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To: CDPHE

Let me introduce myself. I am the recently retired, after 40 years of federal service, Director of the National Institute of Environmental Health, part of the NIH, and of the National Toxicology Program, which involves NIH, FDA, and CDC. I am a past president of the Society of Toxicology, and an elected member of the National Academy of Medicine. I am also an adjunct professor at both Duke University and the University of North Carolina, Chapel Hill. I am a mother and grandmother who has children and grandchildren living in Colorado. My comments in no way reflect my former employer.

I applaud the efforts by the Colorado Department of Public Health and the Environment (CDPHE) to identify sources of per- and poly-fluoroalkyl substances (PFAS) in state waters and limit point and non-point pollution sources. The incredible persistence and mobility of PFAS chemicals in the environment means that small amounts can effectively poison large quantities of ground and surface waters. Their intense toxicity to people and wildlife should compel the state to invest heavily in preventing pollution, rather than paying the long-term price of water treatment and soil removal once contamination occurs. The department's Narrative Policy development is an important and timely step to identify and ultimately halt PFAS discharges into ground and surface water.

However, we are very concerned that the state will miss an important opportunity for prevention by setting unnecessarily high "translation" levels for ground and surface waters. Colorado has proposed to mirror EPA's health advisory level of 70 parts per trillion (ppt) of PFOS and PFOA, which it states were concentrations in drinking water, levels "at which adverse health effects are not anticipated to occur over a lifetime, and were based on the best science available at the time of completion."¹ However 70 ppt is now widely understood to be too weak to fully protect public health, particularly when exposures occur during pregnancy and childhood. This month CDPHE also increased its potential translation level for PFHxS by a factor of 10, to 700 ng/L making it the least protective trigger level for water quality in the country for this chemical. This makes no sense given the extreme biological persistence of PFHxS.

The state suggests that the translation levels are loosely based on EPA guidelines to avoid the need to "pick and choose" between other water guidelines. But the result is that Colorado could ignore emissions that render some state waters undrinkable, or in need of long-term and expensive treatment. Colorado should instead consider stronger protections, including using the recent toxicity assessments of the federal Center for Disease Control's ATSDR program, which proposed more potent toxicity values for several PFAS chemicals. Alternatively, five states have recently set or proposed more

¹ Cite CDPHE november

protective state standards for PFAS in groundwater and surface waters. They range from 11 to 47 parts per trillion for individual chemicals. Details follow.

Recommendation 1. Colorado should select a more health protective trigger level for at least PFOS+PFOA+PFNA in ground water and discharges to surface water

Colorado's draft translation level for 8- and 9-chain fluorochemicals largely mirrors the existing EPA drinking water health advisory, set in 2016. Yet just this year EPA's draft groundwater standard proposed a "screening level" of 40 ppt for the sum of PFOS and PFOA in groundwater - a level that would prompt additional testing and monitoring.²

Further observational studies of 70,000 people exposed to PFOA and other PFAS in West Virginia found an increased risk of ulcerative colitis and cancer after exposures in this range.³ Another set of studies demonstrate long-term immune suppression in children exposed in-utero and in early childhood to similar amounts of PFAS.⁴

Instead of using EPA's assessment, we suggest the state instead review the draft CDC's Agency for Toxic Substances and Disease Registry in toxicity estimates published 2018.⁵

Table 1 displays the ATSDR estimated toxic potencies for PFOS and PFOA and PFNA. ATSDR determined the chemicals are 6.7 and 10 times more potent than the EPA assessment. If Colorado were to follow EPA's process of converting the toxicity values into water standards, it would set with water levels that were in the 7 to 11 ppt range instead of 70 ppt. The ATSDR report affirms the state of Colorado determination that PFNA has similar potency to PFOS and PFOA, and we support this decision by CDPHE.

Table 1 ATSDR toxicity estimates PFAS are more up-to-date and potent than the EPA values

² EPA. 2019. Draft Interim Recommendations for Addressing Groundwater Contaminated with PFOA and PFOS. www.epa.gov/pfas/draft-interim-recommendations-addressing-groundwater-contaminated-pfoa-and-pfos

³ Cite C8 study

⁴ Grandjean P, Budtz-Jørgensen. 2013. Immunotoxicity of perfluorinated alkylates: calculation of benchmark doses based on serum concentrations in children. *Environmental Health*. 12:35, Available: <https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-12-35>

⁵ Agency for Toxic Substances and Disease Registry. 2018. Toxicological Profile for Perfluoroalkyls. Draft for Public Comment, June 2018. Available: <https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf>

Chemical	EPA reference dose	ATSDR reference dose	Relative difference in potency	EPA drinking water level ⁶	Estimated water levels derived from ATSDR assessment
PFOA	20 ng/kg/day	3 ng/kg/day	6.7-times more potent	70 ppt for PFOS+PFO	11 ppt
PFOS	20 ng/kg/day	2 ng/kg/day	10 times more potent	A	7 ppt
PFNA	NA	3 ng/kg/day	NA	NA	11 ppt

Recommendation 2. Colorado should select a more health protective screening level for PFHxS in ground water and discharges to surface water

Between its first and second meeting CDPHE actually *increased* its proposed translation level for PFHxS, the compound presently used in industrial fire-fighting, and a major water contaminant on and near Colorado military bases. PFHxS exposure should be of critical importance to CDPHE due to its continued use in military, industrial, and municipal fire-fighting, as well as legal use in dozens of consumer products.

Coloradans are heavily impacted by PFHxS in ground water. An estimated 70,000 residents of El Paso county drank contaminated groundwater for decades and continue to live on top of a plume of contaminated groundwater. A recent study by the Colorado School of Public Health found residents have on average 10-times more of the chemical in their blood than average for American adults, based on measurements from a large, statistically representative sample of adults in the United States.⁷ Residents down gradient from the Air Force Academy may be similarly affected. While the Air Force

⁶ EPA translates its reference dose into a water advisory level by assuming that a person drinks XX liters of water a day, and that drinking water makes up only 20% of the PFAS compounds a person ingests daily.

⁷ Barton, et al. 2019. Sociodemographic and behavioral determinants of serum concentrations of per- and polyfluoroalkyl substances in a community highly exposed to aqueous film-forming foam contaminants in drinking water. *International Journal of Hygiene and Environmental Health*. *In Press*, Available: <https://www.sciencedirect.com/science/article/abs/pii/S1438463919304419>

recently sampled well water for PFOS and PFOA it either did not analyze or did not report PFHxS levels in the wells.

Colorado justifies increasing its trigger level on the fact that ATSDR review found the chemical to be 10 times less potent than PFOS and PFOA. However, in doing so it ignored the actual toxicity estimate derived by ATSDR, which is identical to EPA's 2016 potency estimates for PFOS and PFOA. Since PFHxS shares many of the same toxic effects of PFOS and PFOA, but has a longer half-life than both in people, we believe that a maximum translation level of 70 is justifiable for our state.

Table 2. EPA and ATSDR toxicity estimates for PFHxS and other compounds

Chemical	Reference dose PFOS and PFOA	Reference dose PFHxS
ATSDR draft	2 and 3 ng/kg/day	20 ng/kg/day
EPA risk assessment	20 ng/kg/day	<i>Not developed yet</i>
Colorado proposal	EPA's 20 ng/kg/day	Proposal to use 200 ng/kg

Recommendation 3: Colorado should adopt the recent, and more protective state standards for ground and surface water for PFOA, PFOS, PFNA, PFHxS, PFHpA and PFDA

Most recently proposed drinking water levels enacted by other states review more recent toxicity studies and use more protective assumptions when translating individual toxic potency values to water standards. Thus, five states have proposed or enacted standards for groundwater that are lower than the EPA health advisory and Colorado's proposed trigger levels.

Table 3: Many states have set more health protective screening levels for ground water and surface water:

State	Water standard	Chemical	Value	Source
Groups of PFAS chemicals				

Vermont	Ground and drinking water	PFOS+PFOA +PFNA+ PFHxS+PFHpA	20 ppt	https://www.healthvermont.gov/sites/default/files/documents/pdf/ENV_DW_PFAAS.pdf
Massachusetts	Groundwater (<i>proposed</i>)	Sum of PFOA+PFOS +PFNA+PFHxS+PFHpA+ PFDA	20 ppt	https://www.mass.gov/doc/pfas-related-proposed-mcp-revisions-2019/download
Wisconsin	Groundwater (<i>proposed</i>)	PFOS+PFOA	20 ppt	https://www.cityofmadison.com/water/water-quality/water-quality-testing/perfluorinated-compounds
PFOA				
New Hampshire	Ground and drinking water	PFOA	12 ppt	https://www.des.nh.gov/media/pr/2019/20190628-pfas-standards.htm
New Jersey	Groundwater (<i>proposed</i>)	PFOA	14 ppt	https://www.nj.gov/dep/newsrel/2019/190021.htm
Minnesota	Groundwater	PFOA	35 ppt	
PFOS				

New Hampshire	Ground and drinking water	PFOS	15 ppt	https://www.des.nh.gov/media/pr/2019/20190628-pfas-standards.htm
New Jersey	Groundwater (<i>proposed</i>)	PFOS	13 ppt	https://www.nj.gov/dep/newsrel/2019/190021.htm
Minnesota	Groundwater (<i>proposed</i>)	PFOS	15 ppt	https://www.health.state.mn.us/communities/environment/risk/docs/guidance/gw/pfosinfo.pdf
PFNA				
New Jersey	Groundwater	PFNA	13 ppt	
New Hampshire	Ground and drinking water	PFNA	11 ppt	https://www.des.nh.gov/media/pr/2019/20190628-pfas-standards.htm
PFHxS				
Minnesota	Groundwater (<i>proposed</i>)	PFHxS	47 ppt	https://www.health.state.mn.us/communities/environment/hazardous/topics/pfcs.html#guidance-release

New Hampshire	Ground and drinking water	PFHxS	18 ppt	https://www.des.nh.gov/media/pr/2019/20190628-pfas-standards.htm
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Recommendation 4: Colorado must reduce the translation level for PFBS by 1000.

PFBS is a replacement chemical for PFOS and commonly used in consumer products. It is more mobile in ground water meaning that it travels further and faster than longer-chain compounds. EPA released a draft risk assessment for PFBS in November 2018 and proposed four different reference doses for PFBS based on the length of exposure. The values range from 10 to 100 ng/kg-day, which is only 2 to 5 times less potent than the EPA assessment for PFOS and PFOA.⁸ The National Toxicology Program released its peer reviewed technical report last year which demonstrates that PFBS causes the same liver and thyroid effects as does PFOA.

Advocacy groups, including Sierra Club and Public Employees for Environmental Responsibility, raised concerns about EPA’s draft assessment, suggesting ways it could be strengthened to more protect public health. But at a minimum, Colorado’s trigger level should be no more than 2 to 5 times higher than the 70 parts per trillion proposed for PFOS+PFOA. That means 140 to 350 ppt, rather than the proposed value that is 1000 times higher.

[conclusion]

CDPHE must greatly expand the scope of the PFAS Narrative Policy and look at other known source of PFAS in the environment, including biosolids, food packaging, car washes. CDPHE should also look at the totality of PFAS exposure, as there are approximately 5000 different PFAS which have been synthesized.

Ideally the narrative standard will be followed up by formal regulations and PFAS-specific water standards, coupled with enforcement to ensure that the state is fully protecting Coloradans from these toxic and highly persistent compounds.

⁸ EPA PFBS risk assessment

REFERENCES

TEDX, NRDC, Sierra Club, EWG comments - Docket EPA-HQ-OW-2018-0614-0001

Sincerely,

Linda S. Birnbaum, Ph.D., D.A.B.T., A.T.S.