish a maximum contaminant level for six perfluoroalkyl substances

Dear Commissioner Suuberg:

The Chemical Products and Technology Division of the American Chemistry Council (ACC/CPTD) submits the following comments on the proposed maximum contaminant level (MCL) for six perfluoroalkyl substances (PFAS) – perfluorohexane sulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), and perfluorodecanoic acid (PFDA). ACC represents a number of companies with an interest in the use of the best scientific information to develop standards for PFAS such as the MCL under consideration by the Department of Environmental Protection (MassDEP).

As described below, ACC/CPTD is concerned about the following aspects of MassDEP's proposal –

- revisions to the reference dose (RfD) for PFOA and PFOS developed by the US Environmental Protection Agency (USEPA),
- application of a Single Standard to Multiple PFAS, and
- errors in the assumptions related to the intake of PFAS via drinking water.

Moreover, MassDEP has not provided an estimate of the cost of compliance with the proposed MCL.

Revisions to the USEPA RfD for PFOA and PFOS are Not Justified by the Available Data

In assessing the health effects of PFOS and PFOA, MassDEP discusses evidence from additional rodent studies suggesting that adverse health effects may occur at levels below those established by USEPA for the development of its lifetime health advisory (LHA). USEPA considered all but one of the studies cited by MassDEP as part of its 2016 analysis, however, and chose not to incorporate these data into the LHA derivation. The sixth study by Koskela *et al.* (2016) was derived from one of the other studies reviewed by USEPA and suffers from many of the same limitations that will be discussed below.

Although acknowledging the weaknesses in the cited studies, MassDEP concludes that these data suggest potentially more sensitive endpoints than those selected by USEPA and applies a data base uncertainty factor (UF_D) of 3 to USEPA's reference dose (RfD). The decision appears to be based on analyses conducted by other regulatory agencies, and not on MassDEP policy. According to USEPA guidance, a UF_D is generally applied when reproductive and developmental toxicity studies are missing since they have been found to provide useful information for establishing the lowest no adverse effect level.[1] The EPA guidance notes that, for a reference dose (RfD) based on animal data, a factor of 3 is often applied if either a prenatal toxicity study or a two-generation reproduction study is missing, or a factor of 10 may be applied if both are missing.[2] In deciding whether to apply an UF_D, EPA advises that the assessor should consider both the data lacking and the data available for particular organ systems as well as life stages.[3]

For PFOA and PFOS, the reproductive and development data base is robust and does not suggest the need to account for an incomplete characterization of toxicity. As described below, the evidence for developmental effects for PFOA are contradicted by other research and not suggestive of an adverse effect. Similarly, the potential immunotoxic effects of PFOS have been studied in both laboratory animals and humans and fail to demonstrate consistent evidence of an adverse effect. While ACC/CPTD appreciates the proposal to apply a lower UF_D of 3, the available data indicate that no uncertainty factor is necessary for either substance.

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1 USEPA Risk Assessment Forum. A review of the reference dose and reference concentration processes. EPA/630/P-02/002F (December 2002). https://www.epa.gov/sites/production/files/2014-12/documents/rfd-final.pdf

2 Dourson ML *et al.* (1996) Evolution of science-based uncertainty factors in noncancer risk assessment. *Regul Toxicol Pharmacol* 24:108–120 (1996).

3 USEPA 2002.

PFOA

MassDEP's analysis describes reports of developmental and liver effects in animals exposed to PFOA in support of the application of a UF_D of 3. Two of the reports come from a study with the adult offspring of C57BL/6/Bkl mice exposed to PFOA in their diet through gestation. Both studies include a small number of animals and a single-dose which severely limits their value as critical studies for evaluating low-dose exposures to PFOA. In the first of these studies by Onishchenko *et al.* (2011), mild sex-related differences in exploratory behavior patterns in offspring were reported after 5 weeks of age.[4] PFOA-exposed males were more active, while PFOA-exposed females were less active, than their respective controls. In the second study, Koskela *et al.* (2016) reported mild alterations in bone morphometry and mineral density of femurs and tibias in mice while noting that the biomechanical properties of the bones were not affected.[5]

Based on the absence of an impact on mechanical function, the biological significance of bone geometry and mineral density alterations reported by Koskela *et al.* is uncertain and may suggest a nontreatment-related adverse effect. Notably, no statistically significant increases in the occurrence of malformations/variations compared with controls were observed in similar studies conducted with rats.[6,7] Koskela *et al.* also appear to have conducted their statistical analysis on a per-fetus basis. This is scientifically unjustified. In reproductive/developmental studies, statistical analysis should be performed on each litter rather than on each pup in a litter as advised by EPA's guidelines for assessing developmental toxicity[8].

Lau *et al.* (2006) also reported skeletal effects in the offspring of mice exposed to PFOA by gavage, but the effects did not change in a dose-related manner.[9] Consequently, the effects

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4 Onishchenko N *et al.* Prenatal exposure to PFOS or PFOA alters motor function in mice in a sex-related manner. *Neurotox Res* 19, 452–461 (2011).

5 Koskela A. *et al.* Effects of developmental exposure to perfluorooctanoic acid (PFOA) on long bone morphology and bone cell differentiation. *Toxicol Appl Pharma* 301:14-21 (2016).

6 Staples RE *et al.* The embryo-fetal toxicity and teratogenic potential of ammonium perfluorooctanoate (APFO) in the rat. *Fundam Appl Toxicol* 4(3 Pt 1): 429–440 (1984).

7 Butenhoff JL *et al.* The reproductive toxicology of ammonium perfluorooctanoate (APFO) in the rat. *Toxicol* 196(1–2):95–116 (2004).

8 EPA. Guidelines for developmental toxicity risk assessment. Risk Assessment Forum. EPA/600/FR-91/001(December 1991). (EPA Guidelines 1991). https://www.epa.gov/risk/guidelines-developmental-toxicity-risk-assessment

9 Lau C *et al*. Effects of perfluorooctanoic acid exposure during pregnancy in the mouse. *Toxicol Sci* 90(2): 510–518 (2006).

noted by Lau *et al.* would generally not be considered relevant to PFOA exposure.[10] In noting the striking difference between their result and the minor effects reported in the two-generation study in rats by Butenhoff *et al.* (2004), Lau *et al* (2006) suggest that they are most likely related to pharmacokinetic differences between the two species.

MassDEP also points to reports of delayed mammary gland development in the offspring of female mice exposed by gavage during pregnancy.[11] In fact, the results in the mouse studies support a peroxisome proliferator activated receptor alpha (PPARα)-activated mechanism in mice. While the cited study reported a delay in mammary gland development in CD-1 mice, Albrecht *et al.* (2013) did not find alterations in mammary gland development in offspring of wild type, PPARα-null, or PPARα humanized mice following *in utero* exposure to PFOA by gavage.[12] In a multi-generational study with CD-1 mice exposed to PFOA (gavage and drinking water) conducted by White et al (2011), no clear dose-response was reported and the investigators noted that the delay in mammary gland development did not appear to affect lactational support based on normal survival and growth of the second generation (F2) offspring.[13]

MassDEP also points to evidence that hepatic effects noted in animals exposed to PFOA may not be solely dependent on PPARα and, therefore, may be relevant to humans. Increased relative liver weight is a common effect of PFOA in animal studies that has been reported to occur at lower levels of exposure than those causing effects on other organ systems.

The C8 Health Project is a large epidemiological study conducted in communities surrounding a manufacturing facility in Parkersburg, West Virginia that used PFOA from the 1950s until 2002. The study included over 32,000 adult residents and facility workers. The Science Panel formed as part of this project concluded that "there is not a probable link between exposure to C8 (also known as PFOA) and liver disease." [14]

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10 EPA Guidelines 1991, at 13. The 1991 guidelines note that a dose-related increase in variations in skeletal ossification is interpreted as an adverse developmental effect, but assessing the biological significance of the variation must take into account what is known about the developmental stage.

11 Macon MB *et al.* Prenatal perfluorooctanoic acid exposure in CD-1 mice: Low dose developmental effects and internal dosimetry. *Toxicol Sci* 121(1):134–145 (2011); Tucker DK *et al.* (2015). The mammary gland is a sensitive pubertal target in CD-1 and C57Bl/6 mice following perinatal perfluorooctanoic acid (PFOA) exposure. *Reprod Toxicol* 54: 26–36 (2015).

12 Albrecht PP *et al.* A species difference in the peroxisome proliferator-activated receptor α-dependent response to the developmental effects of perfluorooctanoic acid. *Toxicol Sci* 131:568–582 (2013).

13 White SS *et al.* Gestational and chronic low-dose PFOA exposures and mammary gland growth and differentiation in three generations of CD-1 mice. *Environ Health Persp* 119(8):1070–1076 (2011).

14 The C8 Science Panel conclusions are summarized at http://www.c8sciencepanel.org/prob_link.html.

The conclusions of the C8 Science Panel are supported by the recent work of Convertino *et al.* (2018) who reported no differences in clinical measures (including triglycerides, urea, glucose, serum AST, GGT, alkaline phosphatase, total bilirubin, fibrinogen, PTT and aPTT) at weekly PFOA doses as high as 1200 milligrams (about 16 milligrams/kilogram or mg/kg), among a sensitive sub-population of cancer patients.[15] The authors concluded that the disparity between animal and human liver endpoint studies, emphasizing a lack of risk of human enlarged liver, fatty liver, or cirrhosis, can likely be attributable to mode-of-action differences. Increased liver weight due to hepatocellular hypertrophy can be an adaptive (protective) effect in animals due to up-regulation of detoxification enzymes, leading toxicologists to revisit key liver endpoint studies.[16] Research has shown that many metabolic effects of exposure to PFOA and PFOS observed in rodents can be explained by the activation of hepatic xenosensor nuclear receptors such as PPARα.[17] These effects are of questionable relevance for human health risk assessment since the associated hepatic proliferative response in mice has not been observed in humans.[18]

The results noted by MassDEP, moreover, come from short-term studies lasting only 14 to 17 days. Although increases in hepatocellular hypertrophy and liver weight were observed at slightly lower doses in these studies, the study by Perkins *et al.* (2004) is the more relevant for assessing hepatic effects since it included dietary exposure durations of up to 13 weeks. In addition, Perkins *et al.* is one of the few studies to report a no observed adverse effect level (NOAEL). Most of the other studies did not identify a NOAEL and could only report a lowest observed adverse effect level (LOAEL) which means that further mathematical conversions (safety factors) to derive a NOAEL send the resulting level lower than necessary.[19]

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[15] Convertino M *et al.* Stochastic pharmacokinetic-pharmacodynamic modeling for assessing the systematic health risk of perfluorooctanoate (PFOA). *Toxicol Sci* 163(1) 293-306 (2018).

[16] Hall, A.P. *et al.* (2012). Liver Hypertrophy: A Review of Adaptive (Adverse and Non-Adverse) Changes- Conclusions from the 3rd International ESTP Expert Workshop. Toxicological Pathology. 40:971-994.

[17] See for example: Bjork JA *et al.* Multiplicity of nuclear receptor activation by PFOA and PFOS in primary human and rodent hepatocytes. *Toxicol* 288: 8-17 (2011).

[18] An understanding of the biological functions and role in chemical effects of PPARα has been facilitated by the use of a mouse model that lacks a functional PPARα (the *PPARα*-null mouse). Many of the effects of peroxisome proliferators have been shown to be mediated by PPARα as these effects were not observed in similarly treated *PPARα*-null mice. See Corton JC *et al.* Mode of action framework analysis for receptor-mediated toxicity: the peroxisome proliferator-activated receptor alpha (PPARα) as a case study. *Crit Rev Toxicol* 44(1):1-49 (2014).

[19] A similar NOAEL of 0.05 mg/kg per day can be obtained from Kennedy *et al.* (1987) when standard assumptions for food intake and bodyweight in rats are used, but the authors did not provide actual values of measured doses. Kennedy GL. Increase in mouse liver weight following feeding of ammonium perfluorooctanoate and related fluorochemicals. *Toxicol Lett* 39(2-3):295-300 (1987).

In addition to *ad libitum* controls, moreover, Perkins *et al.* provide pair-fed controls to ensure that effects did not result from differences in food consumption across dose groups. Finally, PPAR-α activity was measured in the Perkins *et al.* study. This is important because it provides insight into a possible biological basis for the increase in liver weight. PPAR-α is a nuclear receptor and its activation is one possible mechanism for liver hypertrophy in rodents. However, in the Perkins *et al.* study, there was only a slight (not statistically significant) increase in PPAR-α activity at doses greater than 1.94 mg/kg per day indicating that the hepatocellular hypertrophy observed was not associated with peroxisome proliferation.

Since humans are much less responsive to xenobiotic-induced PPAR-α activation than rodents, the effects on PPAR-α reported in the Perkins *et al.* study are more similar to humans. For the reasons mentioned previously (*i.e.*, a human study that found no liver effects and the potential for hepatocellular hypertrophy not to be adverse), using the findings from the Perkins study for purposes of extrapolation should nonetheless be considered precautionary.

Benchmark dose modeling of the data from Perkins *et al.* produces a reference dose (RfD) significantly higher than that derived by USEPA.[20]

PFOS

MassDEP points to the reports of immune effects in animals exposed to PFOS as the basis for adding a UF_D of 3 to USEPA's RfD. The results of the available immune effect studies are conflicting, however, and led both USEPA and Health Canada to express concerns about the significance of these data to assessing the risk to humans.

Several studies have investigated potential effects on the immune system – natural killer (NK) cell activity and plaque forming cell (PFC) response in mice exposed to PFOS. Although the studies reported effects on components of the immune system, USEPA concluded that the differences in the levels at which effects were reported (and conflicts in the direction of the effects) "highlight the need for additional research to confirm the NOAEL and LOAEL for the immunological endpoints."[21] Health Canada reached a similar conclusion noting that "[f]urther exploration should be performed to address the nearly two orders of magnitude difference in LOAELs in the studies before these endpoints can be reliably considered as a basis for risk assessment."[22] The inconsistency of these study results is detailed below.

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20 USEPA. Health effects support document for perfluorooctanoic acid (PFOA). EPA 822-R-16-003. Office of Water (May 2016).

21 USEPA 2016.

22 Health Canada. Guidelines for Canadian Drinking Water Quality – Guideline Technical Document – Perfluorooctane Sulfonate (PFOS). Ottawa, Ontario (2018).

While Dong *et al.* reported a NOAEL of 0.0167 milligrams per kilogram (mg/kg) per day, resulting in an average serum levels of 2.36 milligrams per liter (mg/L) for decreased PFC response in male C57BL/6 mice exposed to PFOS by gavage, [23,24] a dietary study involving B6C3F1 mice did not find a change in PFC response in males exposed to 0.25 mg/kg per day for 28 days, resulting in serum PFOS levels of 12 mg/L.[25] In the only study designed to measure immune system effects on components of the immune system in rats, the NOAEL (for serum IgG levels) was several orders of magnitude higher than some of the LOAELs from mouse studies. [26] The point of departure derived from both the $B6C3F_1$ mouse and rat studies are significantly higher than that used by USEPA.

Sensitivity to immunological effects in the animal studies appears to be dependent on several factors – including species (mice vs rat), route of exposure (gavage vs diet), and exposure duration. In addition, a study with PPARα-null 129/Sv mice suggests that immunomodulation in mice is partially dependent on PPARα and may be rodent-specific.[27] Consequently, USEPA and Health Canada have stressed the need for more research.

Human studies generally report no increase in infection rates in children or adults exposed to PFOS and both USEPA and Health Canada have questioned whether the small variations in the antibodies observed in the available studies are sufficient to result in adverse health effects in humans. As the National Toxicology Program (NTP) noted in its review of PFOS the "effects on diverse endpoints such as suppression of the antibody response and increased hypersensitivity may be unrelated."[28]

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23 Dong GH *et al.* Sub-chronic effect of perfluorooctanesulfonate (PFOS) on the balance of type 1 and type 2 cytokine in adult C57BL6 mice. *Arch Toxicol* 85(10): 1235–1244 (2011).

24 Dong GH *et al.* Chronic effects of perfluorooctanesulfonate (PFOS) exposure on immunotoxicity in adult male C57BL/6 mice. *Arch Toxicol* 83:805–815 (2009)

25 Qazi MR *et al.* 28-day dietary exposure of mice to a low total dose (7 mg/kg) of perfluorooctanesulfonate (PFOS) alters neither the cellular compositions of the thymus and spleen nor humoral immune responses: Does the route of administration play a pivotal role in PFOS-induced immunotoxicity? *Toxicol* 267, 132–139 (2010).

26 Lefebvre DE *et al.* Immunomodulatory effects of dietary potassium perfluorooctane sulfonate (PFOS) exposure in adult Sprague -Dawley rats. *J Toxicol Environ Health A* 71:1516-1525 (2008).

27 Qazi MR *et al.* The atrophy and changes in the cellular compositions of the thymus and spleen observed in mice subjected to short-term exposure to perfluorooctane sulfonate are high-dose phenomena mediated in part by peroxisome proliferator-activated receptor-alpha (PPARα). *Toxicol* 260:68–76 (2009)

28 NTP. Monograph on Immunotoxicity Associated with Exposure to Perfluorooctanoic acid (PFOA) or Perfluorooctanoic Sulfonate (PFOS). Office of Health Assessment and Translation. (September 2016).

The Available Science Does Not Support Applying a Single Value to Multiple PFAS

MassDEP has proposed applying a single drinking standard to the sum of six PFAS that vary significantly in the availability of potential adverse health effects information and metabolism patterns and kinetics. While the use of a single value for multiple PFAS may be useful for screening purposes, it is not appropriate for establishing a regulatory standard. Much is known about PFOS and PFOA, but considerably less data are available for the other four substances.[29] Even in the case of PFOS and PFOA, the mechanism by which exposure to these substances causes adverse health effects in laboratory animals is unknown.

The grouping of substances under a single standard is justified only when the substances are believed to cause adverse health effects by the same mechanism of action.[30] This is clearly not the case for the six substances identified by MassDEP. Although the USEPA's lifetime Health Advisories (LHAs) for PFOS and PFOA are based on developmental effects, the critical developmental endpoints identified by EPA do not suggest a common mechanism.[31] Similar evaluations of the potential adverse health effects of exposure to PFHxS, PFHpA, PFNA, or PFDA are not available from EPA, and the draft evaluations for PFHxS and PFNA from the Agency for Toxic Substances and Disease Registry (ATSDR) indicate that a very limited amount of data exist for these substances – particularly data related to mechanism of action. Moreover, in the case of both PFDA and PFHpA, ATSDR concluded that "insufficient data are available for derivation" of minimum risk levels.

MassDEP's conclusions are based on the results of 28-day *in vivo* studies with five of the six PFAS conducted by NTP which reported liver and thyroid effects. In considering these effects, NTP notes that --

> research suggests that the mechanism for many of the two-year study findings [for PFAS] could be related to PPARα activation, which has questionable relevance for human health. In other cases, the human health impacts of NTP's findings may not be known.[32]

For two of the six PFAS included in the proposal – PFHpA and PFDA – MassDEP notes that sufficient toxicity data are lacking and its analysis is dependent on a "read across" analysis to estimate toxicity. Based on this analysis, in fact, MassDEP concludes that "the data on [PFHpA] are sufficient

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29 ATSDR. Toxicological profile for perfluoroalkyls - draft for public comment (June 2018).

30 EPA. Guidance for identifying pesticide chemicals and other substances that have a common mechanism of toxicity. Office of Pesticide Programs (January 26, 1999). https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/guidance-identifying-pesticide-chemicals-and-other

31 In addition, EPA's selection of the point of departure (POD) for developmental effects for both PFOS and PFOA are not consistent with the conclusions of the authors of the papers from which they are derived.

32 Chad Blystone. NTP Studies of per- and poly-fluoroalkyl substances: understanding human translation. Presentation to the NTP Board of Scientific Counselors, February 21, 2020.

to conclude that it is <u>not</u> appropriate to consider it as being toxicologically equivalent to the other compounds." It is not clear why PFHpA remains in the current proposal.

Existing calculations of the health risks associated with exposure to PFAS are highly dependent on estimates of the terminal elimination half-lives of the substances. In the case of the PFAS identified by MassDEP, significant differences exist. While the terminal elimination half-life of PFHxS in humans is estimated to be on the order of 5 to 8 years, the terminal elimination half-life for PFHpA is estimated to be much shorter, on the order of 70 days,[33] and the limited data for PFDA and PFNA do not allow for a robust estimate of their respective terminal elimination half-life.[34]

The Proposal Significantly Overestimates the Intake of PFOA and PFOS via Drinking Water

In developing the proposed MCL, Mass DEP assumes a relative source contribution (RSC) of 20 percent. Although 20 percent is often used as a default assumption for the exposure resulting from drinking water, the available evidence suggest that other sources of potential exposure to the two major substances -- PFOA and PFOS -- have declined drastically. According to data collected by the Center for Disease Control and Prevention (CDC), mean serum levels of PFOS declined by 85 percent in the US population between 1999 and 2016.[35] According to CDC, mean serum levels of PFOA declined by 60 percent over the same time frame (see Figure 1). Given those dramatic declines, it is inappropriate to assume that 80 percent of exposure to these substances comes from sources other than drinking water. While a few other states have assumed an RSC of 50 or 60 percent, it is likely that the contribution of drinking water to overall exposure is even higher – particularly in areas where drinking water contamination has been detected.

MassDEP further assumes a water intake rate of 0.054 liters per kilogram body weight per day (L/kg-day) which corresponds to the 95th percentile "for the first year of life." However, the reference dose of 0.00002 mg/kg per day developed by US EPA for both PFOA and PFOS, and used by MassDEP, is based on developmental effects. As a result, the more appropriate water intake rate should be the EPA recommended value of 0.038 L/kg-day for pregnant women.[36]

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33 Russell MH *et al.* Inhalation and oral toxicokinetics of 6:2 FTOH and its metabolites in mammals. *Chemosphere* 120:328–335 (2015).

34 ATSDR 2018.

35 CDC. Fourth National Report on Human Exposure to Environmental Chemicals (2019). https://www.cdc.gov/exposurereport/index.html

36 EPA. Update for Chapter 3 of the Exposure Factors Handbook – ingestion of water and other select liquids. Office of Research and Development. Washington, DC. EPA/600/R-18/259F (February 2019), at 3-7.

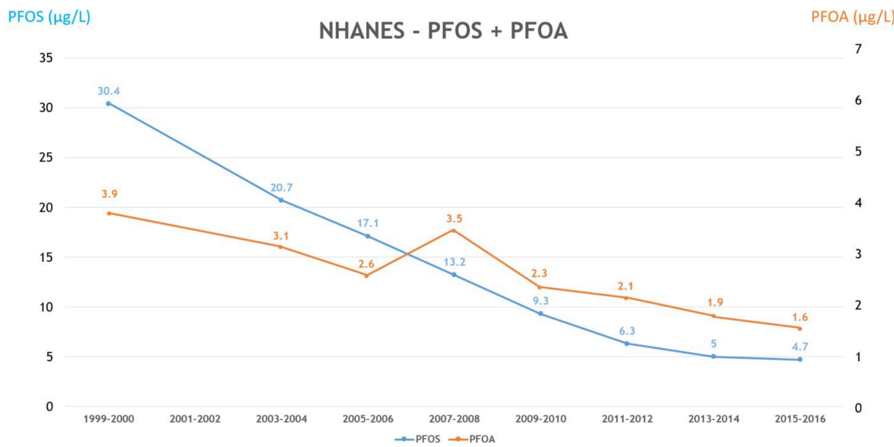

Figure 1. Serum levels of PFOA and PFOS, 1999-2016.[37]

MassDEP Has Not Evaluated the Cost of Its Proposal

The Department has not provided information on how many public water supplies will be affected by the proposal or an estimate of the cost of compliance for the individual suppliers or for the state. Estimates developed by other states indicate that the capital and maintenance costs of treatment technology can be considerable, and none have attempted to estimate the cost for compliance with a standard based on the sum of multiple PFAS. Before moving ahead, it is critical that MassDEP provide the public with information on the estimated costs and benefits of its proposal.

Since these capital and maintenance costs will ultimately be passed onto the customers (i.e., ratepayers) of the water systems, it is imperative that MassDEP also evaluate how these costs would impact the households served by the systems. In addressing the costs for individual households, EPA's National Drinking Water Advisory Council (NDWAC) recommends that a given drinking water standard be considered affordable if the annual cost per customer to meet the standard does not exceed 1.0% of the median household income for the median system in each drinking water system size category.[38] Without estimating the increased cost to households served by the affected water systems, EGLE cannot determine whether the proposed MCLs will or will not cause economic harm.[39]

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37 Human exposure monitoring is conducted as part of CDC's National Health and Nutrition Examination Survey (NHANES).

38 https://www.epa.gov/ndwac

39 It is also likely that the initial and ongoing sampling costs associated with the DES proposal will be passed onto customers and should be included in DES' affordability calculation.

Summary

ACC/CPTD urges MassDEP to revise its proposed MCL to include individual standards for PFOA and PFOS only. If the Department wishes to develop standards for the four other PFAS, the values should be derived from the available data for each individual substance. There is no scientific basis for applying a single value to the six PFAS molecules included in this proposal. . To do so would be a departure from the approach taken by most other authoritative bodies. In addition, the MCL calculation should be based on realistic assumptions of the relative source contribution from drinking water and water consumption rates and a robust assessment of economic and technical feasibility.

Sincerely,

Steve Risotto

Stephen P. Risotto
Senior Director

From: Friedman, Alexa <lexf@bu.edu>
Sent: Friday, February 28, 2020 10:15 AM
To: Director-DWP, Program (DEP)
Cc: Haley, Bethany, Marino
Subject: Written Comment Submission for Proposed Changes to the Massachusetts Contingency Plan (MCP) Cleanup Standards for PFAS

To Whom It May Concern:

Attached is a written comment Re: Proposed Changes to the Massachusetts Contingency Plan (MCP) Cleanup Standards for PFAS in Groundwater and on MassDEP's Office of Research & Standards and the Drinking Water Program's Consideration of PFAS

Thank you,

Alexa Friedman
Doctoral Student
Boston University School of Public Health
Department of Environmental Health

Attachment: PFAS_Comment_BHAF.pdf

February 28th, 2020

[*via* electronic mail]
Elizabeth Callahan
MassDEP
One Winter Street
Boston, MA 02108
Email: BWSC.Information@Mass.Gov

Re: Proposed Changes to the Massachusetts Contingency Plan (MCP) Cleanup Standards for PFAS in Groundwater and on MassDEP's Office of Research & Standards and the Drinking Water Program's Consideration of PFAS

As doctoral students in the Environmental Health department at Boston University School of Public Health, we study drinking water contaminants, including per and poly-fluoroalkyl substances (PFAS), and their relationship with health. We are writing in **support of the proposed changes to the Massachusetts Contingency Plan (MCP) Cleanup Standards for PFAS in Groundwater.** Specifically, we support regulating the six proposed PFAS chemicals (PFOS, PFOA, PFDA, PFHpA, PFHxS, and PFNA) as a group based on similar structures, behavior in the environment and humans, and chemical half-lives.

There is an overwhelming body of evidence illustrating the adverse health effects of some PFAS, a class of over 4,000 chemicals (ASTDR, 2018). Regulation of PFAS is of utmost concern because these chemicals have now been found ubiquitously in the environment and in human serum (CDC, 2016). Although PFAS exposure can occur through many routes, an important and controllable source is drinking water (Hu et al. 2016), underscoring the importance of drinking water regulations. PFAS chemicals are found in breastmilk (Goeden, Greene, and Jacobus 2019) and are able to cross the placenta from mother to the fetus (Cai et al. 2020), indicating that children can be exposed during critical developmental stages in utero and during early life. Health protective drinking water standards are especially important for the safety of vulnerable populations like children.

PFAS have been found to be highly persistent in the environment and human tissues. Substances in this class of chemicals contain carbon-fluorine bonds, some of the strongest to be found in nature (Buck et al., 2011). Some PFAS, often called "forever chemicals," remain in human tissues on the order of years with the lowest predicted half-life of 2.3 years (Bartell, 2010). There is consistent and overwhelming evidence that the half-lives of perfluorooctanoate (PFOA) and perfluorooctane sulfonic acid (PFOS), as outlined in the Technical Support Document for the derivation of the drinking water standard (MASSDEP, Appendix 3), remain in the body for years. It is hypothesized that the environmental half-life of the six grouped chemicals is longer than in human tissue, but that is yet to be truly quantified because they are so highly persistent (NIHES, 2019).

It is appropriate to regulate the six proposed chemicals together based on their similar chemical structures and half-lives. PFAS are a class of human-made chemicals that consist of fluorinated carbon chains attached to functional groups (e.g. sulfonic acids) (Buck et al., 2011). Currently, the class of chemicals are categorized into long and short-chain PFAS. Long-chain PFAS typically are designated as perfluoroalkyl sulfonic acids containing ≥ 6 carbons (e.g., PFOS with 8 carbons) and perfluoroalkyl carboxylic acids with ≥ 7 carbons (e.g., PFOA with 8 carbons). Short-chain PFAS have fewer carbons, such as perfluorobutanoic acid (PFBA) with 4 carbon molecules. The chain length has been shown to affect the half-life of these chemicals. Shorter-chain PFAS have correspondingly shorter half-lives in both the environment, humans and animals (Wang et al., 2013) and differ in regard to health outcomes and movement in the body and plants (Scher et al. 2018). Five of the six chemicals that are included in the proposed PFAS MCL are long-chain PFAS. The exception, PFHpA, is considered a short-chain PFAS although it has 7 carbon molecules. Given what we know about the long half-lives of PFOA and PFOS, regulating these other long-chain chemicals as a class based on their structure is protective for the health of humans and the environment given their likely persistence and behavior.

Finally, it makes sense to regulate the proposed chemicals as a group because recent studies have found that they are associated with similar health outcomes and target organs, including the liver. Human hepatic effects such as increases in serum enzymes, decreases in serum bilirubin (PFOA, PFOS, and PFHxS), and increases in serum lipid levels (PFOA, PFOS, PFNA, and PFDA) have been associated with perfluoroalkyl exposure (ASTDR, 2018). Acute, intermediate, and chronic oral studies in rats, mice, and monkeys indicate that the liver is a sensitive target of PFOA, PFOS, PFHxS, PFNA, PFDA, PFUA, PFBA, PFBuS, PFDoA, and PFHpA toxicity (ATSDR, 2018). PFOA and PFOS have been found to have other overlapping health outcomes. For example, both PFOA and PFOS are associated with pregnancy-induced hypertension and/or pre-eclampsia (C8 Health Study, 2011) and an increased risk of thyroid disease (PFOA and PFOS). Thirdly, a number of analytes are associated with decreased antibody responses to vaccines (PFOA, PFOS, PFHxS, and PFDA)(ASTDR, 2018, Grandjean et al. 2017). These studies collectively show that PFOS, PFOA, PFDA, PFHpA, PFHxS, and PFNA act similarly on health and that health-protective regulations need to consider the cumulative health effects of mixtures of PFAS chemicals that may act on the same systems in the body.

PFAS chemicals are a threat to human health. Drinking water is a common source of PFAS exposure. We support regulating these six proposed analytes (PFOS, PFOA, PFDA, PFHpA, PFHxS, and PFNA) as a group in drinking water because they are structurally similar with long half-lives and have been shown to act on similar target organs and systems, compounding their health effects.

Sincerely,

Alexa Friedman   Beth Haley

Alexa Friedman
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Beth Haley, MA
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References

Agency for Toxic Substances and Disease Registry (ATSDR). 2018. Toxicological profile for Perfluoroalkyl. (Draft for Public Comment). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Buck RC, Franklin J, Berger U, Conder JM, Cousins IT, de Voogt P, et al. Perfluoroalkyl and polyfluoroalkyl substances in the environment: terminology, classification, and origins. Integrated environmental assessment and management. 2011;7(4):513-41. Epub 2011/07/28. doi: 10.1002/ieam.258. PubMed PMID: 21793199; PubMed Central PMCID: PMCPMC3214619.

C8 Health Panel Study. 2011. Probable Link Evaluation of Pregnancy Induced Hypertension and Preeclampsia. Retrieved from http://www.c8sciencepanel.org/pdfs/Probable_Link_C8_PIH_5Dec2011.pdf

Cai, Dan et al. 2020. “High Trans-Placental Transfer of Perfluoroalkyl Substances Alternatives in the Matched Maternal-Cord Blood Serum: Evidence from a Birth Cohort Study.” *Science of The Total Environment* 705: 135885.

Centers for Disease Control and Prevention (CDC). 2016. National Center for Health Statistics (NCHS). National Health and Nutrition Examination Survey Data. Hyattsville, MD: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Goeden, Helen M., Christopher W. Greene, and James A. Jacobus. 2019. “A Transgenerational Toxicokinetic Model and Its Use in Derivation of Minnesota PFOA Water Guidance.” *Journal of Exposure Science & Environmental Epidemiology* 29(2): 183–95.

Grandjean, Philippe et al. 2017. “Serum Vaccine Antibody Concentrations in Adolescents Exposed to Perfluorinated Compounds.” *Environmental Health Perspectives* 125(7). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5744724/ (February 24, 2020).

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Wang, Zhanyun, Ian T. Cousins, Martin Scheringer, and Konrad Hungerbühler. 2013. “Fluorinated Alternatives to Long-Chain Perfluoroalkyl Carboxylic Acids (PFCAs), Perfluoroalkane Sulfonic Acids (PFSAs) and Their Potential Precursors.” *Environment International* 60: 242–48.

From: Jim Occhialini <jocchialini@alphalab.com>
Sent: Friday, February 28, 2020 1:25 PM
To: Director-DWP, Program (DEP)
Cc: Jim
Subject: PFAS MCL Comments

Thank you for the opportunity to submit our comments.

Much appreciated,

Jim

Jim Occhialini
Vice President, Technical Sales
Email: jocchialini@alphalab.com
Mobile: 508-380-8618 | Direct: 508-898-9220 | Main: 800-624-9220
www.alphalab.com | Give Us Feedback
Important: New Customer Center Login Requirements

Attachment: MCL comments_2_28_2020_rev.docx

MassDEP Proposed Drinking Water Regulations to Address PFAS Contamination

Comments on the Analysis and Electronic Reporting Component in the Draft Regulations

Submitted by James Occhialini and James Todaro, Alpha Analytical

2/26/2020

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James Todaro
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Comments on the Analysis and Electronic Reporting Component in the Draft Regulations

To whom it may concern:

Thank you for the opportunity to review the draft regulations and provide our input. We greatly appreciate the Department seeking out feedback from the regulatory community at large and we believe it is in the best interest of both the regulator and regulated stakeholders. As an environmental laboratory, we have expertise in PFAS analysis and that is where our comments are focused. Specifically, we are concerned with some of the requirements for the MassDEP Lab Reporting Form and some of the guidance contained in the "How to Interpret my PFAS Laboratory Report and Understand how my Results Compare to MassDEP's Guideline Levels" guidance document.

1) MassDEP Lab Reporting Form requirement to report data less than the method reporting limit (MRL)

Typically environmental laboratories report drinking water analytical data to the MRL, which in this case is 2 ng/L. Given that these are drinking water samples, there should be no circumstances where samples need to be diluted due to high concentrations or matrix issues. Therefore it is expected that 2 ng/L will be the reported MRL. It goes without saying that 2 ng/L is extremely sensitive and much different from the 5 ng/L MRL used in the "Interpreting" document situation in calculating PFAS totals against the proposed 20 ng/L total. Given the sensitivity of this analysis and the potential for low level contamination from various sources, reporting at less than MRL for PFAS is typically not done and we would not recommend it.

However, if reporting data less than the MRL is going to be required, we do not believe that the process described in the guidance is in the best interest of the Department, the regulated community or the laboratories. Specifically, the MassDEP Reporting Form requires "one of the following - the sample result, or check the box < MRL or < 1/3 MRL" for every compound reported. As stated above, laboratories typically report to the MRL, especially for drinking water. The typical lab report then would not have "J" data or "estimated" data if reporting only to the MRL. "J" data is reported as values below the MRL but >MDL. Since the MassDEP Reporting form is an add on document in addition to the laboratory report, the person filling out the form does not have access to whether there were "J" flag hits or not. Furthermore, the 1/3 MRL cut off is not a value that is stored in laboratory databases. This value would result in 0.67 for a MRL of 2 and is a calculated value and not a stored value in the LIMs system. Therefore, determining whether or not to check this box will be a manual exercise for each compound in each sample requiring hand calculation in many cases. This requirement will slow down laboratory turnaround time and will increase the uncertainty associated with the data. This procedure will also add cost to the analysis because of the additional labor. In addition, we would expect that most, if not all of the reports where the box is checked indicating that there was a "hit" below the MRL will have a follow up call from the client asking what the result was. Due to the sensitive nature of this analysis and ongoing studies to provide the correct MRL and MCL, a check mark would not satisfy information needed to understand what level the checkmark was referring to and its implication from a health concern.

If the Department needs to have laboratories report information that is < MRL, then the requirement should be that laboratories need to report data to the MDL as "ND" non-detect with concentrations that are <MRL but >MDL reported with a "J" flag. Again, to reiterate, we would advocate to just report to the MRL for data certainty and time considerations. However if the choice is between reporting data greater than 1/3 of MRL or reporting to the MDL, we would advocate for reporting to the MDL with "J" flags from the laboratory perspective. This is because the MDL is populated in our databases and laboratory management software does not generate 1/3 MRL values automatically, which would then require this value to be hand calculated.

2) Results reported as <MRL, Table 4 "How to Interpret" document

Table 4 shows an example where a compound is reported <MRL (5 ng/L) and it states that a value of 2.5 (1/2 the MRL) be used for the summation for comparison with the 20 ng/L MCL. If Not Detected values are going to be summed as ½ MRL as a matter of practice, then there is little difference between using ½ MRL and the actual "J" flag value. It would be much simpler to just use ½ the MRL in the total summation if a compound is reported as < MRL than having to evaluate "J" flag results and determine if they are > 1/3 MRL.

Once again, thank you for the opportunity to provide input. So to summarize these comments, Alpha would advocate for the following:

1) do not report results/information < MRL but >MDL. The 500 series PFAS methods state that non-detect values are to be reported as less than the MRL. Reporting concentrations below the MRL would be an anomaly for drinking water compliance applications in general.

2) if, for the purposes of inclusion in the MCL summation evaluation, the Department requires a value less than the MRL to be used for any compound result that is reported as <MRL in the laboratory report, than the water utility or associated party would use the ½ MRL concentration obtained by dividing the MRL in the laboratory report by 2 and using that value in the summation.

3) if #2 above is not an option, have the laboratory report to the MDL and "J" flag hits that are <MRL but >MDL and use those "J" flag values as part of the MCL summation.

4) The state form currently includes columns for the lab to report one of the following items: Result; <MRL and <1/3 MRL The last two, <MRL and <1/3 MRL should be eliminated. These two columns only require a "Check Mark" which is not informative and cannot be determined without generating a report that contains "J" values and MDL. This is laborious and confusing and does not provide useful information to the client.
It should be clearly stated that "ND" or non-detect results are values below the MRL.

In addition to the specific reasons listed above concerning reporting <MRL data, it just seems that requiring utilities to have to incorporate 1/3 and ½ values to evaluate compliance with MCL seems confusing and overly complicated. We have been asked by clients to fill out this table for them, which we are not doing since it is being used for compliance purposes.

Respectfully submitted,

Alpha Analytical

From: Willson, Elizabeth <willsone@amherstma.gov>
Sent: Friday, February 28, 2020 2:27 PM
To: Director-DWP, Program (DEP)
Cc: Rusiecki, Amy; Mooring, Guilford
Subject: PFAS Proposed Regs Comment Ltr

Hello,
The Town of Amherst is submitting the attached written comments regarding the proposed changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00) involving the proposed creation of an MMCL for PFAS. The Town appreciates the opportunity to submit these comments, and will be following this discussion closely.

Thank you,
Beth

Beth Willson
Environmental Scientist
Town of Amherst
413-259-3104
willsone@amherstma.gov

Attachment: 20200228140539988.pdf

Town Of

AMHERST *Massachusetts*

OFFICE OF THE SUPERINTENDENT OF PUBLIC WORKS
586 SOUTH PLEASANT STREET
AMHERST, MA 01002
TEL. 413-259-3050 FAX 413-259-2414

February 28, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)

Dear Ms. DePeiza:

The Town of Amherst (the Town), with support of the Amherst Water Supply Protection Committee, wishes to submit the following written comments to the Massachusetts Department of Environmental Protection (MassDEP) on proposed changes to the Drinking Water Regulations, 310 CMR 22.00. The Town supports the comments that are being submitted by MWWA and urges MassDEP to consider them carefully before moving forward with any new rule.

The Town takes the protection of public health very seriously. Town water system managers and operators work hard to provide clean, safe drinking water to the residents of Amherst, and to ensure we are complying with the many Safe Drinking Water Act requirements. Per- and Polyfluoroalkyl Substances (PFAS) are something the Town is paying close attention to and understands that research, particularly on toxicity and human health effects of PFAS, is ongoing and evolving. Therefore, the Town has the following comments and concerns regarding the States approach to regulating PFAS in drinking water:

- The United States Environmental Protection Agency (EPA) has a rigorous process for evaluating contaminants of concern in drinking water and deciding whether regulation is warranted. EPA has released a National Strategy on PFAS and is working on implementation of its strategy. The Town joins with MWWA in asking you to let EPA take the lead on addressing regulation of PFAS, as this is an issue being seen across the country and it is not particular to Massachusetts.

- MassDEP is proposing to develop a Massachusetts Maximum Contaminant Level (MMCL) of 20 parts per trillion (ppt) for PFAS which includes six compounds: perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA), the Town would ask MassDEP to develop compound-specific standards for each of the PFAS compounds and not employ a cumulative approach. The compounds should not be combined because of different toxicity endpoints, different uncertainty factors between humans and mammal toxicities, different reference dosages, differences in half-lives, bioaccumulation, etc. There are also treatment and operational considerations that could be more challenging if the compounds are considered cumulatively.

- The Town has concerns about MassDEP's proposed MMCL compliance calculations including estimates of analytical results below the Minimum Reporting Level (MRL) and the Town urges MassDEP to exclude this from any final rule promulgated. Any detection below the MRL should not be governed by an arbitrary rule assuming a certain level exists; such an interpretation is not scientific. Values below the MRL should not be reportable, nor counted towards compliance calculations at these low parts per trillion levels. The Town is also concerned about the legal defensibility of estimating values below the MRL. Violations of the MMCL will most likely prompt a Public Water System to look for a Responsible Party. If the exceedance of the MMCL includes estimations of results, Responsible Parties will have grounds to argue that it is not a valid result because it is below the MRL.

- The Town also believes that MassDEP needs to consider ways to invalidate sample results if the Public Water System demonstrates that results were influenced by products used in the piping or plumbing of the sample location, involved human error, or if confirmatory sample results are markedly different than the initial results.

- The Town is very concerned that MassDEP address the following implementation challenges facing Public Water Systems before finalizing and implementing an MMCL:

    - The complexities, timing, and cost of designing, permitting and constructing treatment systems needs to be factored into MassDEP's timeline for enforcing the standards.
    - The existing timeframes and statutory constraints on being able to quickly procure goods, services, and equipment needs to be evaluated and resolved. MassDEP should work with the Operational Services Division to add necessary services and common treatment components to the state bid list.
    - MassDEP must provide the appropriate risk communication tools so that Public Water Systems have the information necessary to communicate with the public, especially if consumers have health questions or concerns.
    - MassDEP should be sure that the language in the "Consumer Notification" it intends to require is specific to the sensitive subpopulations that it is concerned with so that it does not overly alarm the general public.
    - MassDEP must provide context to relative exposures of PFAS in drinking water versus all other exposure points (consumer products, food, air, etc.). If we only concentrate on regulating PFAS in drinking water, we may be giving consumers a false impression they are protected, when in fact, there are many other sources of PFAS exposure in consumer products and food, being detected at even higher levels

than what is found in drinking water. If we are not addressing all these other exposures, intended public health protection will not be achieved

- Guidance must be provided to the public and/or sensitive subpopulations on the appropriate "PFAS-free" alternative water supply options (i.e. bottled water and appropriate Point of Use Filters).
- A definitive timeline must be set by which MassDEP's Bureau of Waste Site Cleanup will launch investigations into the source(s) of contamination of the drinking water to identify Responsible Parties.
- The Commonwealth **must identify additional grant funds** to assist Public Water Systems in paying for treatment of their drinking water.
- MassDEP must provide the appropriate technical and compliance assistance to help Public Water Systems comply with the new rule.

The Town thanks you for the opportunity to provide these comments. Amherst understands the importance of ensuring that drinking water meets Safe Drinking Water Act requirements and protects public health. The issue of emerging contaminants presents a huge challenge. Compliance with regulatory standards will fall on water systems and MassDEP has an obligation to determine what the real human risk exposure is, and then, when and if the science dictates, move towards standards that will achieve desired public health outcomes. As outlined in this letter, there are still many outstanding issues that need to be addressed before moving forward with these new regulations.

Sincerely,

Guilford Mooring
Superintendent
Amherst Public Works

From: Caredwen Foley <caredwen@bu.edu>
Sent: Friday, February 28, 2020 1:16 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Hello,
Attached is a comment on the proposed MassDEP PFAS MCL. The text of the comment is also included below. Thank you for the opportunity to comment.
Best,
Caredwen Foley

—

February 28, 2020
Elizabeth Callahan
Massachusetts Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108
Dear Ms. Callahan,

Thank you for the opportunity to comment on the proposed maximum contaminant limit for PFAS in public water supplies. I am a longtime Massachusetts resident and a graduate student in the Department of Environmental Health at Boston University. For the last several months, I have been studying PFAS groundwater contamination in the area surrounding the former Fort Devens military base, including conducting a risk assessment for consumers of private well water residing in Harvard, MA. I am gravely concerned by the health risks presented by persistent, bioaccumulative, toxic compounds, so I have closely followed the development of the proposed Massachusetts MCL and the regulatory approaches taken by other states. It is laudable that MassDEP will subject PFAS to an enforceable standard with respect to public water supplies, and particularly that the proposed standard is intended to protect even sensitive sub-populations. **While I support MassDEP's proposed 20 ng/L standard for the sum of the six designated PFAS species**, I would like to submit for your consideration two reservations about the proposed standard, one significant and one minor.

My serious reservation, and the reason my support for the standard is provisional, concerns whether the standard is adequately protective of infants and developing fetuses. While the Technical Support Document describes the significance of in utero and nursing exposures and highlights the enhanced protectiveness of the 20 ng/L standard for sensitive subgroups, I am unconvinced that a standard that protects pregnant or lactating persons is *a fortiori* sufficiently protective for developing fetuses and nursing infants. For this reason, I would encourage MassDEP to revisit its exposure assumptions and reevaluate whether 20 ng/L is indeed adequately protective for these populations. The propensity of PFOS and PFOA to bind to plasma proteins results in disproportionately high transplacental exposure to the developing fetus.[1] The partitioning of PFAS in breastmilk also results in doses received by nursing infants over four times higher than the doses received by the breastfeeding parent, particularly in the first few weeks of life when PFAS excretion in breastmilk is at its highest; ratios as high as 15-fold have been modeled.[2],[3] A standard that ensures that an adult woman has sufficiently low PFAS serum concentrations to protect her from adverse health effects may still allow her to accumulate a body burden of PFAS that yields breastmilk contaminated enough to present risks to her child. MassDEP indicates in the Technical Support Document that the presumed drinking water relative source contribution of 20% is intended to protect against potentially higher exposures incurred through nursing or transplacental exposure. The 20% RSC has been substantiated by studies examining PFAS plasma concentrations in adults exposed to tap water.[4] But without corroboration that this RSC is applicable to breastfeeding infants, applying a fivefold RSC may not represent adequate protection, since PFAS doses received from breastmilk may be four to fifteen times the doses received from drinking water.[5],[6]

My second concern is not about the standard itself, but concerns communications and guidance for residents and communities. I am concerned that setting a cumulative standard may place MassDEP in a challenging position as more is learned about the toxicity of currently-unregulated PFAS species. To be clear, I strongly support setting a cumulative standard, based on what is currently known about the co-occurrence, mechanism of action, toxicity, and persistence of PFAS species, and about the relationship between carbon chain length and these characteristics. However, if research eventually reveals that additional species have toxicological profiles similar to the six PFAS included in this standard, it is unclear to me how MassDEP would revise a summed standard without either 1.) including new species in the same cumulative limit, potentially reducing limits for each species below the detection limits of available approved methods and implying that the toxicity of individual previously-included species is lower than previously thought, or 2.) including new species and raising the total cumulative limit to a higher value, loosening the entire standard and undermining the rationale that mechanistic similarities between PFAS species justify summing exposures to them. In short, if detection technology does not dramatically improve, I am concerned that future changes to the cumulative standard could present both communications and feasibility challenges.

With these concerns in mind, I urge MassDEP to take the following steps.

1.) Revisit the toxicokinetic literature concerning transplacental and lactational PFAS exposure – particularly the Minnesota Department of Health model developed by Goeden et al., (2019) – and reconsider whether a 20 ng/L standard sufficiently accounts for the disproportionate partitioning of PFAS in breastmilk and the placenta, and the attendant increases in fetal and infant exposure through these routes (particularly given the susceptibility of these populations to PFAS's developmental effects)

2.) Publish additional clarification about:

   a. The types kind of evidence MassDEP would need to see about a particular PFAS species to consider adding that species to the 20 ng/L MCL, as well as the circumstances under which MassDEP might instead set an individual standard for any particular species

b. How residents and communities should interpret potential future inclusions of additional PFAS species in the 20 ng/L standard (i.e., emphasizing the importance of treating this class of compounds as a group, in order to counter the notion that including more species would imply that the safe threshold for any single species is decreasing)

c. Whether the MCP protocol for quantifying non-detects (i.e., treating samples with values of $^1/_3$MRL < x < MRL as $^1/_2$MRL) remains appropriate for very low, cumulative MCLs that apply to potentially-increasing numbers of species

I hope that MassDEP will endeavor to address these concerns, but – as both a researcher and a Massachusetts resident – I would like to again express my support for this rigorous standard, and my appreciation for the thoughtfulness, meticulousness, and candor with which MassDEP has approached this process. Thank you again for the opportunity to comment and for MassDEP's assiduous work on this important issue.

Respectfully,

Caredwen Foley

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[1] Goeden H, Greene C, Jacobus J. A transgenerational toxicokinetic model and its use in derivation of Minnesota PFOA water guidance. *J Expo Sci Environ Epidemiol*. 2019;29(2):183-195. doi:10.1038/s41370-018-0110-5

[2] Fromme H, Mosch C, Morovitz M, et al. Pre- and Postnatal Exposure to Perfluorinated Compounds (PFCs). *Environ Sci Technol*. 2010;44(18):7123-7129. doi:10.1021/es101184f

[3] Verner M-A, Ngueta G, Jensen E, et al. A Simple Pharmacokinetic Model of Prenatal and Postnatal Exposure to Perfluoroalkyl Substances (PFASs). *Environ Sci Technol*. 2016;50(2):978-986. doi:10.1021/acs.est.5b04399

[4] 1. Hu XC, Tokranov AK, Liddie J, et al. Tap water contributions to plasma concentrations of poly- and perfluoroalkyl substances (PFAS) in a nationwide prospective cohort of U.S. women. *Environ Health Perspect*. 2019;127(6). doi:10.1289/EHP4093

[5] Fromme et al. (2010)

[6] Verner et al. (2016)

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Caredwen Foley
MPH Student, Boston University School of Public Health
caredwen@bu.edu | 413-320-7979
She/her/hers

Attachment: 2-28-20 LSPA Comments on PFAS MCL.pdf

From: Carolyn Hoffman <cfhoff@bu.edu>
Sent: Friday, February 28, 2020 7:17 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Hello,

Attached below is my PFAS MCL Comment.

--
Carolyn Hoffman
Boston University Pardee School of Global Studies 2019
Boston University School of Public Health 2020

Attachment: Hoffman_PFASComments_Final.pdf

February 28, 2020

Elizabeth Callahan
MassDEP
One Winter Street
Boston, MA 02108
Email: BWSC.Information@Mass.Gov

Re: Submission of Comments in Support of the MassDEP PFAS Regulations

Dear Ms. Callahan:

As a Master of Public Health student at Boston University School of Public Health (BUSPH), I appreciate the opportunity to comment on the proposed revisions to the Massachusetts Contingency Plan, 310 CMR 40.0000 to develop drinking water standards perfluorochemicals. Founded in 1976, BUSPH undertakes groundbreaking research and scholarship in fields such as epidemiology, community health, health policy, and environmental science.[1] I have been studying the health effects and regulatory challenges of Per- and Polyfluoroalkyl Substances (PFAS) through my coursework at BUSPH in the context of an Environmental Health Science, Policy, and Law course.

I do not support the established MassDEP PFAS regulations in the Massachusetts Contingency Plan, 310 CMR 40.0000 that set a drinking water standard of 20 ng/L for the sum of six specific PFAS because <u>I do not think the regulations go far enough to protect public health</u>. However, I have recommendations.

<u>Consuming PFAS in drinking water is concerning considering the harmful effects they have on humans.</u> Studies have revealed multiple adverse health effects as a result of human exposure to PFAS, such as altered metabolism, fertility issues, reduced fetal growth, increased risk of being overweight, and reduced immune function.[2] Further adverse health effects may emerge over time with more research as well. Because of PFAS' long half-lives in the body, their existence in human blood and urine leads to prolonged exposure and extends the time frame for adverse health effects.[3] The Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey has found PFAS to be in the blood of 97% of Americans.[4]

In addition, what makes PFAS so hazardous to humans is not just the substance itself but the lack of awareness surrounding them. Before my time at BUSPH, I had no idea PFAS existed. My privilege in obtaining a graduate education has alerted me to the risks of PFAS exposure, but the same cannot be said for all residents of MA. It is unfair to expect individuals who have not had similar educational opportunities to be as knowledgeable about PFAS and the risks they pose.

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[1] Boston University School of Public Health. (n.d.). About SPH. https://www.bu.edu/sph/about/
[2] National Institute of Environmental Health Sciences. (2020). Perfluoroalkyl and polyfluoroalkyl substances (PFAS). https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm
[3] Ibid.
[4] Ibid.

Setting a drinking water standard of 0 ng/L for the sum of six specific PFAS may be unrealistic. As a result, one recommendation I have is setting a drinking water standard to 0.1 ng/L for perfluorooctanoic acid (PFOA) and 0.4 ng/L for perfluorooctane sulfonate (PFOS). These values were developed as reference levels for concentrations of PFOA and PFOS in drinking water that would not pose more than one-in-a-million cancer risk over a lifetime by the Office of Environmental Health Hazard Assessment of California.[5]

Please reconsider setting a drinking water standard of 20 ng/L for the sum of six specific PFAS in order to protect the present and future public health of all Commonwealth residents.

Sincerely,

Carolyn Faith Hoffman

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[5] California Environmental Protection Agency. (2019). *Perfluorooctanoic acid and perfluorooctane sulfonate in drinking water* [PDF file]. https://oehha.ca.gov/media/downloads/water/chemicals/nl/final-pfoa-pfosnl082119.pdf

From: Charley Leonard <chaleo@bu.edu>
Sent: Friday, February 28, 2020 12:29 PM
To: Director-DWP, Program (DEP)
Cc: whb@bu.edu; nielseng@bu.edu
Subject: PFAS MCL Comments

Attached are my comments.

Thank you for your time.

--
Charley Leonard
Boston University 2020
Health Policy and Law
She, Her, Hers

Attachment: Leonard_PFASComments_Final.pdf

February 28, 2020

Elizabeth Callahan
MassDEP
One Winter Street
Boston, MA 02108
Email: BWSC.Information@Mass.Gov

Re: Comments of Proposed Changes to the Massachusetts Contingency Plan Cleanup Standards for PFAS in Groundwater and on MassDEP's Office of Research & Standards and the Drinking Water Program's Consideration of PFAS

Dear Ms. Callahan:

In a few short months I will have completed my Master of Public Health from Boston University with a focus in Health Policy and Law. This program has taught me to look at how policy impacts the health of communities. Advocating for policies that protect the public's health is an essential part of the political process. Within academia, I have been privileged to learn about public health issues that general audiences may not have access to. With that said, I feel it is my duty to stand up for those without the same privileges.

While studying environmental health policy and law, I learned about the health consequences of consuming water that has been contaminated with PFAS. In addition to the levels found in water, PFAS are persistent in the environment, our bodies, and are found in hundreds of manmade products. It is known that some PFAS are present within 99 percent of the U.S. population proving that this is a widespread issue that need be addressed[1]. Unfortunately, the Environmental Protection Agency (EPA) has yet to provide a legally-enforceable federal regulation to protect the public's health from these compounds[2]. Fortunately for the residents of Massachusetts,

[1] U.S. ENVTL. PROTECTION AGENCY, DRINKING WATER HEALTH ADVISORY FOR PERFLUOROOCTANOIC ACID (PFOA) 10 (2016), https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final_508.pdf [hereinafter DRINKING WATER HEALTH ADVISORY FOR PERFLUOROOCTANOIC ACID (PFOA)]. 20 TOXICOLOGICAL PROFILE FOR PERFLUO

MassDEP has begun the process to develop a drinking water standard (MCL). The proposed standard is 20ng/L for the sum of six specific PFAS. Many states have already established drinking water standards, of which several have stricter standards than Massachusetts. I often consider Massachusetts a leader in public health issues that continually pushes progressive regulations that protect public health, but the proposed standards are less than other established standards. With that said, acknowledging that exposure to a mixture of these compounds is important to capture as MassDEP has done with summing the PFAS.

With that being said, I feel there are a few areas in which the standard can improve. There are over 4,000 different kinds of PFAS with similar chemical structure, but the standard is only set to regulate 6 of them[3]. While the United States no longer produces PFOA and PFOS, manufacturers have developed chemical substances with similarities that remain unregulated to date[4]. It is my hope that MassDEP considers expanding the standard to include the vast majority of PFAS as a greater protection to public health, especially vulnerable populations. I recommend including an evaluation process in which MassDEP reviews data on PFAS every two years to inform possible additions to the MCL.

An additional matter of concern is the level that is considered a safe standard, set at 20ng/L.

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[2] The Federal Role in the Toxic PFAS Chemical Crisis, Hearing on SD-342 Before the Subcomittee. on Homeland Security & Governmental Affairs, 115th Cong. (2018) (statement of Chairman Rand Paul and Ranking Member Gary C. Peters), https://www.hsgac.senate.gov/hearings/the-federal-role-in-the-toxic-pfas-chemical-crisis.
[3] Stephen Brendel et al., Short-chain perfluoroalkyl acids: environmental concerns and a regulatory strategy under REACH, 30 ENVTL. SCI. EUR. 1, 3–4 (2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5834591/pdf/12302_2018_Article_134.pdf.
[4] Assessing and Managing Chemicals under TSCA, Fact Sheet: 2010/2015 PFOA Stewardship Program, U. S. ENVTL. PROTECTION AGENCY, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet20102015-pfoa-stewardship-program#what.

According to Linda Birnbaum an expert in PFAS research, the safe dose of PFOA 0.1ppt which is much lower than the proposed regulation[5]. With knowledge of bioaccumulation and environmental persistence, setting a more stringent standard would be the best course of action for public health. A stricter standard would protect infants and fetuses that have significant developmental effects from PFAS[6].

I recognize the challenges to altering the proposed MCL, but I believe these two changes would greatly protect the public's health and I recommend they be considered. I thank you for addressing the issue of PFAS pollution and its significant impact on public health. I also appreciate the time MassDEP has put into reviewing and responding to comments such as these.

Respectfully submitted,

Charley Leonard
Boston University
School of Public Health

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[5] Sharon Lerner, Teflon Toxin Safety Level Should Be 700 Times Lower Than Current EPA Guideline, THE INTERCEPT_ (June 18, 2019, 11:54 AM), https://theintercept.com/2019/06/18/pfoa-pfas-teflon-epa-limit/. Note that, after the article's publication, Linda Birnbaum gave the following statement: The NIEHS has undertaken an extensive PFAS research program, which involves many studies, hundreds of chemicals, and partnerships across federal government. There are almost 5,000 PFAS chemicals in use today. Right now, we don't know enough about the uses and potential hazards of exposure to PFAS, but if our research results for PFAS are similar to what we've seen with other biologically active chemicals such as lead, arsenic, and asbestos, I would not be surprised if the safe level of PFAS for humans is as low as 1.0-0.1 PPT. That's why this research is so important, and necessary for protecting public health.

[6] ANNA READE ET AL., NRDC, SCIENTIFIC AND POLICY ASSESSMENT FOR ADDRESSING PER- AND POLYFLUORINATED SUBSTANCES (PFAS) IN DRINKING WATER 23 (2019) [hereinafter "NRDC Report"]

From: Erica Kyzmir-McKeon <ekyzmir-mckeon@clf.org>
Sent: Friday, February 28, 2020 5:08 PM
To: Director-DWP, Program (DEP)
Subject: FW: PFAS MCL Comments

Dear Commissioner Suuberg,

Attached please find our corrected PFAS MCL Comments. Please disregard the previous email and attachment. I apologize for any confusion. We thank you for the opportunity to provide these comments.

Sincerely,

Erica Kyzmir-McKeon
Staff Attorney
CLF Massachusetts
Pronouns: she/her/hers

62 Summer St
Boston MA 02110
P: 617-850-1763
E: ekyzmir-mckeon@clf.org

For a thriving New England

From: Erica Kyzmir-McKeon
Sent: Friday, February 28, 2020 5:01 PM
To: program.director-dwp@mass.gov
Subject: PFAS MCL Comments

Dear Commissioner Suuberg,

Erica Kyzmir-McKeon PFAS MCL Comments 28 Feb 2020
Conservation Law Foundation (CLF)

Attached please find our PFAS MCL Comments. We thank you for the opportunity to provide these comments.

Sincerely,

Erica Kyzmir-McKeon
Staff Attorney
CLF Massachusetts
Pronouns: she/her/hers

62 Summer St
Boston MA 02110
P: 617-850-1763
E: ekyzmir-mckeon@clf.org

For a thriving New England

Attachment: PFAS MCL Comments - Conservation Law Foundation.pdf

clf
conservation law foundation

For a thriving New England

CLF Massachusetts
62 Summer Street
Boston MA 02110
P: 617.350.0990
F: 617.350.4030
www.clf.org

February 28, 2020

Via Electronic Mail

Commissioner Martin Suuberg
MassDEP
One Winter Street
Boston, MA 02108
Email: program.director-dwp@Mass.Gov

Re: Comments on Proposed Changes to the Massachusetts Drinking Water Standard to Establish a Maximum Contaminant Level for Six Per- and Polyfluorinated Alkyl Substances

Dear Commissioner Suuberg:

Conservation Law Foundation (CLF), Toxics Action Center, and Clean Water Action (CWA) respectfully submit these comments on the proposed changes to the Massachusetts Drinking Water Standard to establish a maximum contaminant level (MCL) for perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexane sulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA) (Proposed PFAS MCL).

Founded in 1966, CLF is a non-profit, member-supported organization with offices located in Massachusetts, Maine, New Hampshire, Rhode Island, and Vermont. CLF uses the law, science, and the market to create solutions that protect public health, preserve natural resources, build healthy communities, and sustain a vibrant economy. CLF has been a leading advocate for clean, safe drinking water in Massachusetts and is engaged in numerous efforts to address the threat of emerging contaminants like PFAS throughout New England, including advocating for more protective PFAS standards to protect the public health and the environment.[1]

Toxics Action Center was founded in 1987 in response to the Woburn drinking water contamination crisis. At Toxics Action Center, we believe the environmental threats we face are big, but the power of well-organized community groups is bigger. That's why we work side by side with everyday people to confront those who are polluting and harming the health of our communities. We partner with the people who are most impacted by environmental problems, training them with the know-how anyone would need to make change in their own backyard.

[1] On October 25, 2018, CLF and Toxics Action Center petitioned MassDEP to establish a drinking water standard for the class of PFAS.

Because when neighbors know how to make change, they can build the power to transform our world. Toxics Action Center has worked with community groups fighting PFAS drinking water contamination since February 2016 and co-facilitates the National PFAS Contamination Coalition, a national network of community groups fighting PFAS contamination.

Clean Water Action's (CWA) mission is to protect our environment, health, economic well-being, and community quality of life. CWA has over 500,000 members nationally and 37,000 members in Massachusetts. CWA Massachusetts is a strong advocate for drinking water protection and sits on the Safe Drinking Water Act Advisory Committee. In addition to sounding the call for strong PFAS pollution standards before the DEP, Clean Water Action is championing the removal of PFAS from food packaging in the legislature.

The Proposed PFAS MCL is an important step forward in protecting Massachusetts communities from dangerous PFAS pollution and we commend MassDEP for engaging in this rulemaking process, particularly in light of the EPA's failure to regulate these dangerous chemicals.[2] However, the proposed rule does not fully protect public health from toxic PFAS chemicals because it fails to protect Massachusetts' most vulnerable populations (developing fetuses, infants, and children), adverse health effects are associated with PFAS concentrations below 20 ppt, and the standard does not address other PFAS that are present in the environment or sufficiently account for the cumulative impacts from exposure to the thousands of toxic compounds in this class of chemicals. Additionally, the monitoring and public notification requirements are not sufficient to protect consumers who have unsafe levels of PFAS in their drinking water.

To protect Massachusetts communities, it is essential that MassDEP apply the most protective and conservative assumptions at each stage of its risk assessment and establish a standard that protects our most vulnerable populations. Applying this approach, MassDEP should (1) establish a (1) maximum contaminant level (MCL) of 1 ppt for all detectable PFAS;[3] (2)

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[2] We appreciate that MassDEP has taken many important steps to promote an open and meaningful public process as it undertakes the difficult work of developing PFAS standards, and that it is committed to standardizing a rulemaking process that encourages more engagement with impacted communities. For example, MassDEP has stated that in the future it will hold public hearings during non-working hours and engage communities most directly affected by PFAS harms.

[3] We note that MassDEP is not currently proposing a Maximum Contaminant Level Goal (MCLG) for PFAS and that the Department is not required to do so prior to establishing an MCL. However, if MassDEP decides to establish an MCLG for PFAS in the future, the MCLG should be zero for the PFAS class of chemicals, including the six PFAS that MassDEP proposes to regulate here, based on the known and potential carcinogenicity and non-carcinogenetic toxicity of PFAS. Of particular note, toxicological studies in humans and animals have found associations between increased cancer risk and PFOA and PFOS exposure, and several authoritative bodies have made findings on their carcinogenic potential. *See* Anna Reade et al., NRDC Report, *Scientific and Policy Assessment for Addressing Per- and Polyfluorinated Substances (PFAS) in Drinking Water* 21 (2019), available at https://www.nrdc.org/sites/default/files/assessment-for-addressing-pfas-chemicals-in-michigan-drinking-water.pdf [hereinafter NRDC Report]). Additionally, we understand that there are testing limitations and that some PFAS

establish a treatment technique drinking water standard for the entire class of PFAS; (3) simplify and make the monitoring protocols more robust and protective; and (4) require public water system operators to communicate clearly that consumers should not consume tap water where any MCL has been exceeded.

I. Introduction

State drinking water standards that prevent exposure to unsafe levels of PFAS are necessary to protect Massachusetts communities. Chemicals in the PFAS class are a serious public health concern because they are (1) toxic in small concentrations; (2) persistent in the environment; (3) bioaccumulative; (4) highly mobile in water; (5) used in hundreds of different industrial and commercial processes and found in a wide variety of consumer products. Additionally, there are over 7,800 chemicals in the class which are structurally similar and pose synergistic and cumulative risk. According to MassDEP:

> Studies indicate that exposure to sufficiently elevated levels of certain PFAS may cause a variety of health effects including developmental effects in fetuses and infants, effects on the thyroid, liver, kidneys, certain hormones and the immune system. Some studies suggest a cancer risk may also exist in people exposed to higher levels of some PFAS.[4]

PFAS have been found at unsafe levels in the environment throughout Massachusetts, including drinking water, groundwater, and surface waters. Drinking water contaminated with PFAS is a significant source of exposure.[5] As MassDEP itself acknowledged in its online materials related to PFAS chemicals in drinking water:

> PFAS in drinking water is an important emerging issue nationwide. Because PFAS are water soluble, over time PFAS from some firefighting foam, manufacturing

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chemicals have detection limits above 1 ppt. However, most PFAS can be detected below 1 ppt and detection at this level for most PFAS chemicals will likely be achievable in the future. To the extent that the Department determines that the detection limits for regulated PFAS are above 1 ppt or that treatment technologies are not able to remove these PFAS to concentrations at or below 1 ppt, MassDEP should establish a combined standard at the most stringent level technologically achievable. Finally, NRDC notes that, while its attached report recommends a 2 ppt standard for several of the PFAS listed based on current reporting limits at specific levels, a 1 ppt standard based on detection limits is also scientifically justified based on the confirmed presence of PFAS. Therefore, NRDC supports the stronger standard for Massachusetts.

[4] *See* MassDEP, *Per- and Polyfluoroalkyl Substances (PFAS)*, available at https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#what-are-pfas-and-why-are-they-a-problem?-

[5] *See* Press Release, Vt. Dep't of Health, *Health Department Releases PFOA Blood Test and Exposure Assessment Results* (Jan. 26, 2017), available at http://www.healthvermont.gov/sites/default/files/documents/2017/01/NEWS_PFOA%20Blood%20Test%20%26%20Exposure%20Assessment%20Results.pdf (noting that "PFOA levels in blood were strongly correlated with PFOA levels in well water.").

sites, landfills, spills, air deposition from factories and other releases can seep into surface soils. From there, PFAS can leach into groundwater or surface water and can contaminate drinking water. PFAS have also been found in rivers, lakes, fish, and wildlife.[6]

DuPont, 3M, and other chemical manufacturers recklessly produced these dangerous chemicals for decades despite being aware of the significant health risks associated with PFAS. In 1981, for example, 3M and DuPont were aware that ingestion of PFOA caused birth defects in rats.[7] After receiving this information, DuPont tested seven children of pregnant workers—two had birth defects.[8] DuPont was also aware that at least one facility had contaminated local drinking water supplies with unsafe levels of PFOA by 1991, but failed to warn anyone.[9] DuPont hid this vital health information from the public and the Environmental Protection Agency (EPA) while making billions of dollars in profits from continued production of PFOA.[10] Ultimately, DuPont was fined a mere $16.5 million dollars in 2005 for failing to disclose information about toxicity and health risks caused by PFOA.[11]

Although PFOA and PFOS have now been phased out of production in the United States,[12] these compounds will remain in our drinking water, groundwater, and surface waters, as well as our bodies, for decades. In addition, manufacturers have rushed to produce thousands of alternative PFAS that are likely to pose comparable health risks given the similarities in chemical structure.[13] There are now over 7,800 different kinds of PFAS.[14]

To make matters worse, the EPA has failed to take meaningful action to protect the public from exposure to PFAS in drinking water. After becoming aware of contamination of drinking water supplies and the significant health risks posed by these dangerous chemicals, EPA gave

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[6] *See* MassDEP, *supra* note 4.

[7] Nathaniel Rich, *The Lawyer Who Became DuPont's Worst Nightmare*, N.Y. TIMES (Jan. 6, 2016), available at https://www.nytimes.com/2016/01/10/magazine/the-lawyer-who-became-duponts-worst-nightmare.html.

[8] *Id.*

[9] *Id.*

[10] *Id*.

[11] Memorandum from Grant Y. Nakayama, Assistant Administrator, to Environmental Appeals Board Re Consent Agreement and Final Order to Resolve DuPont's Alleged Failure to Submit Substantial Risk Information Under the Toxic Substances Control Act (TSCA) and Failure to Submit Data Requested Under the Resource Conservation and Recovery Act (RCRA) (Dec. 14, 2005), available at https://www.epa.gov/sites/production/files/2013-08/documents/eabmemodupontpfoasettlement121405.pdf.

[12] U.S. Environmental Protection Agency, *Assessing and Managing Chemicals under TSCA, Fact Sheet: 2010/2015 PFOA Stewardship Program*, available at https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program#what.

[13] *See, e.g.*, Stephen Brendel et al., *Short-chain perfluoroalkyl acids: environmental concerns and a regulatory strategy under REACH,* 30:9 ENVTL. SCI. EUR. 1, 3–4 (2018), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5834591/pdf/12302_2018_Article_134.pdf.

[14] *See* The Metropolitan Water District of Southern California, *Frequently Asked Questions About PFAS, PFOA, and PFOS*, available at http://www.mwdh2o.com/PDF_About_Your_Water/PFAS_FAQs.pdf.

manufacturers nearly a decade to phase out production and use of PFOA and PFOS through a voluntary program.[15] Despite learning in 2015 that millions of Americans were, and continue to be, exposed to PFAS-contaminated drinking water, EPA has not taken meaningful steps toward requiring public water systems to regularly monitor for PFAS and to treat unsafe water.[16] EPA even suppressed a scientific study suggesting that EPA's current health advisory for PFOA and PFOS does not protect public health.[17] After widespread public outcry, and several years and missed deadlines, EPA only recently made a proposed regulatory determination for PFAS in drinking water. However, the proposed regulation only addresses two PFAS— PFOA and PFOS, and a final regulatory action is likely years away.[18] Furthermore, serious adverse health effects have been linked to PFAS exposure at concentrations well below EPA's proposed MCL of 70 ppt for PFOS and PFOA.

Fortunately, in response to a 2018 *Petition for Rulemaking to Establish a Treatment Technique Drinking Water Standard for Per- and Polyfluoroalkyl Substances* (Petition) filed by CLF and Toxics Action Center, MassDEP has initiated a process to develop a drinking water standard and establish a total maximum contaminant level (MCL) of 20 ppt for 6 PFAS compounds— PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA.

II. Protective state standards for PFAS are necessary to prevent exposure to unsafe levels of PFAS in drinking water.

In light of EPA's failure to act over decades, Massachusetts can— and must— take the lead in the absence of federal safeguards. We will never be able to reverse the damage caused by chemical manufacturers and EPA's inaction, but MassDEP has broad authority to promulgate rules that limit additional exposure to unsafe levels of PFAS in drinking water.[19]

The Proposed PFAS MCL is a critical step forward to prevent exposure to dangerous toxic "forever chemicals". However, the Proposed PFAS MCL does not fully protect public health because it does not protect some of our most vulnerable populations—fetuses, infants, and

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[15] *See, e.g.*, Consent Order, *In the matter of: Dupont Company,* (Nos. P-08-508 and P-08-509, U.S. E.P.A. Office of Pollution Prevention and Toxics, April 9, 2009), available at https://assets.documentcloud.org/documents/2746607/Sanitized-Consent-Order-P08-0508-and-P08-0509.pdf [hereinafter, Consent Order]; *see also* Premanufacture Notification Exemption for Polymers; Amendment of Polymer Exemption Rule to Exclude Certain Perfluorinated Polymers, 75 Fed. Reg. 4295, 4296 (Jan. 27, 2010).

[16] David Andrews, *Report: Up to 110 Million Americans Could Have PFAS-Contaminated Drinking Water*, ENVTL. WORKING GROUP (May 22, 2018), available at https://www.ewg.org/research/report-110-million-americans-could-have-pfas-contaminated-drinking-water#.W6_7a2hKg2w.

[17] Abraham Lustgarten et al., *Suppressed Study: The EPA Underestimated Dangers of Widespread Chemicals*, PROPUBLICA (June 20, 2018), available at https://www.propublica.org/article/suppressed-study-the-epa-underestimated-dangers-of-widespread-chemicals.

[18] Ariana Figueroa, *EPA starts long road towards standards for two toxins*, E&E NEWS (February 21, 2020), available at https://www.eenews.net/stories/1062411861.

[19] *See* Mass. Gen. Laws ch. 111 § 160; *see also* 310 Mass. Code Regs. 22.03.

children; adverse health effects have been associated with exposure to PFAS levels below 20 ppt; and the standard does not address all dangerous PFAS compounds. Thus, MassDEP should establish a (1) 1 ppt MCL for all detectable PFAS; and (2) treatment technique drinking water standard for the PFAS class.

A. MassDEP must establish drinking water standards for PFAS.

1. Legal background.

MassDEP has broad authority to regulate unsafe chemicals in drinking water.[20] Specifically, pursuant to Mass. Gen. Laws ch. 111 § 160, MassDEP "may make rules and regulations and issue such orders as in its opinion may be necessary to prevent the pollution and to secure the sanitary protection of all such waters used as sources of water supply and to ensure the delivery of a fit and pure water supply to all consumers."[21] Additionally, in the event that MassDEP "finds on the basis of a health assessment…that the level of any contaminant found in water collected within a Distribution System and/or a Sampling Point at the entry to a Distribution System, poses an unacceptable health risk to consumers…the Supplier of Water shall take appropriate actions to reduce the level of contaminant concentrations to levels [MassDEP] deems safe or remove the source of supply from service by the deadline specified by [MassDEP]."[22] Thus, MassDEP has the authority to adopt the proposed PFAS MCL.

Pursuant to the drinking water rules and regulations, MassDEP is not required to conduct a cost-benefit analysis. The Department is obligated, first and foremost, to establish drinking water standards that are fully protective of public health. That said, any benefits that would stem from preventing exposure to harmful PFAS in drinking water would clearly outweigh any speculated costs associated with regulation compliance.[23]

There are substantial societal costs avoided and benefits gained from preventing PFAS exposure. Specifically, and as discussed below in Section II.A.2, there are significant environmental and human health costs associated with PFAS and exposure can lead to massive, lifelong health-related costs on individuals exposed (including decreased wages and increased medical bills), a lower quality of life, and premature death.

[20] The Commonwealth of Massachusetts has primacy for the Safe Drinking Water Act in Massachusetts (Mass. Gen. Laws Ch. 111 § 310) and has adopted the authority of the Safe Drinking Water Act via rulemaking (Mass. Dep't of Envtl. Protection, Massachusetts Drinking Water Regulations, 310 CMR 22.00).
[21] Mass. Gen. Laws ch. 111 § 160.
[22] 310 Mass. Code Regs. 22.03.
[23] Additionally, and as discussed below in Section V, there are numerous funding assistance options available to offset and assist with monitoring and treatment costs.

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For example, a recent study estimated the economic burden of PFOA contamination from increased numbers of low birth weight infants at $13.7 billion for the period 2003-2014.[24] Low birth weight may be associated with a higher risk of developing diseases in adulthood such as cardiovascular disease, respiratory disease and diabetes,[25] and is associated with impaired cognitive development. One study found that low birth weight was associated with a 25% lower likelihood of passing high school exit exams and a higher risk of unemployment at age 33 years.[26] Other studies have found that birth weight is positively associated with earnings.[27] For example, one study found that low birth weight was associated with lower income for men 30 years of age and for women between 50 and 60 years of age.[28]

Additionally, a recent and comprehensive report by the Nordic Council estimates that health costs from exposure to PFAS costs Europe between $59-$95 billion per year.[29] Many of the findings from this report came from studies conducted in the United States, and we can presume that comparable PFAS related health impacts and costs exist here. Importantly, these economic calculations do not include indirect costs, such as psychological or emotional impacts. Therefore, the total societal costs are likely underestimated. Thus, while the exact health-related costs associated with PFAS exposure have not been comprehensively quantified, such costs will undoubtedly far outweigh the costs and subsequent benefits of monitoring and treatment to remove PFAS from drinking water.[30]

[24] Malits J., Blustein J., Trasande L., Attina T.M., *Perfluorooctanoic acid and low birth weight: estimates of US attributable burden and economic costs from 2003 through 2014*, 221:2 INTERN J HYGIENE ENVIRON HEALTH, 269-75 (2018), available at https://www.ncbi.nlm.nih.gov/pubmed/29175300.
[25] Almond D. and Currie J., *Killing Me Softly: The Fetal Origins Hypothesis*, 25:3 JOURNAL OF ECONOMIC PERSPECTIVES (2011), 153–72, available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4140221/; Bharadwaj P. et al., *Birth Weight in the Long Run*, 53(1) JOURNAL OF HUMAN RESOURCES (2017), 189–231, available at https://www.nber.org/papers/w21354.
[26] Currie J. and Hyson R., *Is The Impact of Health Shocks Cushioned by Socioeconomic Status? The Case of Low Birthweight*, 89:2 AMERICAN ECONOMIC REVIEW (1999), 245–50, available at https://www.aeaweb.org/articles?id=10.1257/aer.89.2.245.
[27] Black S. et al., *From the Cradle to the Labor Market? The Effect of Birth Weight on Adult Outcomes*, 122:1 THE QUARTERLY JOURNAL OF ECONOMICS (2007), 409–39, available at https://econpapers.repec.org/article/oupqjecon/v_3a122_3ay_3a2007_3ai_3a1_3ap_3a409-439..htm; Bharadwaj P. et al., *supra* at note 25.
[28] Bharadwaj P. et al., *supra* at note 25.
[29] Nordic Council of Ministers, *The Cost of Inaction: A socioeconomic analysis of environmental and health impacts linked to exposure to PFAS*, available at http://norden.diva-portal.org/smash/get/diva2:1295959/FULLTEXT01.pdf.
[30] It is important to note that the burden of PFAS-related health and environmental costs are largely and unfairly born by individuals and the government, and not the chemical manufacturers and polluters that have contributed and are contributing to the PFAS pollution crisis.

2. PFAS are harmful to public health.

Chemicals in the PFAS class are toxic in small quantities; extremely persistent in the environment; highly mobile in water; bioaccumulative, used in hundreds of commercial and manufacturing processes, and found in thousands of consumer products; and there are over 7,800 different kinds of these dangerous chemicals. They have been used in non-stick cookware, water-repellent clothing, stain resistant fabrics and carpets, cosmetics, firefighting foams, and other products that resist grease, water, and oil.[31] These chemicals are extremely strong and highly resistant to degradation.[32]

PFAS "have been detected in all environmental media including air, surface water, groundwater (including drinking water), soil, and food."[33] A study by the Centers for Disease Control and Prevention (CDC) found four PFAS (PFOS, PFOA, PFNA, and PFHxS) in the serum of nearly all people tested, indicating widespread exposure in the U.S. population.[34] PFAS are also found in human breast milk and umbilical cord blood.[35] PFOA and PFOS were found in up to 99 percent of the U.S. general population between 1999 and 2012,[36] and recent testing by the Environmental Working Group (EWG) indicates that PFAS contamination of drinking water is more prevalent than previously reported.[37] EWG tested tap water samples from 44 places in 31 states and the District of Columbia.[38] Alarmingly, only one location had no detectable PFAS and only two other locations had PFAS below the level that poses risks to human health.[39]

PFAS are toxic to humans in concentrations as small as parts per trillion (ppt).[40] These chemicals are associated with cancer and have been linked to growth, learning, and behavioral problems in infants and children; fertility and pregnancy problems, including pre-eclampsia;

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[31] *See* Agency for Toxic Substances and Disease Registry, *Per- and Polyfluoroalkyl Substances (PFAS) and Your Health,* available at https://www.atsdr.cdc.gov/pfas/overview.html.
[32] New Jersey Dep't of Envtl. Prot. Division of Science, Research, and Envtl. Health, *Investigation of Levels of Perfluorinated Compounds in New Jersey Fish, Surface Water, and Sediment* (June 18, 2018), available at https://www.nj.gov/dep/dsr/publications/Investigation%20of%20Levels%20of%20Perfluorinated%20Compounds%20in%20New%20Jersey%20Fish,%20Surface%20Water,%20and%20Sediment.pdf.
[33] Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Perfluoroalkyls* 2, available at https://www.atsdr.cdc.gov/ToxProfiles/tp200.pdf.
[34] Ctr. For Disease Control and Prevention, *Per- and Polyfluorinated Substances (PFAS) Factsheet* (Apr. 7, 2017), available at https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html.
[35] Agency for Toxic Substances and Disease Registry, *supra* note 33 at 3.
[36] *See* U.S. Envtl. Prot. Agency, *Drinking Water Health Advisory for Perflourooctanoic Acid (PFOA)* (May 2016) at 9, available at https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final_508.pdf.
[37] Sydney Evans, et. al., Environmental Working Group, *PFAS Contamination of Drinking Water Far More Prevalent Than Previously Reported: New Detections of "Forever Chemicals" in New York, D.C., Other Major Cities* (January 22, 2020), available at https://www.ewg.org/research/national-pfas-testing/.
[38] *Id.*
[39] *Id.*
[40] U.S. Dep't of Health & Human Serv., Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Perfluoroalkyls* 5–6, available at https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf.

interference with natural human hormones; increased cholesterol; immune system problems; and, interference with liver, thyroid, and pancreatic function.[41] PFAS have been linked to increases in testicular and kidney cancer in human adults.[42]

Developing fetuses and newborn babies are particularly sensitive to PFAS chemicals.[43]

> The impacts of PFAS exposure on fetal development and the young have been studied in both humans and animals. These studies find similar and profound adverse health effects.
>
> Since infants and children consume more water per body weight than adults, their exposures may be higher than adults in communities with PFAS in drinking water. In addition, the young may also be more sensitive to the effects of PFAS due to their immature developing immune system, and rapid body growth during development. Exposure to PFAS before birth or in early childhood may result in decreased birth weight, decreased immune responses, and hormonal effects later in life.[44]

One recent study, for example, found that PFAS exposure occurs *in utero* as a result of placental transfer of PFAS, and there is also a significant, additive PFAS exposure that occurs in infants through breast-feeding.[45]

Alarmingly, epidemiological studies identify the immune system as a target of PFAS toxicity. Some studies have found decreased antibody response to vaccines, and associations between blood serum PFAS levels, immune system hypersensitivity such as asthma, and autoimmune disorders like ulcerative colitis.[46]

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[41] *Id.*
[42] *Id.* at 6; Vaughn Barry et al., *Perfluorooctanoic Acid (PFOA) Exposures and Incident Cancers Among Adults Living Near a Chemical Plant*, 121 ENVTL. HEALTH PERSPECTIVES 1313 (Nov.–Dec. 2013), available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3855514/pdf/ehp.1306615.pdf.
[43] *See* U.S. Envtl. Prot. Agency, DRINKING WATER HEALTH ADVISORY FOR PERFLUOROOCTANOIC ACID (PFOA) 9 (2016), available at https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final_508.pdf.
[44] NRDC Report, *supra* note 3 at 20.
[45] Helen M. Goeden et al., *A transgenerational toxicokinetic model and its use in derivation of Minnesota PFOA water guidance*, 29 J. OF EXPOSURE SCI. & ENVTL. EPIDEMIOLOGY 183 (2019), available at https://www.nature.com/articles/s41370-018-0110-5.pdf (concluding that "early life serum levels are predicted to be approximately 40% higher than adult steady-state levels," and that "[w]hen both placental and breastmilk transfer are taken into account. . . early life serum levels were predicted to be sixfold higher than adult steady-state levels.")
[46] *See* DRINKING WATER HEALTH ADVISORY FOR PERFLUOROOCTANOIC ACID (PFOA), *supra* note 36 at 39.

While a great deal of public attention has recently been paid to PFOA, PFOS, and other long-chain PFAS, EPA and other scientists have raised concerns that other chemicals in the PFAS class of compounds are similar in chemical structure and are likely to pose similar health risks.[47] Specifically, all PFAS share a strong carbon-flourine bond and "degrade very slowly, if at all, under environmental conditions."[48] Although we have less information about these newer compounds, the information we do have suggests that they are not safe. In fact, the information we do have suggests the opposite: these compounds pose just as high of a health risk as longer-chain PFAS.[49] For example, GenX is a replacement technology for PFOA and perfluorobutane sulfonic acid (PFBS) is a replacement for PFOS. The US Environmental Protection Agency released draft toxicity assessments in November of 2018 on two GenX chemicals (hexafluoropropylene oxide (HFPO) dimer acid and its ammonium salt) and PFBS confirming that GenX chemicals are associated with liver and pancreatic cancers and adverse effects on the kidneys, blood, liver, immune system, and development; and PFBS is associated with thyroid and kidney effects and reproductive and developmental toxicity.[50]

A recent study conducted by the National Toxicology Program also found that short-chain perfluoroalkyl sulfonates and perfluoroalkyl carboxylates adversely affect rat livers and thyroid hormones just like their long-chain homologues do.[51] While some newer fluorinated alternatives seem to be less bioaccumulative, they are still as environmentally persistent as long-chain substances or have persistent degradation products.[52] Alarmingly, because some of the newer PFAS are less effective, larger quantities may be needed to provide the same performance.[53] In addition, these newer PFAS compounds are more mobile in their environment.[54] In conclusion,

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[47] *See, e.g.*, Consent Order, at vii (stating that, with respect to "GenX" compounds (chemical substances intended to replace long-chain (C8) PFAS used in Teflon), "EPA has concerns that these PMN substances will persist in the environment, could bioaccumulate, and be toxic ("PBT") to people, wild mammals, and birds."); Arlene Blum et al., *The Madrid Statement on Poly- and Perfluoroalkyl Substances (PFASs)*, 123 ENVTL. HEALTH PERSPECTIVES (2015) A 107, available at https://ehp.niehs.nih.gov/doi/pdf/10.1289/ehp.1509934.

[48] Blum et al., *supra* note 47 at A 107.

[49] Elsie Sunderland et al., *A review of the pathways of human exposure to poly- and perfluoroalkyl substances (PFASs) and present understanding of health effects*, 29 J. OF EXPOSURE SCI. & ENVTL. EPIDEMIOLOGY 131 – 147 (2019), available at https://www.nature.com/articles/s41370-018-0094-1; *see also* NRDC Report, *supra* note 3 at 11.

[50] NRDC Report, *supra* note 3 at 11.

[51] Cheryl Hogue, *Short-chain and Long-chain PFAS Show Similar Toxicity, US National Toxicology Program Says*, Chemical and Engineering News 97.33 (2019), available at https://cen.acs.org/environment/persistent-pollutants/Short-chain-long-chain-PFAS/97/i33. The National Toxicology Program drew its conclusions on the basis of two 28-day studies in laboratory rats. One examined the effects of two short-chain chemicals—perfluorobutane sulfonic acid and perfluorohexane sulfonate potassium salt—along with those from long-chain perfluorooctane sulfonic acid. The other involved a short-chain compound, perfluorohexanoic acid, and long-chain perfluorooctanoic acid, perfluorononanoic acid, and perfluorodecanoic acid.

[52] Blum et al., *supra* note 47 at A 107; s*ee also* Sunderland et al., *supra* note 49: "[a] recent hazard assessment based on the internal dose of Gen X [a short-chain PFAS], suggests that it has a higher toxicity than PFOA after accounting for toxicokinetic differences."

[53] Sunderland et al., *supra* note 49.

[54] *See* Stephen Brendel et al., supra note 13, at 4.

"the extreme environmental persistence, bioaccumulation, and potential toxicity of the entire class of PFAS has led some researchers to question the use of any highly fluorinated chemicals and to call for a class approach in managing them."[55]

3. PFAS have been found in drinking water, groundwater, and surface waters throughout MA.

Not only are PFAS toxic in very small amounts, they are highly mobile in groundwater and surface water. MassDEP is well aware, from its investigations into PFAS problems and its collection of data from entities across the state, that PFAS have been found in waters throughout Massachusetts.[56]

a. Drinking Water

Massachusetts has experienced significant issues related to the presence of PFAS in drinking water and communities in Cape Cod have been especially impacted by PFAS contamination. A 2009 sampling of 20 wells and two distribution systems that supply drinking water on Cape Cod found that 75 percent of test sites had detectable levels of chemicals, including PFOA and PFOS.[57] PFOS was one of the top two most frequently detected, and the levels detected were among the highest reported in U.S. drinking water.[58] PFAS have entered the system through a number of sources, including fire training areas, airports, and landfills, which has led to an ongoing threat to the sole source aquifer that provides drinking water for all Cape Cod residents.[59] Groundwater in Barnstable, Massachusetts has been particularly susceptible to the spread of PFAS because of the town's location in an outwash plain with permeable soil.[60] Additionally, PFOS and PFOA were found at high levels in Hyannis Water System wells downgradient of the Barnstable Municipal Airport.

PFAS contamination of public drinking water supplies in Massachusetts is by no means limited to Cape Cod. On its website, MassDEP notes that as of February 2020, PFAS at levels over 20 ppt were detected in 21 public water supplies in Massachusetts.[61] A report from the Environmental Working Group likewise found that 21 sites in Massachusetts were contaminated

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55 Sunderland et al., *supra* note 49.
56 *See generally* MassDEP, *supra* note 4.
57 Laurel Schaider et al., Silent Spring Institute, *Emerging Contaminants in Cape Cod Drinking Water*, 1-34, iii (2010), available at http://www.commwater.com/wp-content/uploads/2014/03/silentspringreport2010.pdf.
58 *Id.*
59 *Id.*
60 *Sources, Transport, Exposure & Effects of PFASs: Cape Cod*, The U. of R.I., available at https://web.uri.edu/steep/communities/cape-cod/.
61 *See generally* MassDEP, *Per- and Polyfluoroalkyl Substances (PFAS)*, available at https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#pfas-detected-in-drinking-water-supplies-in-massachusetts-.

with PFAS chemicals, affecting nearly 200,000 residents.[62] For example, in November 2019, PFAS were found in the drinking water at the Stow Center School and the Hale Middle School.[63] Follow up sampling conducted by MassDEP detected PFAS in 8 of the 10 private wells that were tested in Stow, Massachusetts.[64] As recently as February 2020, PFAS were detected at levels of almost 24 ppt in the drinking water supplies for Braintree, Holbrook, and Randolph.[65]

These are but a few examples of PFAS contamination in drinking water in Massachusetts. Notably, the testing that has been conducted has been limited to only about 20 PFAS out of 7,800 compounds. The PFAS threat to drinking water is significant and widespread, and communities have already been exposed to unsafe drinking water.

b. Groundwater

Cape Cod is also suffering from groundwater contamination from PFAS linked to several sources, including fire training areas, airports, military bases, landfills, municipal wastewater, and septic systems.[66] In July of 2015, Barnstable Municipal Airport conducted investigations of PFAS in six monitoring wells and PFAS compounds above MassDEP's proposed MCL were detected in all of them.[67]

Additional groundwater investigations conducted in response to the Barnstable Municipal Airport findings speculated that the source of the PFAS contamination was the Airport Rescue and Fire Fighting Building, a fire fighting training deployment area. The resulting investigation found that there was heavy use of aqueous film forming foam (AFFF) at the fire training academy, which is a major source of PFAS contamination.

In Weymouth, Massachusetts, PFAS has been detected in groundwater near the site of the former Naval Air Station.[68] Operational closure of the airfield was effected in September of 1996.

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[62] *See* Jason Claffey, *Toxic PFAS Found in 21 Places in Massachusetts*, PATCH (May 8, 2019), available at https://patch.com/massachusetts/danvers/toxic-pfas-found-19-places-masschusetts.

[63] Stow-mass.gov, *Updated Information Regarding* PFAS (November 27, 2019), available at https://www.stow-ma.gov/home/news/updated-information-regarding-pfas-0.

[64] *Id.*

[65] Fred Hanson, *PFAS levels in Braintree water drop,* The Patriot Ledger (Feb. 26, 2020), available at https://www.patriotledger.com/news/20200206/pfas-levels-in-braintree-water-drop.

[66] *Sources, Transport, Exposure & Effects of PFASs: Cape Cod*, *supra* note 60.

[67] Horsely Witten Group, Inc., Immediate Response Action Plan Status Report 3: Barnstable Municipal Airport 4 (2018), available at http://eeaonline.eea.state.ma.us/EEA/fileviewer/Default.aspx?formdataid=0&documentid=445359 (responding to a Notice of Responsibility issued by MassDEP, tasking Barnstable Airport with investigating for PFAS previously detected in groundwater at the airport, and at a monitoring well downgradient of the Airport on the Maher wellfield property).

[68] U.S. Envtl. Protection Agency, *South Weymouth Naval Air Station: Cleanup Activities*, available at https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0101826.

However, the area was used as a location for fire-fighting training exercises from 1950 until 1990.[69] Likely due to the heavy use of AFFF, a 2010 investigation determined widespread PFAS contamination in soils, groundwater, and surface water.[70] The investigation revealed the presence of PFAS in groundwater at concentrations exceeding the proposed MCL.[71]

As recently as September 2019, sampling conducted by MassDEP detected PFAS in the soil, groundwater, and surface water at the Stow/Hudson border.[72]

c. Surface Water

A study of the Joint Base in Bourne, Massachusetts includes surface water reports showing heavy PFAS contamination at levels above the EPA Health Advisory level.[73] Contamination was again linked to heavy use of AFFFs.[74] Specifically, contaminated surface water was detected in Ashumet and John's Pond and led to findings of affected residential water wells including those in the Lakeside Estates Community and Mashpee Village.[75]

B. The Proposed PFAS MCL does not fully protect public health.

The proposed MCL standards are an important step forward in protecting Massachusetts communities from exposure to PFAS. Although we commend this important step in the right direction, current studies suggest the need for a far more stringent standard that is based on the most conservative approach that protects our most sensitive populations.

1. MassDEP's proposed standard is based on assumptions that do not protect the most vulnerable populations.

In establishing a proposed drinking water MCL, MassDEP relied on several assumptions that are not sufficiently conservative and, therefore, result in standards that will not protect public health. Specifically, several studies indicate that the toxicity value (reference dose) selected by MassDEP for PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA does not protect our most

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[69] *Id.*
[70] *Id.*
[71] Tetra Tech, Explanation of Significant Differences to the Record of Decision Operable Unit 25 Area of Concern Hangar 1 Main Hangar Floor Drains 3 (2011), available at https://semspub.epa.gov/work/01/497699.pdf.
[72] Town of Stow Massachusetts, *Updated Information Regarding PFAS* (Nov. 27, 2019), available at https://www.stow-ma.gov/home/news/updated-information-regarding-pfas-0.
[73] Angela Gallagher, Bureau of Waste Site Cleanup, MassDEP, *PFAS in the Northeast: State of Practice & Regulatory Perspectives at the NEWMOA* Workshop 34 (May 9, 2019), available at http://www.newmoa.org/events/docs/259_227/GallagherMA_May2017_final.pdf. We were not able to ascertain the exact level of PFAS concentrations and whether they were above MassDEP's proposed MCL. However, we note that serious adverse health effects have been linked to PFAS exposure at concentrations well below 70 ppt.
[74] *Id.* at 10, 25.
[75] *Id.* at 34.

vulnerable populations—fetuses, infants, and children. MassDEP selected a reference dose of 5 x 10^{-6} mg/kg-day for these six PFAS.[76] This value was selected by relying on the same point of departure (POD) and human equivalent dose (HED) calculations used by USEPA, with the inclusion of an additional uncertainty factor (UF) of $10^{1/2}$ to account for data indicating effects at lower dose levels.[77]

Studies suggest, however, that a more protective reference dose are appropriate for the six PFAS.[78] If the most sensitive health endpoints are protected against and uncertainty is fully accounted for, the reference dose for these six PFAS would be much more protective than the reference dose selected by MassDEP. Specifically, there are several health endpoints, including immunotoxicity and developmental harms, that occur at doses lower than those selected by the EPA. The $10^{1/2}$ UF proposed by Mass DEP is not sufficient to cover the difference in dose of these endpoints. Furthermore, "[t]he National Academy of Sciences has recommended the use of an additional uncertainty factor of 10 to ensure protection of fetuses, infants and children who often are not sufficiently protected from toxic chemicals such as pesticides by the traditional intraspecies (human variability) uncertainty factor."[79] Some of the more protective reference doses are identified in the table below.[80]

<table>
<tr><th>Chemical</th><th>Proposed Rule (mg/kg/day)</th><th>More Protective Choice (mg/kg/day)</th></tr>
<tr><td>PFOA</td><td rowspan="6">5 x 10^{-6}</td><td>1 x 10^{-8}</td></tr>
<tr><td>PFOS</td><td>2 x 10^{-9}</td></tr>
<tr><td>PFNA</td><td>2 x 10^{-7}</td></tr>
<tr><td>PFHxS</td><td>2 x 10^{-6}</td></tr>
<tr><td>PFHpA</td><td></td></tr>
<tr><td>PFDA</td><td></td></tr>
</table>

Additionally, in establishing its proposed drinking water standard, MassDEP relied upon a water ingestion rate of 0.054 L/kg/d, based on a water consumption rate of a lactating woman at the

[76] MassDEP, *Technical Support Document, Per- and Polyfluoroalkyl Substances (PFAS): An Updated Subgroup Approach to Groundwater and Drinking Water Values* (December 26, 2019), available at https://www.mass.gov/files/documents/2019/12/27/PFAS%20TSD%202019-12-26%20FINAL.pdf.
[77] *Id.*
[78] *See, e.g.*, NRDC Report, *supra* note 3 at 28-44.
[79] *Id*. at 38, citing National Research Council Committee on Pesticides in the Diets of Infants and Children, National Research Council (1993), available at https://www.ncbi.nlm.nih.gov/books/NBK236275/ ("Congress adopted this requirement in the Food Quality Protection Act for pesticides in foods.").
[80] *See, e.g.*, NRDC Report at 28-44.

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90th percentile, as opposed to the much more protective ingestion rate used by VT and NDRC of 0.175 L/kg/d for an infant less than 1 year of age or that used by ATSDR of 0.143 L/kg/d for an infant. Breastfeeding and formula fed infants drink the largest volume per body weight and are the most vulnerable to PFAS contamination.[81] Thus, MassDEP should adopt a more conservative and protective ingestion rate.

In recognition of the significant toxicity of PFAS and the vulnerability of sensitive populations like fetuses, infants, and children to PFAS exposure, MassDEP should rely upon only the most conservative assumptions and sensitive endpoints.[82] Thus, MassDEP should rely upon the most protective reference dose for each chemical, incorporate an additional uncertainty factor of 10, and adopt a water ingestion rate of 0.175 L/kg/d to establish the MCL.[83]

2. Adverse health effects are associated with exposure to PFAS concentrations below 20 ppt.

Although MassDEP's combined standard may offer greater protection in some instances, the numeric component of the Proposed PFAS MCL—20 ppt—will result in individuals being exposed to unsafe levels of PFAS in other instances. In fact, several states have adopted or have proposed to adopt MCLs that are more protective than the proposed MCL for some PFAS.[84] For example, New Jersey and New Hampshire have set lower standards for several individual PFAS compounds:

Chemical	New Jersey (ppt)	New Hampshire (ppt)
PFOA	14	12
PFOS	13	15
PFNA	13	11
PFHxS		18
PFHpA		
PFDA		

[81] NRDC Report, *supra* note 3 at 20.
[82] For example, delayed mammary gland development or immunotoxicity.
[83] In establishing a reference dose for PFAS, we also recommend that MassDEP consider accounting for a pre-existing body burden through placental transfer. For example, Minnesota calculated a placental transfer factor of 87% based on average cord to maternal serum concentration ratios. NRDC Report, *supra* note 3 at 33 and 38.
[84] *See* NJ Dep't of Envtl. Prot., *Statewide PFAS Directive* (Mar. 25, 2019), available at https://www.nj.gov/dep/docs/statewide-pfas-directive-20190325.pdf; *see also* NH Dep't of Envtl. Serv., *NHDES proposes new PFAS drinking water, final rulemaking proposal for PFOA, PFOS, PFHxS and PFNA* (Jun. 28, 2019), available at https://www.des.nh.gov/media/pr/2019/20190628-pfas-standards.htm.

As discussed previously, studies have documented adverse health impacts from exposure to PFOA and PFOS at concentrations well below 20 ppt. For example, one research team documented a strong dose-response between a child's exposure to PFAS and reduced antibody concentrations against tetanus and diphtheria toxoids in serum two years later.[85] Based on the results of the study, the researchers concluded that even exposure to PFOA and PFOS concentrations as low as approximately 1 ppt may have adverse health effects for children.[86]

In addition, Linda Birnbaum, former Director of the National Institute of Environmental Health Sciences (NIEHS) and prominent PFAS expert, recently suggested that the safe dose of PFOA is likely 0.1 ppt based on a recent study conducted by the National Toxicology Program.[87] The California Office of Environmental Health Hazard Assessment confirmed this suggestion when it recently set notification levels of PFOA and PFOS at 0.1 ppt and 0.4 ppt, respectively.[88] For all these reasons, the cumulative 20 ppt MCL for PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA does not fully protect public health.

3. The proposed rule does not address all dangerous PFAS.

The Proposed PFAS MCL is not comprehensive and does not address all toxic PFAS that are in the environment, nor properly account for additive and cumulative exposures to the many thousands of PFAS chemicals that are not currently under review. There are over 7,800 different PFAS compounds,[89] and recent testing in Massachusetts shows that PFAS beyond the six proposed for regulation are present in drinking water, including perfluorobutanesulfonic acid (PFBS), perfluorohexanoic acid (PFHxA), and perfluorotetradecanoic acid (PFTeA).[90] Notably, the testing that has been conducted has been limited to only about 20 PFAS out of 7,800 PFAS. As previously discussed, the information we do have on PFAS beyond the six proposed for

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[85] Phillippe Grandjean and Esben Budtz-Jorgensen, *Immunotoxicity of perfluorinated alkylates: calculation of benchmark doses based on serum concentrations in children*, 12 ENVTL. HEALTH 1 (2013), available at https://ehjournal.biomedcentral.com/track/pdf/10.1186/1476-069X-12-35.
[86] *Id.* (documenting adverse health effects where PFOA and PFOS concentrations are approximately 1 ppt).
[87] Sharon Lerner, *New Teflon Toxin Found in North Carolina Drinking Water*, THE INTERCEPT (June 17, 2017), available at https://theintercept.com/2017/06/17/new-teflon-toxin-found-in-north-carolina-drinking-water/.
[88] Office of Environmental Health Hazard Assessment, *Notification Level Recommendations: Perfluorooctanoic Acid and Perfluorooctane Sulfonate in Drinking Water* (Aug. 2019), available at https://oehha.ca.gov/media/downloads/water/chemicals/nl/final-pfoa-pfosnl082119.pdf.
[89] The Metropolitan Water District of Southern California, *Frequently Asked Questions About PFAS, PFOA, and PFOS*, available at http://www.mwdh2o.com/PDF_About_Your_Water/PFAS_FAQs.pdf.
[90] Massachusetts Dept. of Envtl. Prot., *Office of Research and Standards Final Recommendation for Interim Toxicity and Drinking Water Guidance Values for Perfluorinated Alkyl Substances Included in the Unregulated Chemical Monitoring Rule* 3 (June 8, 2018), available at https://www.mass.gov/files/documents/2018/06/11/pfas-ors-ucmr3-recs_0.pdf (noting that "all of the UCMR 3 PFAS have been detected in one or more MA water supplies, as well as in some groundwater and surface water samples."); *see also* Mass.gov, *Energy & Environmental Affairs Data Portal*, available at https://eeaonline.eea.state.ma.us/portal#!/search/drinking-water/results?ContaminantGroup=PFAS.

regulation here suggests these chemicals are not safe.[91] Notably, Linda Birnbaum has stated that "[e]very PFAS that has been studied is causing problems."[92] The significant toxicity and the unique characteristics of the PFAS class of chemicals, along with the potential cumulative and synergistic effects from exposure to multiple PFAS chemicals, demand a class or subclass approach to regulation.[93] It simply does not make sense to continue using a "whack-a-mole" approach to regulation in light of the fact that over 7,800 of these chemicals already exist and manufacturers will continue producing new PFAS compounds with little oversight. Massachusetts communities should not be forced to continue to bear the health risks associated with these unsafe chemicals while regulators take decades to chase down these chemicals one by one.

C. MassDEP should establish a more protective standard that protects communities from exposure to the PFAS class of chemicals.

1. MassDEP should establish a 1 ppt standard for detectable PFAS chemicals and should expand the number of PFAS for regulation under this rule.

At a minimum, MassDEP should establish a 1 ppt combined MCL for PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA. As discussed in Section II.B., a 1 ppt standard is far more consistent with the most current research regarding the significant adverse human health effects from exposure to PFAS chemicals. These PFAS are present in Massachusetts, and EPA Methods 537.1 and 533, and other analytical methods are able to detect many PFAS below 1 ppt.[94] Similarly, treatment technologies exist to remove most PFAS to concentrations below detection limits.[95]

MassDEP should also expand the number of PFAS proposed for regulation under this rule. Current laboratory methods exist to quantify a broader group of PFAS than the 6 PFAS proposed

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[91] *See* Section II.A.2.
[92] Sharon Lerner, *EPA Continues to Approve Toxic PFAS Chemicals Despite Widespread Contamination*, THE INTERCEPT (Oct. 25, 2018), available at https://theintercept.com/2018/10/25/epa-pfoa-pfas-pfos-chemicals/.
[93] The European Commission has recommended a class-based approach to regulating PFAS chemicals. *See* Sharon Lerner, *European Countries Announce Plan to Phase Out Toxic PFAS Chemicals By 2030*, THE INTERCEPT (Dec. 19, 2019), available at https://theintercept.com/2019/12/19/pfas-chemicals-europe-phase-out/.
[94] *See, e.g.*, NRDC Report, *supra* note 3; *see also* Association of State Drinking Water Administrators (ASDWA), *EPA Announces New 533 for PFAS in Drinking Water* (2019), available at https://www.asdwa.org/2019/12/19/epa-announces-new-method-533-for-pfas-in-drinking-water/ ("Method 533 measure PFAS by isotope dilution anion exchange solid phase extraction and liquid chromatography/tandem mass spectrometry (LC-MS/MS)").
[95] NRDC Report, *supra* note 3 at 53–54. To the extent that the Agency determines that the detection limits for regulated PFAS are above 1 ppt or that treatment technologies are not able to remove these PFAS to concentrations at or below 2 ppt, MassDEP should establish a combined standard at the detection limit or the treatment's removal efficiency.

for regulation here. For example, EPA Method 533 can quantify 25 different PFAS (14 of the 18 PFAS in Method 537.1 plus an additional 11 short chain PFAS).[96] Commercial laboratories are able to quantify between approximately 30-45 different PFAS compounds using modified methods. For all these reasons, MassDEP should adopt a 1 ppt MCL for all detectable PFAS. The standard should require regular review and a requirement to include additional PFAS compounds as they become detectable.

2. MassDEP should establish a treatment technique drinking water standard for the PFAS class of chemicals.

For the class of PFAS compounds that are not detectable, MassDEP should establish a treatment technique drinking water standard. As discussed in Section II.A, there is no reason to believe that the thousands of PFAS chemicals beyond the six proposed for regulation are safe. In fact, research regarding the health effects from exposure to new compounds suggest that these compounds pose serious health risks.

As stated in CLF and Toxics Action Center's Petition, a treatment technique is both authorized by law and is technically feasible.[97] EPA has adopted several treatment technique drinking water standards in lieu of an MCL where EPA has determined that it is "not economically or technologically feasible to ascertain the level of [a] contaminant."[98] For example, the Lead and Copper Rule is a treatment technique.[99] This rule requires public water systems to test drinking water in the homes of consumers and undertake additional treatment measures to control lead if 10 percent of the samples exceed 15 ppb.[100] The Surface Water Treatment Rule is also a treatment technique.[101] Under this rule, most public water systems that obtain water from surface water or groundwater under the direct influence of surface water must use filters and

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[96] U.S. Envtl. Prot. Agency, *Technical Brief: Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) Methods and guidance for sampling and analyzing water and other environmental media* 1 (2019), available at https://www.epa.gov/sites/production/files/2019-02/documents/pfas_methods_tech_brief_28feb19_update.pdf [hereinafter EPA Technical Brief].

[97] CLF Petition (CLF's petition lays out clear, evidence-based arguments for the adoption of a treatment technique standard, citing the legal basis for MassDEP's authority to adopt a treatment technique standard, the basis and precedent for such an approach, the economic and technical feasibility for a treatment technique, and the cost-benefit basis for a treatment technique standard); *see also* U.S. Envtl. Prot. Agency, *How EPA Regulates Drinking Water Contaminants*, available at https://www.epa.gov/dwregdev/how-epa-regulates-drinking-water-contaminants ("a treatment technique is an enforceable procedure or level of technological performance which public water systems must follow to ensure control of a contaminant.").

[98] U.S. Envtl. Prot. Agency, *How EPA Regulates Drinking Water Contaminants*, available at https://www.epa.gov/dwregdev/how-epa-regulates-drinking-water-contaminants.

[99] *Id*.

[100] U.S. Envtl. Prot. Agency, *Lead and Copper Rule*, available at https://www.epa.gov/dwreginfo/lead-and-copper-rule.

[101] U.S. Envtl. Prot. Agency, *supra* note 98.

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disinfectants to reduce pathogens.[102] In both cases, EPA had to establish a unique procedure to address the risks posed by a specific contaminant because an MCL would not have been practical or protective of public health due to the unique characteristics of the contaminants.

Similarly, the unique characteristics of the PFAS class pose a public health threat that cannot be adequately addressed with the establishment of an MCL for one or a few PFAS chemicals. First, in addition to PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA, other PFAS have been found or are being investigated in Massachusetts, including, for example, PFBS, PFHxA, and PFTeA.[103] There are likely many other PFAS in Massachusetts that the Commonwealth is simply not aware of yet given the speed and secrecy with which chemical manufacturers have introduced these dangerous chemicals into commerce,[104] and the fact that current testing methods can only quantify a small subset of PFAS compounds. Second, as discussed in Section II.A, PFAS are similar in chemical structure and some PFAS break down into each other.[105] While long-chain PFAS compounds may be decreasing in the environment due to voluntary phase-outs by manufacturers, "the most common replacements are short-chain PFAS with similar structures."[106] Third, these PFAS chemicals are often found together, and fourth, they are likely to have similar health effects, as discussed in Section II.A.

EPA has applied similar concepts to establish an MCL for a group of chemicals.[107] For example, EPA established an MCL for five haloacetic acid disinfection byproducts (HAA5) because it did not have sufficient information regarding (1) the occurrence of individual haloacetic acids; (2) how water quality parameters affect the formation of haloacetic acids; (3) how "treatment technologies control the formation of individual . . . [haloacetic acids];" and (4) toxicity information for some of the individual haloacetic acids.[108] In light of the unique challenges

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[102] U.S. Envtl. Prot. Agency, *Surface Water Treatment Rules,* available at https://www.epa.gov/dwreginfo/surface-water-treatment-rules.

[103] Massachusetts Dept. of Envtl. Prot., *Office of Research and Standards Final Recommendation for Interim Toxicity and Drinking Water Guidance Values for Perfluorinated Alkyl Substances Included in the Unregulated Chemical Monitoring Rule* 3 (June 8, 2018), available at https://www/mass.gov/files/documens/2018/06/11/pfas-ors-ucmr3-recs_0.pdf (noting that "all of the UCMR 3 PFAS have been detected in one or more MA water supplies, as well as in some groundwater and surface water samples."); *see also* Mass.gov, *Energy & Environmental Affairs Data Portal*, https://eeaonline.eea.state.ma.us/portal#!/search/drinking-water/results?ContaminantGroup=PFAS.

[104] Envtl. Working Group, *Environmental Working Group Comments on the Agency for Toxic Substances and Disease Registry (ATSDR) Draft Toxicological Profile for Perfluoroalkyls* August 20, 2018, https://cdn.ewg.org/sites/default/files/testimony/EWG%20Comments%20for%20ATSDR_Aug20..pdf?_ga=2.236461961.949885036.1539136763-1789323056.1527870942.

[105] NRDC Report, *supra* note 3 at 10 ("For example, one PFAA precursor subgroup, polyfluorinated phosphate esters (PAPs), are not routinely measured or widely investigated, however recent studies show that they are present in house dust, sometimes at extremely high levels that exceed other PFAS subgroups. Additionally, PAPs were found to be incorporated into produce, such as pumpkin, grown on contaminated soils. PFAA precursors can pose health risks associated with their precursor form and when broken down into PFAAs.").

[106] Blum et al., *supra* note 47 at A107.

[107] 63 Fed. Reg. 69390, 69409 (Dec. 16, 1998), available at https://www.gpo.gov/fdsys/pkg/FR-1998-12-16/pdf/98-32887.pdf#page=1.

[108] *Id.*

associated with regulation of these chemicals, EPA promulgated a group MCL even in the absence of complete information about each individual haloacetic acid in order to better protect public health.[109]

Establishing a treatment technique standard for PFAS using standard laboratory methods would be an effective approach to protecting communities against PFAS contamination in drinking water. As discussed in CLF and Toxics Action Center's petition, existing treatment technologies are able to remove long and short chain concentrations to below 2 ppt, including granular activated carbon, ion exchange, and reverse osmosis.[110]

In conclusion, MassDEP should protect Massachusetts communities from these dangerous chemicals by establishing a (1) 1 ppt combined MCL for detectable PFAS; and (2) treatment technique drinking water standard for the PFAS class.

III. The monitoring requirements for PFAS are insufficient to ensure compliance with the MCL and do not protect public health.

The proposed rule's monitoring requirements are inadequate to protect public health and will not ensure compliance with the MCL. Monitoring requirements are critical to ensuring compliance with drinking water standards, and robust and clear monitoring requirements are especially important here because these chemicals are highly mobile in water, persist in the environment, and are harmful at even very low concentrations.

Under the proposed regulation, water systems subject to the MCL will initially be required to take quarterly samples over the course of one year.[111] However, if results for the first two quarters of monitoring are below the applicable MRL, water suppliers can waive the second and third quarters.[112] Thereafter, systems will transition to more or less frequent routine monitoring depending on the results of their initial testing.[113] Additionally, the proposed regulation provides for monitoring waivers if specific circumstances are met,[114] including a waiver that permits testing only once every nine years.[115]

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[109] *Id.*
[110] CLF Petition at 16; *see also* NRDC Report, *supra* note 3 at 54-55. For the reasons articulated by NRDC experts, reverse osmosis appears to be the most robust technology for preventing exposure to PFAS and other unidentified contaminants.
[111] Proposed Rule.
[112] *Id.*
[113] *Id.*
[114] *Id.*
[115] *Id.*

A. The monitoring requirements must be revised to ensure compliance with the proposed PFAS MCL.

The requirements are complicated and difficult to understand, which could lead to compliance issues. Additionally, several of the monitoring provisions are insufficient to protect public health,[116] including the following: 1) if results from the first two quarters of initial monitoring are below the applicable MRL, water suppliers can waive the second and third quarters; 2) if no PFAS are detected during initial monitoring or three years of annual monitoring, water suppliers are only required to provide either one or two samples per year of every three years, depending on whether they serve more or less than 3,300 consumers; and 3) if no PFAS are detected after three years of testing, water suppliers can apply for a waiver that would reduce sampling to once every nine years.

Initial sampling is critical because it shows whether there are statistically significant variations in PFAS concentrations that warrant more frequent monitoring and water suppliers should not be able to opt out of completing this important first step. Additionally, the waiver provisions under the monitoring regime are problematic for several reasons. First, such waivers are given at MassDEP's sole discretion. Second, the proposed regulations do not provide guidance on the process by which waiver determinations will be made and such decisions are not subject to public review. Third, if circumstances change during a waiver period, potentially resulting in increased levels of PFAS, contamination will likely not be detected or treated because there is nothing in the monitoring protocols that would trigger retesting. This is a particularly troubling aspect of the monitoring regime because the PFAS landscape is constantly changing and new compounds are being identified and detected at an alarming rate.

Thus, with respect to the provisions discussed above, the proposed rule should be revised to require the following for all sources of drinking water: 1) all water systems must conduct initial sampling for at least four consecutive quarters, with no option to waive the third and fourth quarters; 2) where PFAS have not been detected during initial or routine monitoring, a water system must conduct annual monitoring; and 3) water suppliers should not have the ability to obtain waivers that reduce sampling to once every nine years.

Additionally, to better ensure compliance, we recommend that MassDEP revise its monitoring protocols to make the regime less complicated and that it provide water suppliers and consumers with a document summarizing or simplifying the requirements. For example, MassDEP could

[116] The proposed monitoring requirements are also inconsistent with standard monitoring schedules for other chemicals. For example, the federal monitoring requirements for organic chemicals are more protective than the proposed monitoring requirements for the PFAS chemicals in several ways. Under the federal rules, where initial monitoring does not detect a contaminant, the PWS must monitor annually. While the water supplier can apply for a limited waiver of the annual sampling requirement, the waiver is effective for no more than six years. 40 C.F.R. § 141.24(f)(5); 40 C.F.R § 141.24(f)(11)(iv); § 141.24 (f)(7).

provide water suppliers and consumers with a decision tree that clearly lays out what actions are required based on various testing results.

B. The rule should be revised to require monitoring for all detectable PFAS.

The proposed rule does not require monitoring for PFAS beyond PFOA, PFOS, PFNA, PFHxS, PFHpA, and PFDA.[117] As discussed previously, EPA Method 533 can quantify 25 different PFAS (14 of the 18 PFAS in Method 537.1 plus an additional 11 short chain PFAS),[118] and commercial laboratories are able to quantify more than 40 of these dangerous chemicals.[119] More than the six PFAS proposed for regulation have been detected in Massachusetts.[120] Thus, water system operators should monitor for all detectable PFAS.

IV. The proposed regulations should be revised to require public water system suppliers to issue "do not drink" letters when any MCL is exceeded.

The proposed regulations should require that all public water system suppliers issue "do not drink" letters to consumers when an MCL is exceeded. As proposed, the regulations only require that suppliers include standard health effects language without a clear communication that consumers should not drink the water.[121] This creates confusion for consumers and shifts the burden on to the public to decide whether or not it is safe to drink their tap water.

Without a clear statement advising consumers that their tap water is not safe when an MCL has been exceeded, it is likely that many Massachusetts consumers will continue to drink water that exposes them to unsafe levels of dangerous chemicals. Public notification of drinking water violations is a critical strategy to protect public health but providing limited information and putting the burden on the public to determine what is necessary to protect their families will undermine public trust and confidence and result in increased exposure to toxics. Thus, MassDEP should revise the regulations to require that public water system suppliers provide a clear statement that water is not safe to drink and that consumers should seek an alternative water supply when an MCL has been exceeded.[122]

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[117] Proposed Rule.
[118] EPA Technical Brief.
[119] *Id.*
[120] *See* Section I.A.3.
[121] *See* MassDEP, 310 CMR 22:00(7)(e): Such notice shall include the results and average of the PFAS samples; list the total PFAS MCL and the definition of MCL; include a Department approved explanation of the health effects of PFAS and steps consumers can take to reduce exposure to PFAS in drinking water; and contact information for the Supplier of Water.
[122] CLF recognizes that the proposed regulations do not apply to bottled water because the Department of Public Health regulates bottlers. However, we take this opportunity to note our concern that domestic and imported bottled water systems are not required to comply with the proposed PFAS MCL. After PFAS contamination is identified in

V. CLF supports MassDEP's proposed method for calculating compliance when samples are below the MRL but above one-third of the MRL.

Pursuant to the proposed regulations, if an analytical result is equal to or greater than one-third of the MRL but less than the MRL, the running quarterly average[123] will be calculated using one-half of the MRL as the concentration for that PFAS.[124] We support this provision of the regulations and agree that samples with levels below the MRL but above one-third of the MRL contain PFAS and that it is important to account for the presence of PFAS in these samples. Therefore, the proposed method for calculating these detections is both more accurate and more protective than other methods, such as quantifying these results as zero or using a J value estimate.

VI. The State and public water systems have options to address the financial costs associated with the clean-up of PFAS contamination.

There will no doubt be costs associated with the necessary monitoring, clean-up, and treatment to remove PFAS from drinking water. This is not a justification for continuing to expose Massachusetts communities to these dangerous chemicals. Water system operators have a legal obligation to provide safe drinking water to consumers. In fulfilling these obligations to provide safe drinking water and protect public health, the State, public water systems, and other impacted entities have funding assistance options they can pursue. For example, $10.65 million in funding has been allocated to the Clean Water Trust for remediation of PFAS contamination in local water systems (via the State Revolving Fund), and $9.05 million in funding has been allocated to improvements to local water systems.[125] Additionally, $4.2 million is available for public and

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tap water, many individuals in Massachusetts have no choice but to drink bottled water. Recently, however, testing revealed that water from a supplier in Massachusetts sold at stores throughout New England contained dangerous levels of PFAS and MassDEP has advised pregnant women, nursing mothers and infants to avoid certain brands of bottled water due to their high levels of PFAS contamination (Mass.gov, *Bottled Water Consumption Advisory*, available at https://www.mass.gov/files/documents/2019/07/08/spring-hill-advisory-july-2-2019_0.pdf). While we commend MassDEP's proposal to request that bottlers conduct voluntary PFAS sampling, this is not sufficient to protect Massachusetts communities and we encourage the Department of Health to regulate PFAS in bottled water.

[123] Running Quarterly Average means the average of the monthly compliance monitoring results from each of the prior three calendar months.

[124] *See* Proposed Rule.

[125] MassGov, *Clean Water Trust Approves 0% Interest Rate Loan Pilot Program for PFAS Treatment*, (February 3, 2020), available at https://www.mass.gov/news/clean-water-trust-approves-0-interest-rate-loan-pilot-program-for-pfas-treatment. Included in this funding is a "0% interest rate loan pilot program for projects that remediate per- and polyfluoroalkyl substances (PFAS) in public water supplies for the 2020 calendar year. These no interest loans will help communities that have identified PFAS in their water to expedite and complete the remediation projects."

private water supply testing through the state's supplemental budget,[126] and MassDEP will offer free voluntary sampling and grants to design drinking water treatment systems for public water systems affected by PFAS contamination.[127]

In addition, as in New Hampshire and Vermont, the State, through its Attorney General, should hold chemical manufacturers and polluters that have contributed and are contributing to the PFAS pollution crisis accountable for the harm they have caused. Such an action could and should generate substantial resource support to compensate the State and public entities for incurring costs to clean up PFAS contamination.

Conclusion

Thank you for the opportunity to provide these comments. We appreciate MassDEP's attention to the significant public health and environmental problem posed by PFAS pollution. We urge MassDEP to revise the proposed rules consistent with our recommendations to ensure Massachusetts communities have access to safe drinking water free of toxic PFAS chemicals.

Respectfully submitted,

/s/ Alyssa Rayman-Read

Alyssa Rayman-Read
Vice President and Massachusetts Director
Conservation Law Foundation

Elizabeth Saunders
Massachusetts Director
Clean Water Action

Shaina Kasper
Water Program Director
Toxics Action Center

Anna Reade

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[126] Bill H.4285: *An Act making appropriations for the fiscal year 2020 to provide for supplementing certain existing appropriations and for certain other activities and projects*, available at https://malegislature.gov/Bills/191/H4285.
[127] MassDEP, *PFAS Convening: MassDEP Panel Presentation on Rulemaking Process for Draft PFAS Drinking Water MCL Standards* (January 1, 2020). We understand that the proposed regulations do not apply to private wells. However, we encourage MassDEP to find ways to provide cities and towns with the necessary resources and guidance that private well owners will need when PFAS contamination is detected.

conservation law foundation

Staff Scientist
Healthy People & Thriving Communities Program
National Resources Defense Council

From: Heather Miller <hmiller@crwa.org>
Sent: Friday, February 28, 2020 2:35 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Please find attached comments from Charles River Watershed Association on MassDEP's proposed PFAS MCL.

Thank you,

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Attachment: 2020-02-28 CRWA Comments_DEP PFAS MCL.pdf

Charles River Watershed Association

February 28, 2020

Via email

Commissioner Martin Suuberg
MassDEP, Drinking Water Program
1 Winter Street, 5th Floor
Boston, MA 02108
program.director-dwp@mass.gov

Re: PFAS MCL Comments

Dear Commissioner Suuberg:

Charles River Watershed Association ("CRWA") submits the following comments on the proposed revisions to the Massachusetts drinking water regulations, 310 CMR 22.00. CRWA's mission is to protect, preserve, and enhance the Charles River and its watershed through science, advocacy, and the law. We appreciate Massachusetts Department of Environmental Protection's ("DEP") efforts to address per- and polyfluoroalkyl substances ("PFAS") contamination and ensure safe drinking water for all residents of the Commonwealth, particularly in light of continued inaction by the federal government. In order to be fully protective of public health, we strongly encourage DEP to go beyond its proposed limit and establish a maximum contaminant level ("MCL") of 1 ppt for *all* quantifiable PFAS.

Surface waters, groundwater, and drinking water are integrally connected. Surface waters like the Charles River and its tributaries are inextricably linked to groundwater and drinking water. PFAS enter surface water through groundwater discharge, runoff from contaminated land, and discharges from industrial sites and wastewater treatment plants. Surface waters in turn, along with groundwater, are sources of drinking water. And much of the drinking water used in our homes eventually makes its way back to surface waters, whether through treatment and discharge from a wastewater treatment plant or because it is used for irrigation or other outdoor uses and migrates back into the soils, groundwater, and then surface waters. PFAS contamination in drinking water, therefore, is a watershed-wide issue and regulation of drinking water will affect surface waters both directly and indirectly.

PFAS pose significant threats to ecological and human health in our watershed communities. PFAS are persistent "forever chemicals" – they do not break down and will remain in the environment for long periods of time, if not indefinitely. PFAS are highly mobile in water and can quickly migrate long distances away from their original sources. In light of these chemical properties, it is crucial that the existence of PFAS in drinking water be closely monitored and accurately reported to users.

PFAS have been found to be toxic to people at extremely low levels. Health concerns associated with PFAS exposure include changes to metabolism, decreased fertility, reduced ability of the immune system to fight infections, and cancer. Impacts from PFAS can be particularly harmful to vulnerable populations such as fetuses, infants, and children. Studies have found that Perfluorooctanoic acid ("PFOA") and Perfluorooctanesulfonic acid ("PFOS") can have significant and lasting impacts on children's health at levels as low as 1 part per trillion ("ppt"). Although the health impacts of PFOA and PFOS are the most widely studied, there is evidence to support that due to structural similarities, the health concerns of PFOA and PFOS are representative of PFAS as a class of chemicals. Thousands of distinct PFAS chemicals have been produced, and these chemicals can have cumulative impacts on human health.

The proposed MCL is not sufficiently protective of human health. Given what we know about PFAS and their impacts on human health, the PFAS MCL should be lowered to 1 ppt. Further, although some PFAS chemicals are more prevalent than others, limiting monitoring to only six chemicals does not accurately capture the actual exposure people face. PFAS should be regulated as a class, with monitoring extending to all quantifiable PFAS chemicals.

The regulations should include standards for treatment techniques and public notification. The prevalence of PFAS in the environment necessitates the creation of standards for effective water treatment techniques. The regulations should also require unambiguous "do not drink" notifications, in multiple languages as appropriate, to be sent by drinking water providers to all users of water contaminated above the MCL.

State surface water quality standards should also be updated to regulate PFAS. While establishing drinking water standards for PFAS is critically important, CRWA urges DEP to also initiate revisions to the state surface water quality standards, 314 CMR 4.00, to address PFAS pollution in our rivers, streams, and lakes. As described above, many surface waters, including several within the Charles River watershed, serve as drinking water sources. In order to ensure that drinking water does not contain unsafe levels of PFAS, it is also therefore necessary to address PFAS in surface waters.

Several other states, including Michigan and Minnesota, have established surface water quality standards for PFAS, and New Hampshire recently completed an analysis of what such regulation would entail. DEP's drinking water regulations will set an important precedent for future surface water quality standards in Massachusetts, which is yet another reason drinking water standards must be sufficiently protective of human health.

CRWA appreciates the opportunity to provide these comments. We are glad DEP is taking action on this important public health concern. Please feel free to contact me with any questions at hmiller@crwa.org or 781-788-0007 x 234.

Sincerely,

Heather Miller

Heather Miller, Esq.
General Counsel & Policy Director

From: Emily Hammel <eghammel@bu.edu>
Sent: Friday, February 28, 2020 2:23 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Director,

Thank you for considering my comments and recommendations for the proposed MCL standard for the six PFAS regulated under 310 CMR 22. I support the work you are doing to protect MA residents from toxic compounds in drinking water.

Sincerely,
Emily Hammel
--
Emily Hammel
Boston University School of Public Health

Attachment: Hammel_PFASComment_final.pdf

Bureau of Waste Site Cleanup
Massachusetts Department of Environmental Protection
1 Winter Street, Boston, MA

Dear Elizabeth Callahan,

I'm writing in support of the proposed revisions to the Massachusetts Contingency Plan, 310 CMR 40.0000 to develop a drinking water standard for six PFAS (PFOS, PFOA, PFHpA, PFDA, PFHxS, and PFNA) under the Massachusetts Drinking Water Regulations, 310 CMR 22.00. My experience researching PFAS in drinking water supplies as a master's student in the Department of Environmental Health at Boston University School of Public Health qualifies me to discuss the regulatory standards of PFAS. I support the proposed amendments to address reportable concentrations of PFAS in soil to limit leaching of mobile persistent compounds into groundwater and offer my perspective here on the efforts to address PFAS in drinking water.

I recently conducted a health-based risk assessment of PFAS in private wells in Harvard, MA and used the toxicological literature to assess risks in sensitive populations from ingestion of PFAS in drinking water sourced from private wells. Drawing from my familiarity with available data and the risk assessment process, I offer comments on 1) using an additional uncertainty factor in deriving the Reference Dose (RfD) and 2) classifying six compounds together under one standard. I encourage MassDEP to consider these recommendations in implementing a final Maximum Contaminant Level (MCL).

Reference Dose

The decision to use developmental toxicity as the critical endpoint in determining the MCL for PFAS is appropriate given the important role drinking water standards play in protecting sensitive populations, including developing children. Developing children are more sensitive to the effects of PFAS in utero and during early childhood than the general population; it is not appropriate to base decisions on what the general public would be exposed to as critics have argued.[1] If there are data available that suggest sensitive subgroups may be at greater risk of experiencing adverse health effects, the MCL must consider them. There is a precedent in regulatory science to consider sensitive populations when deriving an MCL, as demonstrated by EPA when establishing the MCL for perchlorate that considers prenatal exposure to developing fetuses.[2] Similarly, MassDEP has taken a similar approach in setting standards for other chemicals with developmental effects (e.g. perchlorate, haloacetic acids, arsenic).[3]

Data exist on other potentially more sensitive health endpoints, like suppressed immune function.[4] As immunotoxic effects in humans become better characterized, I urge MassDEP to consider a point of departure (POD) based on a more sensitive endpoint. Until the toxicological data is more robust, it is necessary to apply an uncertainty factor that reflects the gap in the toxicological data. Studies indicate adverse health effect occur at doses below the RfD proposed by the EPA based on developmental endpoints, therefore the database uncertainty factor (UF_D) must be applied to the developmental RfD to adequately protect sensitive populations. MassDEP's decision to apply a UF_D of 10^ ½ is appropriate. The PODs based

[1] American Chemistry Council, 2019. Re: Proposed Revisions to the MCP, 310 CMR 40.000, proposed GW-1 standards and RCGW-1 Reportable Concentrations for PFAS
[2] Federal Register :: National Primary Drinking Water Regulations: Perchlorate. https://www.federalregister.gov/documents/2019/06/26/2019-12773/national-primary-drinking-water-regulations-perchlorate. Accessed February 28, 2020.
[3] MassDEP. *Supporting Documentation for Drinking Water Standards and Guidelines*. https://www.mass.gov/files/documents/2018/05/07/contaminants.pdf#page=249. Accessed February 28, 2020.
[4] Agency for Toxic Substances and Disease Registry. Toxicological Profile for Perfluoroalkyls.; 2018. https://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=1117&tid=237.

on non-developmental endpoints observed in animal studies range from 2.2E-7 -2.7E-6 mg/kg-day[5,6,7]. DEP's decision to use a UF_D of 10^ ½ accounts for a roughly 3-fold increase in protection than the POD for developmental toxicity offers on its own. Using the POD supported by the EPA aligns with the methods used by federal and state agencies, and applying the UF_D is supported by the best available science.

Developing subpopulations are potentially exposed to higher concentrations of PFAS in utero and through breastmilk, and the addition of an uncertainty factor that considers the best available science is not only supported, but essential in deriving a drinking water standard that adequately protects sensitive populations.[8,9] By protecting the most sensitive populations, the standard protects against the greater population as well. The issue becomes increasingly important when considering vulnerable populations living in communities with elevated background levels of PFAS as a result of contaminated waste sites (e.g. landfills, manufacturing facilities, military installations, Superfund sites, etc.). These communities may not be aware that their background levels are elevated, and MassDEP has the authority and responsibility to protect all populations from contaminants in drinking water, including vulnerable communities and sensitive subpopulations.

Summing Compounds

It's impossible for MassDEP to understand the potential health effects for each one of the thousands of PFAS before developing a health protective standard in drinking water, and I applaud the Department's first steps in tackling the issue of these persistent compounds. The proposed approach to sum the six PFAS based on toxicokinetic similarities (e.g. similar half-lives) and equipotency across the compounds, as well as EPA methods 533, 537 and 537.1, is appropriate. Classifying groups of compounds together is well supported by other regulatory procedures (e.g. pesticides, 1,4 – dioxin and dioxin-like compounds (DLCs)). Importantly, DLCs are classed together based on their mechanism of action, not toxicity. While the mechanisms of action for the subgroup of PFAS included in the proposed MCL are still being understood, they exhibit similar toxicities. This is an important distinction to consider when thinking about the addition of new PFAS to the existing drinking water standard in the future; will new compounds be added to the proposed subgroup based on toxicokinetics and equipotency? Otherwise, if additional compounds exhibit similar mechanisms of action but different toxicities, will a new subgroup and corresponding standard be developed? While I support the decision to classify these compounds together, I urge MassDEP to consider future regulations of additional PFAS and the burden on water suppliers to adhere to modified standards. How it defines the basis for classification may create challenges down the road.

If MassDEP maintains its approach to group PFAS together, how will the standard accommodate new compounds that are added? From a health perspective, it will be challenging to justify raising the standard to a higher concentration for the sum of additional compounds. Alternatively, lowering the standard to a lower concentration in response to emerging data that point to additional toxic PFAS in drinking water creates an enormous burden for public water suppliers to meet new, more protective standards. To avoid this, MassDEP might consider developing new subgroups for additional PFAS based

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[5] Agency for Toxic Substances and Disease Registry. *Toxicological Profile for Perfluoroalkyls*.; 2018. https://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=1117&tid=237.

[6] Dong GH, Liu MM, Wang D, Zheng L, Liang ZF, Jin YH. Sub-chronic effect of perfluorooctanesulfonate (PFOS) on the balance of type 1 and type 2 cytokine in adult C57BL6 mice. *Arch Toxicol*. 2011;85(10):1235-1244. doi:10.1007/s00204-011-0661-x

[7] Dong GH, Zhang YH, Zheng L, Liu W, Jin YH, He QC. Chronic effects of perfluorooctanesulfonate exposure on immunotoxicity in adult male C57BL/6 mice. *Arch Toxicol*. 2009;83(9):805-815. doi:10.1007/s00204-009-0424-0

[8] Mondal D, Weldon RH, Armstrong BG, et al. Breastfeeding: A Potential Excretion Route for Mothers and Implications for Infant Exposure to Perfluoroalkyl Acids. *Environ Heal Perspect* •. 2014;122(2). doi:10.1289/ehp.1306613

[9] Romano ME, Xu Y, Calafat AM, et al. Maternal serum perfluoroalkyl substances during pregnancy and duration of breastfeeding. *Environ Res*. 2016;149:239-246. doi:10.1016/j.envres.2016.04.034

on unique attributes that distinguish these compounds from those proposed in the current standard. Considering how the current subgroup is defined sets an important precedent for future subgrouping of compounds.

Treating the compounds individually would allow for additional compounds to be regulated based on unique attributes rather than similarities shared among other PFAS. While more time consuming from a regulatory perspective, this would obviate the need to justify why a particular compound should or shouldn't be lumped in with a preexisting standard. This approach presents a daunting task, as there are thousands of PFAS and the process of adding individual PFAS standards could go on in perpetuity. While industry may be in favor of regulating PFAS individually despite the good toxicological evidence to group them together, this laborious process would create unreasonable delays and ultimately interfere with the protection of public health.

I encourage the agency to consider future implications of its proposed standard and the potential burdens faced by communities and water suppliers to stay in compliance. The agency may consider including a clause that outlines its approach for updating its standards based on best available science and most feasible practices:

> *While the proposed standard is derived from the best available data and aims to protect all populations, it is not comprehensive nor protective against every manufactured PFAS. As additional PFAS and their occurrence in drinking water become better understood, MassDEP may update drinking water standards as appropriate, and will consider available treatments and input from public water suppliers on the best ways to implement health protective standards.*

In the haste of developing a standard that is protective, it would be remiss not to consider how the conditions of the proposed rule may hinder the regulations of additional PFAS in the future. Thank you for your work in protecting communities across the Commonwealth. Please reach out to me directly if you would like to further discuss the above comments and recommendations.

Emily Hammel

MPH Candidate
Boston University School of Public Health
eghammel@bu.edu

From: Adam S. Kran <ask@envpartners.com>
Sent: Friday, February 28, 2020 4:54 PM
To: Director-DWP, Program (DEP)
Cc: Paul Gabriel; Ryan J. Trahan; Helen Gordon; Eric A. Kelley
Subject: PFAS MCL Comments

Hi,

Our comments on the proposed changes to 310 CMR 22 are attached.

Have a good weekend.

Thanks,
Adam

Adam S. Kran, PE
Project Manager
O: 617.657.0273
Environmental Partners
envpartners.com

Attachment: EP Letter to MassDEP - PFAS MCL - 2020-02-28.pdf

ENVIRONMENTAL PARTNERS

February 28, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)
Via email to program.director-dwp@mass.gov

Dear Ms. DePeiza,

Environmental Partners is a member of Massachusetts Water Works Association (MWWA) and wishes to submit the following written comments to the Massachusetts Department of Environmental Protection (MassDEP) on proposed changes to the Drinking Water Regulations, 310 CMR 22.00. We support the comments that are being submitted by MWWA and urge MassDEP to consider them carefully before moving forward with any new rule.

As water supply design professionals, we take our role in the planning, design and construction oversight of water systems as part of the protection of public health very seriously. We work hard with our clients, system managers and operators, who work hard to provide clean, safe drinking water and to ensure they are complying with the many Safe Drinking Water Act requirements. Per- and Polyfluoroalkyl Substances (PFAS) are something our industry is paying close attention to. Research, particularly on toxicity and health effects of PFAS is ongoing and the scientific understanding of these compounds on human health, continues to evolve. For public health protection, the United States Environmental Protection Agency (EPA) has a rigorous process for evaluating contaminants of concern in drinking water and deciding whether regulation is warranted. EPA has released a National Strategy on PFAS and is working on implementation of its strategy. We join with MWWA in asking you to let EPA take the lead on addressing regulation of PFAS, as this is an issue being seen across the country and it is not particular to Massachusetts.

With respect to MassDEP's proposal to develop a Massachusetts Maximum Contaminant Level (MMCL) of 20 parts per trillion (ppt) for PFAS, which includes six compounds (perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA)), we would ask MassDEP to develop compound-specific standards for each of the PFAS compounds and not employ a cumulative approach. The compounds should not be combined because of different toxicity endpoints, different uncertainty factors between humans and mammal toxicities, different reference dosages, differences in half-lives, bioaccumulation, etc. There are also treatment and operational considerations that could be more challenging if the compounds are considered cumulatively.

MassDEP is requiring monthly monitoring if detections are above 10 ppt. We are not convinced that monthly monitoring should be required at 10 ppt. PFAS sample costs are high and we question whether the results would vary significantly from month to month to warrant the additional sampling. For systems over the MMCL, quarterly sampling should be enough.

We have strong concerns about MassDEP's proposed MMCL compliance calculations including estimates of analytical results below the Minimum Reporting Level (MRL) and we urge MassDEP to exclude this from any final rule promulgated. Any detection below the MRL should not be governed by an arbitrary rule assuming a certain level exists; such an interpretation is not scientific. Values below the MRL should not be reportable, nor counted towards compliance calculations at these low parts per trillion levels. We are also concerned about the legal defensibility of estimating values below the MRL. Violations of the MMCL will most likely prompt a Public Water System to look for a Responsible Party. If the exceedance of the MMCL includes estimations of results, Responsible Parties will have grounds to argue that it is not a valid result because it is below the MRL.

We also believe that MassDEP needs to consider ways to invalidate sample results if the Public Water System demonstrates that results were influenced by products used in the piping or plumbing of the sample location, involved human error, or if confirmatory sample results are markedly different than the initial results.

We and our clients appreciate that MassDEP is allowing Public Water Systems to submit previously collected data in order to forgo some of the future sampling. We also agree it is important to have waiver provisions and regulatory flexibility related to monitoring if there are emergency, operational, or lab capacity issues, which would preclude such monitoring. We are glad MassDEP has included these provisions in the proposed regulation.

We are most concerned that MassDEP address the following implementation challenges facing Public Water Systems before finalizing and implementing an MMCL. These include:

- DEP Policy 90-04 should be updated to address piloting requirements for PFAS, including what bench scale, piloting, and/or demonstration testing is required for new PFAS treatment systems.
- The complexities, timing, and cost of designing, permitting and constructing treatment systems needs to be factored into MassDEP's timeline for enforcing the standards.
- The existing timeframes and statutory constraints on being able to quickly procure goods, services, and equipment needs to be evaluated and resolved. MassDEP should work with the Operational Services Division to add necessary services and common treatment components to the state bid list.
- MassDEP must provide context to relative exposures of PFAS in drinking water versus all other exposure points (consumer products, food, air, etc.). If we only concentrate on regulating PFAS in drinking water, we may be giving consumers a false impression they are protected, when in fact, there are many other sources of PFAS exposure in consumer products and food, being detected at even higher levels than what is found in drinking water. If we are not addressing all these other exposures, intended public health protection will not be achieved.

- A definitive timeline must be set by which MassDEP's Bureau of Waste Site Cleanup will launch investigations into the source(s) of contamination of the drinking water to identify Responsible Parties.

Thank you for the opportunity to provide these comments. Public water planners, designers and suppliers understand the importance of ensuring that the drinking water that reaches customers meet Safe Drinking Water Act requirements and protect the public health. Water professionals work hard each day to assist water suppliers to meet these goals and satisfy their customers' expectations. As we have all come to be keenly aware, the issue of emerging contaminants presents a huge challenge. Compliance with regulatory standards will fall on water systems and MassDEP has an obligation to determine what the real human risk exposure is, and then, when and if the science dictates, move towards standards that will achieve desired public health outcomes. As outlined in this letter, there are still many outstanding issues that need to be addressed before moving forward with these new regulations.

Sincerely,

Environmental Partners Group, Inc.
Paul F. Gabriel, PE, LSP
CEO
P: 617.657.0200
E: pfg@envpartners.com

Environmental Partners Group, Inc.
Ryan J. Trahan, PE
Senior Principal, COO
P: 617.657.0200
E: rjt@envpartners.com

From: Connell Property Consulting <connellpropertyconsulting@gmail.com>
Sent: Friday, February 28, 2020 2:03 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL COMMENTS

To whom it may concern,

I am currently involved with securing an engineered solution for PFA's, manganese and nitrates in a public water supply. The two best available technologies options are to employ either R.O. or activated charcoal filter to meet the newly proposed standard of care. My concern is that at least one of the solutions appears of questionable efficacy. Reverse Osmosis can perform as designed to remove PFA's; **BUT** discharging backwash into a dry well appears to only "*kick the can down the road*" while potentially returning a large quantity (*and perhaps more concentrated PFA's, manganese and nitrates*) back into the soils. That sort of thinking aligns with what the federal government proposed regarding asbestos back in the 60s. Initially one of the first proposed solutions was to encapsulate asbestos with lead-based paint. Thankfully that concept was recognized as a potential "Darwin Award" and scrapped.
One of the proposals our engineer made was to include an activated charcoal filter to intercept PFA's in the backwash riser on its way to the drywall for discharge. That concept makes me question whether or not anyone has a good handle on the science as to what is the "best available technology". Do we use R. O., activated charcoal, combine the two? ….And then there is a matter of recurring cost for disposal of activated charcoal canisters as nuclear waste.

While we are learning the scope and scale of this issue is likely to be much greater than what we currently have visibility of, I'm hopeful further investigation will result in crafting a reasonable response to dealing not only with the PFA's, but radon, radium, uranium, arsenic, cadmium, mercury etc., focusing a holistic approach to capturing these and other contaminents in a single shot if possible.

Food for thought, … And thanks for your consideration.

Best regards,

Gerry Connell

Connell Property Consulting
P.O. Box 65 - One Church Lane
Plainfield, MA 01070

connellpropertyconsulting@gmail.com
(413) 634-0070
(413)-374-7961 mobile

From: Grace Jimenez <gracejim@bu.edu>
Sent: Friday, February 28, 2020 11:28 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

To Whom It May Concern,

Attached are my written comments pertaining to proposed amendments to 310 CMR 22.00, Massachusetts Drinking Water Regulations.

Thank you for taking my comments into consideration.

Sincerely,

Grace Jimenez | MPH Candidate
Boston University School of Public Health
gracejim@bu.edu | 847-922-6522 | she/her/hers

Attachment: Jimenez_PFAS Comments_Final.pdf

February 28, 2020

Elizabeth Callahan
MassDEP
One Winter Street
Boston, MA 02108

Re: 310 CMR 20.00, Massachusetts Drinking Water Regulation, Proposed Amendments

Dear Ms. Callahan,

I appreciate the opportunity to comment on the proposed amendments to 310 CMR 22.00, Massachusetts Drinking Water Regulations to establish a PFAS Maximum Contaminant Level (MCL) of 20 ppt for six perfluorochemicals (PFAS) in drinking water. I am a Master of Public Health candidate at Boston University School of Public Health and a concerned resident of Massachusetts, troubled by the ubiquity of PFAS chemical exposure throughout the Commonwealth. For this reason, <u>I am writing in support of the decision to assess drinking water contamination based on the sum of six PFAS compounds at 20ppt, rather than assessing each compound individually, and requiring public notification upon initial detection. Both proposed elements are critical to achieve the goal of protecting sensitive subpopulations from the risk of adverse health outcomes associated with PFAS exposure in public water sources in Massachusetts.</u>

Science shows the six PFAS compounds included in the proposed drinking water standard are stable, water soluble, longer-chain chemical compounds similar in both structure and how they manifest in the body.[1] Additionally, these long chain legacy compounds have a long half-life.[2] Because they each persist in the environment and the body, and have similar effects, they must be regulated by factoring in the likelihood of increased risk associated with multiple PFAS detected in one water source.

Conversely, assessing these compounds individually, as some states currently do, fails to reflect the compounding effect of multiple PFAS exposures to people who are dependent on the impacted water source. This could result in public water sources testing in compliance for each individual compound while still putting consumers of that water source at an increased risk from exposure to multiple of the chemicals, compounding to an MCL well above the 20ppt. This is particularly problematic when assessing the risk to infants and children, a particularly sensitive subpopulation.

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[1] MASSDEP OFFICE OF RESEARCH AND STANDARDS, *Per- and Polyfluoroalkyl Substances (PFAS): An Updated Subgroup Approach to Groundwater and Drinking Water Values* (2019).

[2] Per- and Polyfluoroalkyl Substances (PFAS), MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION , https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#what-are-pfas-and-why-are-they-a-problem?.

Children and infants can be exposed to PFAS in drinking water as well as through the placenta and breast milk of their mother resulting in adverse health outcomes due to the scientifically documented developmental toxicity of PFAS.[3] The proposed MCL is a protective approach to ensure consumers of public water sources, particularly sensitive subpopulations, do not incur the health risks associated with this suite of PFAS chemicals. M.G.L. c 111, SS 160 gives the Department the authority to "ensure the delivery of a fit and pure water supply to all consumers".[4] Infants and children are a subpopulation of consumers and the most reasonable means of ensuring a "fit and pure water supply" to these consumers is to apply the protective, additive approach based on cooccurrence of PFAS chemicals in drinking water supplies.

The added protective value of assessing the six PFAS compounds as a group at 20ppt is futile if that detection is not communicated adequately to the public. It is imperative to require public water supplies to notify consumers to ensure communities are made aware that their water supply has a test result detecting greater than the 20ppt MCL for any of the six PFAS compounds. The infant and children subpopulation of greatest concern for exposure may need to avoid consumption of water from a public water source that may not yet be in violation but has a confirmed detection. Residents of Massachusetts must be provided adequate information about the water they consume in order to make an informed decision about their daily water consumption practices. Knowledge is power and the state of Massachusetts must support the distribution of knowledge to the public.

For the above reasons, I am requesting that MassDEP assess drinking water contamination based on the sum of the six PFAS compounds at 20ppt and require rigorous public notification upon detection of any contamination above 20ppt, prior to a violation going into effect. Thank you for your consideration.

Sincerely,

Grace Jimenez, MPH Candidate
Boston University School of Public Health

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[3] J.A. Goeden, H.M., Greene, C.W. & Jacobus, *A transgenerational toxicokinetic model and its use in derivatio nof Minnesota PFOA water guidance*, J. EXPO. SCI. ENVIRON. EPIDEMIOL. 183–195 (2019).
[4] General Law - Part I, Title XVI, Chapter 111, Section 160, , https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXVI/Chapter111/Section160.

From: Nielsen, Greylin, Hillary Rinaldo <nielseng@bu.edu>
Sent: Friday, February 28, 2020 9:51 AM
To: Director-DWP, Program (DEP)
Subject: MA PFAS MCL Comments

Good morning,

Thank you for the opportunity to comment on the proposed revisions to the MCP that establish an MCL for six PFAS. Attached is a comment written by my colleague and I, both doctoral students at Boston University School of Public Health, regarding the MassDEP's selection of the point of departure and application of an additional uncertainty factor.

Thank you for your time and consideration,

Greylin Nielsen, MPH
PhD Candidate in Environmental Toxicology
Boston University School of Public Health

Jennifer Oliver, MS
PhD Candidate in Epidemiology
Boston University School of Public Health

Attachment: MA_PFAs_MCL_Comments_JO_GN.pdf

Greylin Nielsen, M.P.H
Boston University School of Public Health
715 Albany Street
Boston, MA 02118

Jennifer Oliver, M.S.
Boston University School of Public Health
715 Albany Street
Boston, MA 02118

February 28, 2020

Martin Suuberg
Commissioner
Massachusetts Department of Environmental Protection
1 Winter Street
Boston, MA 02108

Subject: Revisions to the Massachusetts Contingency Plan, 310 CMR 40.0000 to develop a PFAS drinking water standard under the Massachusetts Drinking Water Regulations, 310 CMR 22.00

Dear Commissioner Suuberg,

We are writing in support of the proposed revisions to the Massachusetts Contingency Plan to develop a drinking water standard for six PFAS (PFOS, PFOA, PFHpA, PFDA, PFHxS, and PFNA). As doctoral students studying environmental epidemiology and environmental toxicology through the lens of public health, our comments will focus on the approach outlined by MassDEP's Technical Support Document for Per- and Polyfluoroalkyl Substances (PFAS) to select a point of departure and apply uncertainty factors in deriving the reference dose.[1]

We support MassDEP's point of departure selection and application of an additional uncertainty factor to account for effects occurring at lower doses. The animal toxicity studies selected for PFOA and PFOS rely on sensitive developmental effects observed in rodents.[2,3] The lowest observed adverse effect level (LOAEL) and the no observed adverse effect level (NOAEL) from these two studies are consistent with numerous studies finding developmental, immune, kidney, and hepatic effects occurring at similar doses.[4,5] As a result, US EPA and multiple state agencies including in Connecticut, New York, Vermont, Washington, and the five states that have adopted EPA's health-based drinking water values for PFOA

[1] Baker CD, Polito KE, Theoharides KA, Suuberg M. *Technical Support Document Per-and Polyfluoroalkyl Substances (PFAS): An Updated Subgroup Approach to Groundwater and Drinking Water Values*.; 2019. https://www.mass.gov/files/documents/2019/12/27/PFAS TSD 2019-12-26 FINAL.pdf

[2] Lau C, Thibodeaux JR, Hanson RG, et al. Effects of perfluorooctanoic acid exposure during pregnancy in the mouse. *Toxicol Sci*. 2006;90(2):510-518. doi:10.1093/toxsci/kfj105

[3] Luebker DJ, Case MT, York RG, Moore JA, Hansen KJ, Butenhoff JL. Two-generation reproduction and cross-foster studies of perfluorooctanesulfonate (PFOS) in rats. *Toxicology*. 2005;215(1-2):126-148. doi:10.1016/j.tox.2005.07.018

[4] USEPA (U.S. Environmental Protection Agency). 2016a. Health Effects Support Document for Perfluorooctanoic acid (PFOA) US Environmental Protection Agency, Office of Water: Health and Ecological Criteria Division Washington, DC. http://www.epa.gov/dwstandardsregulations/drinking-water-contaminant-human-health-effects- information

[5] USEPA (U.S. Environmental Protection Agency). 2016b. Health Effects Support Document for Perfluorooctane Sulfonate (PFOS) US Environmental Protection Agency, Office of Water: Health and Ecological Criteria Division Washington, DC. http://www.epa.gov/dwstandardsregulations/drinking-water-contaminant-human-health-effects- information

and PFOS all rely on Lau et al. 2006 and Luebker et al. 2005 as the basis for their reference doses, with the acknowledgement that these two studies represent a larger suite of health effects occurring in a similar dose range.[1-3]

Although adverse effects are observed consistently in the dose range selected by MassDEP for the PoD, mounting evidence in animal toxicity studies and human epidemiological studies shows concerning effects occurring at lower doses. The effects occurring at lower doses include increased liver weight, immunotoxicity, and development neurobehavioral and skeletal changes.[6,7,8,9,10] Further, human epidemiological studies observing critical effects of PFOA and PFOS on changes in total cholesterol and immunotoxicity in children derive reference doses considerably lower than the reference dose derived by EPA and MassDEP using animal toxicity studies.[11,12] Collectively, these studies provide evidence of adverse health effects occurring at exposures below the PoD selected by MassDEP and EPA in deriving reference doses. MassDEP carefully considered and could have selected one of these studies as a critical effect in deriving their reference dose.[1] However, we agree with MassDEP's conclusion that limitations within these studies including the use of a single dose, subjective endpoints, lack of replicability, and study bias make them less robust choices for critical endpoints. In the absence of an appropriate study of low-dose effects, the use of an uncertainty factor for database uncertainty to account for observed effects occurring at lower doses is appropriate. While not as protective as a reference dose based on immunotoxicity, the uncertainty factor of $10^{1/2}$ does provide a 3-fold increase in protection for effects occurring in the lower dose range.

Thank you for your time and consideration of our commentary.

Sincerely,

Greylin Nielsen
PhD Student in Environmental Health
Boston University School of Public Health
nielseng@bu.edu

Jennifer Oliver
PhD Student in Environmental Health
Boston University School of Public Health
jagaud@bu.edu

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[6] Dong GH, Zhang YH, Zheng L, Liu W, Jin YH, He QC. 2009. Chronic effects of perfluorooctanesulfonate exposure on immunotoxicity in adult male C57BL/6 mice. Arch Toxicol 83:805-815

[7] Das KP, Grey BE, Rosen MB, Wood CR, Tatum-Gibbs KR, Zehr RD, Strynar MJ, Lindstrom AB, Lau C. 2015. Developmental toxicity of perfluorononanoic acid in mice. Reprod Toxicol 51:133-144, DOI: 10.1016/j.reprotox.2014.12.012

[8] Onishchenko N, Fischer C, Wan Ibrahim WN, Negri S, Spulbur S, Cottica S, Ceccatelli S. 2011. Prenatal exposure to PFOS or PFOA alters motor function in mice in a sex-related manner. Neurotox Res 19:452-461

[9] Koskela A, Finnilä MA, Korkalainen M, Spulber S, Koponen J, Håkansson H, Tuukkanen J, Viluksela M. 2016. Effects of developmental exposure to perfluorooctanoic acid (PFOA) on long bone morphology and bone cell differentiation. Toxicol Appl Pharmacol 301:14-21

[10] Loveless SE, Slezak B, Serex T, Lewis J, Mukerji P, O'Connor JC, Donner EM, Frame SR, Korzeniowski SH, Buck RC. 2009. Toxicological evaluation of sodium perfluorohexanoate. Toxicology 264(1-2):32-44

[11] Grandjean P, Andersen EW, Budtz-Jorgensen E, Nielsen F, Mølbak K, Weihe P, Heilmann C. 2012. Serum vaccine antibody concentrations in children exposed to perfluorinated compounds. J Amer Med Assoc 307:391–397

[12] Chang S-C, Noker PE, Gorman GS, Gibson SJ, Hart JA, Ehresman DJ, Butenhoff J. 2012. Comparative pharmacokinetics of perfluorooctanesulfonate (PFOS) in rats, mice, and monkeys. Reprod Toxicol 33(4):428-440

From: Velis, John (HOU) <john.velis@mahouse.gov>
Sent: Friday, February 28, 2020 4:18 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Good afternoon,

Attached I have my comment for support of the PFAS MCL. If you have any questions or concerns please feel free to reach out and let me know.

Best,

John Velis
State Representative
4th Hampden District
52 Court St., Westfield **|** 413-572-3920
Statehouse, Room 174 **|** 617-722-2877
John.Velis@mahouse.gov

Attachment: MassDEP-PFAS MCL Public Comment.pdf

The Commonwealth of Massachusetts
HOUSE OF REPRESENTATIVES
STATE HOUSE, BOSTON 02133-1054

JOHN VELIS
STATE REPRESENTATIVE
4TH HAMPDEN DISTRICT
ROOM 174, STATE HOUSE
TEL.(617) 722-2877
John.Velis@MAhouse.gov

Vice Chair
Veterans and Federal Affairs

Ways and Means
Judiciary
Financial Services

February 28, 2020
Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108

Dear Commissioner,

I have been serving as the State Representative to my hometown Westfield, MA since 2014 and in that time there have been many pressing issues to have to manage and advocate on behalf of my constituents for. A consistently appearing subject has been the PFAS contamination in the water since 2016. I appreciate MassDEP's work in improving the standards regarding PFAS contamination and many of it's sub-chemicals that are listed. Creating a Maximum Contaminant Level (MCL) of 20 ppt is an important step in creating a regulatory framework for Massachusetts to pave the way for others as contamination is increasingly found in other communities and it is absolutely critical that the regulation be implemented.

Since the establishment of a PFAS lifetime health advisory limit in 2016, Westfield has been mired in a legal and financial nightmare. We are home to an Air National Guard base and several manufacturing companies that have used PFAS for decades, leaving almost half of our public wells contaminated with these "forever chemicals". In the absence of appropriate EPA regulations, such as the maximum contaminant level, it has been difficult to hold polluters accountable. Because of this tenuous situation, the City of Westfield has taken the initiative to look into and manage this contamination at the expense of Westfield. Though there was money set aside in the Supplemental Budget last year for the testing of PFAS contaminated water, and the treatment and design of this contaminated drinking water, our community is continuously pushing for more awareness and accountability for the PFAS contamination in our drinking water. I filed an amendment that was included in the Supplemental budget to allow cities and towns who had already paid out of pocket for these expenses, to not be punished for the state taking a little extra time to catch up.

As the chair of the PFAS Caucus, we scheduled a workshop to be able to learn more about the possible long-term health effects of these chemicals including cancer, immunodeficiency, infertility, and developmental delays at UMASS Amherst and current research being done there. I have submitted numerous letters of support for grants, research opportunities, and testimony since this has been brought to my attention to assist my constituents and fight for them. When the well 7 sample was taken and it showed us that the total PFAS levels were at 1100 ppt, with PFOA at 140 ppt, and PFOS at 540 ppt, my constituents were rightly concerned. Having an MCL of 20 ppt is a great first step in the process of making sure our residents across Massachusetts in affected communities' health is a priority and this contamination is being taken seriously. If we act now to set the standard, we can be a leader in protecting our residents from further potentially serious health impacts.

Thank you for taking for considering comments to allow us to explain our support for the establishment of an Maximum Contaminant Level and for holding public hearings on this regulation change. I can be reached at john.velis@mahouse.gov if there are any further questions.

Sincerely,

John C. Velis

State Representative

4th Hampden District

From: Kate Lila Wheeler <lilawheel@yahoo.com>
Sent: Friday, February 28, 2020 5:32 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

For the public hearing:

Thank you for your efforts to regulate PFAS in drinking water. I support MassDEP's proposal to regulate 6 PFAS with a Maximum Contaminant Level of 20 parts per trillion. However, I am concerned that this proposed regulation does not go far enough in addressing the thousands of PFAS chemicals that are used in industrial processes and products. I respectfully request that you add a provision that allows for MassDEP to review the list of PFAS chemicals again within two or three years; apply test methods to detect total PFAS contamination in water; and regulate additional PFAS compounds in order to protect our drinking water.

--

Thanks,

Kate Lila Wheeler

p: 617-628 3629 m: 617-543-5630
e: lilawheel@yahoo.com

My Zoom Room for Meetings
she/hers, they/theirs

From: Katie McCann <khm@bu.edu>
Sent: Friday, February 28, 2020 10:15 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Hello,

Attached are my PFAS MCL comments.

Best,
Katie McCann

Attachment: McCann_PFASComments_Final.docx

Public Comment:
310 CMR 22.16

I write in support of the promulgation of the PFAS drinking water standard. As a student of public health and as a social worker, I recognize the importance of both setting and enforcing a drinking water standard to protect the public's health. I believe that it is important that Massachusetts DEP both set a strong standard and ensure that all members of the public all informed about their exposure to PFAS. I write in support of the requirements outlined in 310 CMR 22.16 for Public Notification Requirements, however, I think that MassDEP should expand these requirements in order to ensure that the public is aware of the risks they may face from PFAS. Specifically, these requirements should include ways to ensure that the information is made available in the languages that members of a community speak, and that in addition to sending mail notifications to residents, that public meetings are required to be held with language interpretation and any necessary accommodations in order for all residents to be able to participate and have their questions answered about their risks associated with PFAS exposure. Additionally, there should be a requirement for landlords and management companies to provide written notice to tenants in the language that the tenant speaks within 30 days of receiving any notice from MassDEP indicating the results of any testing for PFAS in the water of any residential rented building.

Sincerely,
Katie McCann, MSW, LCSW, MPH candidate
khm@bu.edu

From: Laura Buckley <buckleyl@bu.edu>
Sent: Friday, February 28, 2020 4:02 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Please find attached my comments concerning the proposed PFAS MCL.

Best,
Laura Buckley
--
Laura Buckley, MPH
Doctoral Student | URBAN Trainee
Boston University School of Public Health
Department of Environmental Health
Email: buckleyl@bu.edu

Attachment: Buckley_PFASComments_Final.pdf

February 24, 2020

Commissioner Martin Suuberg
Massachusetts Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108

Re: PFAS MCL Comments

Dear Commissioner Suuberg,

I appreciate this opportunity to comment on the proposed revisions to the Massachusetts Contingency Plan (MCP: 310 CMR 22.00) as related to the Maximum Contamination Level (MCL) of per- and polyfluoroalkyl substances (PFAS) in the Commonwealth's drinking water. Considering that PFAS exposure is ubiquitous across the United States and that PFAS compounds have been found in all Americans tested for them, the need for protective standards is urgent and essential.[1]

PFAS are known to be highly persistent chemicals that bioaccumulate and can have half-lives in humans of multiple years.[2] Because of these qualities, it is extremely important that the public safety be prioritized in creating related standards. While perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) have been phased out of US manufacturing, their bioaccumulative and persistent qualities will lead them to persist in our environments into the future, as will be the case for most other PFAS chemicals.[3] It is imperative that MassDEP consider this when determining what specific PFAS compounds to include.

Additionally, PFAS have been associated with a number of different health risks. Across the suite of PFAS included in MassDEP's proposed MCL (as well as an additional eight PFAS compounds not included), the Agency for Toxic Substances and Disease Registry (ATSDR) has found that these chemicals are linked with a number of different health outcomes. These include deficient immune responses, developmental and reproductive health outcomes, increases in serum cholesterol, increased thyroid disease, potential endocrine disruption, as well as impacts to liver function.[4] Additionally, evidence supports that PFOS and PFOA have a potential carcinogenic effect in humans from both animal toxicity and human epidemiologic research.[5] Massachusetts residents have been exposed to these pervasive chemicals, and our health is at risk because of them. It is important that standards are protective and responsive to this growing body of research.

Because drinking water is a major exposure source for PFAS, it is imperative that Massachusetts communities have access to safe drinking water resources.[6] I appreciate all of MassDEP's effort in researching and crafting this proposed MCL, and I urge the Department to consider additional, shorter

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[1] Centers for Disease Control and Prevention. 2018. Fourth National Report on Human Exposure to Environmental Chemicals. https://www.cdc.gov/exposurereport/pdf/FourthReport_UpdatedTables_Volume1_Mar2018.pdf

[2] Agency for Toxic Substances and Disease Registry (ASTDR). (2018). Toxicological profile for Perfluoroalkyls. (Draft for Public Comment). https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf

[3] Centers for Disease Control and Prevention, 2018.

[4] Agency for Toxic Substances and Disease Registry (ASTDR). (2018). Toxicological profile for Perfluoroalkyls. (Draft for Public Comment). https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf

[5] Ibid.

[6] Post GB, et al., 2012. Perfluoroocantoic acid (PFOA), an emerging drinking water contaminant: A critical review of recent literature. Env Research 116: 93-117.

chain PFAS varieties as well as stronger monitoring and reporting requirements as described in more detail below.

Regulating the Sum of Six PFAS Compounds

The decision to regulate the sum of perfluorodecanoic acid (PFDA), perfluoroheptanoic acid (PFHpA), perfluorohexanesulfonic acid (PFHxS), perfluorononanoic acid (PFNA), PFOS, and PFOA – and their anionic forms – to below an MCL of 20 ng/l is protective of public health. Because it has been demonstrated that PFAS species are so highly persistent in the environment, regulating the sum of these six different compounds, rather than each individually, adds an additional level of protection.[7] This method is in line with the federal government's additive approach to regulate PFOS and PFOA in drinking water, as well being an efficient means of regulating a suite of compounds that have been found to have similar chemical structure and behavior in the environment and humans.

While the Department's decision to regulate the sum of these six compounds is commendable, I urge you to consider including additional PFAS within this MCL standard. Over 4,000 PFAS exist in the world today, and research is growing on their behaviors in the environment and their effects on human populations.[8] Specifically, MassDEP should consider including shorter-chain alternatives, which have grown in overall usage as legacy PFOS and PFOA have declined. Research supports that even short chain varieties – not included in the proposed standard – demonstrate similarly long persistence, mobility, and bioaccumulative behavior.[9] Additionally, research has begun to support that short chain alternatives may have similar toxicological impacts.[10] MassDEP must consider these findings, along with the impact of regulations, noting that these shorter chain varieties could pose a risk to health and may become more widespread as regulations focus on longer chain, legacy PFAS.

Monitoring and Public Information

Additionally, the proposed requirement for an initial year of quarterly monitoring would provide better information on how pervasive PFAS contamination is throughout the Commonwealth. I urge the Department to consider removing options to waive the third and fourth quarters during this initial year period, as seasonal variation should be tested for before a water source is considered suitable for routine monitoring. Additionally, I urge MassDEP to remove the option for monitoring waivers for systems that do qualify for routine monitoring. Such waivers could allow contamination to go undetected in certain communities, putting their health at risk as it has been until this standard is in place.

I commend the decision to create a consumer notification system that would alert the public when a drinking water resource tested above the required MCL, even if the level is below the violation level. This effort to support the most vulnerable populations in knowing when they may need to access

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[7] ASTDR, 2018.

[8] Guelfo JL, Marlow T, Klein DM, Savitz DA, Frickel S, Crimi M, Suuberg EM. 2018. Evaluation and Management Strategies for Per- and Polyfluoroalkyl Substances (PFASs) in Drinking Water Aquifers: Perspectives from Impacted U.S. Northeast Communities. Environmental Health Perspectives 126(6): 1-13, doi:10.1289/EHP2727.

[9] Brendel, S., Fetter, É., Staude, C. et al. (2018). Short-chain perfluoroalkyl acids: environmental concerns and a regulatory strategy under REACH. Environ Sci Eur 30, 9. https://doi.org/10.1186/s12302-018-0134-4

[10] Gomis, M.I., R. Vestergren, D. Borg, and I.T. Cousins. (2018). Comparing the toxic potency in vivo of long-chain perfluoroalkyl acids and fluorinated alternatives. Environ Int 113: 1-9.

another source of drinking water is truly commendable. Additionally, reporting of PFAS in Community Public Water System's Consumer Confidence Reports provides information to concerned communities to understand their risk better. In the initial phase of the monitoring process, the public should have as much information as possible to ensure their wellbeing is protected.

Statement of Relevant Expertise

I am a doctoral student at Boston University's School of Public Health in the Environmental Health Department. Before this, I worked at the Environmental Health Program of the San Francisco Department of Public Health and have been working in the environmental health sphere since receiving my Masters in Public Health in Environmental Health Sciences in 2016. As a resident of Massachusetts, the drinking water standards directly impact my health and that of my neighbors and fellow community members. I am writing on behalf of them and on communities across the country who may seek to use Massachusetts's example in crafting their own response to this growing public health concern.

Thank you again for this opportunity to comment.

Best,

Laura Buckley

Laura Buckley
Doctoral Student
Boston University School of Public Health
buckleyl@bu.edu

From: Lefevre, Molly <Molly_Lefevre@uml.edu>
Sent: Friday, February 28, 2020 5:09 PM
To: Director-DWP, Program (DEP)
Cc: Hoppin, Polly; Kriebel, David
Subject: PFAS MCL Comments

Thank you for the opportunity to submit comments on the PFAS MCL. Please see attached.

Molly Jacobs

University of Massachusetts Lowell
Lowell Center for Sustainable Production
978-934-4943
Molly_Jacobs@uml.edu

Attachment: LCSP comments_MassDEP PFAS MCL_Feb 28.pdf

Lowell Center for Sustainable Production

One University Avenue, University of Massachusetts Lowell, Lowell, MA 01854

February 28, 2020

Comments on: Massachusetts Department of Environmental Protection's 310 CMR 22.00 PFAS MCL Proposed Amendments

Comments submitted to: program.director-dwp@mass.gov

To Whom it May Concern,

The Lowell Center for Sustainable Production (Lowell Center) is a research institute within the Department of Public Health at the University of Massachusetts Lowell. The Lowell Center is recognized by businesses, advocates, and governments at all levels for its expertise in a primary-prevention orientation to environmental health policies and programs, including a focus on the chemical hazards in our economy. Thank you for providing the opportunity for us to comment on the Massachusetts Department of Environmental Protection's (MassDEP) Maximum Contaminant Level (MCL), for the group of per- and polyfluoroalkyl substances (PFAS).

First, we applaud MassDEP's efforts to develop a more protective and more stringent MCL than the US Environmental Protection Agency's (EPA) drinking water health advisory for perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). Although the majority of the scientific research on environmental and public health impacts has focused on PFOA and PFOS, we agree that it is important and appropriate to use additional lines of evidence, such as read-across, to justify including additional PFAS compounds in the MCL. However, we are concerned that by basing its standard on a total PFAS MCL of 20 ppt for 6 PFAS contaminants, MassDEP is still not going far enough to protect the public health from exposure to these substances. We recommend the following addition:

Include language in the regulation that within 3 years after the adoption of MassDEP's MCL for PFAS, the Department will consider additional substances in light of new scientific evidence and new analytical testing methods for PFAS, and amend as necessary to protect the public's health.

Our recommendation is based on several observations:

1) The science relevant to the human health impacts of PFAS, and the methods available to test for these substances are rapidly evolving.

   The class of PFAS comprises over 4700 unique chemical substances. According EPA's PFAS Action Plan published in February 2020, there are over 600 PFAS chemicals that are considered commercially active.[1] Significant investments are being made by EPA, the National Institute for Environmental Health Sciences (NIEHS), the Agency for Toxic Substances and Disease Registry (ATSDR) and numerous other governmental authorities across the globe to monitor and study the impacts of this class of substances. Every month, hundreds of new studies are published in peer-reviewed journals. In December 2019, the European Commission agreed within three years to develop testing protocols as well as a legal limit for all 4700+ PFAS chemicals under its Drinking Water Directive. Simply as a result

[1] See page 10: https://www.epa.gov/sites/production/files/2020-01/documents/pfas_action_plan_feb2020.pdf

of the EU's efforts, new analytic methods specific for use in regulation, such as the validation of testing to address total fluorine in water or use of Non-Targeted Analysis techniques, will become available as well as new regulatory approaches for developing drinking water standards for PFAS.

2) We see a number of gaps in the proposed MCL. These gaps need to be revisited in the near-term given the rapidly evolving science. Gaps include:
   - the failure to address carcinogenicity as a key health endpoint.
   - the failure to the use the most sensitive critical effect in studies to date (e.g., mammary gland development[2]) in establishing the reference dose calculation.
   - the lack of attention to shorter-chain PFAS compounds in the MCL, other than the inclusion of PFHxS. Shorter-chain PFAS (C4-C6) and fluoroethers have replaced the longer chain substances in industrial processes and consumer products. Toxicological evidence is evolving for these substances as evidenced by EPA's own draft toxicological assessment for PFBS and GenX chemicals.[3] These shorter-chain PFAS are also extremely persistent and require different water treatment technology. If such compounds are excluded from the MCL, failure to test will result in a failure to treat.

3) We are also concerned that the draft standard is still 20x higher than the proposed drinking water concentration of 1 ppt for PFOA and PFOS based on Grandjean and Clapp's (2015)[4] review of the evidence.

Our intention is not to create more work for an agency already significantly under-resourced. However, it should not be up to non-governmental organizations to petition the agency to review the merits of an existing standard given the emergence of new information. Such a required review should be built into the regulation, especially considering the rapidly evolving science, the extremely persistent nature of these substances, and their deleterious health impacts.

Thank you for considering -

Molly Jacobs, MPH
Senior Research Associate
Lowell Center for Sustainable Production

David Kriebel Sc.D
Director, Lowell Center for Sustainable Production
Professor, Department of Public Health,
University of Massachusetts Lowell

Polly Hoppin, Sc.D
Research Professor, Department of Public Health
Program Director, Lowell Center for Sustainable Production, University of Massachusetts Lowell

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[2] Cordner A, De La Rosa VY, Schaider LA, Rudel RA, Richter L, Brown P. Guideline levels for PFOA and PFOS in drinking water: the role of scientific uncertainty, risk assessment decisions, and social factors [published correction appears in J Expo Sci Environ Epidemiol. 2019 Mar 29] [published correction appears in J Expo Sci Environ Epidemiol. 2020 Feb 6]. *J Expo Sci Environ Epidemiol*. 2019;29(2):157–171. doi:10.1038/s41370-018-0099-9

[3] See: https://www.epa.gov/pfas/genx-and-pfbs-draft-toxicity-assessments

[4] Grandjean P, Clapp R. Perfluorinated alkyl substances: emerging insights into health risks. New Solut. 2015;25:147–63

From: Linda Segal <lmlsegal@comcast.net>
Sent: Friday, February 28, 2020 11:55 AM
To: Director-DWP, Program (DEP)
Cc: lmlsegal@comcast.net
Subject: PFAS MCL Comments

Greetings.

Attached please find my personal public comment letter.
Please confirm receipt and that you can open this attachment.

Thank you.

Linda L. Segal
92 Varick Road
Waban, MA 02468
lmlsegal@comcast.net
508 655 7362

Attachment: PFASpubliccommentDEP28feb2020final.pdf

TO: Drinking Water Program, MassDEP, 1 Winter St., 5th Floor, Boston, MA 02108
FROM: Linda L. Segal, 92 Varick Rd., Waban, MA 02468
DATE: Feb. 28, 2020
RE: PFAS MCL Comments

Thank you for this opportunity to provide my lay public comment concerning the proposed amendments to 310 CMR 22.00 to establish a new MCL in order to better protect Massachusetts Drinking Water from toxic PFAS/PFOAS contaminants, a.k.a. the "forever chemicals."

The proposed new regulation establishing an MCL of 20 ppt is a great start on this challenging issue. I applaud the MassDEP for spending more than a year listening to and working with various stakeholders to respond to the public's call for action on this matter.

Thanks to your collaborative approach, numerous meetings, public hearing process, and extensive website, more information has become available on this compelling issue. That includes the testimony of citizens who have been damaged by exposures to such compounds, years of scientific research and data gathering by universities and highly regarded organizations such as the Silent Spring Institute, TURI, Environmental Working Group, and the action advocacy of the Conservation Law Foundation and the Toxics Action Center.

The DEP's comprehensive efforts and enactment of the proposed new regulation will make it possible for Massachusetts water suppliers to finally test for the presence of some PFAS/PFOAS compounds and have their samples evaluated by laboratories certified to perform the analyses and publicly report their findings.

Despite news reports and the movie "Dark Waters," I still find the average citizen and many local public officials are relatively uninformed about the risks and the years of exposures that have been occurring. Much more public education needs to occur at the local community level. In my personal experience, I find that official notification mailings and small font legal notices in local newspapers are not enough to inform the general public about possible threats to their drinking water.

It is not clear to me how many municipalities (not connected to the MWRA water supply) are including PFAS testing in their local budget planning for FY2021 and beyond. I understand there will be some state funding and low interest loans available to support testing and remediation. Please publicly announce information about that funding along with details about the application process.

I also understand that exceedances of the new MCL will be required to be reported, including in the annual EPA Consumer Confidence Report but perhaps not showing up in those mailings to households until summer 2021 or 2022. I respectfully request that MassDEP not allow a water supplier to combine or blend test data so that each PFAS exceedance at individual active and inactive wells ends up not specifically and clearly identified to the public.

Once the new MCL is promulgated this year, I urge the MassDEP to continue considering all the cogent input it receives from experienced stakeholders and impacted communities who are saying that the 20 ppt and the selected range of compounds included are a beginning of a longer road toward a lower MCL (between 1 and 10 ppt.) inclusive of more compounds with lower detection limits, supported by the growing body of research, analyses and improved technology in the USA and abroad.

Thank you for your consideration of these comments and for the leadership and expertise of all those involved in this important step forward.

Regards,

Linda L. Segal
lmlsegal@comcast.net
508 655 7362

From: Wendy Rundle <lspa.wendy@gmail.com>
Sent: Friday, February 28, 2020 1:00 PM
To: Director-DWP, Program (DEP)
Cc: Locke, Paul (DEP); Michele Paul
Subject: PFAS MCL Comments from LSP Association

Attached are the LSPA's comments on MassDEP's Proposed PFAS Revisions to 310 CMR 22.00, Drinking Water Regulations.

Thank you for the opportunity to comment.

Respectfully, Wendy

Wendy Rundle, Executive Director
LSP Association, Inc. (LSPA)
405 Concord Ave., #352
Belmont, MA 02478
617-417-4351
www.lspa.org

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Follow us on LinkedIn

COMPLIANCE TIP OF THE MONTH

The MCP includes specific requirements for the application of Remedial Additives at Disposal Sites near *Sensitive Receptors* (310 CMR 40.0046), which are defined along with the key distances to them at 40.0046(3)(a). These include

40.0046(3)(a)3. within 800 feet of any surface water supply used in a public water system or any tributary of such surface water supply
40.0046(3)(a)4. within 50 feet of any other surface water body or any tributary of such surface water

A potential remedial application site should be carefully evaluated for these criteria.

Attachment: 2-28-20 LSPA Comments on PFAS MCL.pdf

LSP Association
assess. advise. restore.
405 Concord Avenue #352, Belmont, MA 02478
617-977-4304 • info@lspa.org • www.lspa.org

February 28, 2020

Via Email: program.director-dwp@mass.gov

Attn: PFAS MCL Comments
MA Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, MA 02108

RE: PFAS MCL Comments from LSPA - Proposed PFAS Revisions to 310 CMR 22.00, Drinking Water Regulations

To MassDEP's Drinking Water Program:

The LSP Association (LSPA) appreciates this opportunity to provide comments on the proposed revisions to 310 CMR 22.00 relating to per- and polyfluoroalkyl substances (PFAS). LSPA members practice primarily in the field of waste site cleanup and have been involved in the development of the recently-promulgated groundwater criteria for PFAS under the Massachusetts Contingency Plan (the MCP, 310 CMR 40.00). We anticipate that the MCL process will lead to the identification of previously unidentified sources of PFAS, and that cleanup activities will be warranted in response to these findings. To that end, many of our comments focus on the differences between reporting, public involvement, and risk assessment requirements between the two programs, and areas of potential conflict which may lead to complications in the roll-out of this program. Our specific comments follow.

COMMENTS REGARDING SUMMARY OF PROPOSED REGULATIONS AND NOTE TO REVIEWERS

The following comments pertain to aspects of the regulations for which MassDEP specifically requested input in its Summary of Proposed Regulations and Note to Reviewers:

1. ***Applicability of Regulations.*** *The proposed rule applies to all public water systems. Community and NTNC systems will be required to meet all requirements under 310 CMR 22.07(G). These systems either serve entire communities, or in the case of NTNC systems, do not serve residences, but do serve the same people on a regular basis such as places of work, schools, daycares and recreational areas. The rule also requires that TNCs, which serve a transient or changing set of consumers like rest areas or restaurants, collect one sample and submit the results to MassDEP. If TNCs were to be regulated further, a separate risk assessment designed for TNC consumers would be appropriate due to differing exposure assumptions at*

these facilities. That assessment would likely result in calculation of a different MCL value for these systems.

LSPA Comments:

The LSPA supports the intent of a "TNC MCL" (Transient Noncommunity Maximum Contaminant Level). We believe that allowing for calculation of a "TNC MCL" would reduce confusion associated with applicability between MCP GW-1 / MCL and TNC MCL. To reduce misinterpretation of reporting requirements under the two programs, it would be helpful to add clarification noting that owners and operators of community, NTNC and TNC systems are exempt from the reporting requirements of the MCP (310 CMR 40.0317(11))

2. ***Staggered Implementation.*** *MassDEP has proposed that Public Water Suppliers begin initial monitoring on a schedule based on their population served. The regulations propose the following schedule:*

- *For Community and NTNC PWSs serving more than 50,000 individuals, begin April 1, 2020 (4.3 million consumers affected); [20 systems per MassDEP presentation slides]*
- *For Community and NTNC PWSs serving 50,000 individuals or fewer, but greater than 10,000 individuals, begin by October 1, 2020 (2.6 million consumers affected); [106 systems per MassDEP presentation slides]*
- *For Community and NTNC PWSs serving 10,000 or fewer individuals, begin by October 1, 2021 (708,000 consumers affected); [569 systems per MassDEP presentation slides] and*
- *TNCs must collect a single sample at each entry point by September 30, 2022 [792 systems per MassDEP presentation slides].*

MassDEP has proposed this staggered start to accommodate an anticipated demand for services related to laboratory analyses, engineering design, equipment procurement, and construction.

LSPA Comments:

The LSPA believes that it would be relevant not only to note the number of consumers affected per PWS size, but also the approximate number of water supply systems in each noted PWS size category. Such information would better demonstrate the number of additional lab samples that will be required to evaluate smaller PWSs, and help determine whether the increased number of samples will actually be a problem for available labs to accommodate within a reasonable time period. The message that PWS monitoring can wait (up to 18 months) in cases where there are potentially fewer people affected presents a risk communication problem (i.e., "The Commonwealth considers my health to be less important because I live in a smaller community").

3. ***Monitoring Scheme.*** *MassDEP has various monitoring thresholds and schedules for initial monitoring, routine monitoring, increased monitoring as a result of PFAS detection, and monitoring waivers. In its proposal, MassDEP seeks to balance the risk to public health from short-term exposure with the cost of monitoring.*

LSP Association
assess. advise. restore.
405 Concord Avenue #352, Belmont, MA 02478
617-977-4304 • info@lspa.org • www.lspa.org

LSPA Comments:
No comments.

4. ***Electronic Reporting.*** *MassDEP proposes that monitoring results be submitted electronically to the department to increase responsiveness by both MassDEP and the PWS, to increase the efficiency of data management, and to decrease the likelihood of human error by decreasing the number of times the data will be handled.*

LSPA Comments:
It will be important for MassDEP to communicate to all stakeholders that eDEP is prepared to receive these submittals.

5. ***Consumer Notice.*** *MassDEP is proposing an early notification, before there has been a determination that the MCL has been violated, in the cases where the average of a PFAS detection and a confirmatory sample exceeds the Total PFAS MCL. This early warning recognizes the sub-chronic risk of exposure and that at-risk sub-populations may choose to take action and discontinue using the water before a determination has been made that there is an MCL violation.*

LSPA Comments:
The LSPA is concerned about the proposal for an early notification using the average of two samples which, based on standard data usability assessments, likely reflect an unrepresentative sample and a representative one. The LSPA believes that it is more appropriate to rely on clear thresholds for exceedances and to avoid offering inconclusive information to the public. We do not recommend proposing consumer notices in cases where the MCL has not been conclusively violated and especially in instances where representative conclusive confirmatory data have not been obtained. At a minimum, at least two representative samples should be used to evaluate compliance.

In addition, if this early notification proposal were to be promulgated, what would be the criterion for comparing the confirmatory sample result to the initial PFAS detection in 310 CMR 22.07G(7)? Would the samples have to agree within a reasonable amount (e.g., within a certain relative percent difference [RPD]), or would it be enough that PFAS are detected vs. not detected in a confirmatory sample?

6. ***Compliance Calculation.*** *MassDEP has proposed that the compliance calculation be based on a Running Quarterly Average of monthly compliance monitoring result(s) from each of the prior three calendar months. Samples with results below the Minimum Reporting Levels ("MRLs" or those minimum concentrations that can be reported as a quantitated value for a target analyte in a sample following*

analysis) but above one-third of the MRL do contain PFAS. To recognize this presence of PFAS in a sample, MassDEP proposes if an analytical result is equal to or greater than one-third of the MRL but less than the MRL, then the Running Quarterly Average shall be calculated using one-half of the MRL as the concentration for that PFAS.

LSPA Comments:

The LSPA does not support and strongly encourages MassDEP to omit or revise the compliance calculation as described here. The calculation for results below the MRL requires additional steps that diminish accuracy, it is confusing and arbitrary, and will result in potential mathematical errors and miscommunication of results. The LSPA recommends instead that the laboratory reported "J" values for results below the MRL, once validated, be used directly.

Further clarification is needed regarding the definition of the Minimum Reporting Level (MRL) as used in 310 CMR 22.07G(3). For example, it would be helpful to know what the definition of the MRL is other than having to meet the concentration requirement in 310 CMR 22.07G(16). Is it the low-level in the calibration curve or is it a multiple of the MDL? How should it be derived by the lab analytically?

We urge that the new compliance form, updated to require reporting of the new 6-compound list, be incorporated into eDEP as soon as possible.

7. ***Maximum Contaminant Level Goal (MCLG).*** *MassDEP is not proposing an MCLG for PFAS. An MCLG is the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, allowing an adequate margin of safety. MCLGs are non-enforceable public health goals and are typically set at zero for carcinogens. MassDEP considered the potential carcinogenicity of PFAS. Through this preliminary assessment, limited human and animal bioassay data were identified that demonstrate associations between exposures to these compounds and certain cancers. At this time however, the level of cancer risk posed by PFAS in drinking water is uncertain. MassDEP is following the research in this area closely. If the connection between PFAS and cancer risk is strengthened, MassDEP will reevaluate the basis of the MCL and may adjust it accordingly.*

LSPA Comments:

No comments.

ADDITIONAL LSPA COMMENTS AND QUESTIONS

- The LSPA has some concerns regarding modifications to the definition of Reliably and Consistently Below the MCL (310 CMR 22.02) and possible interpretations of undefined concepts such as “wide” (as in “wide variations”) and “close” (as in “analytical result which is close to the MCL”). How will MassDEP define/justify the relative meanings of these concepts? We recommend that guidance be provided for relative percent difference (RPD) or relative standard deviation (RSD) acceptance criteria. For example, one option might be to default to EPA Data Validation guidance for acceptable differences in field duplicate RPD such that greater than those differences would be considered “wide.”

- Does the reference to “no PFAS” detections in 310 CMR 22.07G(5) and (6) only refer to the six compounds used to evaluate the Total PFAS MCL in 310 CMR 22.07G(3), or can any PFAS compound detection trigger action?

- The proposed regulations at 310 CMR 22.07G(12) require use of the two current EPA analytical methods. Does this mean updates to the EPA methods will require another change to these regulations? Can language be added to allow for the use of future EPA drinking water methods for PFAS analysis as long as they meet the sensitivity requirements to support these drinking water regulations?

The LSPA appreciates this opportunity to comment on the proposed revisions as reflected above, and is available at your convenience to discuss the comments provided.

Sincerely,

THE LSP ASSOCIATION, INC.

Michele Paul, LSP, President | Wendy Rundle, Executive Director

cc: Paul Locke, Assistant Commissioner, BWSC, MassDEP

From: Madeline Isenberg <misenb@bu.edu>
Sent: Friday, February 28, 2020 11:30 PM
To: Director-DWP, Program (DEP)
Subject: PFAS Comment Period Comment

Hello,

I just realized my wifi was down when I had submitted my comments for the open comment period so it therefore did not send!

Please still see and accept my brief attached comment on the proposed MCL of 20 ppt for the sum of the six PFAS.

I commend the work you're doing to ensure safe drinking water.

Thank you!
Madeline Isenberg
--
MPH candidate, Environmental Health certificate
Boston University School of Public Health

Attachment: Isenberg_PFASComments_Final.docx

To: MassDEP, Office of Research and Standards

Re: Proposed Changes to Mass. Gen. Law Ch. 111 §160D in regards to how residents should be made aware of PFAS in drinking water.

I am a graduate student studying Environmental Health at the Boston University School of Public Health. In our studies, we've gone into depth about drinking water contaminants, including PFAS. I commend the Massachusetts Department of Environmental Protection for setting its proposed Maximum Concentration Level at 20 ppt. This is one of the lowest proposed or adopted by any state, which is important because it provides a greater degree of protection for health, especially for vulnerable populations. By summing the six PFAS (PFOS, PFOA, PFDA, PFHpA, PFHxS, and PFNA), it is a much more protective standard for vulnerable populations since there is more than just one kind of PFAS. The six in the subgroup all have similar structure and prolonged half-lives. Exposure to PFAS has serious negative health effects and the EPA RfD is inadequate for protecting populations from these health effects. The revised MassDEP RfD accounts for an additional uncertainty factor that considers a lower exposure level in laboratory animals than the EPA. Much as with lead, where is it argued that there really is no "safe" level, the same could be said for PFAS. But, this is a great start in lowering exposure.

PFAS has just recently become widely talked about in the news, so many are unaware or uneducated in what PFAS is and the consequences it has on health. Mass. Gen. Laws Ch. 111, §160D, states that landlords/sellers are required by law to disclose if there is lead, manganese, etc. in drinking water. There should be an addendum to add PFAS to the disclosure form. This is an issue that residents have a right to be aware of and then make informed decisions for their health.

Sincerely,

Madeline Isenberg, MPH Candidate

Boston University School of Public Health

From: info@mcwrs.org <info@mcwrs.org>
Sent: Friday, February 28, 2020 4:35 PM
To: Director-DWP, Program (DEP)
Cc: 'Phil Guerin'; Kate Barrett
Subject: PFAS MCL Comments

Good Afternoon,

Attached, please find comments on MassDEP's proposed amendments to 310 CMR 22.00, Massachusetts Drinking Water Regulations.

c/o Regina Villa Associates
51 Franklin Street, Suite 400
Boston, MA 02110
617-357-5772
info@mcwrs.org
www.mcwrs.org

Attachment: PFAS MCL MassDEP Comment Period 2-28-20.pdf

MCWRS
Massachusetts Coalition for
Water Resources Stewardship

February 28, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00)-MCL for PFAS
Via email to program.director-dwp@mass.gov

Dear Ms. DePeiza:

The Massachusetts Coalition for Water Resources Stewardship (MCWRS) is pleased to submit the following written comments to the Massachusetts Department of Environmental Protection (MassDEP) on proposed changes to the Drinking Water Regulations, 310 CMR 22.00 pertaining to a Maximum Contaminant Level (MCL) for Per- and Polyfluoroalkyl substances (PFAS). MCWRS is a nonprofit organization committed to promoting watershed-based policies and regulations that effectively manage and conserve water resources and represents the interests of its municipal and district members in the area of water resources management. MCWRS members include over 40 cities and towns and wastewater treatment districts along with engineering consultants and legal firms.

For MCWRS and its members, rollout of the proposed PFAS MCL has been one of the most discouraging episodes in the recent annals of Massachusetts' environmental regulation. The dispirited feeling that accompanies the proposed MCL arises due to:

- The enormous implications for municipalities, public water systems and their ratepayers
- The far-reaching effects of the unintended consequences
- The lack of compelling scientific evidence that a MCL of 20 parts per trillion is warranted
- The precedent setting approach to establish drinking water limits based on an abundance of caution principle driven by public perception rather than science

Rather than following the proposed course and setting an MCL of 20 ppt for six PFAS compounds, MCWRS urges the Commonwealth of Massachusetts to slow down and take a stepwise approach to regulating PFAS in drinking water. Begin by adopting the current federal health guideline of 70 ppt for PFAS as an initial MCL. While this guideline is also of questionable derivation and extremely low, it was established by the Environmental Protection Agency (EPA) and has some national context. An MCL of 70 ppt would capture

c/o Regina Villa Associates | 51 Franklin Street, Suite 400 | Boston, MA 02110-1301
(617) 357-5772 | www.mcwrs.org | info@mcwrs.org

the more serious drinking water concerns across Massachusetts. While impacted water systems work on mediating contamination at that level, the Commonwealth could begin the process of gathering much needed data on occurrence, total exposure from all media, and health effects and fill in the large gaps in the understanding of PFAS compounds. Once data has been collected and analyzed a more informed MCL could be proposed. While all of that is happening at the state level, EPA is moving forward with implementation of a rational approach to regulating PFAS on a national level. Massachusetts' residents would be better served to have drinking water regulations consistent with the majority of states rather than deriving its own standard through a hasty process. PFAS compounds have been around for some 70 years. The fact that they can now be detected at single digit parts per trillion should not be used to suggest this is a new chemical exposure for the people of Massachusetts requiring immediate action. Evidence suggests body burdens of PFAS have been declining for nearly 20 years. This is a complex issue that needs considerable thought, deliberation and input from many sectors to capture a host of views. Haste is not an ally if one seeks to produce a comprehensive and meaningful approach to PFAS regulation.

MCWRS offers the following general comments:

1. The implications of the proposed MCL for Massachusetts' cities, towns, public water systems and, most importantly, water ratepayers are enormous. Most water systems confronted with an MCL exceedance at 20 ppt will have very limited options. A few may have the ability to shut off a source or blend sources to deliver water under the MCL. A few others might have an option to obtain water from other, unimpacted systems through interconnections. Most, however, will need to build or upgrade treatment facilities to remove PFAS. Treatment options at this time are very limited and none are without significant cost. The Commonwealth is making a limited source of funding available to assist impacted communities but the funding level is far short of what will be needed. The Commonwealth seems to be hoping that the number of impacted public water systems will fall in the 3-5% range as that is what a few other states have observed. However, Massachusetts is one of the most densely populated states in the nation and few public water systems have escaped the impacts of other contamination sources. MCWRS is concerned that there will be many more public water systems impacted by PFAS in Massachusetts than in other areas of the country.

   While direct financial impacts on ratepayers is of great concern, water system managers are also aware that local funds will also be diverted from other critical drinking water infrastructure needs. More pressing needs like pipe replacement, corrosion control, and hydrant maintenance, all of which have significant public health and safety impacts, will be further delayed as PFAS treatment draws away financial resources.

2. While the MCL is directed at public water systems the unintended consequences will be far-ranging. The sources of PFAS cover all facets of modern day living. As water systems expend millions of local ratepayer dollars on treatment, new sources or interconnections they will be looking to recoup these costs through legal means. It has been suggested by some in State government that the manufacturers of PFAs compounds (Dupont, 3M, etc) will ultimately pay the price. However, most sources of contamination will be diffuse and typically a wide net is cast when seeking the deepest pockets to pay for environmental contamination. It should be expected that one consequence of such a low MCL will be a spate of lawsuits. These may pit town against town, if a municipal landfill is a potential source. Agricultural interests will get drawn into the legal fray as sewage sludge based fertilizers applied to crop

fields will get attention as a possible PFAS source. Wastewater treatment plants, groundwater discharges and even individual septic systems will also be under scrutiny as sources and potentially be part of legal actions brought by impacted water systems. It has even been suggested that solar panels may contain PFAS films which could potentially wash off and enter soils, groundwater and surface water. With hundreds of acres of land now covered by solar arrays, that would be an interesting new source of PFAs contamination to be considered. With an extremely low MCL of 20 ppt more water supplies are likely to fall under costly treatment requirements making for a vastly expanded world of PFAS related legal actions. If the Commonwealth believes that PFAS manufacturers should ultimately be held responsible then MCWRS suggests that the Commonwealth pay for all PFAS related drinking water treatment needs across the state then take action against the chemical corporations they deem responsible to seek reimbursement.

Legal actions against PFAS sources will inevitably lead to changes in many common practices. For instance, wastewater treatment plants may stop accepting landfill leachate, sewage sludge, septage and drinking water treatment plant residuals out of concern that those potential PFAS sources could implicate them in lawsuits. Is there a plan to provide alternative disposal options? Domestic solid waste is likely to contain PFAS in discarded clothing, coated papers and other household goods. Where does that waste go if incinerators and landfills close or become restricted due to PFAS concerns.

3. After reviewing MassDEP's December 26, 2019 ***Technical Support Document PFAS: An Updated Subgroup Approach to Groundwater and Drinking Water Values***, it is apparent that a 20 ppt MCL standard was not derived through strong scientific evidence of harm being done at or near that level. Rather, the 20 ppt limit is the result of the application of multiple uncertainty factors applied to results of lab animal tests, which themselves were subject to various interpretations. The variation in interpreting data, applying uncertainty factors and otherwise selecting supporting data by the handful of state agencies pursuing their own PFAS limits is truly breathtaking. This practice appears to be very subjective. Massachusetts, for example applies an uncertainty factor of 1000 for determining a reference does for PFOA while EPA used 300 and New Hampshire 100. Massachusetts applies the derived reference dose to lactating women, a subset of the population deemed more susceptible to PFAS health effects. The Commonwealth then selected the 90th percentile for water consumption by this subset to determine the drinking water MCL value. Apparently lactating women drink a lot more water than the general population (3.2 liters per day) yet the State still used a 20% source contribution for deriving the MCL. The 20% value is a default value with no apparent basis. It would seem that if lactating women are the target for the MCL and they consume 60% more water than the 2 liters per day typically assumed for the general population then the % source contribution should likewise be higher than 20%. Increasing the % source contribution for drinking water raises the MCL as per the formula used to derive the drinking water value:[1]

$$\text{Drinking water value} = \frac{\text{RfD x RSC}}{\text{Water consumption rate per kg body weight}}$$

Where: RfD = 5 x 10-6 mg/kg-day
Water consumption rate for lactating woman = 0.054 L/kg-day
Relative Source Contribution Factor (RSC) = 0.2

[1] Mass DEP December 26, 2019 ***Technical Support Document PFAS: An Updated Subgroup Approach to Groundwater and Drinking Water Values; page 35***

Lack of data or understanding of PFAs total exposure and sources of exposure for the general population remains a significant gap in data. Without that information it is not possible to determine whether an MCL of 20 ppt or any other value is protective of public health. If drinking water constitutes 3% of the daily intake of PFAS and a community spends $10 Million on treatment to eliminate PFAS in drinking water has public health been protected when 97% of the PFAS intake remains? Various published studies suggest associations between PFAS blood levels and consumption of fish or fast food, use of certain dental floss, paper cups and Gore Tex goods to name just a few. Everything points to widespread, daily intake of PFAS from a variety of sources but the only one of interest in Massachusetts appears to be drinking water from the tap.

4. MCWRS strongly disagrees with the proposed requirement to include so-called "J-values" (detections below the Minimum Reporting Level (MRL)) in the sum of total PFAS detections used to determine MCL compliance. To do so defeats the purpose of having an MRL, which is based on laboratory QA/QC data for the test method. If values below the MRL are reliable (which they are not) then do away with the MRL and use the Minimum Detection Level (MDL) for reporting. That flies in the face of sound laboratory practice and MCWRS is not endorsing that approach but it makes a lot more sense than assuming values for unreliable measurements.

   The entire J-value issue is quite puzzling given the vast uncertainty in the 20 ppt MCL. Even if one accepts that this MCL value is well conceived, the number itself is derived from uncertainty factors and rounding of values. To suggest that it is necessary to include measurements of 1 ppt (or less) into a sum value as if those results actually make a difference in determining whether water is safe to drink is not scientific or factual.

5. It is extremely concerning to MCWRS that this proposed MCL sets a precedent for how drinking water contaminants will be regulated in the future. As we all know there are many contaminants (i.e., things other than water) present in drinking water that have never been considered of concern at the low levels found. These include both natural and man-made substances. Limits (MCLs) are based on our best understanding of health impacts, risk analysis, the potential for public health protection and the reasonable ability to remove contaminants through treatment. Drinking water meeting these standards has been considered safe to drink, even though it is not "risk free". The proposed PFAS MCL, however, takes a new path that sets a very low limit based on an abundance of caution principle that implies that some unknown risk posed by trace amounts of PFAS cannot be tolerated. It is a very frightening prospect for the future of public drinking water system management and should be even more concerning for the ratepayers who will bear the costs, if only they knew and understood the implications.

MCWRS recommends the following actions be undertaken by the Commonwealth of Massachusetts regarding PFAS:

a) Set an interim MCL of 70 ppt for drinking water until such time that necessary health studies are completed and evaluated, total PFAS intake from all sources is ascertained and then a determination is made as to whether a lower MCL is warranted and protective of public health.
b) Conduct the necessary studies to better quantify the total PFAS intake by residents of Massachusetts and identify the feasibility for controlling non-drinking water sources. Early studies should focus on milk and dairy products and foods, especially so-called fast food.

c) Evaluate whether PFAS films used in solar panel manufacturing present a potential source of environmental and water contamination through the runoff of rainwater across panels.
d) Create a funding mechanism so that the Commonwealth directly pays for all community public drinking water system PFAS treatment needed to achieve MCL compliance.
e) Pursue legal action against manufacturers of PFAS compounds in order to reimburse the Commonwealth for costs incurred for drinking water treatment.
f) Remove the proposed requirement to count so-called "J-values" (detections below the Minimum Reporting Level) toward the sum of the six regulated PFAS compounds. Only detections at or above the MRL should be counted

MCWRS believes the setting of a PFAS MCL at an extremely low level of 20 ppt is a very risky approach for initially regulating this class of contaminants. There are severe economic implications for cities, towns, districts and ratepayers, and enormous potential for unintended consequences impacting the public and private sector including agriculture, manufacturing, wastewater treatment, waste disposal and "green energy" and little certainty of health benefits. The Commonwealth of Massachusetts is strongly urged to slow down and move forward with PFAS regulation in a more deliberate, comprehensive, responsible and thoughtful way.

Sincerely,

Philip D. Guerin
President & Chairman

CC: Attorney General Maura Healey
Lieutenant Governor Karyn Polito

From: Ariela Lovett <alovett@mma.org>
Sent: Friday, February 28, 2020 12:12 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Please find attached a comment letter from the MMA in response to the draft PFAS MCL regulations.

Thank you,

Ariela

--
Ariela Lovett
Legislative Analyst

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Boston, MA 02110
617-426-7272 x161
617-695-1314 fax
alovett@mma.org | www.mma.org

Follow us on Twitter: @massmunicipal
Like us on Facebook: massmunicipal

Attachment: PFAS Regs Letter of Comment.pdf

Massachusetts Municipal Association

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www.mma.org

February 28, 2020

MassDEP
Drinking Water Program
1 Winter Street, 5th Floor
Boston, Massachusetts 02108

ATTN: Comments Regarding the Proposed PFAS MCL in 310 CMR 22.00

Dear Commissioner Suuberg:

On behalf of the cities and towns of the Commonwealth, the Massachusetts Municipal Association is pleased to provide comment in response to proposed amendments to 310 CMR 22.00, Massachusetts Drinking Water Regulations, establishing a Total Per- and Polyfluoroalkyl Substances (PFAS) Maximum Contaminant Level (MCL) of 20 parts per trillion.

The MMA appreciated the opportunity to meet with you and the MassDEP staff of the Drinking Water Program to review details of the draft regulations. The MMA is particularly appreciative of the inclusion of 'off-ramps' to allow communities to discontinue monitoring of public water supplies if no detection is recorded in the third and fourth quarters. Along with an allowance that existing testing results can be submitted in place of new ones on a one-to-one basis, these provisions will save costs for many municipalities as they endeavor to comply with the regulations.

The MMA fully supports the intent of the draft regulations to protect public and environmental health. We also believe there is broad understanding that both mandatory testing of public drinking water supplies and remediation of point sources with PFAS detection at or above 20 parts per trillion will be very expensive for cities, towns, ratepayers and taxpayers. We are grateful for the appropriation of funds in the FY19 closeout budget that included a $10.65 million transfer to the Clean Water Trust to assist in the remediation of PFAS contamination in local water systems, $9.05 million for the State Revolving Fund program to help finance improvements to local water systems, and $4.2 million to help cities and towns test local water systems for PFAS contamination. As the full scope and cost of the need for remediation is not yet known, the MMA remains deeply concerned over how municipalities could pay for what has already been and will continue to be exorbitant cleanup costs. We respectfully ask that the implementation of any new regulatory standard not result in new unfunded mandates.

The MMA has been in close communication with several of our member communities that have already been impacted by detection of PFAS in their drinking water supplies. Some of these communities received individual cost estimates for PFAS remediation in their own local water systems that exceed the *total* authorization in the close-out budget for this purpose. This is evidence that the actual costs statewide will far exceed the initial state assistance funds that have been appropriated. New state funding to support municipal capital infrastructure needs and other financial and technical assistance associated with PFAS testing, monitoring, and remediation will be necessary, as cities and towns do not have the resources to finance new mandates of this magnitude.

We welcome the opportunity to work collaboratively with MassDEP as final regulations are promulgated, to ensure that municipal concerns and realities are taken into full consideration.

Thank you for considering our comments on the draft PFAS MCL for drinking water. If you have any questions regarding our comments, or require additional information, please do not hesitate to contact me or MMA Legislative Analyst Ariela Lovett at alovett@mma.org or 617-426-7272 ext. 161 at any time.

Sincerely,

Geoffrey C. Beckwith
Executive Director & CEO

From: Estes-Smargiassi, Stephen <Stephen.Estes-Smargiassi@mwra.com>
Sent: Friday, February 28, 2020 2:45 PM
To: Director-DWP, Program (DEP)
Cc: Jennifer Pederson (jpederson@masswaterworks.org); downing.jane@epa.gov; Baskin, Kathleen (DEP); DePeiza, Yvette (DEP)
Subject: PFAS MCL Comments

Attached please find MWRA's comments on MassDEP's proposed drinking water standards for PFAS.

Stephen Estes-Smargiassi
Director of Planning and Sustainability
Massachusetts Water Resources Authority
Building 39 - First Avenue
Boston MA 02129
617-788-4303 FAX 788-4888
www.mwra.com
smargias@mwra.com **(new shorter e-mail address)**

Attachment: MWRA comments on MDEP drinking water proposal FINAL.pdf

MASSACHUSETTS WATER RESOURCES AUTHORITY
Charlestown Navy Yard
100 First Avenue, Building 39
Boston, MA 02129

Frederick A. Laskey
Executive Director

Telephone: (617) 242-6000
Fax: (617) 788-4899
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Martin Suuberg, Commissioner
Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108

February 28, 2020

Via email to: program.director-dwp@mass.gov

Subject: PFAS MCL Comments

Dear Commissioner Suuberg:

The Massachusetts Water Resources Authority (MWRA) appreciates the opportunity to comment on Massachusetts Department of Environmental Protection's proposed drinking water regulation of Per- and Polyfluoroalkyl Substances (PFAS). These regulations represent another important step forward as Massachusetts develops an approach for dealing with the legacy of decades of use of these long-lived and now ubiquitous chemicals. The combination of their use and presence in so many aspects of our lives along with concern about potential health risks merits the multi-pronged approach that DEP has taken.

As the largest water supplier in New England, the MWRA takes its responsibility to provide safe drinking water to its customers, and to actively participate in the development of state-wide environmental policy seriously. The proposed rule will provide communities and the customers they serve with information on the existence, if any, of these chemicals in their drinking water, and set standards triggering treatment or source changes for systems with excessively high levels. On behalf of the MWRA, I respectfully submit these comments for DEP's consideration. As you will see, MWRA has primarily included suggestions for making the proposed rule clearer and easier to understand, and compatible with existing reporting and notification processes. This type of consistency will improve compliance and promote more effective risk communication.

Specific Comments:

310 CMR 22.07G(3) Total Per- and Polyfluoroalkyl Substances MCL.

- The statement "PFAS Detection shall mean a measured concentration of any PFAS in the scope of the analytical method greater than or equal to the analytical laboratory's MRL." does not appear to be necessary in this section, as this section deals with the MCL. If DEP's intent is to use this statement to require that public water suppliers (PWS) report all detections of any PFAS, ***MWRA recommends*** that a separate subsection on reporting of detected non-regulated PFAS be created. As currently drafted, this sentence adds uncertainty to the MCL definition.

- The term “Total PFAS” could be mis-construed to mean the sum of all PFAS, or all PFAS analyzed by a particular lab method. ***MWRA recommends*** specifically defining the term “PFAS6” (analogous to HAA5) to mean the sum of the six PFAS regulated by this proposal, in lieu of “Total PFAS” and using this term throughout the rest of the proposed regulation. This modification will allow the remaining sections of the regulation to be more readable, and will eliminate any confusion with the numerous occurrences of “total PFAS” throughout the scientific and common literature. If at a later date, DEP chooses to promulgate a regulation covering a wider range of PFAS, DEP could then adjust the definition, similarly to EPA using HAA9 in UCMR4[1].

- The sentence just above the table of six PFAS (“Total PFAS shall mean…”) and the one just below (“Total PFAS Detection shall mean…”) are almost the same and thus are subject to confusion. Taken together with the sentence defining “PFAS Detection”, the three sentences seem contradictory. As discussed above, ***MWRA recommends*** moving any mention of unregulated PFAS out of this subsection. ***MWRA also recommends*** defining the six regulated contaminants as PFAS6. In addition, as discussed below in more detail, ***MWRA recommends*** applying the same requirements to measurement and summing of PFAS6 as used in the disinfection byproducts rule: detection means above the method reporting level, and only “detected” contaminants as so defined are summed for compliance and reporting purposes.

- The statement “calculated to two significant figures” is confusing, and has the potential to be interpreted in a way that contradicts 310 CMR 22.00 typical requirements that results be reported to the same number of significant figures as the MCL is stated in. As drafted, it may not be clear to all readers whether DEP intends the MCL to be enforced as xx ng/l or xx.yy ng/l. ***MWRA recommends*** deleting this phrase and maintaining the typical MCL reporting approach of reporting to the same number of significant figures as the MCL.

310 CMR 22.07G(5) Initial Monitoring

- ***MWRA recommends*** that DEP simplify the monitoring sections (5) and (6) to provide clarity. In presentations during the comment period, DEP staff provided clear explanations of how monitoring would occur: an initial year of quarterly monitoring; routine monitoring (one year out of every three); and increased monitoring (monthly, quarterly or annually, depending on PFAS levels and treatment). That clarity should be incorporated into the regulatory text.
- It is not clear what DEP intends by the phrase “PFAS detections” in this section. ***MWRA recommends*** that DEP change all mentions of PFAS detection in section (5)(a) to “PFAS6”
- ***MWRA recommends*** that DEP consider staggering the months that monitoring would be required to reduce the burden on laboratory capacity. As currently drafted, all samples are required to be taken during the first month of each quarter. An approach that results in a

[1] To avoid confusion, MWRA is using PFAS6 throughout this comment letter to refer to the six PFAS compounds proposed to be regulated.

more even initial and on-going distribution of sample volume per month would ensure that laboratories could keep up with statewide demand from PWS.

310 CMR 22.07G(6) Routine Monitoring

- In subsection (a), DEP appears to be conditioning a system being on routine monitoring to only systems that have no PFAS detections, rather than no detections of the six PFAS being regulated. While it seems appropriate that systems provide DEP with data on any unregulated PFAS compounds detected for informational purposes, this subsection appears to be using those unregulated detections (or their absence) for regulatory purposes. ***MWRA recommends*** that DEP be consistent in implementing the regulations only for the six named compounds and require only reporting of any others compounds that are detected.

310 CMR 22.07G(7) PFAS Detections

- It is unclear how DEP intends Subsection (7)(a)4 to be complied with. It states that a result "outside the historic range of PFAS results, <u>as determined by the Department</u>" is required to be reported within seven days. A system will not know that the Department has made such a determination until after the results are reported. ***MWRA recommends*** that DEP delete this requirement.
- Subsection (7)(A)1 creates a mandatory reporting requirement, that is more rapid than normal, for any detection of unregulated PFAS compounds. As discussed below, it is appropriate for there to be more rapid reporting of a regulated contaminant that is above its regulatory standard. This subsection creates a new and very different reporting requirement than used for any other contaminant class.
  Typically, EPA and DEP drinking water regulations only require reporting prior to the normal monthly reporting deadlines when a contaminant is above the regulatory standard. ***MWRA recommends*** that DEP modify subsection (7)(a) and (b) to require more rapid reporting for only those circumstances where results for regulated contaminants are above the regulatory standard.
- Subsection (7)(e) creates an entirely new consumer notice requirement, duplicating, but not precisely, and expanding upon, the public notification processes under 310 CMR 22.16. What this section appears to be requiring is that a single confirmed sample that is individually above the MCL value, triggers what is for all intents a Tier 2 Public Notice, when the system <u>has not exceeded</u> the MCL. The proposed regulation is clear that an MCL violation is based on a quarterly average, and thus only if a single confirmed value is high enough that the system would exceed the MCL even with non-detectible results in subsequent samples should public notification be required. Requiring public notification when a system is in compliance with regulatory limits can only confuse the public.
  MWRA recommends that DEP be consistent in its regulatory construction: a Tier 2 public notification is required only if the system exceeds the MCL as required by section (11) of this proposal. Detected results below the MCL would, of course, still be reported in the annual Consumer Confidence Report.
  If DEP chooses to retain this requirement, ***MWRA recommends*** that it simply refer to the notice requirements already laid out in 22.16 and not create new requirements slightly different from those already in place.

310 CMR 22.07G(8) Increased Monitoring Frequency

- The triggers for subsection (a) seem unclear. The introductory sentence under (8) refers to a "PFAS detection", but subsection (a) refers to a confirmed "Total PFAS detection" over 10 ppt. ***MWRA recommends*** that DEP clarify the conditions for required monthly sampling to be systems with confirmed results over half the MCL for the regulated PFAS6.

310 CMR 22.07G(9) Invalidation of PFAS Samples

- ***MWRA recommends*** that DEP clarify that DEP will require resampling only if results for any of the regulated PFAS6 compounds are invalidated.

310 CMR 22.07G(10) Compliance Calculations

- Subsections (10)(e) and (f) create an entirely new regulatory method for calculating compliance, which differs from EPA and DEP's approach to all other drinking water regulatory structures. This new approach creates significant reporting and risk communication problems, which would be avoided if DEP structured this regulation as its other regulations with MCLs for groups of contaminants. All other regulated contaminants treat results below the MRL as zero. This includes contaminants such as bromodichloromethane and bromoform (THMs) and dichloroacetic acid (HAA5) that have individual MCLG values of zero. They are included as part of the regulated compliance sum, but only sample results above the laboratory minimum reporting level (MRL) are included in their compliance sums.
- Even though DEP has stated their intention not to require laboratories or PWSs to report numbers for values below the MRL, the compliance sums calculated by DEP could result in confusion for the public and regulated community. ***MWRA recommends*** that only numeric results that are traceable directly back to reportable values on the laboratory reports be used for transparency and clarity.
- ***MWRA strongly supports*** the language in 310 CMR 22.07G(3) that reads "PFAS Detection shall mean a measured concentration of any PFAS…" (emphasis added) ***MWRA recommends*** that this standard apply to results that are part of the compliance calculation as well.
- The phrase "minimum reporting level" should be consistent with its plain language meaning (e.g. the level below which results are not to be reported). The Consumer Confidence Report regulations require reporting of only contaminants detected above the MRL, thus a system with no requirement to report undetected PFAS might still need to report a numerical value for PFAS6. This seems unnecessarily confusing to the public.
- Given the wide range of other exposures to PFAS in the environment, it is exceedingly unlikely that such small changes in the reporting of exposure from drinking water (no more than 1 ng/L for any of the six being regulated) would have any measurable public health benefit.

- Subsection (10)(a) creates a quarterly average, not the running quarterly average defined in the changes to 22.02. ***MWRA recommends*** that the definition in 22.02 be modified to match the compliance calculation.
- ***MWRA supports*** using a quarterly average as described to determine compliance with the MCL. However, this makes requirements that initial monitoring or subsequent quarterly monitoring happen in the first month of each quarter superfluous and unnecessary. It is highly likely that this will further exacerbate what may be a limited laboratory capacity, and may create a "seller's market". ***MWRA recommends*** that references to the "first month" be removed from 310 CMR 22.07G(5)(b); 310 CMR 22.07G(6)(b); and 310 CMR 22.07G(8)(a), (b) and (c).
- Subsection (10)(b) uses the phrase "…who detects PFAS…" It seems given the context that what was meant was "…that detects PFAS6…"

310 CMR 22.07G(16) PFAS Minimum Reporting Levels

- It is unclear what is intended by specifying that laboratories must be capable of obtaining a minimum reporting level (MRL) of 2.0 ng/L for the six PFAS that are included in the MCL determination. This type of requirement is normally handled during the laboratory certification process, so it seems inappropriate to include it in 310 CMR 22.00. ***MWRA recommends*** removing this requirement from 310 CMR 22.00 and adding it to the Laboratory Certification Office's method specific requirements.
- If DEP's intent is to only accept sample results that have an MRL of 2 ng/L or less for these six compounds, the regulations should state that explicitly. However, it should be noted that the lowest concentration minimum reporting levels that EPA was able to attain during method validation for the six PFAS range from 0.63 ng/L to 3.3 ng/L in EPA 537.1 and 2.6 ng/L to 4.8 ng/L in the newer EPA Method 533. Furthermore, EPA Methods 537, 537.1 and 533 all utilize the entire volume of the sample, so individual sample MRLs vary depending on the volume of sample in the bottle tested. MWRA has seen sample results with MRLs ranging from 1.8 ng/L to 2.4 ng/L even though the laboratory's nominal MRL is 2 ng/L. ***MWRA recommends*** that DEP accept individual sample MRLs up to 2.5 ng/L as valid. This could be achieved by describing the MRL as "2 ng/l" or "two ng/l".

Revisions to 310 CMR 2.16 Public Notification Requirements

- The suggested language for Health Effects and Major Sources is far too wordy in comparison to the required language for other contaminants of similar concern. ***MWRA recommends*** that DEP work with health communication specialists to develop simpler, easier to understand language. A more concise message would also be prudent given the amount of space needed in the regulated contaminant tables in Consumer Confidence Reports. MWRA staff would be happy to participate in a working group on this issue.

310 CMR 22.02 Definition of Running Quarterly Average

- The compliance calculation in 22.07G (10)(a) is a quarterly average, as it calculated only once per quarter, rather than every month as suggested by the RQA definition. A simple quarterly average is simpler, and matches the Stage 2 DBP rule. In addition, most of this text is repetitive of the text in section (10)(a).
- The last sentence of this definition is unclear. ***MWRA recommends*** that DEP create a separate subsection within the compliance calculation section (section (10)) dealing with how additional samples will be used in the compliance calculations.

Thank you again for the opportunity to comment on the proposed regulation of Per and Polyfluoroalkyl Substances. Please feel free to contact me at dave.coppes@mwra.com or our Director of Planning and Sustainability, Stephen Estes-Smargiassi at smargias@mwra.com with any questions or concerns.

Very Truly Yours,

David W. Coppes
Chief Operating Officer

Cc: Kathleen Baskin and Yvette Depeiza, MassDEP
Jane Downing, EPA Region 1
Jennifer Peterson, MWWA

From: janine@nebiosolids.org <janine@nebiosolids.org>
Sent: Friday, February 28, 2020 2:03 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Please see attached for the public record.

Janine Burke-Wells, Executive Director
North East Biosolids & Residuals Association
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Tamworth, NH 03886
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Attachment: NEBRACommentsonMassDEP-MCL4PFAS28Feb2020.pdf

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nebra
North East Biosolids & Residuals Association
Cooperatively promoting the environmentally sound recycling of biosolids and other residuals

February 28, 2020

Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108
delivered by email to program.director-dwp@mass.gov

Re: PFAS MCL Comments

Dear Director DePeiza,

On behalf of all our Massachusetts members, the North East Biosolids & Residuals Association (NEBRA) remains highly concerned about the unintended consequences of your well-intentioned efforts to set a Maximum Contamination Limit (MCL) for state drinking waters in the absence of federal regulations.

It is our understanding that the Massachusetts Department of Environmental Protection (MassDEP)'s proposed MCL for PFAS is based on the highly conservative health risk calculations performed by its Office of Research and Standards (ORSG), and builds on, most recently:

- the final promulgation of the Massachusetts Contingency Plan (MCP) site cleanup regulations, with an S-1 soil standard at 0.2 ng/g (ppb) for the sum of six PFAS. For perspective, a 2019 study by Sanborn Head and the University of Vermont for the Vermont Department of Environment Conservation found PFAS "background" in shallow soils for the six compounds proposed for regulation by MassDEP in the range of 0.38 to 14.6 ppb with a mean sum of 2.3 ppb. In comments to MassDEP, the authors of that study noted that "the S-1/GW-1 soil standard could be set at 4.2 ppb, which is the 90th percentile value of the summed concentrations of six PFAS compounds measured in the Vermont study." Absent any data on background soil levels in Massachusetts, it is inappropriate to set cleanup standards that are likely exceeded in numerous locations, including sites with no obvious sources of PFAS contamination. Unfortunately, that regulation is now final.
- G-1 groundwater standard of 20 ng/L (ppt) for six PFAS compounds.

Likewise, it is inappropriate to set such low groundwater standards without understanding of PFAS background levels in groundwater. As NEBRA noted in our comments on the draft MCP regulations, research on Cape Cod shows that home septic systems are impacting drinking water wells at levels equivalent to the adopted MCP groundwater standards and the proposed MCL of 20 ppt.

NEBRA, some of our members, and other stakeholders have repeatedly raised these concerns:

- the excessive, multiple layers of uncertainty factors and conservative assumptions in the MassDEP health risk calculations related to PFAS,
- potential unintended or unanticipated impacts on myriad beneficial environmental and public health programs,
- the potential for very high costs to not only drinking water systems, but also to systems and programs managing wastewater, septage, residuals (sludge, biosolids, digestates, composts) and landfill leachate, and
- a lack of calculation of the marginal costs and marginal benefits to the Commonwealth and its residents gained through adjusting the standards downward from 70 ppt for 2 PFAS combined to 20 ppt for six PFAS combined.

In its response to comments on the MCP regulations, MassDEP rejected or rebutted most of the arguments related to health risk calculations, remaining convinced that the choice of specific uncertainty factors or relative source contribution percentages are justified, with that justification based on the fact that a few other agencies around the country have used similar assumptions or have used different assumptions but arrived at similarly low numbers. But others have not (e.g. Health Canada, with its 200 ppt and 600 ppt standards for PFOA and PFOS).

MassDEP never adequately responded to our questions and comments about unintended and unanticipated impacts on other programs and the costs and benefits, except for noting that the MCP regulations allow for site-specific consideration of costs in determining a permanent site solution. For example, in its response to comments, MassDEP stated repeatedly with regards to biosolids: "The proposed standards do not directly apply to biosolids. MassDEP will continue to study and work with stakeholders on this issue." We continue to caution about indirect impacts on beneficial reuse and landfilling of biosolids, two of the three options available for managing biosolids. By setting such a low MCL, MassDEP may be unable to maintain options for solids management in the Commonwealth, leading to irresponsible exportation of biosolids and other residuals, setting back the years of efforts to remove organics from landfills and advance renewable energy from anaerobic digestion. Millions of dollars and extensive staff time and effort at multiple state agencies may be wasted by setting extremely low MCP and MCL limits for PFAS. Climate change, the driver behind the landfill ban on organics, is a far more significant issue compared to lowering PFAS standards from 70 to 20 ppt. Yet the climate benefits of recycling organics are already being lost because of MassDEP PFAS regulation.

We expected, as part of the process of the proposed MCLs, to see a report on estimated costs of the regulation. Is that available? Comments on the MCP from NEBRA, Agresource, MWWA, GHD, ACC, LSPA, MCWRS, MWRA, CDM Smith, AIM, and many others raised legitimate policy concerns including the potential liability on public municipal and utility systems (wastewater and waste management) that MassDEP is creating with the 20 ppt MCL and related soil-cleanup standard. The regulations just finalized and being proposed will set the basis for surface water and effluent standards. Yet they are at levels equivalent to background in many instances. Others can better comment on the science and calculations used to propose these standards. NEBRA has commented in the past about the lack of data -- especially human toxicity studies – and the large uncertainty factors upon which these proposed standards are based.

The patchwork of regulations that result from each state in the region creating its own standards has already had impacts on the market for biosolids and other organic residuals (for both beneficial reuse and disposal). Concerns about liability and costs are having additional unintended impacts on the drinking water and clean water industry and the businesses that rely on it, as we have seen in other states. Our members want to know how MassDEP intends to apply the new regulations and how our municipalities and utilities which receive PFAS – but are not sources of PFAS – can be assured that they will not be liable for cleanup costs as they continue to provide critical public health and environmental protections to residents of the Commonwealth.

In closing, we thank MassDEP for the extended comment period and numerous public hearings held on these proposed regulations. We appreciate the opportunities to comment and your consideration of our comments.

Sincerely,

Janine Burke-Wells

Janine Burke-Wells
Executive Director

From: Powers, Martha <m.powers@northeastern.edu>
Sent: Friday, February 28, 2020 1:33 PM
To: Director-DWP, Program (DEP)
Cc: Brown, Phil; Alissa Cordner; Jennifer Ohayon; Lauren Richter; Marina Atlas; Grace Poudrier
Subject: PFAS MCL Comments

Dear MassDEP Drinking Water Program,

On behalf of the Social Science Environmental Health Research Institute at Northeastern University and collaborators, please find attached our comments on the draft regulations.

Thank you,
Martha

Martha Powers, PhD MPH MES
Postdoctoral Fellow
Social Science Environmental Health Research Institute
Northeastern University
m.powers@northeastern.edu

Attachment: MassDEP MCL comments 28 Feb 2020.pdf

February 28, 2020

MassDEP Drinking Water Program
One Winter Street, 5th Floor
Boston, MA 02108
Attn: PFAS MCL Comments

To MassDEP Drinking Water Program:

We are writing to comment on Massachusetts' proposed PFAS Maximum Contaminant Levels (MCLs). We are a group of academic researchers who study the scientific, regulatory, and economic considerations related to per- and polyfluoroalkyl substances (PFAS) in the United States. We convened two national PFAS conferences, which brought together academics, state and federal regulators, and impacted communities, and have published broadly on PFAS-related topics including a comparison of the scientific and political factors shaping different state PFAS water advisory levels (1).

We applaud the State for drafting what are currently some of the strongest existing standards in the nation for PFAS, an ever-expanding and complex group of chemicals. However, we urge MassDEP to consider taking a stronger stance by continuing to recognize the best available, newly developed science; considering the effect of replacement PFAS; and approaching PFAS as a chemical class. With regulatory action from the federal government unlikely to be health protective and timely, combined with the non-enforceable EPA health advisory and ATSDR MRL standards, it is even more important that Massachusetts take action to protect public health.

Newly published studies should be taken into consideration

We encourage MassDEP to consider new studies that have been published since the Technical Support Document was prepared that identify associations between exposure to PFAS and a range of health effects. We outline some of these studies in the following paragraphs.

Toxicological

MassDEP followed the direction of federal agencies and based state drinking water values on non-cancer effects. In the Technical Support Document, MassDEP referenced the National Toxicology Program (NTP) summary data tables that were issued regarding animal bioassay data which reported elevated pancreatic and liver tumor rates following high dose exposure to PFOA, but for which a final report had not been issued. However, there has been an update since that previous review. A Draft NTP Technical Report was issued on December 16, 2019 after a peer review by a panel of experts, which unanimously endorsed findings from the study. The peer review panel agreed with NTP research that there was *clear evidence* of carcinogenic activity following PFOA exposure in male rats and *some evidence* of such activity in female rats, further pointing to the strength of these findings (2). Given peer-reviewed approval of the NTP Technical Report, we urge you to set more stringent MCLs that are protective of the sensitive health endpoints identified by the study.

Epidemiological

Findings from a recent nested case-control study of non-occupationally exposed postmenopausal women in France suggest a linear dose-response relationship between PFOS serum concentrations and the risk of developing hormone receptor-positive breast cancer (3). The cases were pulled from a cohort study involving 98,995 women, and researchers were able to prospectively investigate health effects of PFOS and PFOA. The study points to the importance of PFAS as a potential risk factor for breast cancer.

Published in 2018, but not mentioned in the technical review, is an ecological study from Italy which found statistically significant relative risks for overall mortality, kidney and breast cancer, among other diseases, in PFAS contaminated areas (drinking water exceeding either 30 ng/l for PFOS, 500 ng/l for PFOA, or 500 ng/l for other PFAS) in comparison with uncontaminated areas, pointing to the need to reduce exposure of populations to PFAS in drinking water (4).

The volume of epidemiological evidence on PFAS will increase substantially in the coming years, particularly with the recent start of three large prospective cohort studies:

- ATSDR Pease Study, which examines human health effects of PFAS exposure through contaminated water in New Hampshire.
- ATSDR Multi-site Study, consisting of 7 sites across the US, will provide a better scientific understanding about the relationship between PFAS exposure and health outcomes, and help people understand their risk for health effects.
- US Air Force announced in January 2020 it is conducting the Pease Military Cancer Mortality Study, a retrospective cohort study examining cancer deaths between 1970 and 2018 at the former Air Force base.

Between these three cohort studies, the last of which is expected to take only a year to complete, **we ask the DEP to commit to reviewing the MCL every three years to be protective of human health and the environment.**

Effects of replacement PFAS should be considered

We strongly recommend that MassDEP consider additional PFAS beyond the currently included six compounds. Many PFAS have been phased out of production and replaced by alternative PFAS compounds, which lack comprehensive toxicity data. Studies of alternatives are just beginning to examine outcomes associated with their exposure.

MassDEP concluded that perfluorobutane sulfonate (PFBS), a common substitute for PFOS, should not be included in the ORSG due to its shorter serum half-life and lower toxicity than other compounds. However, PFBS may not be a safer alternative. Studies have linked pregnant women's exposure to PFBS with preeclampsia and overall hypertensive disorders of pregnancy, as PFBS may impair the ability of cells to form a fully functioning placenta (5). Additionally, an in vitro study found that prenatal exposure to PFBS could cause placental cells to function improperly, echoing the epidemiology data and providing underlying mechanisms (6).

Similarly, findings from a recently published birth cohort study suggest that PFOS alternatives may be reproductive toxicants in humans. The study, which examined chlorinated polyfluorinated ether sulfonic acids (Cl-PFESAs), a replacement for PFOS, on developmental risks from maternal exposure, found associations between greater gestational Cl-PFESAs exposure and higher risk for adverse birth outcomes (7).

PFAS should be regulated as a class

We encourage MassDEP to take a class approach to regulating PFAS. Over 4700 individual PFAS have been identified by the OCED, the majority of which are un- or understudied (8). For this reason, chemical-by-chemical regulation is a time prohibitive and ineffective approach to protect public health. As Dr. Linda Birnbaum, NIEHS Director (retired), stated at a Senate Committee on Environment and Public Works, "current human exposures to PFAS involve complex mixtures, not individual chemicals" (9). This has led numerous leading scientists to call for PFAS to be regulated and studied as a class (10).

In conclusion, we again thank MassDEP for taking the important action of pursuing MCLs for PFAS. We urge MassDEP to consider lower levels for PFAS, as well as MCLs for additional PFAS, and review the MCL every three years to be protective of human health and the environment.

Respectfully submitted,

Dr. Phil Brown, University Distinguished Professor of Sociology and Health Sciences and Director, Social Science Environmental Health Research Institute, Northeastern University; p.brown@northeastern.edu

Dr. Alissa Cordner, Associate Professor of Sociology, Whitman College; cordneaa@whitman.edu

Dr. Jennifer Liss Ohayon, Research Scientist, Silent Spring Institute; ohayon@silentspring.org

Martha Powers, PhD, Postdoctoral Research Fellow, Northeastern University; m.powers@northeastern.edu

Dr. Lauren Richter, Assistant Professor, Rhode Island School of Design; lrichter@risd.edu

Marina Atlas, Graduate student, Social Science Environmental Health Research Institute, Northeastern University; atlas.m@husky.neu.edu

Grace Poudrier, Graduate Research Assistant, Social Science Environmental Health Research Institute, Northeastern University; poudrier.g@husky.neu.edu

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2. Technical Report 598: Draft NTP Technical Report on the Toxicology and Carcinogenesis Studies of Perfluorooctanoic Acid (CAS No. 335-67-1) Administered in Feed to Sprague Dawley (Hsd:Sprague Dawley® SD®) Rats: National Toxicology Program; 2019. Available from: https://ntp.niehs.nih.gov/ntp/about_ntp/trpanel/2019/december/actionstrprp20191212_508.pdf.

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From: Kyla Bennett <biojustus@comcast.net>
Sent: Friday, February 28, 2020 7:28 AM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL comments

Attachment: PFAS MCL comments.docx

PUBLIC EMPLOYEES FOR ENVIRONMENTAL RESPONSIBILITY • NEW ENGLAND

February 28, 2020

ATTN: PFAS MCL Comment
MassDEP
Drinking Water Program
1 Winter Street, 5th Floor
Boston, MA 02108

SENT VIA EMAIL TO: Program.director-dwp@mass.gov

To Whom It May Concern,

Thank you for the opportunity to comment on Massachusetts Department of Environmental Protection's (MADEP's) proposed new regulation establishing a total PFAS drinking water Maximum Contaminant Level (MCL) of 20 ppt for six PFAS contaminants: PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA. Public Employees for Environmental Responsibility (PEER) applauds MADEP's efforts to tackle the PFAS contamination crisis. While PEER agrees that the proposed MCL is a good start, we urge MADEP to regulate PFAS as a class, to lower the MCL, and to persuade other Commonwealth agencies to prevent more contamination from occurring. Our specific comments are set forth below.

Background

PFAS chemicals are known as "forever chemicals" because of their persistence in the environment. PFAS chemicals have been manufactured since the 1940s, and are utilized in various industries because of their ability to repel oil, stains, and water. They are ubiquitous in both the environment and in consumer products, and are found in nonstick cookware, stain and water repellants, paints, cleaning products, food packaging, carpeting, upholstery, artificial turf, make-up, dental floss, biosolid fertilizer, and firefighting foams. This extreme persistence is a substantial hazard, as PFAS will stay in the environment for decades to centuries.[1]

[1] Cousins, I.T., et al. The precautionary principle and chemicals management: the example of perfluoroalkyl acids in groundwater. Environ Int. Vol. 94: 331–340 (2016).

Long-chain PFAS

Long-chain PFAS bioaccumulate and easily migrate. A study by the Centers for Disease Control and Prevention (CDC) found four PFAS (PFOS, PFOA, PFHxS, and PFNA) in the serum of nearly all of the people tested, indicating widespread exposure in the U.S. population.[2] PFOA and PFOS were found in up to 99 percent of the U.S. general population between 1999 and 2012.[3] PFAS are found in human breast milk and umbilical cord blood.[4] Epidemiological studies identify the immune system as a target of long-chain PFAS toxicity.[5] Other studies have found decreased antibody response to vaccines, and associations between blood serum levels of PFAS and immune system hypersensitivity and autoimmune disorders.[6]

Long-chain PFAS are also toxic to humans in very small concentrations—in the parts per trillion (ppt).[7] Long-chain PFAS are suspected carcinogens and have been linked to growth, learning and behavioral problems in infants and children; fertility and pregnancy problems, including pre-eclampsia; interference with natural human hormones; increased cholesterol; immune system problems; and interference with liver, thyroid, and pancreatic function,[8] and increases in testicular and kidney cancer in human adults.[9] The developing fetus and newborn babies are particularly sensitive to certain long-chain PFAS.[10]

Short-chain PFAS

Short-chain PFAS are highly mobile, and are also becoming ubiquitous.[11] Such mobility means that short-chain PFAS easily reach water bodies, which can result in drinking water contamination.[12] Data show that short-chain PFAS are present in remote areas and have a widespread distribution in both biotic and abiotic environments.[13] Due to the manufacturing

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[2] Center for Disease Control and Prevention, Per-and Polyfluorinated Substances (PFAS) Factsheet (Apr. 7, 2017), https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html.

[3] U.S. Environmental Protection Agency (USEPA), Drinking Water Health Advisory for Perflourooctanoic Acid (PFOA)(May 2016) at 9, https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final_508.pdf.

[4] Agency for Toxic Substances and Disease Registry, Toxicological Profile for Perfluoroalkyls, supra note 2, at 3.

[5] U.S. EPA, Drinking Water Health Advisory for Perflourooctanoic Acid (PFOA), supra note 4, at 10.

[6] Id. at 39.

[7] Agency for Toxic Substances and Disease Registry, Toxicological Profile for Perfluoroalkyls, supra note 2, at 5-6.

[8] Id.

[9] Id. at 6; Vaughn Barry et al., Perfluorooctanoic Acid (PFOA) Exposures and Incident Cancers among Adults Living Near a Chemical Plant, 121 Envtl. Health Perspectives 11-12, 1313-18 (2013), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3855514/pdf/ehp.1306615.pdf.

[10] USEPA, Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS), (May 2016) https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final_508.pdf at 10.

[11] Zhao P, et al. Short-and long-chain perfluoroalkyl substances in the water, suspended particulate matter, and surface sediment of a turbid river. Sci Total Environ. 568: 57–65 (2016); See also Ahrens L., Polyfluoroalkyl compounds in the aquatic environment: a review of their occurrence and fate. J Environ Monit. 13: 20–31 (2011).

[12] Schwanz TG, M. Llorca, M. Farré, D. Barceló. Perfluoroalkyl substances assessment in drinking waters from Brazil, France and Spain. Sci Total Environ. 539: 143–152 (2016); See also Boiteux V, et al.. Concentrations and patterns of perfluoroalkyl and polyfluoroalkyl substances in a river and three drinking water treatment plants near and far from a major production source. Sci Total Environ. 583: 393–400 (2017).

[13] Ahrens L. RJ, Axelson S., Kallenborn R., Source tracking and impact of per- and polyfluoroalkyl substances at Svalbard. Svalbard Environ Prot Fund, 2016; Llorca M, et al. Fate of a broad spectrum of perfluorinated compounds in soils and biota from Tierra del Fuego and Antarctica. Environ Pollut. 163: 158–166 (2012); Kirchgeorg, T, et al. Seasonal accumulation of persistent organic pollutants on a high-altitude glacier in the Eastern Alps. Environ Pollut. 218: 804–812 (2016)..

phase-out of PFOA and PFOS in the United States,[14] manufacturing and use of short-chain PFAS and related substances are increasing.[15] Due to their low adsorption potential, short-chain PFAS do not bind to particles and stay mainly dissolved in water. Thus, while long-chain PFAS can be removed from water with activated carbon filters, this removal method is not as effective for short-chain PFAS.[16] The absence of effective measures on a larger scale is particularly problematic with respect to contaminated drinking water.

Considering that the use of short-chain PFAS will continue to increase, it is therefore likely that both humans and the environment will be permanently exposed to short-chain PFAS. Very little research has been performed on the toxicity of most PFAS, with the majority of studies performed by industry itself.[17] Additionally, scientists have failed to consider the mixture toxicity of PFAS. Regulatory paradigms should consider the dangers of exposure to several PFAS simultaneously, not just concentrations of individual substances one at a time.[18]

Federal and state regulation of PFAS. Because the current U.S. Environmental Protection Agency (EPA) is failing to take any significant actions on regulating PFAS, a number of states have developed much lower standards of PFAS in drinking water. A recent study from Harvard University researchers has suggested that a safe limit for PFAS in drinking water is 1 ppt.[19] In June 2019, Linda Birnbaum, director of the National Institute for Environmental Health Sciences (NIEHS) and the National Toxicology Program (NTP), suggested that the safety threshold for PFOA in drinking water should be as low as 0.1 ppt, which is 700 times lower than the advisory level set by the EPA.[20] Every reported case of PFAS contamination is higher than these suggested limits.

MADEP must consider regulating PFAS as a class. The chemical similarities of all PFAS, together with their toxicity, supports a broader regulatory scheme is necessary. There are currently more than 5,000 different PFAS chemicals.[21] While MADEP is proposing to regulate six PFAS, many others are found in drinking water throughout the Commonwealth, and these additional PFAS are chemically similar to those with known toxicity. In addition, new research into the newer PFAS chemicals indicates that they are just as toxic as the long-chain PFAS.[22] Because of the vast number of PFAS, together with the speed at which chemical manufacturers are creating new PFAS, it will take far too long to determine the toxicity of each PFAS chemical individually. Therefore, regulating PFAS as an entire class seems to be the only alternative that would be protective of both human health and the environment.

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[14] Renner R. The long and the short of perfluorinated replacements. Environ Sci Technol. 40: 12–13 (2006).

[15] https://www.ehn.org/forever-chemical-replacements-on-the-rise-in-the-great-lakes-2639219145.html

[16] Zhang C., H. Yan, F. Li, X. Hu, and Q. Zhou. Sorption of short-and long-chain perfluoroalkyl surfactants on sewage sludges. J Hazard Mater. 260: 689–699 (2013).

[17] A Never Ending Story of Per-and Polyfluoroalkyl Substances (PFASs), *Environ. Sci. Technol.* 2017, 51, 5, 2508-2518 (2017).

[18] Id.

[19] Grandjean P, Budtz-Jørgensen E. Immunotoxicity of perfluorinated alkylates: calculation of benchmark doses based on serum concentrations in children. *Environ Health* 12, 35 (2013).

[20] https://pfasproject.com/2019/02/05/2019-pfas-conference/

[21] PFAS and Protecting Your Health, Rogers, R. et al., CDC Public Health Grand Rounds, November 19, 2019, Event ID 4207262.

[22] See, e.g., https://theintercept.com/2019/09/19/epa-new-pfas-chemicals/

Moreover, laboratories can only test for approximately 36 PFAS. While total fluorine tests are indicative of PFAS, they are not determinative. If we cannot test for the presence of PFAS, we cannot regulate them. The only way out of this conundrum is to regulate the chemicals as a class.

MADEP's MCL is too high. Scientific understanding of the effects PFAS have on human health and the environment is changing swiftly. As the science surrounding PFAS evolves, we see adverse health effects at lower levels of exposure, and from different exposure pathways (including dermal exposure).[23] It is unclear whether MADEP took the new research on dermal exposure into account when developing its proposed standard. If it did not, MADEP should re-evaluate the proposed standard to ensure the drinking water MCL is protective of both human health and the environment.

Moreover, PEER believes that MADEP should set lower individual limits on certain PFAS, such as PFOA and PFOS, as well as including them in the cumulative exposure limit. Specifically, PEER suggests a limit of 10 ppt (or less) for PFOA and PFOS individually and cumulatively. Although PFOA and PFOS are no longer manufactured in the United States, they appear to still be imported and used in consumer goods. Setting a lower limit for these two PFAS may increase the likelihood that manufacturers stop using them.

The Commonwealth must regulate the sources of PFAS. It is non-sensical to regulate PFAS contamination in our drinking water without also attempting to reduce the sources of such contamination. As such, PEER believes that the Commonwealth must regulate PFAS in commercial products and waste streams, as well as in our drinking water. While some of these suggested actions might be outside the scope of MADEP, they are certainly actions that other divisions of the Commonwealth can address.

Landfill leachate: PFAS manufacturing waste, as well as consumer goods laden with PFAS, are sent to solid waste landfills, where it contaminates landfill leachate and becomes a source of release to the environment.[24] Leachate treatment by wastewater treatment plants (WWTPs) is common prior to discharge to surface water, or distribution for agricultural or commercial use.[25] However, standard WWTP technologies do little to reduce or remove PFAS, and can actually increase the amount of PFAS released to the environment.[26] MADEP should mandate the testing of all landfill leachate, and any leachate with PFAS levels over certain levels should not be allowed to be sent to WWTPs.

[23] Poothang, S., et al., Multiple pathways of human exposure to poly- and perfluoroalkyl substances (PFASs): From external exposure to human blood, Environment Internat'l, Vol. 134, January 2020.
[24] See, e.g., https://www.bostonglobe.com/metro/2019/11/05/toxic-chemicals-can-dumped-into-merrimack-river-federal-and-state-officials-say/N0u3jOxo1CnpcQiACEW88N/story.html
[25] Lang JR, Allred BM, Peaslee GF, Field JA, Barlaz MA, Release of Per- and Polyfluoroalkyl Substances (PFASs) from Carpet and Clothing in Model Anaerobic Landfill Reactors. Environ Sci Technol. 50(10): 5024-32 (2016).
[26] Gallen, C. et al., A mass estimate of perfluoroalkyl substance (PFAS) release from Australian wastewater treatment plants, Chemosphere, Vol. 208: 975-983, 2018.

Biosolids: Sewage sludge, which is often applied on land and as fertilizer, has been found to be contaminated with PFAS.[27] MADEP should mandate the testing of all biosolids, and prohibit the sale, distribution, or use of PFAS-contaminated biosolids.

Artificial turf: PFAS has also been found in artificial turf.[28] Despite this, municipalities continue to install artificial turf fields, sometimes in the Zone IIs of their municipal wells. The Commonwealth should: 1) require artificial turf manufacturers to disclose whether they use PFAS as an ingredient or a process aid in their products; and 2) prohibit the installation of any fields containing PFAS in Massachusetts.

Pesticides: PFAS have been used in pesticides as inert ingredients in the past, and probably are still used.[29] Pesticide manufacturers are not required to disclose the list of so-called "inert" ingredients in their products. It is interesting to note (although anecdotal) that towns in the south coast area are finding PFAS in their water supplies without any known source. Since the south coast of Massachusetts is the area that is aerially sprayed most frequently, it is possible that the Anvil 10-10 contains PFAS. The Commonwealth should test (or require Clarke, the manufacturer of Anvil 10-10) to disclose all the ingredients in their pesticides before they are allowed to be used. In addition, the Commonwealth should test all larvicides and pesticides currently sprayed from trucks or applied to wetlands/waters, and should ensure that all pesticides considered for use in the future (whether sprayed aerially or used on the ground) are PFAS-free - *before* they are utilized.

Other exposure pathways. In March of 2019, PEER asked the Department of Public Health to consider a "Do Not Eat" advisory for fish, waterfowl, and deer caught near highly contaminated areas.[30] We never received a response. The State of Michigan has instituted a "Do Not Eat" advisory for game taken within five miles of PFAS-contaminated areas.[31] Massachusetts should consider doing the same.

Conclusion. PEER is supportive of MADEP's 20 ppt proposed drinking water standard for six PFAS, but we believe that MADEP should consider doing more to protect the citizens and environment of Massachusetts. Because PFAS is so potentially dangerous, it is prudent to use the precautionary principle and regulate PFAS as a class. Moreover, PEER feels strongly that a MCL in the absence of any attempt to control the sources of PFAS defies logic. As such, we respectfully request that the Commonwealth address PFAS in landfill leachate, biosolids, artificial turf, and pesticides.

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[27] See, e.g., https://www.bostonglobe.com/metro/2019/12/01/levels-toxic-chemicals-mwra-fertilizer-found-tests-are-raising-concern/tlnN0BffyugFKCweSpFq5J/story.html

[28] See, e.g., https://theintercept.com/2019/10/08/pfas-chemicals-artificial-turf-soccer/ and https://www.bostonglobe.com/metro/2019/10/09/toxic-chemicals-found-blades-artificial-turf/1mlVxXjzCAqRahwgXtfy6K/story.html

[29] See, e.g., http://www.fluoridealert.org/wp-content/pesticides/pfos.pfoas-page.htm

[30] See https://www.peer.org/massachusetts-needs-a-pfas-public-health-advisory-for-game/

[31] https://cvm.msu.edu/vdl/news/2019/do-not-eat-advisory-issued-for-deer-taken-in-oscoda-township

Thank you for the opportunity to comment.

Sincerely,

Kyla Bennett, PhD, JD
New England PEER
P.O. Box 574
North Easton, MA 02356

From: Parr, Ashley E. <Ashley.Parr@btlaw.com>
Sent: Friday, February 28, 2020 3:35 PM
To: Director-DWP, Program (DEP)
Cc: Longsworth, Jeffrey; Helminski, Tammy; Andes, Fredric
Subject: PFAS MCL Comments

Attached, please find comments on behalf of the PFAS Regulatory Coalition regarding the State's Proposed Amendments to 310 CMR 22.00, Massachusetts Drinking Water Regulations. Please contact us if you have any questions or need any additional information.

Thank you,

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Attachment: 2020-02-28 Massachusetts Proposed Rulemaking Comments.pdf

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February 28, 2020

VIA ELECTRONIC MAIL
Massachusetts Department of Environmental Protection
Drinking Water Program
Attention: PFAS MCL Comment
One Winter Street, Fifth Floor
Boston, Massachusetts, 02108
program.director-dwp@mass.gov

Re: ***PFAS MCL Comment***
Comments of the PFAS Regulatory Coalition Regarding the Proposed Amendments to 310 CMR 22.00, Massachusetts Drinking Water Regulations

Dear Sir or Madam:

The PFAS Regulatory Coalition (Coalition) appreciates the opportunity to file comments regarding the proposed Amendments to 310 CMR 22.00, Massachusetts Drinking Water Regulations.

I. The Coalition's Interest

The Coalition is a group of industrial companies, municipal entities, agricultural parties, and trade associations that are directly affected by the State's development of policies and regulation related to per- and polyfluoroalkyl substances (PFAS). Coalition membership includes entities in the automobile, coke and coal, iron and steel, municipal, paper, petroleum, and other sectors. None of the Coalition members manufacture PFAS compounds. Coalition members, for purposes of these comments, include: American Coke and Coal Chemicals Institute; American Forest and Paper Association; American Iron and Steel Institute; Barr Engineering; Brown & Caldwell; Gary Sanitary District (IN); Illinois Association of Wastewater Agencies; Lowell, MA; Pueblo, CO; Tempe, AZ; Toyota; Trihydro, and Yucaipa Valley Water District (CA).

Coalition members support the State's efforts to identify potential sources of those individual PFAS that pose risks to human health and the environment, and to prioritize the protection of drinking water sources for vulnerable populations. In the State's pursuit of such regulations, the Coalition urges State regulators to ensure that final standards are scientifically supported, cost-effective, and achievable.

II. Proposed Rulemaking

The Massachusetts Department of Environmental Protection (MassDEP or State) has proposed a new regulation that establishes a total per- and polyfluoroalkyl substances (PFAS) Maximum Contaminant Level (MCL) of 20 parts per trillion (ppt) for six PFAS contaminants: perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorodecanoic acid (PFDA). The proposed regulation would establish a drinking water standard (MCL) of 20 ng/L for the sum of six specific PFAS. The proposed regulation would apply to all public water systems and would require quarterly sampling, minimum reporting requirements, and corrective action when PFAS is detected.

The Coalition appreciates the work that the State has done and continues to do to address the concerns about PFAS in Massachusetts. As reflected in the comments below, the Coalition highly encourages Massachusetts to work towards supporting the federal rulemaking process. Many of our members have interests in multiple states and it is important to have uniformity and consistency regarding regulatory standards, not just for business operations but for risk communication, as well. If finalized, Massachusetts' proposed rules would make this already complex regulatory landscape only more complex.

As discussed below, the U.S. Environmental Protection Agency (EPA) is taking action to address PFAS in drinking water. Massachusetts can still address those public water systems where PFAS has been found, while assisting EPA in its efforts for national uniformity.

III. Coalition Analysis and Recommendations

In the comments below, the Coalition recognizes and summarizes some of the challenges that the State faces in attempting to promulgate enforceable regulations, as well as some of the challenges that Coalition members face if states promulgate standards that vary from any existing or future federal standards. The Coalition appreciates the State's desire to act to protect its citizens from potential risks associated with exposure to certain PFAS compounds, but urges Massachusetts and other states to work with the federal government to develop a cohesive national strategy to help ensure national uniformity. The prospect of a patchwork set of state-specific standards that vary widely is likely to cause significantly more confusion and overwhelming challenges for Coalition members that operate in multiple states or nationwide.

A. The Scientific Community Does Not Agree on Human Health Toxicity Values for PFAS

The term "PFAS" refers to a group of man-made chemicals that include perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), GenX,[1] and other fluorinated compounds. The most prevalent and available science regarding the incidence and potential health effects of PFAS is based on PFOA and PFOS, two compounds that are no longer manufactured in the United States due to voluntary phase outs. For replacement chemicals, industry has begun using shorter-chain PFAS that have different physical, chemical, and toxicological properties from long-chain PFOA and PFOS. The scientific understanding of how PFAS impacts people and the environment is still developing and, for thousands of PFAS compounds, much remains unknown. From a toxicological perspective, regulatory agencies must have adequate science for determining health-based values before promulgating individual compound standards, limits, and related regulations.

Toxicologists, whether they work for various state agencies, EPA, international standards-setting organizations, academia, or in private practice, have not yet established specific methodologies, resources, or even agreed on which of the hundreds of studies of PFAS compounds are the appropriate or critical studies that must or should support appropriate regulatory "standards." Different methodologies, levels of experience, procedural prerequisites to standards-setting, and even local political pressures are leading to consideration of very different standards in various states and at EPA. Accordingly, the Coalition urges states to work with one another and with EPA to continue developing science and methodologies to inform and encourage a more uniform approach to federal and state PFAS regulatory mandates.

B. Federal Action on PFAS

EPA has issued "Interim Recommendations for Addressing Groundwater Contaminated with PFOA and PFOS."[2] Those recommendations provide clear and consistent guidance for federal cleanup sites being evaluated and addressed under federal programs, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Resource Conservation and Recovery Act (RCRA). The screening levels followed under such cleanups are risk-based values that are used to determine if levels of contamination may warrant further investigation at a site. The

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[1] Note that GenX is a trade name for a specific PFAS compound, ammonium, 2,3,3,3-tetrafluoro-2-(heptafluoropropoxy) propanoate. ITRC "Naming Conventions and Physical and Chemical Properties of Per- and Polyfluoroalkyl Substances (PFAS)," at 12, *available at* https://pfas-1.itrcweb.org/wp-content/uploads/2018/03/pfas_fact_sheet_naming_conventions__3_16_18.pdf (last visited January 23, 2020). More generically, GenX can be denoted by the abbreviation, "HFPO-DA."

[2] EPA Office of Land and Emergency Management, OLEM Directive No. 9283.1-47 (December 19, 2019), *available at* https://www.epa.gov/sites/production/files/2019-12/text_version_epas_interim_recommendations_for_addressing_groundwater_contaminated_with_pfoa_and_pfos_dec_2019.txt.

recommendations are intended to be used as guidance for states to evaluate state cleanup and corrective action sites. The interim guidance recommends in relevant part:

- Using a screening level of 40 parts per trillion (ppt) to determine if either PFOA, or PFOS, or both, is present at a site and may warrant further attention.
- Using EPA's PFOA and PFOS Lifetime Drinking Water Health Advisory level of 70 ppt as the preliminary remediation goal (PRG) for contaminated groundwater that is a current or potential source of drinking water, where no state or tribal MCL or other applicable or relevant and appropriate requirements (ARARs) are available or sufficiently protective.

In addition, EPA is focusing significant resources on developing appropriate regulatory mechanisms specific to various PFAS compounds. For example, EPA has developed a PFAS Action Plan, which provides a multi-media, multi-program, national research, and risk communication plan to address emerging PFAS challenges.[3] Part of EPA's PFAS Action Plan involves expanding the scientific foundation for understanding and managing risk from PFAS, including researching improved detection and measurement methods, generating additional information about PFAS presence in the environment and drinking water, improving the understanding of effective treatment and remediation methods, and developing more information regarding the potential toxicity of a broader set of PFAS. In turn, EPA expects that this information will help states and others better manage PFAS risks.

EPA is also moving towards possible Maximum Contaminant Level (MCL) standards for PFOA and PFOS—two of the most well-known and prevalent PFAS chemicals. On February 20, 2020, EPA released a prepublication version of its Regulatory Determination for Contaminants on the Fourth Drinking Water Contaminant Candidate List. The Regulatory Determination supports regulating under PFOA and PFOS under the Safe Drinking Water Act, meaning EPA is proposing to move forward with setting MCLs for this two PFAS compounds. In making this determination, EPA also relied on the reference dose of 0.00002 mg/kg/day for both compounds.[4] EPA has stated that, "[p]roposing a regulatory determination is the next step in the maximum contaminant level [] rulemaking process under the Safe Drinking Water Act; it enables the EPA to propose and solicit comment on information critical to regulatory decision-making towards protecting public health and communities across the nation."[5] Additionally, EPA is gathering and evaluating information to determine if similar regulations are appropriate for a broader number of PFAS compounds.

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[3] *See* EPA "EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan" (February 2019) *available at* https://www.epa.gov/sites/production/files/2019-02/documents/pfas_action_plan_021319_508compliant_1.pdf.
[4] This Regulatory Determination had not yet been published in the *Federal Register* at the time of drafting of these comments, but is available at: https://www.epa.gov/sites/production/files/2020-02/documents/ccl_reg_det_4_preliminary_frn.webposting.pdf.
[5] *Id.*

While EPA is working through its long-established processes and rulemaking procedures, Congress is considering ways to expedite and fund various national standards-setting approaches. Recently, the U.S. House of Representatives passed the PFAS Action Act (H.R. 535), which would require, among other things, that EPA promulgate a national primary drinking water regulation for certain PFAS and a health advisory for other PFAS not subject to a national primary drinking water regulation. Also, Congress passed and then the President signed into law the National Defense Authorization Act (NDAA) (P.L. 116-92) that mandates additional federal actions to regulate and manage various risks associated with many PFAS. While we recognize that not all states and stakeholders can agree on specific priorities or approaches to PFAS regulations, these congressional actions, combined with EPA's efforts, are important national developments that should be supported by the states through their contribution of expertise, resources, and efforts as the Nation works to respond to PFAS exposure risks.

Indeed, a patchwork of 50 different state solutions is unworkable and contrary to how the U.S. has previously addressed similar emerging contaminant issues. While some limited variations related to groundwater, surface water, or soil cleanup levels may be expected and appropriate, the highly variable regulatory health advisories, action levels, and drinking water standards currently being developed or under consideration across the country create unnecessary confusion and complexity for the public and the regulated community.

The Coalition recognizes the states have elected to utilize different methods and processes for communicating risks to their populations. However, standards-setting must reflect more national and uniform collaboration and cohesion. We must work to avoid the undesirable solution of 50 separate state rules, particularly with regard to drinking water standards. With this in mind, we urge the states to work closely with EPA to establish science-based and peer-reviewed federal standards that serve as the basis for comparable state standards. Such an approach is consistent with how EPA and the states have addressed environmental and human health risks since the creation of EPA.

In every instance in which Massachusetts has proposed to deviate from basic EPA findings or determinations, it should clearly state its authority for such deviation. For example, in developing its proposed MCL, the State has calculated a reference dose (RfD) that is significantly more stringent than that of EPA.[6] In fact, the Massachusetts RfD appears to be the most stringent in the country, implying that the State has far more disproportionately sensitive populations than any other state.[7] Certainly, Massachusetts

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[6] Massachusetts uses an RfD of $5x10^{-6}$ based on PFOS and PFOA values, which is applied to all regulated PFAS based on what the State asserts are similarities in chemical structures, toxicities, and long serum half-lives. *See* ECOS White Paper (*Processes & Considerations for Setting State PFAS Standards*) Appendix A *available at*: https://www.ecos.org/documents/ecos-white-paper-processes-and-considerations-for-setting-state-pfas-standards/ (last accessed Feb. 28, 2020).

[7] MassDEP selected a factor of $10^{½}$ as the database uncertainty factor (UF_D) to account for data uncertainties regarding the lower dose effect data for PFOA and PFOS previously discussed. MassDEP explained that this decision was based on professional judgement and consideration of

residents, on average, must generally be about the same size and drink comparable amounts of water on a daily basis as do residents of other states. This "outlier" approach needs to be well explained and supported, including with appropriate cost-benefit analyses.

The Coalition also requests that the State revisit its decision to use the "summing approach" to regulate the six PFAS compounds subject to regulation. The Coalition realizes that Massachusetts grappled with this issue and whether to establish unique standards for each PFAS compound during its promulgation of groundwater standards (before the Coalition had been formed). But, Massachusetts should reevaluate the "summing approach" in this MCL rulemaking or, in the alternative, provide more specific scientific justification for treating the toxicity or human health impacts of the six different PFAS compounds as if they were interchangeable.[8]

In addition, the Coalition can foresee challenges to states that choose to develop their own unique and varying drinking water standards. Many jurisdictions have existing laws or rules that prohibit the state from promulgating regulations that are more stringent than the federal rules. When EPA does promulgate national primary drinking water regulations, such states may be in conflict with their legislature's clearly stated policy. These states may be required to amend their state-specific PFAS regulations when EPA completes its work in this regard. And, state antibacksliding provisions may complicate their abilities to change their standards to conform with federal rules.

Considering the above, implementation of any future federal standards likely will be more complex and resource-consuming for states that set their own limits in advance of federal action. Indeed, the purpose of federal law is to protect against a patchwork of state law. Accordingly, the State should clearly articulate how forthcoming federal drinking water standards may impact this State-specific proposed rulemaking, how the State will help to foster consistency and uniformity with neighboring states, and how the State will defer to federal standards or revise standards based on future federal action and improved scientific understanding about exposure, dose, and toxicology.

The Coalition urges the State to use its resources to support the development of sound science upon which EPA can base its federal standards, heed the non-binding recommendations of EPA's Federal Health Advisory of 70 ppt (for PFOA and PFOS

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the following factors: extent of available data; serum concentrations at key effect and no effect levels; and the magnitude of the composite uncertainty factor. MassDEP also noted decisions by various other agencies regarding the need for a UF_D and the reasons those agencies provided to support the UF_D used during derivation of their RfDs for PFOA and PFOS. MassDEP's rationale suggests that the agency chose a conservative UF_D because the underlying data are uncertain. In other words, because MassDEP is developing the MCLs before the data are better developed, the agency has chosen a conservative value. The conservative UF_D, however, results in a conservative estimate that does not reflect actual risk. Accordingly, the Coalition recommends that MassDEP support federal efforts to develop the underlying science on which EPA can base its federal standards, rather than setting premature state standards that do not reflect actual risk.

[8] *See infra* Section III.C.

combined) and, ultimately, work to implement any forthcoming national primary drinking water standards. This will protect the State from expending resources on establishing and enforcing individual PFAS drinking water standards that are inconsistent both with other states and with federal science-based and peer-reviewed standards.

C. Reliance on the ATSDR Values

The ATSDR, part of the federal Center for Disease Control, and many states have reviewed the toxicity information available for PFOA and PFOS and opined on appropriate dosages that reflect highly conservative assumptions designed to protect human health, including the most susceptible subpopulations. ASTDR values are derived through different methods than EPA's MCL (and Health Advisory) values and the two are not directly comparable.[9] These variabilities in how various health recommendations are derived must be considered and addressed to ensure that any final standards are scientifically justified and corroborated.[10]

Moreover, ATSDR has only finalized the Toxicological Profile for two PFAS compounds, PFOA and PFOS. The profiles for two additional PFAS—Hexafluoropropylene Oxide (HFPO) Dimer Acid, more commonly referred to as the "GenX Chemicals," and Perfluorobutane Sulfonic Acid/Potassium Perfluorobutane Sulfonate, referred to as PFBS—are still only in draft form. ATSDR made the Toxicological Profiles for these additional PFAS available for public comment in 2018, and the Profiles have not yet been finalized.

Considering the above, the Coalition recommends that the State base any rulemaking on any forthcoming national primary drinking water standards, rather than the draft ATSDR report. And, even if the State still seeks to base its rulemaking on the ASTDR reference doses, the Coalition recommends that it wait until ATSDR finalizes its Toxicological Profiles, as the science supporting ATSDR's reference doses is not fully developed nor has the scientific community generally agreed on the science. Moreover, ATSDR has not even drafted profiles for some of the compounds that the State is proposing to regulate.

The State, at best, must avoid underpinning regulations on information that the scientific community is still debating, or using science not yet fully developed enough for ATSDR to draft recommendations. EPA is actively working on developing its own assessments for these and other PFAS compounds and, consequently, final standards-setting is still premature.

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[9] *See* ATSDR Public Health Assessment Guidance Manual (2005) at Appendix F: Derivation of Comparison Values (https://www.atsdr.cdc.gov/hac/phamanual/appf.html) ("MCLs represent more realistic assumptions about toxicity and contain fewer uncertainty factors than the very conservative ATSDR environmental guidelines.")

[10] For a thorough discussion on possible confusion created by comparing ATSDR and EPA standards, *see supra* n.6, at 14.

D. Specificity in the Type of Regulated PFAS

Generally, PFAS regulations should clearly specify the individual compounds of PFAS that they seeks to regulate. Given the wide variations in toxicities and other characteristics exhibited by different PFAS chemicals, it is not scientifically appropriate to group all PFAS together for purposes of risk assessment or to assume that exposures to mixtures of PFAS necessarily bioaccumulate in one's body in interchangeable 1:1 ratios.

Accordingly, the Coalition supports the proposed rulemaking's specificity in identifying which PFAS compounds are regulated and recommends that the regulation of individual PFAS substances reflect peer-reviewed science regarding the physical, chemical, and toxicological properties of each compound. Similarly, the Coalition recommends against including any combined PFAS standards or limits unless science clearly demonstrates that the mixture of the PFAS compounds subject to the combined limit results in bioaccumulation in hazardous concentrations.

E. Validated Test Methods for PFAS

The State should regulate only those PFAS comopounds for which there are validated analytical test methods. EPA's main validated test methods for PFAS, Methods 537 and 537.1, apply only to 18 PFAS compounds in samples derived from drinking water. EPA recently issued Method 533 that can be used to measure an additional 11 "short-chain" PFAS compounds (and only 14 of the 18 PFAS covered by Method 537.1), again only for use in testing drinking water. Therefore, the entirety of EPA's approved test methods can measure no more than 29 different PFAS compounds, and multiple methods would have to be used to obtain results from all 29 compounds.

No yet validated EPA test methods exist for testing PFAS compounds in any other environmental media. EPA has received comments on a draft non-potable water test method (SW-846 Method 8327), but that method is only considered "guidance" at this time. EPA also is working with the Department of Defense's Naval Seas Systems Command Laboratory Quality and Accreditation Office to validate a solid-phase extraction/isotope dilution method to include solid matrices (*i.e.,* for soil, sediment, fish tissue, biosolids), as well as non-potable water sources, but that effort may not be completed until 2021.[11]

Accordingly, the Coalition recommends that the proposed rulemaking recognize the limits of the available EPA validated test methods and choose a specific test method to be referenced by any standards being adopted. Limitations on test methods and the lack of any validated method by EPA for anything except drinking water create major challenges for the State's efforts to regulate non-potable water or other matrices.

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[11] *See* PFAS Methods Technical Brief at https://www.epa.gov/sites/production/files/2020-01/documents/pfas_methods-sampling_tech_brief_7jan2020-update.pdf .

F. Testing Capabilities and Reliability

The Coalition urges the State to consider the capabilities and reliability of laboratories that test for PFAS. There is limited capacity nationally to perform all of the analytical laboratory work and limited reliability on any given sample result due to potential lab error, cross contamination, or other factor that could impact results in the very low parts-per-trillion levels being considered. There is little doubt that the closer the State sets a limit or standard to the detection limit, analytical sampling and related lab results become increasingly unreliable.

For example, Coalition members who have sent split samples to multiple labs report receiving highly variable results. Such anecdotal evidence demonstrates the potential difficulty and unreliability of performing testing at limits that approach the detection limit. Considering that the State can potentially impose fines, costly corrective action, or other penalties for failing to meet regulatory limits, the regulated community must have the ability to accurately measure PFAS to demonstrate compliance. Subjecting the regulated community to fines, corrective action, and other penalties based on potentially unreliable testing raises due process concerns. Accordingly, the Coalition urges the State to consider testing capability and reliability, and set limits and impose a regulatory scheme that accounts for the variability in and limits of current laboratory testing.

G. Availability of Testing and Disposal

A limited number of established laboratories in the country have robust experiecnce testing and reporting PFAS results. The State's rulemaking should account for the limited number of testing laboratories in the region. The Coalition recommends, for example, that in regions where testing capacity is limited that the rule provide for a delayed effective date or phased implementation that allows for laboritories to develop the expertise necessary to reliably accommodate the increased testing that the rule will require.

Similarly, treatment technologies for PFAS are still being developed, and there is limited capacity for the disposal of byproducts from newly-developed technologies. For example, absorption technologies such as granular activated carbon (GAC) are being developed as potential response measures to achieve compliance with new drinking water standards for PFAS. The regulated community will need to safely dispose of the byproducts of such treatment technologies used to treat PFAS in drinking water. Again, this is another area where EPA is taking action.

Congress, in the NDAA, mandated that EPA, not later than one year after enactment, "publish interim guidance on the destruction and disposal of perfluoroalkyl and polyfluoroalkyl substances and materials containing perfluoroalkyl and polyfluoroalkyl substances," which includes guidance on "spent filters, membranes, resins, granular carbon, and other waste from water treatment."[12] The Coalition urges the State to use its

[12] NDAA Sec. 7631(4).

resources to support the development of EPA's interim guidance documents prior to independently establishing MCLs.

H. The State Should Consider the Rulemaking's True Costs

The State has acknowledged that "[t]he costs of treating PFAS at the wellhead, or of obtaining alternate sources of clean drinking water, are significant."[13] As the State further explained in its letter to the Conservation Law Foundation Massachusetts and Toxics Action Center with the groups' "Petition for Rulemaking to Establish a Treatment Technique Drinking Water Standard for Per- and Polyfluoroalkyl Substances," "[t]hese costs [of treating PFAS] are especially significant for the small public water systems (68% of the Community Public Water Systems in Massachusetts serve less than 10,000 people and provide drinking water to 10% of the state's population)." The proposed rulemaking, however, fails to adequately account for the developing nature of treatment technologies and availability of disposal or other treatment endpoints. The State provides an example of one Massachusetts community, Barnstable, which installed GAC to treat PFAS in drinking water. The State noted that "Barnstable has reported a capital cost for installing GAC at $6.5 million, plus it reports annual operation and maintenance costs of greater than $200,000 per year." More information exists regarding the variable costs of treatment systems installed at locations around the country, and the State should consider that information in setting MCLs.

The example above shows the significant costs associated with PFAS treatment but does not acknowledge the additional uncertainty and costs associated with handling byproducts of PFAS treatment. For example, a treatment system may not be able to find a landfill to take the spent media, and incineration of the media is currently subject to criticism and further study. As stated in Section G above, Congress has directed EPA to develop guidance to specially address these issues.

Further, the proposed rulemaking should account for the effects that drinking water standards may have on remediation sites. For sites with impacted groundwater, drinking water standards can become the remediation standards, unless it can be demonstrated that there is in fact no one drinking the water and such exposure pathway is subject to an institutional control. Likewise, sites being remediated under federal programs, such as Superfund, could have to address the MCLs as applicable or relevant and appropriate requirements (ARARS) that have to be met as remediation standards. For Department of Defense (DOD) sites, for example, the NDAA requires that cooperative agreements with states include that the DOD "shall meet or exceed the most stringent . . . standards for PFAS in any environmental media," including an enforceable drinking water standard.[14] The states, municipalities, and private parties that are conducting these cleanups will incur

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[13] MassDEP Letter to the Conservation Law Foundation Massachusetts and Toxics Action Center (January 28, 2019) *available at* https://www.mass.gov/doc/massdep-action-on-petition-to-establish-a-treatment-technique-drinking-water-standard/download.

[14] NDAA Sec. 332(a)(2).

substantial costs as a result. Accordingly, the State should consider the costs to remediate to these proposed MCLs in its regulatory analysis.

In sum, if this regulation will become final before there is more certainty regarding the underlying questions of treatment and disposal, then the State should conduct a more robust cost analysis to account for the potential costs, including remediation and the range of true disposal and ongoing operation and maintenance costs.

V. Conclusion

The Coalition appreciates the opportunity to submit these comments concerning the proposed rulemaking. Please feel free to call or e-mail if you have any questions, or if you would like any additional information concerning the issues raised in these comments.

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From: Robert Rutkowski <r_e_rutkowski@att.net>
Sent: Friday, February 28, 2020 10:16 AM
To: Constituent Services (GOV); Suuberg, Martin (DEP); Director-DWP, Program (DEP)
Subject: MASSSACHUSETTS PFAS PLAN GOOD START, BUT TOO LIMITED/Sets Limits too High, Omits Thousands of PFAS and Fails to Address Sources

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Re: MASSSACHUSETTS PFAS PLAN GOOD START, BUT TOO LIMITED/Sets Limits too High, Omits Thousands of PFAS and Fails to Address Sources

Dear Governor and Commissioner:

Massachusetts is poised to take a commendable first step to counter the growing water pollution crisis arising from so-called "forever chemicals" that do not breakdown in the environment, but needs to go much further.

On December 27, 2019, the Massachusetts Department of Environmental Protection (MADEP) proposed setting a maximum contamination level (MCL) in drinking water for only a handful of toxic per- and polyfluoroalkyl substances, collectively labelled PFAS. The proposed MCL would be 20 parts-per-trillion (ppt) for six PFAS contaminants: PFOS, PFOA, PFHxS, PFNA, PFHpA, and PFDA. By contrast, the U.S. Environmental Protection Agency's unenforceable Lifetime Health Advisory is 70 ppt for two chemicals (PFOS and PFOA). EPA has yet to adopt an MCL for any PFAS.

The state's proposed action –

Sets the Limit Too High. Recent research findings that the safety threshold for PFOA in drinking water should be as low as 0.1 ppt, which is 200 times lower than the proposed state MCL and 700 times lower than the advisory level set by the EPA;

Ignores Thousands of PFAS Variations. There are currently more than 5,000 different PFAS chemicals yet MADEP is proposing to regulate only six. Many other PFAS are found in drinking water throughout the Commonwealth and are chemically similar to those with known toxicity. MADEP should regulate the entire class of PFAS; and

Address Sources of Contamination. Massachusetts cannot protect its drinking water if it does not shut down the multiple sources of PFAS contamination from industrial, military, and waste streams.

By proposing to proceed on a chemical-by-chemical basis, the state is embarking upon an unwinnable game of regulatory whack-a-mole. Massachusetts cannot effectively tackle the PFAS problem in a piecemeal fashion but must adopt a holistic posture.

Even as the Bay State seeks to regulate PFAS, it promotes the spread of PFAS by allowing it in landfill leachates, biosolid fertilizers, pesticides, and even in artificial turf. As a result, PFAS keeps seeping into both surface and groundwater throughout the state.

Without a cradle-to-grave approach, these forever chemicals will forever plague us. Note that PFAS chemicals have been linked to cancer, immune system effects, liver failure and birth defects. Massachusetts needs to take this first step but must resolve to go the distance if it expects to surmount this growing environmental and public health threat.

Thank you for considering the foregoing.

Yours sincerely,
Robert E. Rutkowski

cc:
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House Majority Leader
Legislative Correspondence Team
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https://urldefense.proofpoint.com/v2/url?u=https-3A__www.majorityleader.gov_content_email-2Dwhip&d=DwIDaQ&c=lDF7oMaPKXpkYvev9V-

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Re: PEER comments:
https://urldefense.proofpoint.com/v2/url?u=https-3A__www.peer.org_wp-2Dcontent_uploads_2020_02_02-5F28-5F2020-2DPFAS-2DMCL-2Dcomments.pdf-3FeType-3DEmailBlastContent-26eId-3Dbb243682-2D3a58-2D41c4-2Da0cb-2Db7e4258f4467&d=DwIDaQ&c=lDF7oMaPKXpkYvev9V-fVahWL0QWnGCCAfCDz1Bns_w&r=KgEj5p2bSvumNVp_vyUKBgTy730uPKVcBKtKDcSH4Pw&m=v55e84fH0OKbCzgBXpgL103LadO6JU1k7cxn6E0mW-w&s=DCjF0n31bLRAn6IKHDXo9hujiOV6iQR14WZKRQc0NLE&e=

From: Stephen G Zemba <szemba@sanbornhead.com>
Sent: Friday, February 28, 2020 4:03 PM
To: Director-DWP, Program (DEP)
Cc: Russ Abell; Matt Heil; Harrison Roakes
Subject: PFAS MCL Comments

Dear Colleague,

I write on behalf of my colleagues at Sanborn Head to provide comments on the proposed MCL for PFAS. Our comments are contained in the attached file. Please feel free to contact us with any questions, and thank you for consideration of our comments.

Sincerely,

Stephen Zemba

Stephen G. Zemba, PhD, PE
Project Director
Licensed: PE in MA

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Attachment: 20200228 Sanborn Head PFAS Comments MA MCL.pdf

SANBORN HEAD
Building Trust. Engineering Success.

Program Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, MA 02108

February 28, 2020

Submitted via e-mail to: program.director-dwp@mass.gov

Re: Comments on the Proposed Maximum Contaminant Level (MCL) for PFAS

Dear Colleague:

Sanborn Head is grateful for the opportunity to comment on the proposed Maximum Contaminant Level (MCL) for the sum of six perfluoroalkyl substances (PFAS) in drinking water. Our comments are a follow-on to comments we previously submitted in July 2019 on proposed 2019 amendments to the Massachusetts Contingency Plan (MCP). A copy of our July 2019 comments is attached for reference and is pertinent to our present comments on PFAS background exposure and the proposed MCL. We very much appreciate the past consideration of our comments with respect to setting MCP soil standards for PFAS.

The U.S. EPA reference dose (RfD) for PFOA and PFOS is 2×10^{-5} mg/kg-d, which the Massachusetts Department of Environmental Protection (DEP) has adjusted to 5×10^{-6} mg/kg-d to incorporate an additional safety factor.[1] DEP states in the technical support document (TSD) that the derivation of the proposed 20 ng/L MCL from the RfD includes the same relative source contribution (RSC) term used by the U.S. EPA in the derivation of its 70 ng/L Lifetime Health Advisory. U.S. EPA uses an RSC of 0.2 (20%), which is the default value applied to emerging contaminants in the absence of adequate data to derive a contaminant-specific value. However, in the case of PFAS, data do exist to estimate background exposure (and consequently the RSC). A scientifically defensible RSC for PFAS can be derived from the blood serum data collected by the Center for Disease Control (CDC). The National Report on Human Exposure to Environmental Chemicals[2] provides the appropriate data, which we have used in conjunction with data on PFAS half-lives and volume distributions to derive background estimates of exposure to 4 of the 6 PFAS included in DEP's proposed MCL. Estimates for the other 2 PFAS (PFHpA and PFDA) can with sufficient accuracy be based on scaling the background exposure estimate for PFOS (based on PFAS blood data). Details of the derivations are provided in the attached (previously submitted) comments. A summary of the estimates of background exposure estimates to PFAS are provided in the following table, and results in a background exposure estimate of 1×10^{-6} mg/kg-d for the sum of the 6 PFAS.

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[1] The technical support document's stated justification for the adjustment of the RfD is somewhat confusing, as the addition of a claimed additional safety factor of 3 (square root of 10) should by our calculation reduce the RfD from 2×10^{-5} mg/kg-d to 6×10^{-6} mg/kg-d.

[2] See https://www.cdc.gov/exposurereport/index.html

PFAS	Background exposure estimate (mg/kg-d)	Notes
PFOS	6.12×10^{-7}	See attached July 2019 comments
PFOA	2.68×10^{-7}	See attached July 2019 comments
PFHxS	1.67×10^{-7}	See attached July 2019 comments
PFNA	7.57×10^{-8}	See attached July 2019 comments
PFHpA	1.22×10^{-8}	Scaled from the PFOS estimate based on blood serum concentrations of 5 µg/L and 0.1 µg/L for PFOS and PFHpA, respectively
PFDA	2.45×10^{-8}	Scaled from the PFOS estimate based on blood serum concentrations of 5 µg/L and 0.2 µg/L for PFOS and PFHpA, respectively
Total of 6 PFAS	1×10^{-6}	Rounded to 1 significant digit

The background exposure estimate of 1×10^{-6} mg/kg-d constitutes 20% of DEP's RfD. Consequently, the complementary RSC can be set to 80% based on data available to estimate background exposure. Application of this RSC value of 0.8 would result in a health-protective MCL of roughly the same value as the current U.S. EPA Lifetime Health Advisory of 70 ng/L, assuming that DEP maintains use of its recommended RfD.

We greatly appreciate the opportunity to comment and are happy to discuss our comments at greater length, so please do not hesitate to contact us with questions.

Thank you again for this opportunity to participate in this process.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

Stephen G. Zemba
Stephen G. Zemba, Ph.D., P.E.
Project Director

Russell H. Abell, LSP
Vice President

Harrison Roakes, P.E.
Project Manager

Matthew P. Heil, P.E., LSP
Project Director

Attachment: July 2019 Comments on Proposed MCP Standards for PFAS (following pages)

Comments on the proposed groundwater and soil standards for per- and polyfluoroalkyl substances (PFAS) specified within the proposed 2019 amendments to the Massachusetts Contingency Plan

Sanborn Head respectfully submits these comments to the Massachusetts Department of Environmental Protection (MassDEP) for its consideration regarding the establishment of Massachusetts Contingency Plan (MCP) Method 1 soil and groundwater standards for per- and polyfluoroalkyl substances (PFAS). We recognize and support MassDEP's responsible actions to protect public health and the environment, and we applaud the focus and attention MassDEP has dedicated to this issue. We also recognize the concerns of the regulated community regarding the potentially very high costs of meeting extremely low concentration standards for PFAS, especially if these standards are more stringent than the levels necessary to protect public health, as supported by existing toxicological and epidemiological data. It is thus imperative, from our perspective, that MassDEP set MCP standards for PFAS at levels that reflect scientifically sound evaluation of adverse health effects based on a holistic analysis of available data.

COMMENT ON THE PROPOSED GW-1 GROUNDWATER STANDARD OF 20 PPT

Based on our review of available scientific studies and information related to PFAS, and considering this information in aggregate, insufficient scientific evidence has been developed to compel establishing a GW-1 standard for PFAS at 20 parts per trillion (ppt), equivalent to 20 nanograms per liter (ng/l), in place of using the U.S.EPA 70 ppt Lifetime Health Advisory (LHA) level. The LHA was established as MassDEP's Drinking Water Guideline and thus far MassDEP's *de facto* level of concern. Current, important, scientific evidence (some not available when U.S. EPA established its guideline of 70 ppt) demonstrates that concentrations this low pose no significant threat to public health. We urge MassDEP to carefully review and consider comments submitted by Green Toxicology that discuss this new evidence.

There is a considerable degree of health protectiveness built into the U.S.EPA's LHA that receives insufficient attention and acknowledgment. Recently, in announcing the PFAS Action Plan in February 2019, the U.S.EPA stated its position that the 70 ppt LHA is a safe level (https://www.youtube.com/watch?v=xaRgWcwwmXc), in direct response to a question on the lower levels being established by certain states such as New Jersey.

The U.S.EPA has not been compelled to recommend lower advisory levels for PFAS. A principal reason to believe that 70 ppt is a "safe level" stems from the safety factor of 300 built into the underlying reference dose (RfD) of 20 nanograms per kilogram body weight per day (ng/kg-d). The combined safety factor of 300 is based on (i) the most sensitive effect identified, in (ii) the most sensitive test species (laboratory mice), and (iii) includes a safety factor of 3 to account for the possibility that people are more sensitive than laboratory rodents to effects from PFAS exposure. While this is a common standard "default" assumption for deriving reference doses, evidence related to PFAS effects mediated via the PPAR- alpha receptor (which effects include actions on the liver and on development) indicates precisely the opposite from the default. PFOA is now known to be much more toxic to mice and rats than it is even to other rodents, such as guinea pigs and hamsters, let alone to monkeys and, importantly, humans.[3] It would thus be scientifically justifiable, and based on the evidence more technically correct, to either remove this safety factor of 3 or to apply the factor in the opposite sense (and by doing so *increase* the LHA by a factor of about 10).

There are additional degrees of protectiveness built into the U.S. EPA's 20 ng/kg-d reference dose that MassDEP should clearly communicate to the public and consider in their own standard development process. The safety factor of 300 also includes a factor of 10 to protect sensitive subpopulations. This factor is arguably unnecessary because the subpopulation thought to be most sensitive to PFAS – developing infants – is explicitly accounted for in the derivation of the LHA from the RfD – which is designed to protect the developing fetus and nursing infant, via the child's nursing mother. The assumed drinking water ingestion rate of 0.054 liters per kilogram body weight per day (L/kg-d) for a nursing mother is almost twice as large as the 0.029 L/kg-d ingestion rate typically used to derive Maximum Contaminant Levels (MCLs) and health advisories.[4]

The final safety factor of 10 that contributes to the overall safety factor of 300 is used to extrapolate the Lowest Observed Adverse Effects Level (LOAEL) to an assumed No Observed Adverse Effects Level (NOAEL) because effects on the mice offspring were observed in the lowest dose group tested in the toxicity study. This is again standard default procedure in RfD derivation, but is arguably over protective in the case of PFAS because the observed effects in the toxicity study were transient in nature, *i.e.*, the observations of delayed ossification of phalanges in the offspring and hastened puberty in male pups did not permanently affect the health of the baby mice and prevent them from developing into normal adults.[5] Many toxicologists would argue that more serious and permanent effects, such as cellular damage, should serve as the basis of RfDs used for regulatory purposes. By basing its RfD on transient effects, the U.S.EPA has incorporated yet another health protective safety factor.

We also note that the U.S.EPA chose a developmental toxicity study in laboratory mice as the basis of its RfD even though no developmental health effects were linked to PFOA in the C8 Studies[6] (the most comprehensive epidemiological studies conducted to date on people exposed to high levels of PFOA in their drinking water with approximately 70,000 respondents). Specifically, these studies found no associations between exposures to PFOA (whether measured in water or assessed according to concentrations in people's blood) and rates of birth defects, miscarriages, stillbirths, and/or preterm/low birth weight.

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3 See for example: Tyagi S, Gupta P, Saini AS, Kaushal C, Sharma S. The peroxisome proliferator-activated receptor: A family of nuclear receptors role in various diseases. J Adv Pharm Technol Res. 2011 Oct;2(4):236-40

4 0.029 l/kg-d = 2 L/d of water consumption by a 70 kg individual.

5 Lau, C., J.R. Thibodeaux, R.G. Hanson, M.G. Narotsky, J.M. Rogers, A.B. Lindstrom, and M.J. Strynar. 2006. Effects of perfluorooctanoic acid exposure during pregnancy in the mouse. Toxicological Science 90:510–518.

6 http://www.c8sciencepanel.org/

As correctly noted by MassDEP, there is yet another factor of safety built into the procedural basis of deriving GW-1 standards. The target hazard quotient of 0.2 that serves as the basis of GW-1 standards allows for background exposure (from pathways other than drinking water) to contribute up to 80% of the safe exposure level. But recent blood serum data collected by the Center for Disease Control indicate that current background exposure to PFAS is much smaller than 16 ng/kg-d (80% of the RfD). Our calculations, which are based on serum levels of several PFAS in human subpopulations over time and are described in Appendix A, indicate that current background exposure to four of the PFAS compounds of interest to MassDEP is only about 1 ng/kg-d, meaning that almost all the 80% assumed exposure via background is unnecessary (and hence highly protective) for a typical person. In other words, because PFOA and PFOS have not been manufactured and used in the U.S. for almost two decades now, our body burdens of these compounds are much smaller than they were even as recently as the year 2000. To the extent that PFOA and PFOS pose a potential threat to public health, that threat is already far smaller than it once was, both here in Massachusetts and throughout the U.S. These recent data and evidence-based trends should also be taken into account by MassDEP in development of their standards.

MassDEP has proposed to add another safety factor of 4 to the U.S. EPA's RfD to reduce the level from 20 ng/kg-d to 5 ng/kg-d to account for potential immunotoxicity effects. Based on the protective factors described above, the extra factor of 4 is not necessary, and MassDEP should simply adopt the U.S.EPA's 70 ppt LHA as the GW-1 standard and await further change (if any) from the U.S.EPA to re-evaluate the merits of such change. We note that the U.S.EPA also considered immunotoxicity effects in establishing its RfD and LHA, and a relevant discussion is provided in the Drinking Water Health Advisory for PFOA document.[7] At present, the U.S. EPA does not find consistent evidence to warrant any additional factor to account for possible immunotoxicity effects of PFOA or related compounds.

Moreover, MassDEP's stated basis of the additional factor of 4 reflects concern over potential immunotoxicity effects, which differs from the developmental basis of the U.S.EPA RfD. This is a non-standard and unjustified approach for RfD derivation. If MassDEP wishes to base its RfD on immunotoxicity, then a toxicological study based on immunotoxicity should be used as the basis of the RfD derivation. If instead no scientifically reliable immunotoxicity study can be identified, as is apparently the case here, then no "accounting" for "immunotoxicity" can or should be offered. In the absence of a scientifically reliable study, the additional safety factor of 4 is entirely arbitrary.

In summary, the 70 ppt LHA that remains supported by the U.S.EPA contains a systematic series of protective assumptions and biases that, when considered in aggregate, impart a high degree of health protectiveness. There is no reliable scientific evidence that these, yet alone lower levels of exposure, actually harm human health. We therefore recommend that MassDEP adopt the 70 ppt concentration as the PFAS GW-1 standard (and subsequently as the state MCL) subject to reevaluation if there is any further modification by the U.S.EPA.

[7] https://www.epa.gov/sites/production/files/2016-05/documents/pfoa_health_advisory_final-plain.pdf

COMMENT ON THE PROPOSED S-1/GW-1 SOIL STANDARD OF 0.2 PPB

We believe that MassDEP's proposed S-1/GW-1 standard is both impractical and unnecessarily low because the underlying assumptions in its selection do not consider or account for key information. Specifically, our comments below support an increase in the proposed standard because: (1) the proposed standard is less than likely background levels in shallow soils, (2) the proposed standard, set at the MassDEP's proposed reporting limits for the six PFAS, is less than common commercial laboratory reporting limits for those six PFAS, and (3) the proposed standard should be based on the already-protective concentration of 70 ppt in groundwater.

Because the proposed S-1/GW-1 PFAS soil standard is unnecessarily low and PFAS occurrence in background soils is potentially widespread, the proposed standard could result in reportable conditions at any site in the state where soil is sampled for PFAS, leading to unnecessary groundwater sampling and remedial actions throughout the state.

The MassDEP proposed Method 1 Soil Standard is 0.0002 micrograms per gram (µg/g) ∑PFAS for S-1 Soils, where ∑PFAS is the sum of six PFAS (PFHpA, PFOA, PFNA, PFDA, PFHxS, and PFOS). The 0.0002 µg/g value is equivalent to 0.2 ppb in soil. This value is based on the anticipated reporting limit (RL) for the six PFAS rather than a leaching-based value, because MassDEP's calculated leaching-based value is less than the anticipated RL. It should be noted that we refer to the "anticipated RL" since this is based on MassDEP conversations with several commercial laboratories who stated that they could meet an RL of 0.2 ppb but this is not the current practice at these same laboratories where the RLs are currently higher than 0.2 ppb. From documentation provided in MassDEP's 2019 MCP Revision Spreadsheets, we understand the following methodologies were used for calculating a leaching-based value and then selecting the anticipated RL.

- **The leaching-based value** is based on the proposed GW-1 standard and a dilution attenuation factor (DAF). The ∑PFAS leaching-based value was calculated from an assumed/default dilution attenuation factor (DAF) of 1 and the target GW-1 standard of 20 ppt, resulting in a value of 0.02 ppb based strictly on leaching from soil. Documentation of the DAF is unclear. The MassDEP apparently did not model the DAF for ∑PFAS or the DAFs for individual PFAS using its standard MCP approach. Further comments on the DAF are provided below.

- **A RL** of 0.2 ppb was selected by the MassDEP for ∑PFAS and for individual PFAS, in soil, and in the spreadsheet documentation, the MassDEP noted that the RL for the individual PFAS were based on a "Reporting Limit (RL) from MassDEP Wall Experiment Station recommendation". In the summary of the proposed revision, MassDEP indicated the RL, was "based on a survey of several laboratories currently conducting PFAS analysis". Technical documentation supporting the anticipated RL has not been provided for review and comment.

The proposed S-1/GW-1 standard for ∑PFAS appears to be based solely on the reported analytical capabilities of laboratories; neither chemical-specific fate and transport information nor toxicological information (e.g., via the proposed GW-1 standard) are the basis. Although not noted in the documentation, the approach suggests that the MassDEP has insufficient fate and transport information for PFAS to model leaching from soil to derive chemical-specific DAFs, or perhaps, the MassDEP believes the model would not sufficiently describe PFAS leaching. While the science regarding PFAS is rapidly evolving and may sometimes be uncertain, we urge the MassDEP to consider the available information on PFAS in soil and to modify the proposed PFAS standard accordingly.

Background Levels

Published studies indicate detectable concentrations of PFAS in surface soils collected around the world, including the Northeast United States. One global study (n=60, Strynar et al. 2012[8]) estimated global median "background" concentrations of 0.124 ppb and 0.472 ppb for PFOA and PFOS, respectively. Another study (n=62, Rankin et al. 2016[9]) included "background" samples from across the US and across the globe, including Antarctica (0.048 ppb PFOA and 0.007 ppb PFOS) and the Arctic Circle in Canada (0.270 ppb PFOA and 0.018 ppb PFOS). Every soil sample had quantifiable concentrations of PFAS, with PFOA and PFOS being the most prevalent. The reported mean concentrations for North America were 1.82 ppb for the sum of perfluoroalkyl carboxylic acids (which includes PFHpA, PFOA, PFNA, and PFDA) and 0.410 ppb for the sum of perfluoalkyl sulfonic acids (which includes PFHxS and PFOS). These studies indicate a global background distribution of PFAS in soils, with mean and median concentrations of summed PFAS in North America likely exceeding the proposed S-1/GW-1 standard.

In addition to the global studies, a study of PFAS concentrations in Vermont shallow soils was recently published by the Vermont Department of Environmental Conservation (VTDEC).[10] The study was conducted by the University of Vermont and Sanborn Head with partial funding and support provided by VTDEC. Soil samples were collected from 66 properties with no known potential sources of PFAS (primarily municipal or state-owned parks, forests, greens, or lawns). Because PFAS is anthropogenically sourced, it is reasonable to suspect that background data collected from largely-rural Vermont may be indicative of, or perhaps underpredict, background concentrations that may be detected in Massachusetts.[11] The VT Background Soil Study data for the six PFAS included in the proposed MCL standards are provided with these comments as an excel spreadsheet named "VTBackgroundSoilData.xlsx".

8 Mark J. Strynar, Andrew B. Lindstrom, Shoji F. Nakayama, Peter P. Egeghy, Laurence J. Helfant. (2012). Pilot scale application of a method for the analysis of perfluorinated compounds in surface soils. Chemosphere, 86, 252-257.

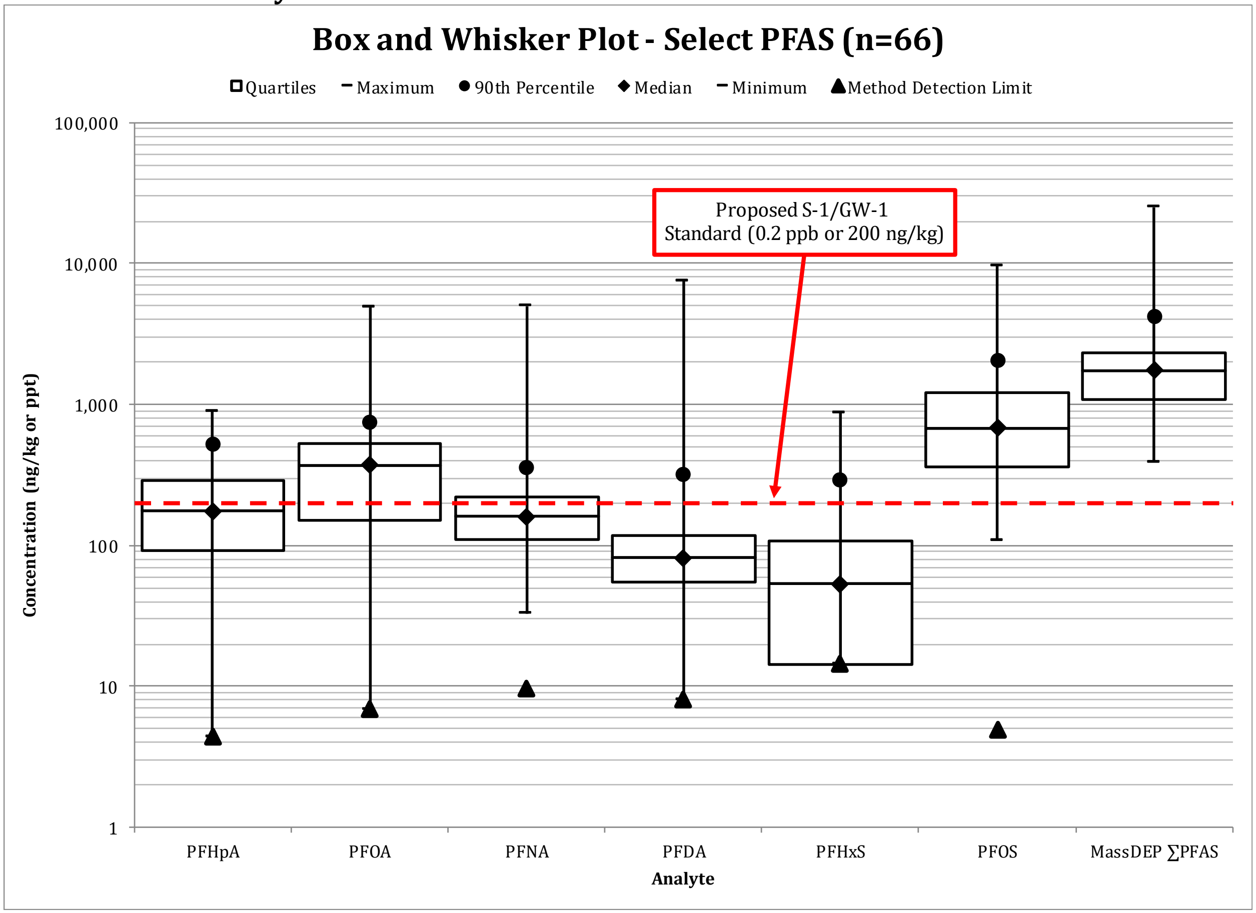
9 Rankin, K., Mabury, S. A., Jenkins, T. M., & Washington, J. W. (2016). A North American and global survey of perfluoroalkyl substances in surface soils: Distribution patterns and mode of occurrence. Chemosphere, 161, 333–341.

10 Badireddy, A.R, Zhu, W., Zemba, S. G., Roakes, H. (2019). PFAS Background in Vermont Shallow Soils. Available for download: https://anrweb.vt.gov/PubDocs/DEC/PFOA/Soil-Background/PFAS-Background-Vermont-Shallow-Soils-03-24-19.pdf

11 Vermont is known to have a "point" source that released PFOA and impacted groundwater wells in and near Bennington via atmospheric deposition. Studies of the area indicate facility-related impacts to soil and water extending several miles from the point of PFOA emissions. While it is likely that emissions from this facility have deposited to soils at some levels at greater distances, the speciation and distribution of PFAS suggest atmospheric deposition from other (probably multiple) sources have more greatly affected the shallow soils sampled in the VT background soil study. The other cited background soil studies corroborate the significance of longer-range transport of PFAS from multiple sources to the environment.

Several PFAS were detected in greater than 50% of the soil samples collected in Vermont, including the six PFAS proposed to be included in the S-1/GW-1 standard. A summary of the data is provided in Exhibit 1, below. The proposed S-1/GW-1 standard of 0.2 ppb, or 200 ng/kg, is plotted on the exhibit for reference.

Exhibit 1. Summary of Vermont Shallow Soil PFAS Data



Note: Estimated values are used for the data detected above the method detection limit but below the laboratory reporting limit.

The detected background concentrations of individual PFAS compounds often exceed the proposed S-1/GW-1 standard. For example, over 95% of the samples had PFOS concentrations greater than 0.2 ppb. The sum of the six PFAS exceeds the proposed S-1/GW-1 standard in all samples. Clearly, we do not present the comparison to suggest that all soil in Vermont presents a potential leaching concern because it is greater than MassDEP's, or other, proposed soil screening values for the protection of groundwater. On the contrary, the comparison provides evidence that the proposed S-1/GW-1 standard is inconsistent with environmental occurrence data and that "below detection" is not a reasonable threshold for assessing the leaching potential of PFAS in soils.

Thus, MassDEP should either use available data to assign background levels to PFAS in soils or engage in a state-specific study of background levels in Massachusetts. Consistent with

MassDEP policies under the MCP, background levels should be set at upper percentile levels (e.g., 90th percentile) and should also consider potential differences in urban and rural areas.

Finally, the implication of the proposed 0.2 ppb S-1/GW-1 standard is that, if background PFAS levels are considerably greater than the 0.2 ppb value proposed by MassDEP as an S-1/GW-1 standard, as suggested by the Vermont soil study results, then one might expect PFAS levels in groundwater should be ubiquitously greater statewide than the 20 ppt level of concern as proposed by MassDEP. This is because the leaching models used by MassDEP, based on the 20 ppt GW-1 standard, resulted in a target soil value of 0.02 ppb. The proposed 0.2 ppb soil standard, based on the anticipated RL, is ten-times greater than the modeled soil value; through application of the same leaching model, the proposed 0.2 ppb soil standard would be associated with 200 ppt in groundwater (i.e., ten-times greater than the 20 ppt GW-1 standard). Because anthropogenic background is likely much higher than the proposed 0.2 ppb standard, the model suggests PFAS in background groundwater should be above even 200 ppt. Although paired groundwater data was not collected as part of the Vermont soil study, the implied, ubiquitous, elevated concentrations of PFAS in groundwater are inconsistent with our understanding of PFAS occurrence in background groundwater based on sampling at multiple sites in VT, NH, and MA.

In addition to considering the occurrence of PFAS in background soils, the MassDEP should consider the proposed S-1/GW-1 standard in the context of empirical relationships between PFAS in soil and groundwater. PFAS leaching from soil to groundwater is difficult to generically model due to complex interactions and sorption processes, including an affinity for the air-water interface in vadose zone soil. Proposed standards should be compared with actual soil and groundwater data, including background studies, to support the feasibility and appropriateness.

Dilution Attenuation Factor Determination for PFAS

MassDEP elected not to use its leaching model of PFAS from soils because the model predictions were much lower than detectable concentrations of PFAS in soil. Hence the proposed S-1 standard of 0.2 ppb represents the analytical reporting limit that MassDEP believes is reliably achievable. MassDEP can and should explore more realistic leaching models in developing S-1/GW-1 standards. While we recognize that the use of MassDEP's standard leaching model likely does not account for the complexities of PFAS fate and transport, MassDEP should at a minimum apply its standard modeling approach as described in its the Background Documentation for the Development of the MCP Numerical Standards (April 1994) technical guidance to estimate a Dilution Attenuation Factor (DAF).

The only chemical-specific data provided in the guidance was for PFOS. Henry's Law Constant (K_H^{pc}) and soil organic carbon-water partitioning coefficient (K_{OC}) were reported for PFOS as 0.011 $\frac{atm-m^3}{mol}$ and 370 $\frac{ml-aqueous}{g-soil}$, respectively. References for these values were not provided. Per a relatively simple MassDEP guidance model, these values correspond to a DAF of 130.[12] Applying this DAF of 130 would result in a leaching-based soil standard of 2.6

[12] Estimated from DAF = 6207*H + 0.166*Koc, as provided in MassDEP's 1994 documentation.

ppb. We note that chemical-specific data are also available for the other PFAS (*e.g.*, see the ITRC PFAS fact sheets). While chemical-specific data may not be available for the typical model used by MassDEP for DAF calculation, sufficient information is available to calculate DAF from the more simple MassDEP model.

We also suggest that MassDEP could modify and improve its standard approach to account for the unusual properties of PFAS. Shortcomings of MassDEP's model with respect to PFAS will likely lie in the difficulty of estimating partitioning to the air-water interface and the inadequacy of using K_{oc} alone to model PFAS partitioning to solids. As described in a recent paper by Anderson et al. 2016,[13] PFAS partitioning in soil depends on additional factors not included in MassDEP's model. We suggest that MassDEP review the available literature and propose a different model to estimate PFAS leaching potential. Similar to models used for some metals, it may be more practical and appropriate to estimate DAFs from soil-water distribution coefficients based on empirical factors and data.

MassDEP's assumed DAF of 1 is inconsistent with reasonable models for PFAS in the environment. A DAF of 1 has been used by MassDEP as a lower limit for chemicals that, based on modeling by MassDEP, are highly soluble and tend not to partition to solids (e.g. K_{oc} values less than 40 $\frac{ml-aqueous}{g-soil}$), and therefore, flush through soils. The six PFAS are the only chemicals in the MassDEP spreadsheets for which a DAF of 1 was assumed without modeling. The K_{oc} values reported in the ITRC PFAS fact sheets range on the order of $40 \text{ to } 5{,}000\ \frac{ml-aqueous}{g-soil}$ across the six PFAS, so the broad assumption that there is very little adsorption of the six PFAS to soil is not appropriate. In addition to neglecting sorption of the PFAS to soil, the DAF of 1 does not include dilution that can be anticipated from groundwater dilution and flow within a typical aquifer system. The result is an unrealistic leaching scenario that is not based on any chemical-specific information or hydrogeologic model.

Reporting Limit (RL) Selection

In the MassDEP's 2019 MCP Revision Spreadsheets, the MassDEP referenced the "reporting Limit (RL) from MassDEP Wall Experiment Station recommendation" as the basis for the proposed selection of the RL for PFAS. Further, in the MassDEP's "Summary of Proposed MCP Method 1 Standards Revision, March 2019," it was described that the RL "was established by [the MassDEP] based on a survey of several laboratories currently conducting PFAS analysis." However, as summarized in Exhibit 2 below, the selected RL is less than common laboratory reporting limits for soil, as reported in laboratory reports prepared by reputable commercial laboratories and provided in reports to us.

Exhibit 2. Summary of Common Laboratory Reporting Limits (RLs)

Laboratory	Report Date	Method	RL (min.-max.) (ppb)
Commercial Lab A	2019 QAPP	Modified EPA 537 with Isotope Dilution	1
Commercial Lab A	Spring 2019		0.976 – 2.00
Commercial Lab B	2019 QAPP		2

13 R. Hunter Anderson, Dave T. Adamson, Hans F. Stroo. (2019). Partitioning of poly- and perfluoroalkyl substances from soil to groundwater within aqueous film-forming foam source zones. Journal of Contaminant Hydrology, 220, 59-65.

Commercial Lab B	Fall 2018		2.00
Commercial Lab C	2019 QAPP		0.2 – 0.5
Commercial Lab C	Summer 2018		0.21 - 0.60
Commercial Lab D	Fall 2017		~0.1 – 5

Results at the lowest ends of the RL spectrum may be less reliable, lack precision, be more subject to cross contamination, and more commonly result in false positive detections or qualified, estimated values. False positive detections, whether from cross-contamination or laboratory methods, are especially problematic when laboratory reporting limits are at or near the S-1 standard. This concern is amplified by the lack of standard laboratory methodologies for PFAS in soil analysis and the great potential from cross-contamination issues where PFAS are present in many consumer products.

MassDEP has thus not determined that commercial laboratories can reliably detect PFAS at levels as low as 0.2 ppb. There is, to our knowledge, no commonly accepted analytical method for determining PFAS levels in soils. We suggest that MassDEP provide a recommended analytical method for determining PFAS in soils, and then engage in a multi-lab study to determine whether commercial labs are reliably able to quantify PFAS concentrations at the S-1/GW-1 level proposed by MassDEP. Further, MassDEP should also provide guidance on handling combinations of detections, non-detections, and estimated values with respect to calculating the sum of six PFAS compounds and comparing the result to the proposed standard.

Closing Comments for the Proposed S-1/GW-1 Soil Standard

In consideration of the above information, MassDEP should reconsider the 0.2 ppb proposed S-1/GW-1 Soil Standard for ∑PFAS. The table below demonstrates that the 0.2 ppb value for ∑PFAS is not practical given expected background levels of PFAS in soil (based on the Vermont shallow soils study) and typical commercial laboratory reporting limits for PFAS.

PFAS	Leaching-Based Value Based on Modeling or Empirical Data	90th Percentile from VT Background Soil Study	Typical Commercial Laboratory Reporting Limit
PFHpA	Not Calculated	0.53 ppb	1 ppb
PFOA		0.75 ppb	1 ppb
PFNA		0.36 ppb	1 ppb
PFDA		0.32 ppb	1 ppb
PFHxS		0.30 ppb	1 ppb
PFOS		2.1 ppb	1 ppb
∑six PFAS		4.2 ppb[14]	6 ppb

Based on the above, MassDEP should at least consider background soil concentrations and common laboratory reporting limits in establishing the PFAS standard for soil. Further,

[14] The 90th percentile of the sum of six PFAS does not equal the sum of the 90th percentile values of the individual PFAS as the PFAS concentrations do not correlate perfectly between samples.

MassDEP should consider development of leaching-based values using modeling and/or empirical data. Because modeling may not account for the complexities of PFAS fate and transport, we urge that a proposed standard based on modeling be made available for public comment prior to finalizing.

A soil background study should be completed in Massachusetts to understand anthropogenic background of PFAS in soil and to develop soil standards that are protective of human health and the environment, but that are also more likely indicative of leaching potential of PFAS to groundwater. MassDEP could consider using the VT Background Soil Study results to develop interim S-1/GW-1 standards. The table above suggests that a S-1/GW-1 standard of 4.2 ppb for the sum of six PFAS could be used as an interim standard until a background study can be completed in Massachusetts. The accompanying spreadsheet file "VTBackgroundSoilData.xlsx" contains the individual sample results and derivation of the 90th percentile value.

APPENDIX A ESTIMATION OF PFAS BACKGROUND EXPOSURE

By regulation, MCP standards based on non-cancer health endpoints correspond to a Hazard Quotient of 0.2, meaning that the allowable exposure is only 20% of the safe reference dose, thereby allowing up to 80% additional exposure from other exposure pathways. MassDEP states that, in the case of PFAS, this is likely a conservative/protective allowance as typical background exposure is likely smaller than 80% of the reference dose. MassDEP's observation is indeed supported by a, time trend analysis of the PFAS serum concentration data collected by the Center for Disease Control (CDC) under the National Health and Nutrition Examination Survey (NHANES). The NHANES data indicate that Americans are at present excreting more PFOA, PFOS, PFHxS, and PFNA than they are taking in. Better estimates of PFAS Relative Source Contributions (RSCs) can be calculated using the NHANES time trend data and other parameters documented by New Hampshire Department of Environmental Services (NH DES)[15] in their recently proposed Maximum Contaminant Levels.

The draft Toxicological Profile for Perfluoroalkyls issued by the Agency for Toxic Substances and Disease Registry (ATSDR) provides a framework for estimating background exposure to PFAS based on the observation that concentrations of many PFAS have been decreasing in blood in the general U.S. population.[16] Heuristically:

Rate change in PFAS body burden = Background intake rate of PFAS – PFAS excretion rate

Adapting the nomenclature in Appendix A of the ATSDR Toxicological Profile, and assuming (as does ATSDR) 100% absorption of PFAS intake exposure:

$$\frac{d}{dt}(C_b V_d) = D_{back} - k_e C_b V_d$$

$$k_e = \frac{\ln(2)}{t_{1/2}}$$

where the terms are:

- C_b Arithmetic average concentration of PFAS in serum (blood) (ng/l);
- V_d Apparent volume of PFAS distribution (l/kg);
- D_{back} Background exposure to PFAS (ng/kg-d);
- k_e PFAS elimination constant (d^{-1}); and
- $t_{1/2}$ PFAS half-life in the body (d).

15 https://www.des.nh.gov/organization/commissioner/pip/publications/documents/r-wd-19-01.pdf

16 https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf The fact that serum levels of many PFAS are decreasing in the general U.S. population is an important point worthy of greater emphasis in the face of growing concerns over adverse health effects. We recommend the incorporation of graphics similar to Figure 1 and Figure 2 within the ATSDR report, along with additional discussion of the declining trends.

PFAS concentrations have been measured in blood in the general U.S. population over several periods as part of the NHANES, the earliest in 1999, and the latest in 2013 (https://www.atsdr.cdc.gov/pfas/pfas-blood-testing.html). Assuming (1) PFAS concentrations in blood of C_{b1999} and C_{b2013} in the earliest and latest periods, (2) independence between the variables C_b and V_d, and (3) constant background exposure to PFAS over the period of exposure (T = 14 yrs = 5133.5 d),[17] the differential equation can be solved and rearranged to yield the following expression for estimating the background exposure D_{back}:

$$D_{back} = \frac{k_e V_d (C_{b2013} - C_{b1999} e^{-k_e T})}{1 - e^{-k_e T}}$$

We apply this equation to four of the six PFAS that MassDEP includes in its PFAS sum (PFOA, PFOS, PFHxS, and PFNA). Arithmetic average serum PFAS concentrations, which are appropriate for the model, are not directly available from ATSDR in the draft toxicity profile. As such, the values of the 50th, 75th, 90th, and 95th percentile levels have been extracted from CDC[18], curve-fit to estimate parameters for assumed log-normal distributions, and the parameters have been used to estimate arithmetic means. A spreadsheet with the calculations to estimate these values is provided as an attachment to our comments.

Applying the following parameters for PFOA:

C_{b1999}	5,625 ng/l (estimated arithmetic mean, U.S. residents, 1999-2000);
C_{b2013}	2,337 ng/l (estimated arithmetic mean, U.S. residents, 2013-2014);
V_d	0.17 l/kg (NH DES)[13];
$t_{1/2}$	2.7 yr = 985.5 d (NH DES)[13]; and
T	5133.5 d (14 years)

yields a background PFOA dose estimate of 0.268 ng/kg-d.

Applying the following parameters for PFOS:

C_{b1999}	33,405 ng/l (estimated arithmetic mean, U.S. residents, 1999-2000);
C_{b2013}	6,408 ng/l (estimated arithmetic mean, U.S. residents, 2013-2014);
V_d	0.23 l/kg (NH DES)[13];
$t_{1/2}$	3.4 yr = 1,241 d (NH DES)[13]; and
T	5133.5 d (14 years)

yields a background PFOS dose-estimate of 0.612 ng/kg-d.

[17] The pattern of serum PFNA does not indicate a steady decline since 1999, but rather an increase from 1999 through 2009, followed by a subsequent decline. The equation to consider background is thus considered over the period from 2009 to 2013 for PFNA.

[18] https://www.cdc.gov/exposurereport/

Added together, PFOA and PFOS background exposure are predicted to be 0.88 ng/kg-d, or 4.4% of EPA's reference dose of 20 ng/kg-d for the sum of PFOA and PFOS.

Similar estimates can be developed for PFHxS and PFNA using the blood serum data and parameters reported by ATSDR. However, unlike PFOA and PFOS, concentrations of PFHxS and PFNA (Figure 1) have not declined as rapidly in blood as those of PFOA and PFOS (Figure 2). In fact, from 1999 to 2009, concentrations of PFNA increased (Figure 1).

Applying the following parameters for PFHxS:

C_{b1999}	2,645 ng/l (estimated arithmetic mean, U.S. residents,1999-2000);
C_{b2013}	1,350 ng/l (estimated arithmetic mean, U.S. residents, 2013-2014);
V_d	0. 287 l/kg (NH DES)[13];
$t_{1/2}$	5.3 yr = 1934.5 d (NH DES)[13]; and
T	5133.5 d (14 years)

yields a background PFHxS dose estimate of 0.167 ng/kg-d.

Applying the following parameters for PFNA, but adjusting the equation to cover only the recent decay period from 2009 to 2013:

C_{b2009}	1,418 ng/l (estimated arithmetic mean, U.S. residents, 2009-2010);
C_{b2013}	801 ng/l (estimated arithmetic mean, U.S. residents, 2013-2014);
V_d	0. 2 l/kg (NH DES)[13];
$t_{1/2}$	2.5 yr = 912.5 d (NH DES)[13]; and
T	1461 d (4 years)

yields a background PFNA dose estimate of 0.0757 ng/kg-d.

The total background dose estimate for the sum of the four PFAS is:

0.268 ng/kg-d + 0.612 ng/kg-d + 0.167 ng/kg-d + 0.0757 ng/kg-d = 1.1 ng/kg-d,

which represents 5.6% of the U.S. EPA' reference dose of 20 ng/kg-d, a value far less than the default allowance of 80% under the MCP regulatory formula.

A more complex analysis that considers time-varying background and other factors, or a sensitivity study could be constructed to test the variability introduced by different parameter choices. But barring extreme changes in parameter values, large differences in estimated background exposure estimates are not likely.

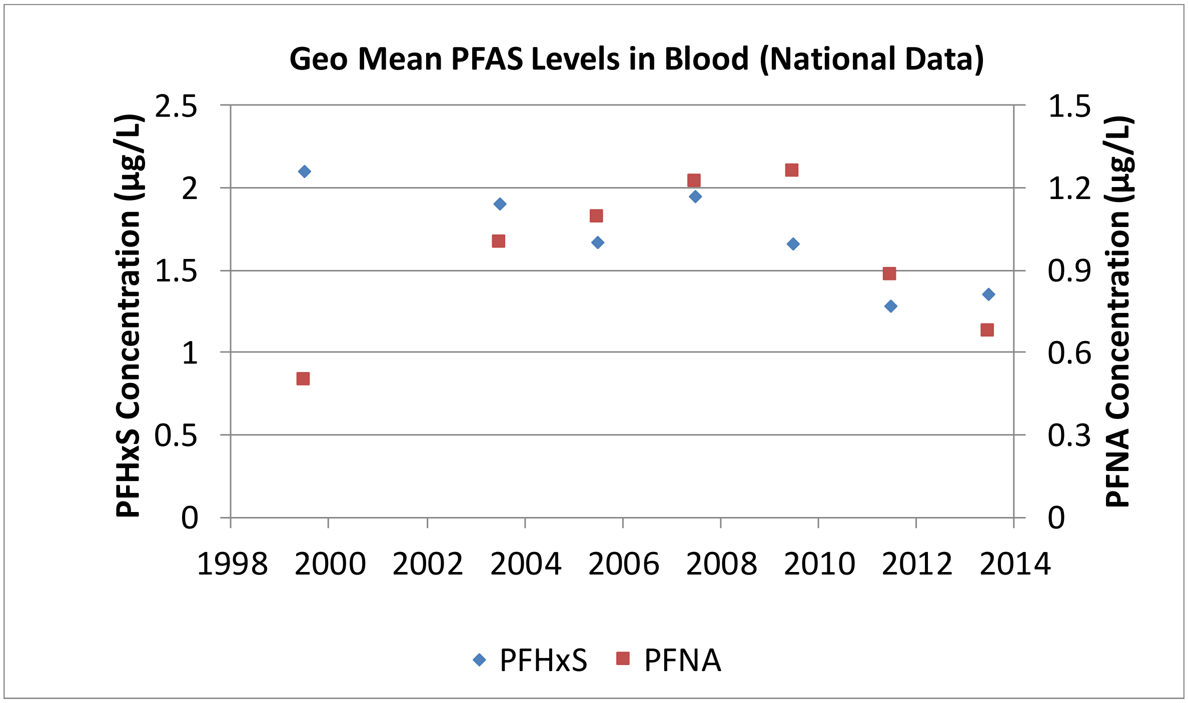


Figure 1 Geometric mean concentrations of serum PFHxS and PFNA reported for the U.S. population, from Table 5-22 of the draft ATSDR Toxicity Profile

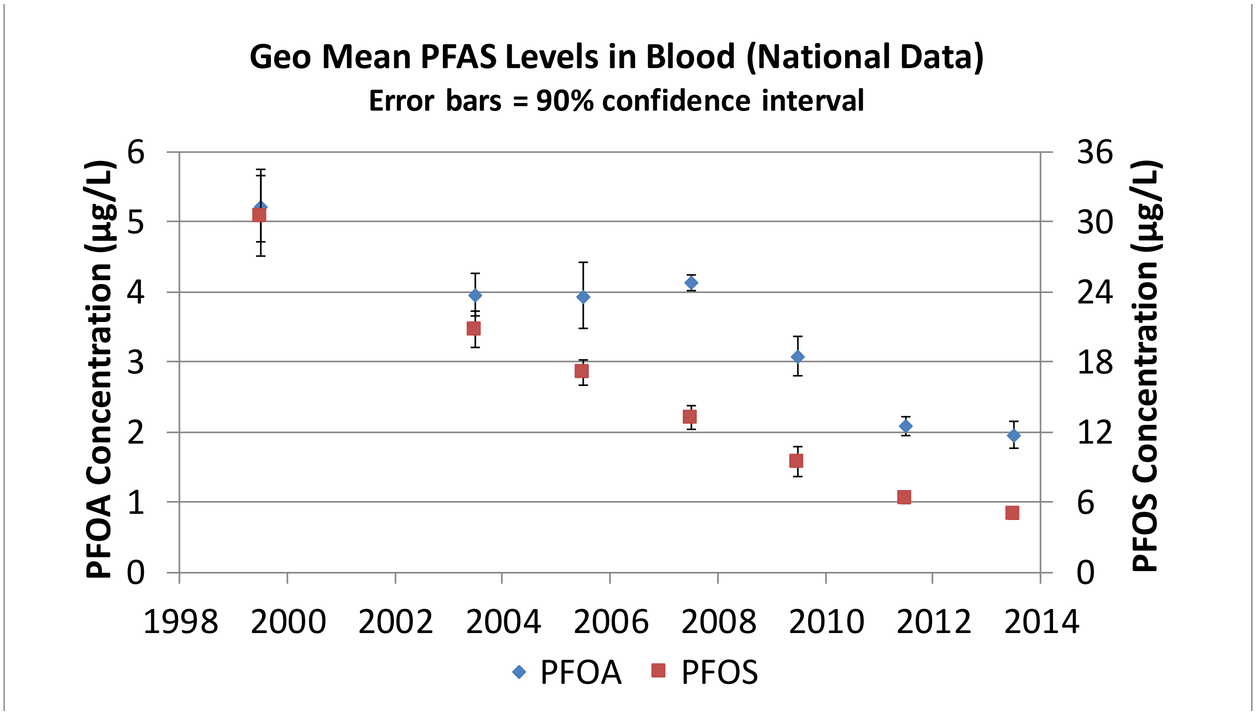


Figure 2 Geometric mean concentrations of serum PFOA and PFOS reported for the U.S. population, from Table 5-21 of the draft ATSDR Toxicity Profile. Bars represent the 5th and 95th percentile concentrations, obtained from the more detailed NHANES data available online.

From: Deb Pasternak <deb.pasternak@sierraclub.org>
Sent: Friday, February 28, 2020 4:36 PM
To: Director-DWP, Program (DEP)
Cc: Clint Richmond
Subject: PFAS MCL Comments

Dear Commissioner Suuberg,

Please find attached PFAS MCL comments from the Sierra Club's Massachusetts Chapter.

We appreciate this opportunity for input, please feel free to contact us with any questions.

Regards,

Deb

--
Deb Pasternak
Director
Sierra Club Massachusetts Chapter
pronouns: she/her/hers
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office: 617.423.5775
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Add to our power by becoming a member today!

Attachment: SC-Mass-DEP-2020-02-28.docx

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February 28, 2020

Massachusetts Department of Environmental Protection
1 Winter Street
Boston, MA 02108

Re: *PFAS MCL Comments*

Dear Commissioner Suuberg:

The Massachusetts Chapter of the Sierra Club actively supports efforts to protect people from the exposure from toxic chemicals and fulfill the basic human right to clean and safe drinking water. We commend the Department on its leadership with regard to PFAS. We submit the following comments on the proposed Drinking Water Regulations for your consideration.

We believe Massachusetts should set a limit on total PFAS chemical burden in drinking water. There are considerable chemical similarities between them all. At a high level, all PFAS are synthetic; when ingested, none are beneficial to any organism; and they never fully degrade in the environment. While about a dozen PFAS chemicals have been subject to exhaustive health study and use restrictions, thousands of related chemicals are virtually unrestricted and growing in use.

There are so many commercial PFASs, with more being produced and approved for use by the EPA, that it will be impossible to regulate them all individually. Indeed, the EPA is moving very slowly and therefore many states are appropriately acting now as they recognize the harm being imposed on their communities.

We support DEP's current approach to set an additive standard for one subgroup of PFAS which recognizes these facts. This approach harmonizes with regulations in neighboring Vermont for example and strengthens it by adding one chemical.

At the same time, we recommend that DEP build on research and standards in other states for the six base chemicals and set lower limits on individual chemicals, where demonstrated:

- PFOA, demonstrably one of the most harmful chemicals studied to date, should be at the lowest level indicated across the various state standards, so this should follow Michigan's proposed level of 8 ppt using their justifications.
- PFOS - 10 ppt, following New York justifications or even 6 ppt based on Quebec.
- PFNA - 6 ppt, again, based on Michigan justifications.

These three chemicals are a high priority given that they have been found universally in human serum samples in large-scale population surveys like CDC's NHANES study. We note that no safe level of has been determined for any PFAS and these levels should be considered a floor not only for humans but other animal species.

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DEP should consider adding all chemicals falling into the initial subgroup also present in EPA Method 533 - namely perfluoroheptanesulfonic acid (PFHpS). At a minimum, it deserves to be added to the reporting scheme.

Individual MCLs need to be set for widespread short-chain substitutes that (1) do not fall into the initial subgroup of C8 along with “carbon chain lengths with plus or minus two carbons”; and (2) have drinking water limits in other states; and (3) are part of EPA Method 533:

- PFBS, 420 ppt as recommended in Michigan. PFBS needs to be included since the United Nations Environment Program Convention on Persistent Organic Pollutants is considering adding this chemical.
- HFPO-DA, 140 ppt as in North Carolina. GenX will become a subgroup as testing methods become available.

It is impractical to test for every PFAS individually; and in keeping with regulating the class, DEP should also explore one or more measurements that quantify the presence of organic fluorine (such as TOP, TOF, EOF) and consider setting a safety level that triggers additional testing and possible water treatment in water systems with elevated measurements of total organic fluorine.

Given the high human health risk from PFAS, monitoring of all individual PFAS chemicals under EPA Methods 537 and 533 should be conducted at a minimum annual frequency for all community water systems and NTNCs.

Finally, there will be considerable costs associated with providing public drinking water that meets the new PFAS safety standards. In cases such as this, the Sierra Club consistently supports recovering the cost of PFAS testing, regulation and water treatment from the fluorochemical manufacturers, and industrial users. We also urge DEP to develop a source reduction program for PFAS in the Commonwealth, starting with non-essential uses such as food ware and cosmetics.

Please let us know if you have any comments or questions.

Respectfully,

Deb Pasternak

Deb Pasternak
Mass. Sierra Club, Chapter Director
deb.pasternak@sierraclub.org

From: Kathryn Rodgers <rodgers@silentspring.org>
Sent: Friday, February 28, 2020 4:33 PM
To: Director-DWP, Program (DEP)
Cc: Laurel Schaider
Subject: PFAS MCL Comments

Dear MA DEP Drinking Water Program Director,

Please find comments attached from Silent Spring Institute on MA DEP's proposed MCL for PFAS in drinking water. Thank you,

Kathryn

--
Kathryn Rodgers
Staff Scientist
Silent Spring Institute
320 Nevada Street, Newton MA 02460
617-332-4288
www.silentspring.org

Attachment: Silent Spring Institute MCL comments February 2020.pdf

SILENT SPRING INSTITUTE
Researching the Environment and Women's Health

320 Nevada Street, Suite 302, Newton, MA 02460 / 617.332.4288 / www.silentspring.org

February 28, 2020

Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108

Re: PFAS Maximum Contaminant Level (MCL) Proposed Amendments to the Massachusetts Drinking Water Regulations

Dear Commissioner Suuberg,

Thank you for the opportunity to comment on Massachusetts's proposal to regulate the sum of six PFAS in public drinking water supplies. We are scientists at Silent Spring Institute, a non-profit scientific research organization, where we study exposures to PFAS in drinking water and consumer products and associated health effects. Silent Spring Institute currently has three key ongoing research projects focused on PFAS. With collaborators at the University of Rhode Island (lead institution) and the Harvard T.H. Chan School of Public Health, we are working on a NIEHS-funded Superfund Research Program grant that focuses on measurement methods, environmental transport, bioaccumulation, and health effects of PFAS called STEEP (Sources, Transport, Exposure and Effects of PFASs)[1] (grant number P42ES027706). We are leading a NIH-funded project, along with Northeastern University and Michigan State University, to evaluate potential effects of PFAS exposures on the immune systems of young children in two communities that have had PFAS water contamination called PFAS-REACH (Research, Education, and Action for Community Health)[2] (grant number 5R01ES028311). We are also leading one of seven projects funded as part of ATSDR's PFAS Multi-site Health Study to investigate associations between PFAS exposures from drinking water and a wide range of health outcomes (grant number U01TS000313).

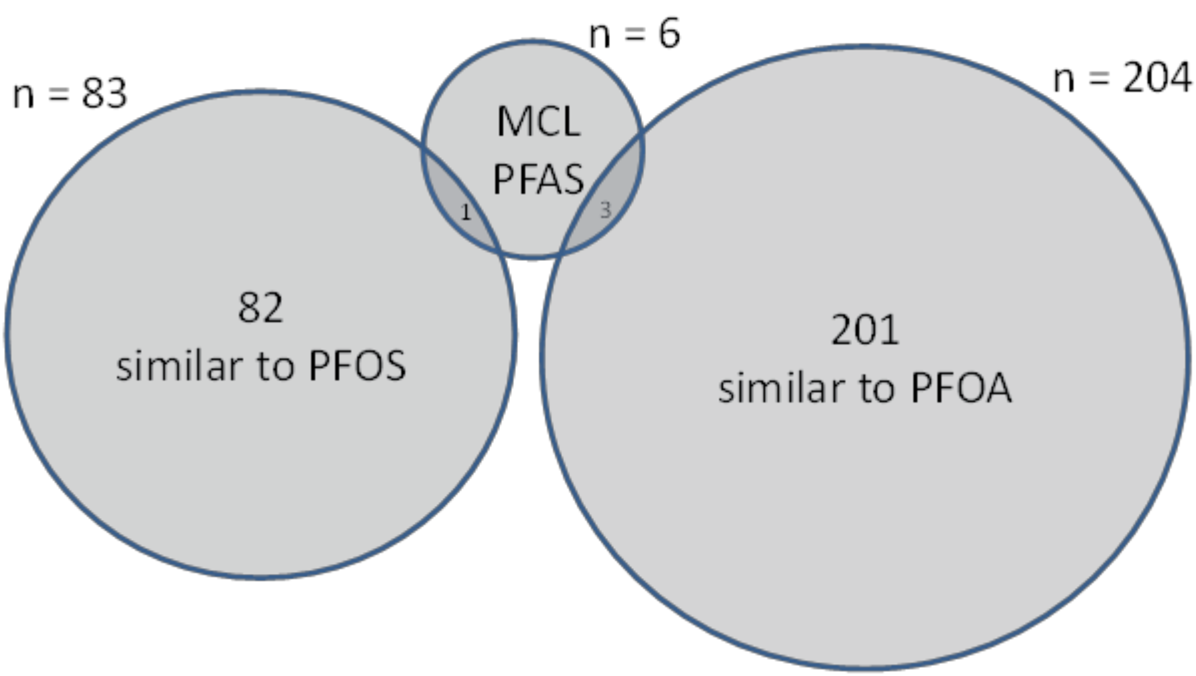
We are supportive of MassDEP for developing a drinking water standard that would require routine testing and enforcement for six PFAS in Massachusetts drinking water. We applaud DEP for including additional PFAS beyond PFOS and PFOA, the only PFAS included in EPA's lifetime health advisory, and agree that it is appropriate to use read across to extend to PFDA and PFHpA. We also have a number of additional suggestions.

<u>MassDEP should consider additional PFAS that are frequently detected in drinking water and those that are chemically similar to PFOS and PFOA.</u>

The PFAS included in the MCL are limited in scope compared to the 4,730 PFAS that have been identified by OECD.[3] Although 600 PFAS are registered for active use in the U.S.,[4] it is possible that additional PFAS also may be present in the environment through chemical transformation processes.

DEP chose to limit the scope of PFAS to those closely related to PFOA and PFOS based on +/- 2 carbon chain lengths. This approach leaves out many PFAS, and there are other reliable methods to identify structurally similar PFAS. EPA's Distributed Structure-Searchable Toxicity (DSSTox) Database, "a high quality public chemistry resource for supporting improved predictive toxicology" of more than 760,000 substances,[5] provides lists of chemicals with the highest Tanimoto (T) scores for user-specified chemicals. Tanimoto scores are based on a chemical structure's similarity to another chemical. Using EPA's Comptox Chemicals Dashboard, which relies on DSSTox, there are 204 chemicals similar to PFOA with a T score of >0.80, henceforth called "similar." There are 83 chemicals similar to PFOS with a T score of >0.80. None of the chemicals on these two lists are overlapping. In addition to the other 4 PFAS in the draft MCL, there are many additional PFAS compounds similar to PFOS and PFOA with Tanimoto scores above 0.80.

Figure 1. Many PFAS that are structurally similar (T> 0.80) to PFOS and PFOA are not among the 6 PFAS included in MassDEP's proposed MCL.



There are additional PFAS that are also frequently found in drinking water that should be prioritized. In addition to PFHxA, other short-chain PFAS were frequently found in treated tap water collected from 25 drinking water treatment plants (all in different states) in a 2019 study by the EPA and US Geological Survey study (Boone et. al. 2019),[6] including PFBS, PFBA, and PFPeA. PFHxA and PFPeA were found in Boston's tap water according to 2019 testing of 44 public drinking water supplies, released by the Environmental Working Group.[7] PFBA and PFPeA are included in EPA's new method 533, but are not part of the existing EPA method 537.1. While short-chain PFAS have half-lives in the human body of weeks to months rather than years and do not show the same level of effects at low doses, they are associated with similar health effects, and could be regulated in drinking water by including equivalency factors or creating a separate subgroup.

Table 1. PFAS detected in U.S. public drinking water supplies according to testing by the US EPA and US Geological Survey (Boone et al. 2019) and 2019 testing by the Environmental Working Group.

PFAS	CASRN	Detection frequency (%) Boone et al. 2019	Detection frequency (%) EWG 2019
PFOA*	335-67-1	100	70
PFHxA	307-24-4	100	68
PFBS	375-73-5	100	61
PFPeA	2706-90-3	96	70
PFOS*	1763-23-1	92	77
PFHpA*	375-85-9	92	59
PFNA*	375-95-1	92	23
PFBA	375-22-4	88	73
PFHxS*	355-46-4 **	84	52
PFDA*	335-76-2	80	7
FOSA	754-91-6	-	48
GenX	13252-13-6	-	14
PFPeS	2706-91-4	-	7
6:2 FTSA	27619-97-2	-	5

*included in MADEP proposed MCL

**Note: We identified an error in DEP's proposed regulation. It lists the CASRN for perfluorohexane sulfonic acid as 335-46-4, when it is actually 355-46-4.

It is clear there are many other long chain PFAS that are not in the proposed MCL that could potentially be present in drinking water, which could also be considered for additive toxicity. Read across can be applied to other PFAS, or subgroups of PFAS, as well. Epidemiological studies have found associations between C11 and C12 perfluorocarboxylates (C11 and C12) and thyroid disorders and adverse birth outcomes.[8]

DEP should to consider additional analytical methods that are currently available and future analytical methods as they become available.

Current EPA methods include up to 25 PFAS chemicals and do not include many precursor compounds. These precursors have the potential to transform into PFOS, PFOA, and other highly stable PFAS endpoints in the environment and in our bodies. Current use aqueous film forming foams (AFFF), used to fight fuel fires, contain PFAS that are not included in EPA methods, but studies have found fluorotelomer precursors that may also be making their way into drinking water. For example, a studies of groundwater contaminated with PFAS from military use of AFFF found perfluoroalkyl carboxylic acids (PFCAs) in the groundwater, despite not detecting PFCAs in AFFF tested, which suggests they may have been used in other or older AFFF than what was tested, or that PFAS in the foam may transform to PFCAs.[9] Although 3M agreed to phase out PFOA and PFOS from their foams after 2002,[10] other manufacturers did not take this action until the deadline of the PFOA/PFOS Stewardship Program of 2015. Manufacturers have not disclosed replacement chemicals, though independent testing of foams have found novel PFAS.

Table 2. New PFAS identified in AFFF produced after 2002 (from Place and Field 2012)

AFFF Product	Nominal Mass	Generic Name
Buckeye	414	5:3 fluorotelomer betaine
	432	5:1:2 fluorotelomer betaine*
	514	7:3 fluorotelomer betaine
	532	7:1:2 fluorotelomer betaine*
	614	9:3 fluorotelomer betaine
	632	9:1:2 fluorotelomer betaine*
Fireade	513	6:2 fluorotelomer sulfonamide amine
	571	4:2 fluorotelomer sulfonamide betaine
	613	8:2 fluorotelomer sulfonamide amine
	671	6:2 fluorotelomer sulfonamide betaine
	771	8:2 fluorotelomer sulfonamide betaine
	871	10:2 fluorotelomer sulfonamide betaine

* x:y:z fluorotelomer indicates an alkyl chain with x carbons completely fluorinated, y carbons partially fluorinated, and z carbons non-fluorinated.

Because many PFAS are detected outside of those included in EPA's methods (both 537.1 and 533), and because PFAS from newer AFFF are entering groundwater where AFFF is used, it makes sense for DEP to use testing methods to measure total impact from PFAS. One analytical method that could complement existing EPA methods is the total oxidizable precursor assay, or TOP assay, which is a commercially available method for evaluating the presence of precursor compounds. Using the TOP Assay would provide a more complete evaluation of PFAS precursors in water.

We suggest DEP include a provision to consider additional analytical methods as they become available. For instance, the European Commission announced in December that it would develop a method to measure total PFAS in water within 3 years and to set a limit for drinking water.[11] There are multiple ways that DEP could incorporate total organofluorine measurements into an MCL, such as creating a screening level that would require additional testing for individual PFAS.

DEP should continue to incorporate new science and to ensure that its standards are adequately protective for the PFAS that show effects at the lowest levels of exposure.

There is ample evidence that EPA's lifetime health advisory is not adequately protective. For instance, the New Jersey Drinking Water Quality Institute, in developing its recommended MCL of 14 ng/L for PFOA, noted that the target human serum level for delayed mammary gland development was 18 times lower than the target level that they were basing their standard on, and it was below median blood serum levels in the general population U.S.[12] Changes in breast development could have significant public health impact because of the long-term implications for breastfeeding and breast cancer,[13,14,15,16] making this an important endpoint to consider in risk assessment. Other state agencies have similarly concluded that drinking water guidelines should be much lower. ATSDR's minimal risk levels for PFOA and PFOS are 6.7 and 10 times lower than EPA's reference doses,[17] and the European Food Safety Authority's tolerable intakes are proposed to be set at even lower levels, with a corresponding water limit of 5 ng/L for the sum of four PFAS: PFOA, PFNA, PFHxS and PFOS.[18] We are glad to see that DEP considered this evidence in applying an extra database uncertainty factor to account for additional low-dose effects.

We support the inclusion of the six PFAS for their health effects. While PFOA's effects on liver toxicity in humans have been called into question, we want to re-iterate that PFOA's liver effects appear to occur independently of the PPAR-alpha mechanism in mice. A study led by scientists at the National Toxicology Program administered low doses of PFOA to pregnant PPAR-alpha knockout mice and found liver toxicity (adenomas and lesions) occurred in the female offspring of the knockout mice, indicating that liver toxicity occurs via another pathway.[19] This is important to note because it is contrary to the idea that PFOA's effects on liver toxicity are irrelevant to humans because the PPAR-alpha receptor is activated to a lesser degree in humans.

We suggest DEP include a provision to continue to incorporate new studies to ensure that their standards are adequately protective based on our rapidly evolving understanding of the many ways that PFAS can affect human health. Because the science is rapidly evolving, a yearly review of available exposure, health, and toxicity data is reasonable.

DEP should also evaluate whether maximum concentrations for PFOS and PFOA, for which we have the most extensive toxicity information, should be set at concentrations below 20 ppt, in addition to be included in a sum. For instance, levels of PFOA and PFOS individually at 10-20 ppt would not exceed DEP's standard but would exceed standards set by other states.

Terminology

The proposed standard is referred to as a "Total PFAS Maximum Contaminant Level," yet six PFAS compounds are included in the draft standard. We suggest an alternative name for the standard to better communicate that the limit applies to a subgroup of 6 compounds, such as PFAS6 MCL, PFAS-6 MCL, or LC6-PFAS (LC for long-chain) MCL.

There are several locations in the proposed regulation that need clarification. For instance, Section 22.07G (5)(a) discusses "PFAS detections," but it is not clear if this refers to just the six PFASs in the proposed standard or any PFAS measurable with the analytical method.

Results below Method Reporting Limit

We think that DEP's provision for using one-half of the MRL for values that fall between one-third of the MRL and the MRL is reasonable. Measured concentrations in this range are above the detection limit, so using zero for these concentrations would underestimate the total amount of the 6 PFAS chemicals included in the standard. For concentrations between 1/3*MRL and the MRL, using ½*MRL is a reasonable approximation for these concentrations, since it falls within the range of possible concentrations. As an illustration, for compounds with an MRL of 2 ng/L (the maximum allowed under the proposed regulation), detected concentrations between 0.67 and 2 ng/L would be assigned a value of 1 ng/L. A more conservative approach would be to select a value at the upper range of possible values, closer to the MRL, but we recognize that values below the MRL have more uncertainty, so using ½*MRL provides a reasonable approximation of the likely real concentration.

Thank you for the opportunity to submit comments. We would be happy to discuss any of the points we have made further.

Sincerely,

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From: Laurel Schaider <schaider@silentspring.org>
Sent: Friday, February 28, 2020 5:25 PM
To: Director-DWP, Program (DEP)
Cc: Rainer Lohmann; Grandjean, Philippe; Wendy Lucht; Swift, Judith; Amber Neville; Nathan Vinhateiro
Subject: PFAS MCL Comments

Dear Ms. DePieza,

On behalf of the STEEP Superfund Research Program, attached please find our comments on the proposed PFAS MCL.

Thank you for this opportunity to provide comments.

Best regards,
Laurel Schaider

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Attachment: STEEP Comments for MassDEP MCL submitted 2-28-20.pdf

February 28, 2020

Commissioner Martin Suuberg
Massachusetts Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108

Re: 2020 Proposed PFAS Maximum Contaminant Level

Dear Commissioner Suuberg,

Thank you to the Massachusetts Department of Environmental Protection for the opportunity to provide comments on the proposed PFAS Maximum Contaminant Level. We are glad to see the Commonwealth of Massachusetts moving forward with the development of PFAS standards for drinking water.

We are co-directors and project leaders of the Sources, Transport, Exposure & Effects of PFASs (STEEP) Superfund Research Program, led by the University of Rhode Island in partnership with the Harvard T.H. Chan School of Public Health's Department of Environmental Health and Silent Spring Institute. STEEP's team members contribute decades of interdisciplinary experience in developing methods for chemical detection in the environment, determining health impacts of chemical compounds and where in the body these compounds accumulate, training the next generation of scientists, engaging communities to improve well water quality and awareness, and communicating complex science to a variety of audiences. Here in Massachusetts, we are conducting a private well water testing program on Cape Cod to characterize exposures from well water and identify potential sources, and we are studying the fate and transport of PFAS compounds as they move through Cape groundwater and ponds and potential bioaccumulation and ecological effects.

We agree that there are serious health concerns arising from the exposure of the general public to PFASs, and that the reference doses (RfDs) developed by EPA for PFOS and PFOA are not adequately protective. Recent studies by STEEP researchers and many others indicate the potential for harmful effects resulting from low-dose exposures according to both toxicological and epidemiological research. Below we offer comments on DEP's proposed MCL and suggestions DEP's ongoing efforts to protect from the harmful effects of PFAS chemicals.

Terminology

The proposed standard is referred to as a "Total PFAS Maximum Contaminant Level." However, this terminology is somewhat misleading, as only 6 PFAS compounds are included in the draft standard. A

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true total PFAS MCL would be based on a more comprehensive analytical method, such as combustion ion chromatography, that measures total organofluorine. We suggest that an alternative name for the standard would better reflect this current subgroup of 6 compounds. Suggested names include the PFAS6 MCL, PFAS-6 MCL, or LC6-PFAS (LC for long-chain) MCL.

There are several locations in the draft text that would benefit from greater precision in wording. The regulation states clearly that the term "Total PFAS detection" refers to the total concentration of the 6 PFAS compounds included in the draft MCL. However, there are other instances in the text where the term "PFAS detection" is used where it is not clear whether this refers specifically to the 6 PFAS chemicals presented in the table or any PFAS chemical. For instance, Section 22.07G (5)(a) discusses whether or not there have been "PFAS detections," but it is not clear if this refers to just the 6 PFASs in the proposed standard or any PFAS measurable with the analytical method.

Identification of potential sources

In Section 22.07G (6)(c)(3)(b), there is a fairly comprehensive list of potential sources of contamination. We recommend adding a phrase that also includes industrial and commercial facilities where PFAS-containing products are frequently used, such as metal platers, paper manufacturers, textile mills, and fabric/leather treaters. These types of sources have been found to be significant sources of PFAS to wastewater treatment plants and surface waters.[1, 2]

Importance of early-life exposures and evidence for low-dose effects

STEEP research is focusing on risks to human health from early-life exposures that may occur during pregnancy or through breastfeeding. PFASs can pass the placental barrier,[3] thereby allowing a mother's PFAS body burden to be transferred to her child. The shared exposure continues postnatally, as PFASs are transferred through breast milk, and longer durations of breastfeeding result in increased serum PFAS concentrations in children.[4] Since adverse effects on the next generation, for instance on the development of the immune system, may have long-term adverse health implications, we believe that a substantial amount of precaution is appropriate to protect the most vulnerable part of the population.

Epidemiological research led by STEEP researcher Philippe Grandjean on the Faroe Islands has shown associations between PFAS exposures in young children and suppressed antibody response to vaccines.[5] Based on benchmark dose calculations of immunotoxic effects, Grandjean and Budtz-Jorgensen[6] suggested that 0.1 ng/mL serum would be an appropriate benchmark dose level for PFOS and PFOA, which corresponds to 1 ng/L when converted to drinking water concentrations, assuming a ratio of 1:100. More recently, Budtz-Jorgensen and Grandjean[7] extended these benchmark dose calculations to simultaneously account for exposures to five of the six long-chain PFAS chemicals included in the draft standard.

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The Minnesota Department of Health developed a toxicokinetic model that accounts for accumulation of PFASs *in utero* and transfer of PFAS compounds via breast milk.[8] The New Hampshire Department of Environmental Services recently issued revised draft MCLs that accounted for this model. The resulting draft MCLs, which are lower than initially proposed, are 12 ng/L PFOA, 15 ng/L PFOS, 11 ng/L PFNA, and 18 ng/L PFHxS. Still, the model does not appropriately take into regard that exposure during prenatal or infancy development can cause lasting impairment of organ functions with associated disease risks. This concern suggests that further lowering of the MCLs is needed.

Current evidence on rodent models has shown that low-dose PFOA exposures can impair mammary gland development,[9-12] and we are glad to see that DEP considered this evidence in applying an extra database uncertainty factor to account for additional low-dose effects. Altered breast development associated with low-dose PFOA exposure is concerning because of the potential to disrupt lactation. PFOA exposure in mice was associated with reduced mammary differentiation and altered milk protein gene expression.[11] In humans, elevated serum PFOA was associated with early termination of breastfeeding in a cohort of U.S. mothers[13] and PFOA, PFOS, PFNA, and PFDA serum concentrations were associated with shorter duration of breastfeeding in a cohort of mothers in the Faroe Islands.[14] As noted by researchers at Silent Spring Institute and others, altered mammary gland development may increase breast cancer susceptibility later in life.[9, 15] The New Jersey Department of Environmental Protection (NJDEP) noted that delayed mammary gland development, along with increased liver weight, were the two most sensitive non-carcinogenic endpoints associated with PFOA exposure.[16] NJDEP concluded that the target serum concentration to be protective of delayed mammary gland development was below the median serum PFOA level in the general population. While NJDEP's recommended MCL was not based on this endpoint due to a lack of precedent for using this endpoint as the basis for risk assessment, NJDEP applied an extra uncertainty factor to account for this and other sensitive endpoints. It is worth noting that the Texas Commission on Environmental Quality (TCEQ) used a study of impaired mammary gland as its critical study in developing its 2016 Protective Concentration Level, deriving a RfD of 1.2×10^{-5} mg/kg-day.[17]

In the revised draft opinion on joint exposures to PFOA, PFNA, PFHxS and PFOS, the European Food Safety Authority (EFSA) considered immunotoxicity as the critical effect and calculated a tolerable limit for long-term exposure at 1.16 ng/kg bw-day.[18] This limit is substantially lower than the Reference Doses used by the EPA and MassDEP for PFOS and PFOA (in both cases 20 and 5 ng/kg-day for EPA and MA, respectively). The EFSA intake limit corresponds to a drinking water limit of 5 ng/L for the four PFASs combined when using the calculations applied by both EPA and MassDEP.

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Additional compounds for consideration

We applaud MassDEP's approach for the proposed MCL that includes the sum concentrations of PFOS, PFOA, and four additional PFAS compounds. This approach recognizes the extreme persistence of PFAS compounds as a class and the long human half-lives of PFAS chemicals, especially long-chain compounds. Beyond the six compounds in the draft standard, we note that there are many more PFAS compounds of concern.

There is ample evidence that MCLs ought to be considered for PFUnDA (C11) and PFDoDA (C12), along with PFDA that has already been added to the original five PFAS compounds in the current ORSG. In addition to the continual exposures to these compounds, the health effects and toxicokinetic behavior of the C10-C12 compounds all show similarities to the behavior of PFNA. The human half-lives for PFCAs generally increase with chain length. Geometric mean human half-lives for PFDA and PFUnDA were estimated to be 7.1 and 7.4 years, respectively, in males and older females, more than twice the estimated half-life for PFNA.[19] As noted in the ATSDR draft toxicological profile, PFDA, PFUnDA, and PFDoDA have been associated with thyroid disorders and adverse birth outcomes in epidemiological studies.[20] PFDA and PFUnDA have been linked with serum lipid outcomes, neurodevelopmental outcomes and prostate cancer. PFUnDA and PFDoDA have been linked to suppressed antibody response to vaccines and decreases in childhood growth. PFDA has been linked with male reproductive outcomes and adverse pregnancy outcomes, and PFUnDA has been linked to diabetes. Mother-child transfer efficiencies for these compounds are often greater than PFNA, as indicated by the low maternal-fetal and maternal-infant ratios reported in the recent ATSDR toxicological profile on PFASs.

In addition, emerging research demonstrates that select short-chain alternatives may bioaccumulate to the same extent or to a greater degree than legacy compounds such as PFOA or PFOS.[21-25] Pharmacokinetic models suggest that shorter-chain alternatives may be equally toxic compared to legacy compounds after adjusting for differences in toxicokinetics.[26] While short-chain PFAS have half-lives in the serum of weeks to months rather than years, they are associated with similar types of health effects,[27, 28] and could regulated in drinking water by including equivalency factors or creating a separate subgroup.

Shorter-chain and other alternatives replacing legacy PFAS continue being produced and show widespread environmental occurrence, including in drinking water. In our STEEP study of PFAS in Cape Cod private wells, PFPeA, PFBS, PFHxA, and 4:2 FtS were among the compounds that we detected. PFBA, PFPeA, PFHxA, and PFBS were found in 88-100% of drinking water supplies tested in a 2019 study by the US EPA and the US Geological Survey.[29] PFHxA and PFPeA were found in a tap water sample from Boston's public water supply according to testing released in January by the Environmental Working Group.[30] Perfluoroalkyl ether carboxylic acids (i.e. HFPO-DA or "GenX"), polyfluoroalkyl carboxylic acids,

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and polyfluorinated alkanesulfonates and sulfates persist in air, surface water, and drinking water downstream from release sources.[31-35]

Support for relative source contribution

A recent analysis led by STEEP researcher Elsie Sunderland supports the applicability of the 20% default relative source contribution estimate.[36] Using pharmacokinetic modeling and blood and drinking water samples archived from 1989-1990, these authors estimated that contributions of drinking water to overall PFAS exposures ranged from around 3% for PFOS to 34% for PFHxS.

Consideration of a class-based approach

As a class, PFAS compounds are united in their extreme persistence and mobility. In recognition of concerns about chemicals that are very persistent and very mobile, the European Union has proposed adding a "very persistent very mobile" (vPvM) criteria to the European chemical regulatory program REACH. To the extent possible, PFASs should be considered as a class, or relevant subclasses, rather than attempting to regulate them one at a time. The scientific community has repeatedly acknowledged similar physicochemical characteristics linking >4,000 PFASs and has suggested PFASs be considered and regulated as a group or as subgroups.[37-39] Most recently, the governments of the EU countries have urged the European Commission to generate a joint strategy on PFASs, treating all the many individual compounds as a group and recommending that they be approved only for essential uses. The EU has also proposed two drinking water guidelines based on differing groupings of PFAS compounds: 100 ng/L for the sum of 20 PFAS compounds (perfluorocarboxylic acids and perfluorosulfonic acids), and 500 ng/L for the sum of all total PFAS. These values shall only apply once technical guidelines for monitoring these parameters are developed in accordance with Article 13(7). Member States may then decide to use either one or both of the parameters.

The current regulatory paradigm essentially assigns zero toxicity to PFAS not included in GW/MCL standards. While setting a total PFAS standard will be difficult to establish, it would be advisable to include a measure of total PFAS on a regular basis to be able to assess how abundant non-targeted PFASs are. This approach would allow Mass DEP to be alerted to the presence of other PFASs that might become threats to public health.

Analytical considerations of the proposed standards

We think that is it appropriate for the calculation of the sum PFAS concentration to include detected concentrations that fall between one-third of the MRL and the MRL. Measured concentrations in this range are above the detection limit, so using zero for these concentrations would underestimate the total amount of the 6 PFAS chemicals included in the standard. For concentrations between one-third

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of the MRL and the MRL, substituting one-half of the MRL is a reasonable approximation for these concentrations, since it falls within the range of possible concentrations.

The proposed standard requires that analytical laboratories are able to provide minimum reporting levels of 2 ng/L or lower for each of the 6 PFAS compounds. Many commercial laboratories already offer methods that have low ng/L or sub ng/L MRLs that will allow them to comply with this requirement.

The current regulation requires that laboratories follow either EPA Method 537 or 537.1. EPA recently released a third method, EPA Method 533. PFBA and PFPeA, which have been frequently found in drinking water sampling, are included in this new method, but are not part of the existing EPA method 537.1. We think that it is appropriate to add Method 533 to the list of acceptable methods.

We also encourage DEP to consider additional analytical methods that are currently available and future analytical methods as they become available. Current EPA methods include around 20 PFAS chemicals and do not include many precursor compounds. These have the potential to transform into PFOS, PFOA, and other highly stable PFAS endpoints in the environment and in our bodies. Current use AFFF firefighting foam contains PFAS that are not included in EPA methods, but studies have found fluorotelomer precursors that may also be making their way into drinking water.

One analytical method that could complement existing EPA methods is the total oxidizable precursor assay, or TOP assay, which is a commercially available method for evaluating the presence of precursor compounds. Using the TOP Assay would provide a more complete evaluation of PFAS precursors in water. DEP could include a provision to consider additional analytical methods as they become available. For instance, the European Commission announced in December 2019 that it would develop a method to measure total PFAS in water within 3 years and to set a limit for drinking water. There are multiple ways that DEP could incorporate total organofluorine measurements into an MCL, such as creating a screening level that would require additional testing for individual PFAS.

Applicability of regulations
The proposed standard would apply to both community water systems and non-transient non-community water systems. Including NTNC systems is important because they serve locations where people spend a substantial proportion of their time and may ingest a majority of their daily water intake. At the Pease Tradeport in Portsmouth, NH, where PFAS contamination was discovered in the public water supply in 2014, testing by the state of New Hampshire found that serum-PFAS concentrations were elevated in members of the Pease community, particularly PFHxS, even though Pease is not a residential community. In particular, since some schools and daycare centers are served by NTNC systems, including NTNCs in this regulation is important for protecting children from PFAS exposures.

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Thank you, once again, for inviting our comments. Please contact us if you wish to discuss any of the above issues further.

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Sources, Transport, Exposure & Effects of PFASs
UNIVERSITY OF RHODE ISLAND SUPERFUND RESEARCH PROGRAM

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NIH NIEHS **STEEP is funded by the Superfund Research Program, National Institute of Environmental Health Sciences under award number P42ES027726.**

From: Stephanie Grady <sgrady@bu.edu>
Sent: Friday, February 28, 2020 4:25 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Program Director,

Please find attached my comments related to the PFAS MCL proposal. Thank you for your time and consideration.

Best,
Stephanie

Attachment: Grady_PFASComments_Final.pdf

February 28, 2020

Commissioner Martin Suuberg
Massachusetts Department of Environmental Protection
One Winter Street, 2nd Floor
Boston, MA 02108

Re: Submission of Comments in Support of the MassDEP PFAS Regulations

Dear Commissioner Suuberg,

Thank you for your efforts in addressing the imperative need to regulate per- and poly-fluoroalkyl substances (PFAS) in the proposed revisions to the **Massachusetts Contingency Plan: Development of a PFAS Drinking Water Standard (MCL) (MCP: 310 CMR 22)**. I am very thankful that MassDEP has devoted so much time and effort to this extremely important issue.

I have been working in environmental health for the past seven years and currently training as a doctoral student in the Department of Environmental Health at Boston University. I am passionate about the effects of mixtures of environmental exposures on health and concerned about the quality of drinking water in our state. Therefore, I am happy to see that MassDEP is proposing a standard that sums concentrations of PFOS, PFOA, and four additional PFAS, recognizing the persistence of these PFAS as a class.

PFAS are persistent in our environment and can spread to other environments in air, soil, and water due to their mobile properties.[1] Once individuals are in contact with these chemicals, PFAS can be dermally absorbed, inhaled, or ingested given their multiple pathways of exposure.[2] Studies have shown relationships between several PFAS exposures and a number of disease end points, such as hypercholesterolemia, liver damage, decreased fertility and birth weight, increased cancer incidence, and other chronic diseases.[1,2]

I support treating these PFAS (PFOA, PFOS, PFDA, PFHxS, PFNA, and PFHpA) as a class because these compounds have similar structures, toxicities, and characteristics as stable, mobile, and persistent compounds.[1] Additionally, many of these compounds exist as PFAS mixtures depending on their source.[3] It would be an inefficient use of time, money, and resources to regulate each PFAS compound individually, particularly when they already are found in groups.

Although proposing an MCL of 20 ng/L for the class is a step in the right direction, I do have some recommendations. **I suggest that MassDEP replace the term "total PFAS" in the 310 CMR 22.07G language and in tables to "sub-class" or "sub-group"**, as "total PFAS" may

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[1] Agency for Toxic Substances and Disease Registry (ATSDR). Toxicological profile for Perfluoroalkyls. (Draft for Public Comment). https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf (2018).
[2] Sunderland EM, et al. A review of the pathways of human exposure to poly- and perfluoroalkyl substances (PFASs) and present understanding of health effects. J Expo Sci Environ Epidemiol 29, 131–147 (2019).
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imply that these compounds are the only existing PFAS in drinking water. Using a term similar to "sub-class" or "sub-group" will encourage the public to keep in mind that these compounds are not the only PFAS compounds in drinking water.

I also suggest that MassDEP consider other PFAS, particularly shorter-chained compounds, to be added to this sub-class. Although there are only six compounds currently listed in this sub-class, there are over 4,000 PFAS that are registered.[4] I understand that the MassDEP restricts compounds to those with carbon chain lengths +/- 2 from PFOA and PFOS; however, with the anticipated regulation of longer-chained PFAS, it is possible that the usage of shorter-chained PFAS will increase. Evidence in 28-day toxicity studies showed that even though these shorter chained PFAS have shorter half-lives, an increase in dose may lead to similar effects as long-chained compounds.[5,6] A review that was published this year also noted that shorter-chained PFAS may actually be more persistent and mobile than longer-chained compounds.[7]

The regulations MassDEP sets are important to protect our most vulnerable populations in this state. Given that the EPA's current standard for PFOS and PFOA is at 70 ppt, Massachusetts is considering these vulnerable populations within the proposed guidelines and basing its standard on a defensible modification of the EPA analysis. Although research on PFAS is continually evolving, I applaud MassDEP's stance towards a more protective approach regarding the quality of our drinking water.

Respectfully,

Stephanie Grady

Stephanie Grady
sgrady@bu.edu

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[7] Li, F. et al. Short-chain per- and polyfluoroalkyl substances in aquatic systems: Occurrence, impacts and treatment. Chem Eng 380, 122506 (2020).

Professor
Boston University School of Public Health

____
From: Webster, Thomas F <twebster@bu.edu>
Sent: Friday, February 28, 2020 7:38 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Program Director,
Please find attached my comments.

Kind regards,
Tom Webster

Attachment: MA PFAS MCL comments-Webster.pdf

Boston University School of Public Health
Department of Environmental Health

Comments on the proposed MA MCL for PFAS

Submitted to program.director-dwp@mass.gov
From Dr. Thomas F. Webster, Professor, Dept Environment Health, Boston University School of Public Health, twebster@bu.edu
27 February 2020

Dear Program Director:

I am writing to provide comments on the updated MA water MCL for PFAS. I am professor of environmental health at the Boston University School of Public Health and have done research on PFAS for about fifteen years. I have published over twenty peer reviewed articles on PFAS, primarily on the epidemiology and human exposure to these compounds, including exposure via drinking water. I am currently the Principal Investigator of two grants funded by the National Institute of Environmental Health Sciences on methods for examining the health effects of exposure to mixtures in both epidemiology and toxicology, so I bring expertise to that important topic as well. I was also an invited speaker at the US National Academies meeting on PFAS exposure this last year.

I have reviewed the "Technical Support Document Per- and Polyfluoroalkyl Substances (PFAS):An Updated Subgroup Approach to Groundwater and Drinking Water Values" dated 26 December 2019. Overall, I find the proposed MCL to be well supported scientifically. Below are comments on some specific aspects.

<u>Relative source contribution of 20%</u>

As stated above, I have done research on human exposure to PFAS from a number of different sources including water, food (including food packaging) and the indoor environment. All of these pathways are important and require more investigation, as do others such as personal care products. Water can be the dominant route of exposure in communities with substantial drinking water contamination. For the general public in other areas, it provides a smaller percentage of the contribution. The best empirical data we have for the USA now supports a relative source contribution of 20% (Hu et al 2019). This supports DEPs use of the default value of 20%.

<u>Half-life</u>

The half-life of PFAS in the human body is important for animal to human extrapolation and for the summing approach used by MassDEP for six PFAS (more on the summing approach below). I am familiar with these data, teach about pharmacokinetics at my university, and do research in this area. The Technical Support Document reviews data on the human half-lives of a number of PFAS. The longer chain PFAS that Mass DEP have selected have relatively similar half-lives, on the order of years.

At a few meetings this last year, most notably at a SETAC meeting in summer 2019, I heard claims that these estimates for the human half-life for PFOA are too large. Two reasons were given but both are incorrect. First, it was claimed that the standard estimates are biased upwards because they do not take into account background exposure. For example, the C8 studies estimated the human half-life of PFOA following installation of water filters in the WV/OH area (Bartell et al 2010). The people involved in the study are more highly exposed by water than the average American. It is straightforward to show that "background exposure" (e.g., from food) would contribute at most a very small upward bias to this estimate. It cannot lead to the huge difference claimed at the SETAC meeting. In addition, we empirically examined the relationship between serum and water levels of PFOA in this area (e.g., Hoffman et al 2019). The ratio was well predicted by pharmacokinetic models incorporating the standard half-life. Second, it was claimed at the SETAC meeting that pharmacokinetic data based on extremely highly exposed, terminally ill cancer patients deliberately exposed to PFOA show a much shorter half-life. Such data, even if accurate in this setting, cannot be generalized to the general population because 1) the patients are very ill, meaning that their elimination of PFOA may have been altered from that seen in the general population, ii) the pharmacokinetics may be different at such very high doses. This certainly does not outweigh the other evidence on the length of the PFOA half-life.

I agree with MassDEP's conclusions about the length of half-lives and selection of PFAS – in part on the basis of similar half-lives and resultant serum concentrations.

<u>Use of the USEPA's Reference dose plus an additional safety factor for new data</u>

MassDEP based their reference dose on that of the USEPA from data published by Lau et al in an important paper from 2006. MassDEP then added an additional safety factor of about 3 to take into account new data indicating that effect levels might be lower and that the suite of effects observed in the animal models are developmental effects. I have reviewed this information and I conclude that MassDEP's reasoning is appropriate and scientifically supported. As more toxicology data becomes available, the reference dose may need to be lowered.

<u>Comparison with human effects</u>

As stated above, I have been particularly involved with human epidemiology of PFAS. MassDEP is aware of the efforts of the European Food Safety Authority (EFSA) to set guidelines for PFAS in food. On 24 February 2020, EFSA released their updated report for public comment (EFSA 2020), proposing a tolerable weekly intake (TWI) of 8 ng/kg-bw per week for the sum of four PFAS: PFOA, PFNA, PFHxS and PFOS. I will discuss the sum concept below. This TWI implies a daily value of just over 1 ng/kg-day, about a factor of five lower than the MassDEP reference dose of 5×10^{-6} mg/kg-d, i.e., 5 ng/kg-d. The EFSA value is based primarily on human epidemiology, in particular observed effects on the immune system (antibody response to vaccination). EFSA discusses other epidemiologic evidence as well and notes that the proposed TWI is protective for other potential critical endpoints, e.g., increased cholesterol. The EFSA TWI is based on a no effect level in human serum without any additional safety factors. Reference doses are of course designed to be protective. But it is important to note that human health effects of PFAS <u>can be</u> observed in general populations. MassDEPs drinking water standard, based on animal data with uncertainty factors, needs to be protective of human health in susceptible populations with an adequate margin of safety. It is similar in magnitude to that of EFSA, derived using different methods and data, and is thus scientifically supported.

<u>Sum of six PFAS</u>

As stated earlier, I have expertise in the toxicology of mixtures and my group is doing research on mixtures of PFAS. MassDEP's MCL applies to the sum of six PFAS: PFOA, PFOS, PFNA, PFHxS, PFHpA, as well as PFDA; the latter was added since the 2018 proposal. A number of elements go into this decision. 1) As discussed above, these six PFAS have similar, long half-lives, leading to accumulation and long periods of internal exposure. Internal doses will reflect external exposure in the same way, i.e., they can be treated together from a pharmacokinetic point of view. Pharmacokinetics can be used to calculate human effective doses. 2) Their target organs overlap and all are developmentally toxic. 3) Animal toxicology data have critical effect doses in similar ranges. There is not strong evidence that their potencies differ. As a result of these considerations, we can therefore assume that concentration addition is applicable. PFAS are typically found as mixtures in water, e.g., with AFFF as a source, leading to simultaneous exposure that should be taken into account. I conclude that MassDEP's decision to use the sum of the six PFAS is scientifically justified as a policy for water regulation. Similarly, EFSA (2020) applied their TWI to the sum of four PFAS (PFOA, PFOS, PFNA, PFHxS); they restricted to these four compounds in part because they are typically the most abundant in human serum.

Please feel free to contact me if you have any questions.

Sincerely,

Thomas F. Webster, D.Sc.
Professor

References

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Hoffman K, Webster TF, Bartell SM, Weisskopf MG, Fletcher T, Vieira VM. Private Drinking Water Wells as a Source of Exposure to PFOA in Communities Surrounding a Fluoropolymer Production Facility. *Environ Health Perspect* 2011; 119:92-97.

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From: Tracy Stewart <tracystewart903@gmail.com>
Sent: Friday, February 28, 2020 4:30 PM
To: Director-DWP, Program (DEP)
Cc: Kathy Michels; Diana Conway; Rebekah Thomson; Renee Scott; Diana Carpinone
Subject: PFAS MCL Comments

Dear MA DEP,

Please accept the attached PDF into the record for Public comment in the matter of PFAS MCL.

Sincerely,
Tracy Stewart
tracystewart903@gmail.com
C 617-797-1946

Attachment: PFAS MCL Comments _ MA DEP_Stewart_Medway SHPFC 02282020.pdf

Tracy Stewart
21 Lovering Street
Medway, MA 02053
Tracystewart903@gmail.com

Mass DEP
Drinking Water Program
1 Winter Street, 5th Floor
Boston, MA 02108

February 28, 2020

Dear Mr. Suuberg and Mass DEP staff,

I am a resident of Medway Massachusetts and a representative of the Safe Healthy Fields Coalition.
I would first like to thank you for your efforts to regulate PFAS in drinking water. I support MassDEP's proposal to regulate 6 PFAS with a Maximum Contaminant Level of 20 parts per trillion.

In the fall of 2019, initial findings indicate that synthetic turf carpet contains PFAS (linked). I do agree with the statements of MA DEP presenters during the public hearing that the PFAS findings are emerging. Many residents who have concerns about PFAS in Synthetic turf carpet are in relying on information from scientists and organizations including:

The Ecology Center, Jeff Gearhart:
https://www.ecocenter.org/toxic-forever-chemicals-infest-artificial-turf

Toxic Use Reduction Institute, UMass Lowell:
https://www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/PFAS_in_Artificial_Turf_Carpet

In the case of Franklin Massachusetts it is important to acknowledge some factors that could contribute to drinking water contamination from and artificial turf carpet (the plastic blades and/or backing):

- The field located at Beaver Pond / Chilson Beach was originally built in approximately 2004.
- The back end of the field is within 100 feet of the wetlands.
- in approx. 2004-2005, Franklin's Conservation Commission issued a special order of conditions to MA DEP to test both soil and water for various contaminants that could possibly leach from synthetic turf and/or the infill. Not only were these conditions never executed, they did not include testing for PFAS.
- the plastic grass surface was replaced in 2017, 11 rolls of the 2004 turf were left 35 feet from the wetlands.

Globe inquired about the piles of old turf, crews removed the material within hours.

Tracy Stewart held some runoff by the Beaver Street Field at Chilson Park in Franklin. THE BOSTON GLOBE/GLOBE STAFF

The Ecology Center also tested samples of turf installed this summer at Oliver Ames High School in Easton and found similarly high levels of another PFAS chemical. In addition, they tested eight other samples of turf blades, which they acquired directly from distributors of artificial turf, and found that all contained high amounts of fluorine, a chemical suggesting the presence of PFAS.

Synthetic turf (plastic) carpets are used for Athletic Fields, Playgrounds, Golf areas and Residential Landscaping (to name a few). In the case of Athletic Fields, the plastic fibers breakdown from use and are a source of Microplastics pollution.

Our Coalition has first-hand experience and documentation of the breakdown of plastic fibers and migration of infills. It is simple for anyone to theorize that rain, snow and other elements filtrating through an 85,000 square foot plastic playing field containing PFAS then runs off ultimately finding its way into soil, water and our supplies of food and drinking water. The Microplastics (as a source of PFAS) are enormous and I believe very much unknown as a source of microplastic pollution by scientists and environmentalists.

As I have observed the Beaver Street Field in Franklin Massachusetts for the past 4 years; there is an alarming amount of tire crumb rubber in the wooded area around the field and evidence of run off into the pond and wetlands. Additionally, there is so much microplastic in the same area it looks like piles of moss. You can view photos and video from 2018 and July 2019 and November 2019 HERE

Some important facts and calculations to note:
• Synthetic turf Carpet is NOT made of any recycled materials and is NOT recyclable in any closed-loop process.
• One Synthetic Turf Field is equivalent to approximately 3.2 million plastic bags.
• There are more than 15,000 Plastic Fields in the US. While we do not have an exact calculation, it is estimated that there are more than 400 plastic grass fields in Massachusetts, this estimation is a combination of municipal, private schools and Colleges/Universities.
• These fields often have direct uncontrolled drainage into their surroundings including urban stormwater, wetlands, streams and the ocean.
• Many Massachusetts communities have been permitted the construction of these fields within wetland protection areas and well head protection areas.

I offer these few examples, images can be found in this link.
Harvard University on Soldiers Field Road on the Charles River, DCR / Simmons College at the edge of the Charles, Medfield, Ma feet from Nantasket Brook (a tributary of the Charles), Franklin, Ma on a water Resource Area. And lastly but importantly: Westfield Ma, a community that is already severely impacted by PFAS: The Synthetic Turf Fields on Root Road are in the Zone II aquifer recharge area allocated to wells in neighboring Southampton, MA.

I am concerned that this proposed regulation does not go far enough in addressing the thousands of PFAS chemicals that are used in industrial processes and products used in synthetic turf fields. I respectfully request that you add a provision that allows for MassDEP to review the list of PFAS chemicals again within one year; apply test methods to detect total PFAS contamination in water; and regulate additional PFAS compounds in order to protect our drinking water from the contamination source.

I appreciate your time and consideration,

Tracy Stewart

From: Wendy Heiger-Bernays <whb@bu.edu>
Sent: Friday, February 28, 2020 7:04 PM
To: Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Commissioner Suuberg,

I am writing in support of the proposed revisions to the Massachusetts Contingency Plan to develop a drinking water standard for six PFAS (PFOS, PFOA, PFHpA, PFDA, PFHxS, and PFNA) chemicals.

Please find my attached comments.

Thank you for the opportunity to provide comment.

Respectfully,

Wendy

Wendy Heiger-Bernays, Ph.D. | Clinical Professor
Department of Environmental Health | Boston University School of Public Health
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Attachment: MCP Comments_HeigerBernays.pdf

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Mr. Martin Suuberg
Commissioner
Massachusetts Department of Environmental Protection
1 Winter Street
Boston, MA 02108

February 28, 2020

Subject: Revisions to the Massachusetts Contingency Plan, 310 CMR 40.0000 to develop a PFAS drinking water standard under the Massachusetts Drinking Water Regulations, 310 CMR 22.00

Dear Commissioner Suuberg,

I am writing in support of the proposed revisions to the Massachusetts Contingency Plan to develop a drinking water standard for six PFAS (PFOS, PFOA, PFHpA, PFDA, PFHxS, and PFNA) chemicals.

As a clinical professor of environmental health at the Boston University School of Public Health, I have been conducting research on chemical mixtures and specifically on mixtures of PFAS in animal and cell culture models. I have also been actively involved in the research and practice of risk assessment for environmental chemicals that require regulation. I serve on multiple science advisory committees – all of which focus on use of the best, most defensible science for decision making for setting public health protective levels of contaminants in the environment.

Reference Dose and MCL Derivation

Based on my comprehensive review of the available health and toxicological data, as well as my review of multiple other risk-based criteria for PFAS, the proposed MCL (GW-1 groundwater standard) of 20 ppt is robust, based on scientific data, incorporates a margin of protection. MassDEP has also taken into careful consideration the implementation of the MCL. I do, however have a couple of comments regarding the process for risk communication and the need to provide sufficient and actionable risk communication strategies.

MassDEP bases it's RfD on two animal toxicity studies selected for PFOA and PFOS that rely on sensitive developmental effects observed in rodents.[1,2] The lowest observed adverse effect level (LOAEL) and the no observed adverse effect level (NOAEL) from these two studies are consistent with numerous studies finding developmental, immune, kidney, and hepatic effects occurring at similar doses.[3,4] While MassDEP relies on Point(s) of Departure (POD) in a fairly tight dose range, there is accumulating evidence from epidemiological studies showing effects at lower doses (based on comparative serum concentrations) - changes in total cholesterol and immunotoxicity in children.[5,6] Animal studies also show effects occurring at lower doses than those that MassDEP used for selection of its POD, including increased liver weight, immunotoxicity, and development neurobehavioral and skeletal changes.[7,8,9,10,11] These studies provide evidence of adverse health effects occurring at exposures below the POD selected by MassDEP and EPA in deriving reference doses. MassDEP carefully considered and could have selected one of these studies, although these studies each had study design limitations and as such, were insufficient to form the basis for the derivation of the RfD. Rather than derive a less than robust RfD, it is entirely consistent with state of the practice to recognize the low dose effects occurring (in the other cited studies) with the application of an additional uncertainty factor of $10^{1/2}$ for database uncertainty. It is important to note that had immunotoxicity been identified as the critical effect, the resultant RfD would have been lower than 5×10^{-6} mg/kg-d.

It should be noted that the European Food Safety Authority (EFSA)[12] released their updated report for public comment on February 26, 2020, in which they propose a tolerable weekly intake (TWI) of 8 ng/kg-bw per week for the sum of four PFAS: PFOA, PFNA, PFHxS and

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[1] Lau C, Thibodeaux JR, Hanson RG, et al. Effects of perfluorooctanoic acid exposure during pregnancy in the mouse. *Toxicol Sci*. 2006;90(2):510-518. doi:10.1093/toxsci/kfj105

[2] Luebker DJ, Case MT, York RG, Moore JA, Hansen KJ, Butenhoff JL. Two-generation reproduction and cross-foster studies of perfluorooctanesulfonate (PFOS) in rats. *Toxicology*. 2005;215(1-2):126-148. doi:10.1016/j.tox.2005.07.018

[3] USEPA (U.S. Environmental Protection Agency). 2016a. Health Effects Support Document for Perfluorooctanoic acid (PFOA) US Environmental Protection Agency, Office of Water: Health and Ecological Criteria Division Washington, DC. http://www.epa.gov/dwstandardsregulations/drinking-water-contaminant-human-health-effects- information

[4] USEPA (U.S. Environmental Protection Agency). 2016b. Health Effects Support Document for Perfluorooctane Sulfonate (PFOS) US Environmental Protection Agency, Office of Water: Health and Ecological Criteria Division Washington, DC. http://www.epa.gov/dwstandardsregulations/drinking-water-contaminant-human-health-effects- information

[5] Grandjean P, Andersen EW, Budtz-Jorgensen E, Nielsen F, Mølbak K, Weihe P, Heilmann C. 2012. Serum vaccine antibody concentrations in children exposed to perfluorinated compounds. J Amer Med Assoc 307:391–397

[6] Chang S-C, Noker PE, Gorman GS, Gibson SJ, Hart JA, Ehresman DJ, Butenhoff J. 2012. Comparative pharmacokinetics of perfluorooctanesulfonate (PFOS) in rats, mice, and monkeys. Reprod Toxicol 33(4):428-440

[7] Dong GH, Zhang YH, Zheng L, Liu W, Jin YH, He QC. 2009. Chronic effects of perfluorooctanesulfonate exposure on immunotoxicity in adult male C57BL/6 mice. Arch Toxicol 83:805-815

[8] Das KP, Grey BE, Rosen MB, Wood CR, Tatum-Gibbs KR, Zehr RD, Strynar MJ, Lindstrom AB, Lau C. 2015. Developmental toxicity of perfluorononanoic acid in mice. Reprod Toxicol 51:133-144, DOI: 10.1016/j.reprotox.2014.12.012

[9] Onishchenko N, Fischer C, Wan Ibrahim WN, Negri S, Spulbur S, Cottica S, Ceccatelli S. 2011. Prenatal exposure to PFOS or PFOA alters motor function in mice in a sex-related manner. Neurotox Res 19:452-461

[10] Koskela A, Finnilä MA, Korkalainen M, Spulber S, Koponen J, Håkansson H, Tuukkanen J, Viluksela M. 2016. Effects of developmental exposure to perfluorooctanoic acid (PFOA) on long bone morphology and bone cell differentiation. Toxicol Appl Pharmacol 301:14-21

[11] Loveless SE, Slezak B, Serex T, Lewis J, Mukerji P, O'Connor JC, Donner EM, Frame SR, Korzeniowski SH, Buck RC. 2009. Toxicological evaluation of sodium perfluorohexanoate. Toxicology 264(1-2):32-44

[12] EFSA. 2020 Public consultation on the draft scientific opinion on the risks to human health related to the presence of perfluoroalkyl substances in food. http://www.efsa.europa.eu/en/consultations/call/public-consultation-draft-scientific-opinion-risks-human-health

PFOS. This TWI implies a daily value of just over 1 ng/kg-day, about a factor of five lower than the MassDEP reference dose of $5x10^{-6}$ mg/kg-d, i.e., 5 ng/kg-d. The EFSA value is based primarily on human epidemiology, in particular the observed effect on the immune system (antibody response to vaccination). EFSA discusses other epidemiologic evidence as well and notes that the proposed TDI is protective for other potential critical endpoints, e.g., increased cholesterol. The EFSA TDI is based on a no effect level in human serum without any additional safety factors. Reference doses are of course designed to be protective. But it is important to note that human health effects of PFAS can be observed in general populations. MassDEPs drinking water standard, based on animal data with uncertainty factors, needs to be protective of human health in susceptible populations with an adequate margin of safety. It is similar in magnitude to that of EFSA, derived using different methods and data, and is thus scientifically supported.

People are NOT exposed to single PFAS in their water. By adding the most prevalent and most pervasive PFAS, a default assumption of additivity is made. However, there is strong evidence that the critical effects (discussed above and all have effects on liver and development) are consistent for a suite of the longer carbon chain PFAS. There has been much discussion about the defensibility of the additivity model for the six selected PFAS. The approach to sum the six PFAS based on toxicokinetic similarities (e.g. similar half-lives) and equipotency across the compounds, relies on good, defensible data about the half-lives of these compounds. All of the half-lives of the six PFAS are all within 900-4500 days, with the exception of PFHpA which appears to be shorter. The data that define the half-life of PFDA is not as robust. The least robust data are for PFDA, which comes from a single study.[13] I point out that in its 2020 TWI derivation, EFSA combines PFOA, PFNA, PFHxS and PFOS, based on effects observed in humans and animal models, half lives and co-occurrence. Strict mechanistic additivity was not examined. There is no known common mechanism of action for these PFAS and in the absence of an alternative interactive model, it is not prudent to wait for the mechanism, nor is it defensible from a public health perspective to ignore the toxicities of these compounds in drinking water. I don't think that we can assume that each of these compounds is acting identically, but there is sufficient evidence to support an MCL that is based on the sum of multiple PFAS, as MassDEP has done.

Monitoring, Interpretation of MCL Exceedences and Public Information

The proposed requirement for an initial year of quarterly monitoring would provide better information on how pervasive PFAS contamination is throughout the Commonwealth. I urge the Department to consider removing options to waive the third and fourth quarters during this initial year period, as seasonal variation should be tested for before a water source is considered suitable for routine monitoring. Additionally, I urge MassDEP to remove the option for monitoring waivers for systems that do qualify for routine monitoring. Such waivers could allow

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[13] Zhang Y, Beesoon S, Zhu L, W. Martin J. Biomonitoring of Perfluoroalkyl Acids in Human Urine and Estimates of Biological Half-Life. *Environ Sci & Technol*. 2013;47(18):10619-10627. doi:10.1021/es401905e

contamination to go undetected in certain communities, particularly for smaller systems that often lack the monitoring and treatment but unfortunately put the health of these communities at risk.

I commend the decision to create a consumer notification system that would alert the public when a drinking water resource tested above the required MCL, even if the level is below the violation level. This effort to support the most vulnerable populations in knowing when they may need to access another source of drinking water is truly commendable. Additionally, reporting of PFAS in Community Public Water System's Consumer Confidence Reports provides information to concerned communities to understand their risk better. In the initial phase of the monitoring process, the public should have as much information as possible. Since the proposed MCL is based on developmental effects, exposure to high (exceeding the proposed MCL) levels of PFAS will be is problematic when it comes to risk communication and intervention. Consideration of the Imminent Hazard level will necessarily result in challenges ahead and I suggest that MassDEP develop suitable guidance for to address this situation. Additionally, it will be critical to involve local Boards of Health moving forward.

Thank you again for this opportunity to comment.

Please do not hesitate to contact me for more information.

Sincerely,

Wendy J Heiger-Bernays

Wendy Heiger-Bernays, Ph.D.
Clinical Professor of Environmental Health
whb@bu.edu

From: Heather Stayton <h.stayton@cityofwestfield.org>
Sent: Friday, February 28, 2020 2:03 PM
To: Director-DWP, Program (DEP)
Cc: David Billips (d.billips@cityofwestfield.org); Susan Phillips (s.phillips@cityofwestfield.org)
Subject: Comments on proposed 310 CMR 22.00 Changes

Dear Ms. DePeiza,

Attached please find the City of Westfield DPW-Water Division comment letter on the proposed changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00) regarding Per- and Poly Fluorinated Alkyl Substances (PFAS) and an MMCL. Please do not hesitate to contact me if there is an issue with the attachment or if you have any questions or concerns.

Sincerely,

Please note name and email change
Heather N. (Miller) Stayton, P.E.
Systems Engineer
City of Westfield, Massachusetts
h.stayton@cityofwestfield.org
(413) 572-6209

Attachment: Proposed MMCL Comments.pdf

CITY OF WESTFIELD, MASSACHUSETTS
Department of Public Works – Water Division
28 Sackett Street, Westfield, MA 01085-3572
(413) 572-6243

David Billips, Director
Francis Cain, Assistant Director

February 28, 2020

Ms. Yvette DePeiza, Director
Massachusetts Department of Environmental Protection
Drinking Water Program
One Winter Street, 5th Floor
Boston, Massachusetts 02108

Re: **Comments on Proposed Changes to the Massachusetts Drinking Water Regulations (310 CMR 22.00) via email to** program.director-dwp@mass.gov

Dear Ms. DePeiza,

As a community that is dealing with the very real consequences of Per- and Polyfluoroalkyl Substances (PFAS), the City of Westfield has a very real interest in the regulation of these substances. The Department of Public Works - Water Division (DPW-Water) has had to adapt, adjust, and alter their operations to continue to provide clean, safe drinking water through these challenging times, and offers the following comments for MassDEP consideration before moving forward with implementing any new rule.

The Massachusetts Water Works Association has worked closely with member communities to understand and address concerns regarding these emerging contaminants and their impact on drinking water production and delivery. As water supply professionals, we take our roles in the protection of public health very seriously, which is why we work with MWWA on these and other issues, and urge MassDEP to consider the comments MWWA has submitted carefully, and adjust rulemaking in light of them.

Our support for the leadership of MWWA on addressing these issues, and their submitted comments allow the DPW-Water division to tailor these comments to those of acute concern for Westfield. Of particular concern for the DPW-Water Division are two of the items within the proposed changes.

First, I have strong concerns about MassDEP's proposed MMCL compliance calculations including estimates of analytical results below the Minimum Reporting Level (MRL) and I urge MassDEP to exclude this from any final rule promulgated. Any detection below the MRL should not be reportable, nor counted towards compliance calculations at these low parts per trillion levels. The background PFAS concentrations that exist and the high likelihood for cross contamination requires that any PFAS sampling and testing be done with rigorous quality control using only scientifically and legally defensible methods. If water systems are to be held responsible for the results of these expensive laboratory tests, those results must be reliable. Any detection below the MRL is, by virtue of being below the MRL, unreliable. Not only could these unreliable results easily bring a community from compliance to non-compliance at the miniscule concentrations that are proposed, but slight variations in the PFAS background noise level of an instrument on the day that a sample is run could lead to costly public notifications, public mistrust in the safety of their drinking water, and expensive repeat sampling that (at this point) could take weeks to months to receive results from.

scientifically sound lab methods, with rigorous QA/QC procedures, scientifically peer reviewed, and laboratories who can perform these new methods and turn around results within the time frames required by MassDEP for costs that are not prohibitive to water utilities looking to comply. Until those are provided, results below the 2ppt MRL are not reliable, and requiring them to count against compliance or notification requirements at the level of one half that MRL is strictly arbitrary and inappropriate. Again, this should absolutely be excluded from any proposed rulemaking until and unless the science catches up and labs can provide the reliability and accuracy required.

And second, requiring Tier 2 public notification *prior to violation* of this proposed rule amounts to levying a fine without justification. Each Tier 2 notification that occurs in Westfield amounts to approximately $10,000 in printing and postage costs, not including all of the labor required to distribute copies to apartment complexes, mobile home parks, and other multi-resident rate payers, nor does it account for the countless phone calls, emails, and other follow up that takes place as the terrified public responds to required inflammatory language in these notices. Tier 3 notification should be adequate for keeping the public informed of any of the results and potential risks of levels that are not in violation.

Thank you for the opportunity to provide these comments. The City of Westfield, and in particular the DPW-Water Division, understands the importance of ensuring that the drinking water that reaches their customers meet Safe Drinking Water Act requirements and protect the public health. We work hard each and every day to meet these goals and satisfy our rate payers' expectations. As we have all come to be keenly aware, the issue of emerging contaminants presents a huge challenge. Compliance with regulatory standards will fall on water systems and MassDEP has an obligation to determine what the real human risk exposure is, and then, when and if the science dictates, move towards standards that will achieve desired public health outcomes. Please carefully consider the impact that these regulations will have on our cities, towns, and water utilities, along with their impact on the public and their confidence in the clean water being provided at their tap.

Sincerely,

Davis S. Billips
Director

Francis Cain
Assistant Director

Heather N. Stayton, P.E.
Systems Engineer

Steven Fernandes
Water Division Deputy

City of Westfield, Massachusetts
Department of Public Works
28 Sackett Street
Westfield, MA 01085

From: Kristen Mello WRAFT <klm.wraft@gmail.com>
Sent: Friday, February 28, 2020 4:57 PM
To: Director-DWP, Program (DEP); Director-DWP, Program (DEP)
Subject: PFAS MCL Comments

Dear Commissioner Suuberg,

Thank you for accepting these comments on the Per- and Polyfluoroalkyl Substances (PFAS) Maximum Contaminant Level (MCL) amendments that the Department of Environmental Protection (MassDEP) is proposing to 310 CMR 22.00, Massachusetts Drinking Water Regulations. My name is Kristen Mello. I offer these written comments, in addition to my oral comments at the Springfield and Boston hearings, as Director and Co-founder of Westfield Residents Advocating For Themselves (WRAFT), one of only two affected PFAS contaminated Community Members invited to the MassDEP PFAS MCL Stakeholder Group, and a recently elected (Nov. 2019) At-Large member of the City of Westfield's City Council. In this last capacity, while I do not speak for the City of Westfield itself, I do speak for the thousands of registered voters who have entrusted me to do so.

The proposed new regulation, establishing a Total MCL of 20 ppt for six PFAS contaminants: perfluorooctanesulfonic acid (PFOS), perfluorooctanoic acid (PFOA), perfluorohexane sulfonic acid (PFHxS), perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpS), and perfluorodecanoic acid (PFDA),
is a ***very good start*** toward addressing the decades long, slow-motion unfolding, environmental and public health disaster that is PFAS contamination facing Massachusetts communities like Westfield.

The proposed new regulation is a necessary, properly promulgated standard which will begin to give Baystate cities and towns the legal framework required to hold polluters accountable. **Absent federal regulations, state standards are the only way to ensure that those who profited from these chemistries for decades pay for their cleanup.** Without properly promulgated state standards those who, like Westfield residents, drank these man-made, persistent, bioaccumulating, toxic compounds will be left to continue to bear the environmental, financial, and medical burdens of these "forever chemicals".

As I said, these proposed amendments are a very good beginning toward decreasing our PFAS exposure and assembling the legal framework Massachusetts communities require, but is by no means all we need. These standards do not account for two things in particular:

1. **The toxicity of PFAS in mixtures.** Communities polluted by complex PFAS mixtures like those in Aqueous Film Forming Foams (AFFF) used by the military and fire service have been exposed to a broad range of PFAS, far more than the 6 covered in this regulation. In the legacy AFFF sample examined by UMASS Amherst, several hundred PFAS were discovered, with ~100 being identifiable, and only 10 found by a commercial laboratory using EPA 537. (Timme-Laragy paper in press)
2. **The 20ppt standard is not health protective of the MOST vulnerable populations in Massachusetts**, those developing children in expectant mothers who are from generations families living in over-exposed communities. All residents, especially children and pregnant

/nursing mothers, in Westfield and other contaminated communities, need their PFAS exposure to end, and our body burdens to decrease.

With over 4,700 PFAS, **we have neither the time nor the resources to investigate the individual and mixture toxicities in order to regulate each per-and polyfluoroalkyl substance one at a time**. I urge MassDEP to consider regulation by class, or subclass using structure / activity / functional group as a guide.

None of these man-made persistent, bioaccumulating, toxic compounds belong in the drinking water of residents who, under Article 97 of the state constitution are guaranteed the right to clean air and water.

Thank you for proposing these amendments, PLEASE keep them as written, and I hope to see future PFAS regulatory action in the very near future.

Very sincerely yours,

Kristen L. Mello

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Kristen Mello

co-founder, WRAFT

Westfield Residents Advocating For Themselves

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413.564.4772

From: Brendan Shea <bshea81@gmail.com>
Sent: Sunday, March 1, 2020 3:39 PM
To: Director-DWP, Program (DEP)
Subject: Regulate PFAS!

I support MassDEP's proposal to regulate 6 PFAS with a Maximum Contaminant Level of 20 parts per trillion.

However, I am concerned that this proposed regulation does not go far enough in addressing the thousands of PFAS chemicals that are used in industrial processes and products.

I respectfully request that you add a provision that allows for MassDEP to review the list of PFAS chemicals again within two or three years; apply test methods to detect total PFAS contamination in water; and regulate additional PFAS compounds in order to protect our drinking water.

Thank you,

Brendan Shea
Somerville, MA