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Perfluoroalkyl and Polyfluoroalkyl Substances: Using Law and Policy to Address These Environmental Health Hazards in the United States

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PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES: USING LAW AND POLICY TO ADDRESS THESE ENVIRONMENTAL HEALTH HAZARDS IN THE UNITED STATES

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INTRODUCTION

Public health concern continues to grow as research reveals more information about the potential health risks associated with exposure to perfluoroalkyl and polyfluoroalkyl substances, referred to collectively as PFAS.[1] PFAS are a large family of man-made chemicals that have been manufactured since the mid-20th century.[2] There are more than 3,000 compounds in the PFAS family, but only a few have been studied and receive regulatory attention, despite growing health and environmental justice concerns associated with exposure.[3] Adding to this concern is the lack of consistency in the regulatory actions that have been implemented. This article describes some of the legal and policy approaches that have been taken to phase out and regulate these contaminants.

Polytetrafluoroethylene (PTFE) was discovered by DuPont scientists in 1938 and was used until 1946 to develop atomic bombs for the Manhattan Project, which researched and developed nuclear weapons for use during World War II.[4] PFAS were later used in industrial and consumer products to make products stain-resistant,

1. Gloria B. Post, Jessie A. Gleason, & Keith R. Cooper, *Key Scientific Issues in Developing Drinking Water Guidelines for Perfluoroalkyl Acids: Contaminants of Emerging Concern*, 15 PLOS BIOLOGY 1, 2 (2017); *PFAS: About PFAS*, WASH. ST. DEP'T OF HEALTH, https://www.doh.wa.gov/CommunityandEnvironment/Contaminants/PFAS [https://perma.cc/YWF9-AJMM].

2. *Basic Information on PFAS*, U.S. ENV'T PROTECTION AGENCY, https://www.epa.gov/pfas/basic-information-pfas [https://perma.cc/HVL7-UF2B]; *Basic Information on PFAS*, EPA (Dec. 25, 2018), https://www.epa.gov/pfas/basic-information-pfas [https://perma.cc/9Q2Y-C8CU]; HISTORY AND USE OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS), INTERSTATE TECH. & REGUL. COUNCIL (Nov. 13, 2017), https://pfas-1.itrcweb.org/wp-content/uploads/2017/11/pfas_fact_sheet_history_and_use___11_13_17.pdf.

3. *Id.*; Diana P. Martin, *PFASs: If You Haven't Heard of Them, You Will Soon*, NICKEL REPORT (Mar. 30, 2017), https://www.huntonnickelreportblog.com/2017/03/pfass-if-you-havent-heard-of-them-you-will-soon/ [https://perma.cc/R2H6-G25H]. *See generally* U.S. ENV'T PROTECTION AGENCY, PFAS NAT'L LEADERSHIP SUMMIT (2018), https://www.epa.gov/sites/production/files/2018-08/documents/pfas-meeting-summary_final_508.pdf [https://perma.cc/66LM-LWDD] (providing an overview of discussions regarding efforts to monitor PFAS and address health concerns).

4. *See History of PTFE*, AFT FLUOROTEC, (Sep. 27, 2016), https://www.fluorotec.com/news/blog/the-history-of-ptfe/ [https://perma.cc/3K49-VN3Y]; Education in Chemistry, *The discovery of Teflon*, ROYAL SOC'Y OF CHEMISTRY (Oct. 31, 2008), https://edu.rsc.org/news/the-discovery-of-teflon/2020492.article [https://perma.cc/5KLT-ABJD].

waterproof, and nonstick.[5] Examples of widely used products containing PFAS include some firefighting foams, nonstick cookware, fast food containers, stain-resistant fabrics, and waterproof clothing and carpets.[6]

The presence of PFAS in humans was first suspected in the 1960s, but studies in the 1970s documented high concentrations of PFAS in exposed workers where PFAS were produced.[7] Soon after, laboratory testing confirmed that PFAS could be absorbed into the human body through inhalation and ingestion.[8] It was not until the late 1990s, through the National Health and Nutrition Examination Survey (NHANES), a program under the Centers for Disease Control and Prevention (CDC) to measure and assess health status, that PFAS were measured in the general U.S. population.[9]

PFAS Properties and Health Consequences of Exposure:

PFAS can migrate into soil, water, and air during production and use.[10] Some PFAS bioaccumulate, or build up in humans and animal tissue, and are persistent, remaining there for years.[11] They are also

5. *Basic Information on PFAS*, EPA (Dec. 25, 2018), https://www.epa.gov/pfas/basic-information-pfas [https://perma.cc/9Q2Y-C8CU]; INTERSTATE TECH. & REGUL. COUNCIL, *supra* note 2.

6. *See Perflouroalkyl and Polyflouroalkyl Substances (PFAS)*, NAT'L INST. OF ENV'T HEALTH SCI., https://www.niehs.nih.gov/health/topics/agents/pfc/index.cfm [https://perma.cc/KBH9-9L7P]; Mark Scialla, *What are PFASs, the Toxic Chemicals Being Found in Drinking Water?*, PBS NEWSHOUR (Aug. 12, 2016), https://www.pbs.org/newshour/science/pfas-toxic-chemical-millions-peoples-drinking-water [https://perma.cc/42D8-2FEK];_*How Can I Be Exposed?*, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR), https://www.atsdr.cdc.gov/pfas/health-effects/index.html [https://perma.cc/38AQ-9HJ7].

7. Philippe Grandjean & Richard Clapp, *Changing Interpretation of Human Health Risks from Perflourinated Compounds*, 129(6) PUB. HEALTH REP. 482 (2014).

8. *Id.*

9. *PFAS Blood Testing*, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR), https://www.atsdr.cdc.gov/pfas/pfas-blood-testing.html, [https://perma.cc/AW4Z-3NQK].

10. ATSDR, *supra* note 6; *What are PFAS?*, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR), https://www.atsdr.cdc.gov/pfas/health-effects/index.html, [https://perma.cc/7XKG-JHSV].

11. *Immunotoxicity Associated with Exposure to Perfluorooctanoic Acid (PFOA) or Perfluorooctane Sulfonate (PFOS),* NAT'L TOXICOLOGY PROGRAM, https://ntp.niehs.nih.gov/pubhealth/hat/noms/pfoa/indei.html [https://perma.cc/3LAL-DZPX]; NAT'L INST. OF ENV'T HEALTH SCI., FLAME RETARDANTS (July 2016), https://www.niehs.nih.gov/

persistent in the environment because they do not break down in air, water, or soil.[12] PFAS are also mobile (i.e., they can travel long distances through environmental media), so human exposures can occur beyond the physical location where PFAS are originally manufactured.[13]

More research is needed to adequately understand the health effects of PFAS exposure in animals and people. Some animal studies have linked PFAS exposure to health concerns such as adverse effects on the liver and immune system, as well as birth defects, delayed development, and newborn deaths.[14] Research on the effects of PFAS exposure in humans suggest that exposure may be associated with health issues such as increased cholesterol levels, changes in liver enzymes, decreased vaccine response in children, increased risk of high blood pressure or pre-eclampsia in pregnant women, decreases in infant birth weight, and increased risk of kidney or testicular cancers.[15] Widespread use of PFAS, coupled with their unique chemical properties, have led to detectable levels of PFAS in most people.[16] This is concerning due to evidence

health/materials/flame_retardants_508.pdf[https://perma.cc/7E3A-NLK9]; *PFAS in Pennsylvania: What's New*, PA. DEP'T OF ENV'T PROT., https://www.dep.pa.gov/Citizens/My-Water/drinking_water/PFAS/Pages/default.aspx [https://perma.cc/K6EZ-34NE]; Glenys Webster, *Potential Human Health Effects of Perfluorinated Chemicals (PFCs)*, NAT'L COLLABORATING CTR. FOR ENV'T HEALTH (Oct. 2010), http://www.ncceh.ca/sites/default/files/Health_effects_PFCs_Oct_2010.pdf [https://perma.cc/4V6S-2KTL].

12. Webster, *supra* note 11.

13. ATSDR, *supra* note 10; U.S. ENV'T PROTECTION AGENCY, TECHNICAL FACT SHEET – PERFLUOROOCTANE SULFONATE (PFOS) AND PERFLUOROOCTANOIC ACID (PFOA) (Nov. 2017), https://www.epa.gov/sites/production/files/2017-12/documents/ffrrofactsheet_contaminants_pfos_pfoa_11-20-17_508_0.pdf [https://perma.cc/6UN8-U7T3]. *See Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) in Drinking Water*, VT. DEP'T OF HEALTH, https://www.healthvermont.gov/environment/drinking-water/perfluoroalkyl-and-polyfluoroalkyl-substances-pfas-drinking-water [https://perma.cc/C3RY-CMPU].

14. *An Overview of Perfluoroalkyl and Polyfluoroalkyl Substances and Interim Guidance for Clinicians Responding to Patient Exposure Concerns*, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (May 7, 2018), https://www.atsdr.cdc.gov/pfc/docs/pfas_clinician_fact_sheet_508.pdf[https://perma.cc/3LXQ-VNP7]; Post et al., *supra* note 1, at 5–6; Scialla, *supra* note 6.

15. *Drinking Water Health Advisory for Perfluorooctane Sulfonate (PFOS)*, EPA (Jan. 7, 2019), https://www.epa.gov/sites/production/files/2016-05/documents/pfos_health_advisory_final-plain.pdf [https://perma.cc/V5NP-8JHJ]; ATSDR, *supra* note 14; ATSDR, *supra* note 6.

16. *Reducing Human Exposure to Highly Fluorinated Chemicals to Protect Public Health*, AM. PUB. HEALTH ASSOC. (APHA) (Nov. 1, 2016), https://www.apha.org/policies-and-advocacy/public-health-

suggesting that exposures to mixtures of PFAS may lead to adverse health conditions in humans;[17] additional research is necessary to further explore the extent to which PFAS exposure is associated with adverse health conditions.[18]

PFAS and Environmental Health Justice:

The burden of many public health problems, such as water-related health issues, is often disproportionately borne by certain at-risk populations, including communities of color and low-income communities.[19] While more research is necessary to understand how, and to what extent, PFAS exposure contributes to potential health inequities, research suggests that sources of PFAS contamination are often located near low-income communities.[20] Releases of PFAS from military sites, airports, industrial sites, and wastewater treatment plants—facilities near which low-income communities are often disproportionately located—can contaminate surface water and drinking water wells.[21] Data suggest that people who work or live near these sites may be at higher risk of exposure to PFAS through drinking water.[22] Additional analysis is necessary to better understand how PFAS exposure through various other channels, including consumer products, drinking water, or other materials, may disproportionately impact certain at-risk communities. Disparities in PFAS exposure may

policy-statements/policy-database/2016/12/21/reducing-human-exposure-to-highly-fluorinated-chemicals, [https://perma.cc/5ZKB-CSZ7]; *Per- and Polyfluoroalkyl Substances (PFAS) and Your Health,* AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (May 12, 2019), https://www.atsdr.cdc.gov/pfas/pfas-blood-testing.html [https://perma.cc/TM4G-UFBX].

17. *See* Webster, *supra* note 11.

18. APHA, *supra* note 16.

19. *Creating the Healthiest Nation: Water and Health Equity*, AM. PUB. HEALTH ASSOC. (APHA), https://www.apha.org/-/media/files/pdf/topics/equity/water_health_equity_factsheet.ashx?la=en&hash=B542106089AAAB7E7E3E4D1CFB408342A932831F [https://perma.cc/UHD8-EKGP].

20. *Id.*

21. APHA, *supra* note 16; Xindi C. Hu et al., *Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants,* 3 ENV'T SCI. & TECH. LETTERS 344, 344–350 (2016).

22. APHA*, supra* note 16.

exacerbate challenges these communities already face related to the disproportionate burden of disease and limited access to health care.[23]

This suggests that PFAS exposure may be a significant environmental justice issue that raises considerations about who should be responsible for cleaning up PFAS contamination. Researchers have noted that:

> . . . because there is not a federal maximum containment level nor any other federal regulation for these toxic chemicals, sites located in communities with access to more resources are being prioritized for cleanup. The costs of cleaning these sites up are staggering. For local water testing for PFAS contamination, not all communities can afford the tax hikes required to do weekly or biweekly monitoring, and as a result, don't have the same access to vital water quality information that higher-income communities have.[24]

Because PFAS exposure, and the growing data about the potentially associated health risks, may disproportionately impact low-income communities and people of color, who often lack the resources to obtain or perform appropriate testing or clean-up and struggle with aging infrastructure, it is important that PFAS laws, policies, and programs be contemplated, developed, and implemented through a lens of health equity and justice.

I. PHASE-OUT ACTIONS

Laws and policies are often implemented to limit the uses of toxic substances and mitigate the potential for human exposure.[25] Health concerns related to PFAS increased in the early 2000s and prompted

23. *See, e.g.*, Liza Gross, *Pollution, Poverty, and People of Color: Don't Drink the Water*, SCI. AM.: ENV'T HEALTH NEWS (June 12, 2020), https://www.scientificamerican.com/article/pollution-poverty-people-color-dont-drink-water/ [https://perma.cc/7XCK-H46V] (finding higher nitrate levels in the water systems of Latino communities); Katherine E. Boronow et al., *Serum concentrations of PFAS and exposure-related behaviors in African American and non-Hispanic white women*, 29 J. EXPOSURE SCI. & ENV'T ECOLOGY 206 (2019) (finding that PFAS exposure was influenced by the types of prepared foods consumed and varied by race).

24. Genna Reed, *PFAS Contamination is an Equity Issue, and President Trump's EPA is Failing to Fix it*, NE. UNIV. PFAS PROJECT LAB (Oct. 31, 2019), https://pfasproject.com/2019/10/31/pfas-contamination-is-an-equity-issue-and-president-trumps-epa-is-failing-to-fix-it/ [https://perma.cc/EC2R-BCHL].

25. *See* Claire McCarthy, *Lead Poisoning: What Everyone Needs to Know,* LONGWOOD SEMINARS (Feb. 2, 2016), https://hms.harvard.edu/sites/default/files/assets/OCER/files/Taking It All In Reading Materials Web.pdf [https://perma.cc/JQS4-N6S8].

phase-outs of certain PFAS in North American and European manufacturing.[26] Since that time, most legal and policy actions initiating the phase-out of these chemicals have addressed two of the most studied PFAS: perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA).[27] PFOS was voluntarily phased out by the chemical's primary U.S. manufacturer, 3M, between 2000 and 2002.[28] Phase-out of PFOA began in 2006 under the EPA's PFOA Stewardship Program.[29] Several other actions sought to move beyond phasing out just these two PFAS, some domestically, such as the Toxic Substances Control Act (TSCA)[30], and others internationally, like the Stockholm Convention.[31]

A. PFOA Stewardship Program

In 2006, the Environmental Protection Agency (EPA) invited eight of the major PFAS manufacturers to join the PFOA Stewardship Program and commit to working toward a global phaseout of PFOA and related chemicals.[32] The program was initiated in response to growing concerns about the impact of long-chain PFAS (perfluoroalkyl carboxylic acids, with eight or more carbons, or perfluoroalkane sulfonates, with six or more carbons) and PFOA on human health and the environment, including their widespread presence in the blood of people in the United States.[33] The program had two main goals: 1) reduce emissions and product content of PFOA, PFOA precursors, and

26. Hu et al., *supra* note 21, at 344.

27. *Fact Sheet PFOA & PFOS Drinking Water Health Advisories*, U.S. ENV'T PROT. AGENCY (Nov. 2016), https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf [https://perma.cc/K6BS-5WJY]; NAT'L TOXICOLOGY PROGRAM, *supra* note 11.

28. *Long-Chain Perfluorinated Chemicals (PFCs) Action Plan*, U.S. ENV'T PROT. AGENCY (Dec. 12, 2009), https://www.epa.gov/sites/production/files/201601/documents/pfcs_action_plan1230_09.pdf [https://perma.cc/6CFU-4A37] [hereinafter *Long-Chain PFCs*]; U.S. ENV'T PROT. AGENCY, *supra* note 27.

29. *Fact Sheet: 2010/2015 PFOA Stewardship Program*, U.S. ENV'T PROT. AGENCY (Aug. 9, 2018), https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program [https://perma.cc/7EUF-NJVR].

30. *See Summary of the Toxic Substances Control Act*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/laws-regulations/summary-toxic-substances-control-act [https://perma.cc/R3BU-JSHP].

31. *Stockholm Convention*, UNIDO, https://www.unido.org/our-focus/safeguarding-environment/implementation-multilateral-environmental-agreements/stockholm-convention [https://perma.cc/649Z-YJSC].

32. U.S. ENV'T PROT. AGENCY, *supra* note 29. *See also* INTERSTATE TECH. & REGUL. COUNCIL, *supra* note 2.

33. U.S. ENV'T PROT. AGENCY, *supra* note 29.

higher homologues by 95% by 2010, using PFOA levels from 2000 as a baseline, and 2) achieve complete elimination by 2015.[34] The eight participating companies provided baseline data on levels of PFOA emissions and product content and submitted annual progress reports to EPA.[35] The companies supported a global stewardship program in which they committed to work toward phase-outs of PFOA and related chemicals for their U.S. and global operations.[36] Participants in the Stewardship Program also worked with EPA to create analytical standards and laboratory methods that were both scientifically credible and comparable for reporting.[37] All eight companies reported in their 2016 final reports that they had met the goals set out for the program, and EPA has reported that the manufacture and import of PFOA has been phased out in the United States.[38]

B. TSCA

The Toxic Substances Control Act,[39] enacted in 1976, requires chemical manufacturers to notify EPA before manufacturing a new chemical or using an in-use chemical for a significant new use.[40] TSCA grandfathered in approximately 62,000 chemicals, including PFAS, that were already in commerce, meaning they were beyond EPA's scope of review.[41] As a result, PFAS remained extensively used for several more decades after the law was first enacted.[42]

However, under TSCA's Section 5 Significant New Use Rules (SNURs),[43] EPA can require chemical manufacturers to notify the agency before manufacturing or importing a chemical. Upon notification, EPA can determine whether the "relevant chemical substance or significant new use presents an unreasonable risk of injury

34. *Id.*

35. *Id.*

36. *Id.*

37. *Id.*

38. U.S. ENV'T PROT. AGENCY, *supra* note 29.

39. Toxic Substances Control Act, 15 U.S.C. § 2601 (2018).

40. U.S. ENV'T PROT. AGENCY, *supra* note 30.

41. Sheldon Krimsky, *The Unsteady State and Inertia of Chemical Regulation Under the US Toxic Substances Control Act,* PLOS BIOLOGY, Dec. 18, 2017, at 3.

42. Grandjean & Clapp, *supra* note 7, at 484. *See* NAT'L TOXICOLOGY PROGRAM, *supra* note 11.

43. Toxic Substances Control Act, 15 U.S.C. § 2604 (2018).

to health or the environment."[44] EPA also reviews substitute substances for PFOA or other PFAS to ensure that any new substances are safer alternatives.[45] These alternatives are also subject to the testing requirements under TSCA Section 5.[46] EPA has used this authority to require manufacturers to notify the agency before manufacturing or importing certain PFAS chemicals designated by the agency and to report any use of PFOA or related alternatives.[47] In June 2020, EPA finalized the Significant New Use Rule that allows the agency to review a list of products that contain PFAS prior to their manufacture, sale, or importation to the United States.[48] This rule provides EPA authority to require notice and allow for agency review prior to allowing the use of listed PFAS that had been phased out, and prevent importation of certain products containing PFAS surface coatings.[49]

TSCA Section 6 sets requirements for imports and exports applicable to certain chemicals.[50] Under Section 6,[51] if after evaluating the risks of the manufacture, use, or other related distribution of a chemical, EPA finds the chemical to pose an unreasonable risk of injury to health or the environment, the agency can conduct rulemaking for the chemical.[52] In 2009, EPA published an Action Plan Summary to declare its intent to consider banning or restricting manufacture,

44. Toxic Substances Control Act, 15 U.S.C. § 2604(3)(A) (2018); *Actions Under TSCA Section 5,* EPA, https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/actions-under-tsca-section-5#SNURs [https://perma.cc/PAJ8-FMLB].

45. *New Chemicals Program Review of Alternatives for PFOA and Related Chemicals*, EPA (Sep. 13, 2018), https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/new-chemicals-program-review-alternatives-pfoa-and [https://perma.cc/YGY7-MWTH].

46. *Id.*

47. *Risk Management for Per- & Polyflouroalkyl Substances (PFAS) Under TSCA*, U.S. ENV'T PROT. AGENCY (Jan. 14, 2021), https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-and-polyfluoroalkyl-substances-pfass [https://perma.cc/T26J-54T8].

48. *EPA Takes Action to Stop Use of Certain PFAS in Products and Protect American Consumers*, EPA (June 22, 2020), https://www.epa.gov/newsreleases/epa-takes-action-stop-use-certain-pfas-products-and-protect-american-consumers [https://perma.cc/S2KG-CDFA].

49. *Id.*

50. *TSCA Section 6 Import/Export Requirements for Specific Chemicals*, EPA (Aug. 8, 2019), https://www.epa.gov/tsca-import-export-requirements/tsca-section-6-importexport-requirements-specific-chemicals [https://perma.cc/L7KP-TEHB].

51. Toxic Substances Control Act, 15 U.S.C. § 2605 (2018).

52. *Regulation of Chemicals Under Section 6(a) of the Toxic Substances Control Act*, EPA, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/regulation-chemicals-under-section-6a-toxic-substances [https://perma.cc/28V9-RPZW].

processing, and use of long-chain PFAS chemicals under section 6 rulemaking.[53] Even with these phase-out measures, PFAS are still largely present in the environment.[54] Because of their mobility, some PFAS are found even in places where the chemicals were not used or manufactured.[55] Although the United States and other developed countries have taken steps to phase out some of these chemicals, other countries still produce them. For instance, manufacturers in China began large-scale production of PFOS in 2003.[56] Therefore, the gains of phase-out efforts may be offset by increases in production in other regions around the globe.[57] However, international groups have initiated global efforts to reduce the use of some of these chemicals. For example, the World Bank approved a project to reduce and phase out PFOS in China and adopt best practices for acceptable uses under the Stockholm Convention.[58]

C. Stockholm Convention

The United Nations Environment Programme's Stockholm Convention was ratified in 2004 as "a global treaty to protect human health and the environment from persistent organic pollutants (POPs)."[59] The Convention aims to eliminate or reduce the release of POPs.[60] Appendix B of the Convention lists the chemicals slated for elimination in production and use by the 182 parties to the Convention, except those that are produced for acceptable purposes (e.g., use in photo imaging and certain medical devices) or that are under a specific exemption.[61] In 2009, Appendix B included PFOS and related chemicals

53. *Long-Chain PFCs*, *supra* note 28.

54. NAT'L TOXICOLOGY PROGRAM, *supra* note 11.

55. INTERSTATE TECH. & REGUL. COUNCIL, *supra* note 2.

56. *Long-Chain PFCs*, *supra* note 28.

57. Hu et al., *supra* note 21, at 344–345.

58. *Reduction and Phaseout of PFOS in Priority Sectors*, WORLD BANK, https://projects.worldbank.org/en/projects-operations/projectdetail/P152959?lang=en [https://perma.cc/AUD6-G72Y].

59. UNIDO, *supra* note 31.

60. *Acceptable Purposes,* UNEP, http://chm.pops.int/Implementation/Exemptions/AcceptablePurposes/tabid/793/Default.aspx [https://perma.cc/U2HJ-KP7J].

61. *Specific Exemptions*, STOCKHOLM CONVENTION, http://chm.pops.int/Implementation/Exemptions/SpecificExemptions/tabid/1133/Default.aspx [https://perma.cc/GU68-2V6S]; *Acceptable Purposes*, STOCKHOLM CONVENTION, http://chm.pops.int/Implementation/Exemptions/AcceptablePurposes/tabid/793/Default.aspx [https://perma.cc/RS45-VZZ2]; Status of Ratification, STOCKHOLM CONVENTION, http://chm.pops.int/Countries/StatusofRatifications/PartiesandSignatoires/tabid/4500/Default.aspx [https://perma.cc/8A7Z-2368].

and perfluorooctane sulfonyl fluoride (PFOSF) as chemicals slated for reduction and elimination.[62] In 2019, the parties to the Convention amended the acceptable purposes and specific exemptions for those compounds.[63] The same year, the Convention also added PFOA and related chemicals in Appendix A, which lists chemicals for which parties must take measures to eliminate in production and use.[64] The United Nations Environment Programme provides guidance on how parties to the Convention can inventory products containing PFOS and related chemicals and industrial processes using these chemicals, which provides baseline data on the presence of PFOS in each country that is a party to the treaty.[65] This information helps parties develop plans to meet elimination or reduction obligations as described in the Convention.[66]

Since these widespread phase-out actions began, studies have shown that the levels of some PFAS present in blood of the general population have been decreasing.[67] Specifically, data collected under NHANES have demonstrated that PFOA and PFOS levels have decreased in the U.S. general population as a result of these important initiatives.[68] Continued implementation of various phase out actions that reduce the manufacture and use of PFAS, including PFOA and PFOS, may continue these trends that can lead to significant public health benefit.

62. UNEP, GUIDANCE FOR THE INVENTORY OF PERFLUOROOCTANE SULFONIC ACID (PFOS) AND RELATED CHEMICALS LISTED UNDER THE STOCKHOLM CONVENTION ON PERSISTENT ORGANIC POLLUTANTS (Jan. 2017), http://chm.pops.int/Portals/0/download.aspx?d=UNEP-POPS-NIP-GUID-InventoryPFOS-201701.En.pdf [https://perma.cc/7G7X-5DLJ].

63. *Ninth Meeting of the Conference of the Parties to the Stockholm Convention*, UNEP, http://chm.pops.int/TheConvention/ConferenceoftheParties/Meetings/COP9/tabid/7521/Default.aspx [https://perma.cc/55JD-YAJN].

64. *Id.*; *Chemicals Listed in Annex A,* UNEP, http://chm.pops.int/Implementation/Alternatives/AlternativestoPOPs/ChemicalslistedinAnnexA/tabid/5837/Default.aspx [https://perma.cc/4GW5-2VJJ].

65. *Guidance for the Inventory of Perfluorooctane Sulfonic Acid and Related Chemicals Listed Under the Stockholm Convention on POPs,* UNEP, http://chm.pops.int/Implementation/NIPs/Guidance/GuidancefortheinventoryofPFOS/tabid/3169/Default.aspx [https://perma.cc/XL39-8X8P].

66. *Id.*

67. *An Overview of Perfluoroalkyl and Polyfluoroalkyl Substances and Interim Guidance for Clinicians Responding to Patient Exposure Concerns,* AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (June 7, 2017), https://www.atsdr.cdc.gov/pfc/docs/pfas_clinician_fact_sheet_508.pdf[https://perma.cc/N88T-VNJP]; U.S. ENV'T PROT. AGENCY, *supra* note 27.

68. ATSDR, *supra* note 16. ATSDR, *supra* note 67.

II. CURRENT FEDERAL APPROACHES

PFAS have not been consistently regulated by either U.S. states or the federal government.[69] However, several federal laws have recently been drafted to regulate PFAS more uniformly and expand upon current federal statutes, including the Toxic Substances Control Act (TSCA), the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), and the Clean Air Act.[70]

While extensive drinking water regulations in the United States have created one of the cleanest and safest water systems in the world, the levels of PFAS in drinking water have become one of the biggest exposure concerns related to these chemicals.[71] Because of these concerns, several federal statutes, regulations, and advisories have been implemented to address PFAS contamination.

A. Safe Drinking Water Act

Some state governments have taken actions to monitor PFAS in drinking water through authority under the Safe Drinking Water Act (SDWA).[72] In fact, most direct oversight under the SDWA occurs under state drinking water programs, which are permitted by EPA to implement the SDWA requirements and as long as they adopt standards that are at least as stringent as EPA's standards.[73] All states and territories, except Wyoming and Washington, D.C., have applied

69. Martin, *supra* note 3.

70. *Environmental Law Update: The Forever Chemicals: New Concerns With Per- and Polyfluoroalkyl Substances*, AM. BAR ASSOC., https://www.americanbar.org/groups/real_property_trust_estate/publications/probate-property-magazine/2020/march-april/the-forever-chemicals-new-concerns-per-and-polyfluoroalkyl-substances/, [https://perma.cc/44Z9-HDP4]; *PFAS Laws and Regulations*, EPA (Nov. 17, 2020), https://www.epa.gov/pfas/pfas-laws-and-regulations [https://perma.cc/Q73Q-D9KZ].

71. *Water Quality Division: Safe Drinking Water: Drinking Water and Your Health,* ARIZ. DEP'T OF ENV'T QUALITY, http://legacy.azdeq.gov/environ/water/dw/health.html [https://perma.cc/P377-KR8S]; Martin, *supra* note 3; Xindi C. Hu et al., *Detection of Poly- and Perfluoroalkyl Substances (PFASs) in U.S. Drinking Water Linked to Industrial Sites, Military Fire Training Areas, and Wastewater Treatment Plants*, ENV'T SCI. & TECH. LETTERS 3(10) 344, 345 (2016).

72. *Summary of the Safe Drinking Water Act*, U.S. ENV'T PROT. AGENCY (Aug. 3, 2020), https://www.epa.gov/laws-regulations/summary-safe-drinking-water-act [https://perma.cc/DS56-CCGN].

73. *Understanding the Safe Drinking Water Act*, U.S. ENV'T PROT. AGENCY (June 30, 2004), https://www.epa.gov/sites/production/files/2015-04/documents/epa816f04030.pdf [https://perma.cc/ZN6F-6X3Z].

for and been granted the authority to adopt and implement their own drinking water standards.[74]

The SDWA directs EPA to publish a list of contaminants on the Contaminant Candidate List (CCL), which EPA can decide to regulate through legally-enforceable standards known as National Primary Drinking Water Regulations (NPDWR).[75] These regulations limit contaminants in drinking water by setting maximum contaminant levels (MCLs).[76]

A contaminant can be added to the NPDWRs if evidence shows that it presents a public health risk in drinking water.[77] Before deciding whether to regulate a contaminant, EPA compiles information based on monitoring and evaluation under the Unregulated Contaminant Monitoring Rule (UCMR), which requires EPA to issue a list of up to thirty unregulated contaminants to monitor every five years, and the CCL, which is largely the basis for selection of contaminants for the UCMR.[78] Together, the UCMR and CCL require data collection and evaluation for specified chemicals known or anticipated to occur in public water systems.[79] Under the UCMR, laboratories that have been approved by EPA analyze contaminants and report data based on established reporting guidelines.[80] To create the CCL, EPA first publishes a draft list for public comment and then creates the final list after considering those comments.[81] The CCL and UCMR provide data

74. *Id.*

75. *Basic Information on the CCL and Regulatory Determination*, EPA, https://www.epa.gov/ccl/basic-information-ccl-and-regulatory-determination [https://perma.cc/ED4N-6Z2Z].

76. *PFAS Laws & Regulations*, U.S. ENV'T PROT. AGENCY (Nov. 17, 2020), https://www.epa.gov/pfas/pfas-laws-and-regulations [https://perma.cc/GHK7-DA74; *National Primary Drinking Water Regulations*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#one [https://perma.cc/7BK6-PXZK].

77. *How EPA Regulates Drinking Water Contaminants*, EPA (Jan. 27, 2020), https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#one [https://perma.cc/6SXX-N84C].

78. *Learn About the Unregulated Contaminant Monitoring Rule*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/dwucmr/learn-about-unregulated-contaminant-monitoring-rule [https://perma.cc/9P2A-BHNU].

79. *Id.*

80. *Id.*

81. *Basic Information on the CCL and Regulatory Determination*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/ccl/basic-information-ccl-and-regulatory-determination#does-ccl-impose [https://perma.cc/LK3F-TD9J]; *SWDA Evaluation & Rulemaking Process*, U.S. ENV'T PROT. AGENCY (Jan. 27, 2020),

on the prevalence and public health risk posed by exposure, information that supports EPA in determining whether regulations for a specific contaminant are necessary.[82] Every five years, EPA must engage in a Regulatory Determination through which it considers whether to regulate at least five contaminants from the most recent CCL.[83] EPA publishes its preliminary determination for public comments prior to making the final regulatory determination.[84] If EPA makes a positive determination, it will establish a NPDWR for the specific contaminant.[85]

EPA has collected data on some PFAS under the UCMR and listed PFOS and PFOA on CCL4, which was published in 2016.[86] EPA's 2019 PFAS Action Plan detailed the agency's commitment to moving forward with the MCL process for PFOA and PFOS and evaluating data to determine whether a broader class of PFAS should be regulated.[87] In December 2019, EPA sent its preliminary determinations for the candidates on CCL4, which included PFOA and PFOS.[88] The agency then issued its preliminary determinations for both contaminants on February 20, 2020.[89] Public comment for the proposed rulemaking was open during March 10–June 10, 2020, at which point

https://www.epa.gov/sdwa/sdwa-evaluation-and-rulemaking-process [https://perma.cc/8JZ8-7RL4].

82. U.S. ENV'T PROT. AGENCY, *supra* note 76; Drinking Water Contaminant Candidate List 4-Final, 81 Fed. Reg. 81099 (Nov. 17, 2016); For the minimum reporting levels for 30 contaminants, see *Third Unregulated Contaminant Monitoring Rule*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule [https://perma.cc/WX7A-YQLQ].

83. U.S. ENV'T PROT. AGENCY, *supra* note 75.

84. *Id.*; U.S. ENV'T PROT. AGENCY, *supra* note 81.

85. *Basic Information on the CCL and Regulatory Determination*, EPA (Feb. 1, 2021), https://www.epa.gov/ccl/basic-information-ccl-and-regulatory-determination [https://perma.cc/6SXX-N84C]; U.S. ENV'T PROT. AGENCY, *supra* note 81.

86. U.S. ENV'T PROT. AGENCY, *supra* note 82; Drinking Water Contaminant Candidate List 4-Final, 81 Fed. Reg. 81099, 81104 (2016).

87. *EPA's PFAS Action Plan: A Summary of Key Actions*, U.S. ENV'T PROT. AGENCY, https://www.epa.gov/sites/production/files/201601/documents/pfcs_action_plan1230_09.pdf [https://perma.cc/YCB4-D2SU].

88. *See, e.g.*, *EPA Announces Proposed Decision to Regulate PFOA & PFOS in Drinking Water*, U.S. ENV'T PROT. AGENCY (Feb. 20, 2020), https://www.epa.gov/newsreleases/epa-announces-proposed-decision-regulate-pfoa-and-pfos-drinking-water [https://perma.cc/ZW3S-2J7U].

89. *EPA Continues to Act on PFAS, Proposes to Close Import Loophole and Protect American Consumers*, EPA (Feb. 20, 2020), https://www.epa.gov/newsreleases/epa-continues-act-pfas-proposes-close-import-loophole-and-protect-american-consumers [https://perma.cc/TZF6-NSTQ].

EPA is expected to review the comments before promulgating a final rule.[90] Also in 2019, EPA released PFAS Groundwater Guidance for Federal Cleanup Programs, as was outlined in the PFAS Action Plan.[91] These guidelines recommend a screening level of 40 ppt to determine whether PFOA or PFOS are present and reference EPA's health advisory for the preliminary remediation goal for contaminated groundwater that is a current or potential source of drinking water.[92]

B. EPA's Health Advisories

Emerging contaminants are chemicals "characterized by a perceived, potential, or real threat to human health or the environment or by a lack of published health standards."[93] Drinking water contaminants that are considered to be of emerging public concern are not initially regulated by enforceable standards under the SDWA.[94] Instead, EPA may issue health advisories (HAs) for these emerging contaminants, as has been the case for PFOA and PFOS.[95]

HAs are created based on EPA's assessment of peer-reviewed science and are used to "provide information on contaminants that can

90. *Preliminary Regulatory Determinations for Contaminants on the Fourth Drinking Water Contaminant Candidate List*, REGULATIONS.GOV (Mar. 9, 2020), https://www.regulations.gov/document?D=EPA-HQ-OW-2019-0583-0001 [https://perma.cc/H9XT-BCUE].

91. *EPA Releases PFAS Groundwater Guidance for Federal Cleanup Programs, Fulfilling PFAS Action Plan Commitment*, EPA (Dec. 20, 2019), https://www.epa.gov/newsreleases/epa-releases-pfas-groundwater-guidance-federal-cleanup-programs-fulfilling-pfas-action [https://perma.cc/Z5P9-7E23].

92. *Id.*

93. ATSDR, *supra* note 67. *Emerging Contaminants–Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA),* EPA (Mar. 2014), https://nepis.epa.gov/Exe/ZyNET.exe/P100LTG6.TXT?ZyActionD=ZyDocument&Client=EPA&Index=2011+Thru+2015&Docs=&Query=&Time=&EndTime=&SearchMethod=1&TocRestrict=n&Toc=&TocEntry=&QField=&QFieldYear=&QFieldMonth=&QFieldDay=&IntQFieldOp=0&ExtQFieldOp=0&XmlQuery=&File=D%3A%5Czyfiles%5CIndex%20Data%5C11thru15%5CTxt%5C00000014%5CP100LTG6.txt&User=ANONYMOUS&Password=anonymous&SortMethod=h%7C-&MaximumDocuments=1&FuzzyDegree=0&ImageQuality=r75g8/r75g8/x150y150g16/i425&Display=hpfr&DefSeekPage=x&SearchBack=ZyActionL&Back=ZyActionS&BackDesc=Results%20page&MaximumPages=1&ZyEntry=1&SeekPage=x&ZyPURL [https://perma.cc/4QVD-G7LS].

94. *Basic Information on the CCL and Regulatory Determination*, EPA (Feb. 1, 2021), https://www.epa.gov/ccl/basic-information-ccl-and-regulatory-determination [https://perma.cc/6SXX-N84C].

95. *Drinking Water Health Advisories for PFOA and PFOS*, EPA (Dec. 9, 2020), https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos [https://perma.cc/7DVV-LB5K].

cause human health effects and are known or anticipated to occur in drinking water."[96] HAs are unenforceable guidelines that provide federal, state, and local public health officials with technical, scientific guidance about how best to protect the public's health against emerging contaminants.[97] EPA's Health Advisory Program publishes values for concentrations of drinking water contaminants at or below which there are no anticipated cancer risk and no carcinogenic health effects over specific durations, such as a lifetime of exposure.[98]

EPA may decide to create an HA instead of regulating contaminants on the CCL.[99] When determining whether to regulate a contaminant through NPDWRs, EPA considers 1) whether it may have adverse health effects; 2) the likelihood that it will frequently occur in public water systems at levels of concern; and 3) whether regulating the contaminant would provide a meaningful opportunity for health risk reduction.[100] HAs are often used in efforts to communicate risks sooner than regulatory requirements can be put in place, as NPDWRs are created only if robust scientific health and occurrence data are

96. *Id.*

97. *Provisional Health Advisories for Perfluorooctanoic Acid (PFOA) & Perfluorooctane Sulfonate (PFOS)*, U.S. ENV'T PROT. AGENCY (Jan. 8, 2009), https://www.epa.gov/sites/production/files/2015-09/documents/pfoa-pfos-provisional.pdf [https://perma.cc/W33M-JA76] [hereinafter *Provisional Health Advisories for PFOA & PFOS*]; *Emerging Contaminants and Drinking Water Health Advisories*, U.S. ENV'T PROT. AGENCY (Dec. 7, 2016), https://www.epa.gov/sites/production/files/2016-12/documents/emerging_contaminants-health_advisories.pdf [https://perma.cc/SFL2-HQMB]; *Drinking Water Health Advisories for PFOA and PFOS*, U.S. ENV'T PROT. AGENCY (Dec. 9, 2020), https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos [https://perma.cc/7DVV-LB5K].

98. U.S. ENV'T PROT. AGENCY, 2018 EDITION OF THE DRINKING WATER STANDARDS AND HEALTH ADVISORIES TABLES (2018), https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf [https://perma.cc/2YZN-P2JU].

99. *Drinking Water Health Advisories for PFOA and PFOS*, EPA (Dec. 9, 2020), https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos [https://perma.cc/7DVV-LB5K].

100. *Basic Information on the CCL and Regulatory Determination*, EPA (Feb. 1, 2021), https://www.epa.gov/ccl/basic-information-ccl-and-regulatory-determination [https://perma.cc/6SXX-N84C].

available.[101] EPA created its first Provisional Health Advisory for PFOA and PFOS in 2009.[102]

EPA issued new HAs in May 2016 after evaluating the latest scientific studies on the health effects of PFAS.[103] These new advisories reduced the levels of PFOA and PFOS in drinking water that were set in in the 2009 provisional HAs (200 ppt for PFOA and 400 ppt for PFOS, individually) to 70 ppt for PFOA and PFOS concentrations, individually or combined.[104] If water samples from a particular water system confirm that concentrations of PFOA and PFOS exceed 70 ppt, EPA recommends conducting additional sampling to confirm the results and notifying the state drinking water safety agency.[105] EPA also recommends that water systems and public health officials take steps to limit exposure and provide notice and explanation of PFAS-associated risks to consumers of the water system.[106] A notice to consumers should include information about risks to specific populations, actions the water system is taking, and actions individuals can take to limit their exposure.[107] EPA is also studying new technologies that can be used to remove PFAS in drinking water

101. *Emerging Contaminants and Drinking Water Health Advisories*, EPA (Dec. 7, 2016), https://www.epa.gov/sites/production/files/2016-12/documents/emerging_contaminants-health_advisories.pdf [https://perma.cc/SFL2-HQMB]; *How EPA Regulates Drinking Water Contaminants*, EPA (Jan. 27, 2020), https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations#one [https://perma.cc/6SXX-N84C].

102. *Provisional Health Advisories for Perfluorooctanoic Acid (PFOA) & Perfluorooctane Sulfonate (PFOS)*, *supra* note 97.

103. *Fact Sheet PFOA & PFOS Drinking Water Health Advisories*, *supra* note 27.

104. *Frequently Asked Questions – PFOA and PFOS*, ALA. DEP'T OF PUB. HEALTH (ADPH) (June 8, 2016), http://www.alabamapublichealth.gov/tox/assets/PFOAandPFOS-FAQS.pdf [https://perma.cc/H9PU-JTT6]; *Provisional Health Advisories for PFOA & PFOS*, *supra* note 97; U.S. ENV'T PROT. AGENCY, *supra* note 27; *Drinking Water Health Advisories for PFOA and PFOS*, EPA (Dec. 9, 2020), https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos [https://perma.cc/7DVV-LB5K].

105. Fact Sheet: PFOA & PFOS Drinking Water Health Advisories, EPA (May 2016), https://www.epa.gov/sites/production/files/201606/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf [https://perma.cc/XN82-ZL8J].

106. *Id.*

107. U.S. ENV'T PROT. AGENCY, *supra* note 27; Fact Sheet: PFOA & PFOS Drinking Water Health Advisories, EPA (May 2016), https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf [https://perma.cc/XN82-ZL8J].

treatment facilities, water systems in buildings, or homes.[108] EPA makes information available through its Drinking Water Treatability Database about bench-, pilot-, and full-scale studies of water treatment processes.[109] These data can be used by researchers, policy makers, or members of the public to learn more about water treatment processes, such as Granular Activated Carbon, which has been used to remove certain types of PFAS.[110] While EPA provides recommendations and information for states and water systems to use in decision making, the agency does not provide instruction for such policies.

Because HAs are not legally enforceable and PFAS are not currently regulated contaminants under SDWA, responsibility for monitoring data for PFAS detection rests with the states.[111] Data collection between 2013 and 2015 indicated that the drinking water of at least six million U.S. residents was contaminated with PFOA or PFOS that exceeded the EPA's HA for lifetime exposure.[112] Many water systems have taken steps to reduce exposure when drinking water samples indicate that concentrations of these contaminants are above the HA levels.[113]

C. ATSDR and CERCLA

The Agency for Toxic Substances and Disease Registry (ATSDR) is a public health agency that works to prevent or reduce harmful effects on human health associated with exposure to hazardous substances.[114] ATSDR is mandated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to work with

108. Fact Sheet: PFOA & PFOS Drinking Water Health Advisories, EPA (May 2016), https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf [https://perma.cc/XN82-ZL8J].

109. *Reducing PFAS in Drinking Water with Treatment Technologies*, U.S. ENV'T PROT. AGENCY (Dec. 27, 2018), https://www.epa.gov/sciencematters/reducing-pfas-drinking-water-treatment-technologies [https://perma.cc/ZW3S-2J7U].

110. Drinking Water Treatability Database, EPA, https://oaspub.epa.gov/tdb/pages/treatment/treatmentContaminant.do [https://perma.cc/4AY7-WCRN].

111. *Memorandum of Understanding: Guidelines for monitoring and reporting Perfluoroalkyl substances (PFASs) in finished water samples*, ALA. DEP'T OF PUB. HEALTH (ADPH)(July 13, 2016), http://gadsdenwater.org/files/ADPH_ADEM_GuidelinesForPFASIn DrinkingWater.pdf, [https://perma.cc/LE65-NGQG] [hereinafter *Memorandum of Understanding*].

112. APHA, *supra* note 16.

113. *See, e.g., Memorandum of Understanding*, *supra* note 111.

114. *Frequently Asked Questions,* AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (May 27, 2020), https://www.atsdr.cdc.gov/faq.html [https://perma.cc/VA8G-Z7ZW].

EPA to create a list of hazardous substances and prepare a toxicological profile for each.[115] Each toxicological profile must include interpretation of toxicological information on the hazardous substance and "a determination of whether adequate information on the health effects of each substance is available or in the process of development to determine levels of exposure which present a significant risk to human health of acute, subacute, and chronic health effects."[116]

Under this mandate, when ATSDR determines that reliable and sufficient data exist, the agency develops a minimal risk level for the substance (MRL), which is an estimate of the amount of a chemical a person can eat, drink, or breathe each day without a detectable risk to health.[117] MRLs are intended to serve as a tool to help public health professionals determine areas and populations potentially at risk for adverse health effects from exposure to a particular chemical.[118] MRLs only serve as screening levels and are not intended as action levels.[119] ATSDR calculates MRLs based on scientific review of data, including how people can be exposed to the chemical, duration of exposure, potential health effects of exposure, and the quality of human and animal data in scientific literature. Proposed MRLs are rigorously reviewed with participation from EPA and other federal agencies.[120]

ATSDR published draft MRLs for perfluorohexane sulfonic acid (PFHxS), perfluorononananoic acid (PFNA), perfluorooctane sulfonic acid (PFOS), and perfluorooctanoic acid (PFOA) in June 2018.[121] The draft MRLs for PFHxS and PFOS are set to 0.00002 and 0.000002 mg/kg per day, respectively, while PFNA and PFOA are each set to 0.000003 mg/kg per day.[122]

ATSDR is also involved in PFAS-related site investigations and is authorized under CERCLA to conduct health consultations and public

115. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §9604(i)(1)-(2) (2018).

116. AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR), TOXICOLOGICAL PROFILE FOR PERFLUOROALKYLS ii (2018), https://www.atsdr.cdc.gov/toxprofiles/tp200.pdf [https://perma.cc/RM28-2NX8]; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §9604(i)(3)(B) (2018).

117. *Minimal Risk Levels (MRLs) – For Professionals,* AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (June 21, 2018), https://www.atsdr.cdc.gov/mrls/index.asp [https://perma.cc/R7EG-X3FU].

118. *Id.*

119. *Id.*

120. ASTDR, *supra* note 117; *See* Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §9604(i)(1)–(3) (2018).

121. ASTDR, *supra* note 117.

122. *Id.*

health assessments in response to specific requests about health risks associated with hazardous substances or waste sites.[123] ATSDR often works in conjunction with state health departments and federal partners, such as EPA and the Department of Defense, to investigate PFAS in the environment.[124] ATSDR can also recommend specific actions through its health consultations and health assessments, such as replacing water supplies or conducting additional evaluation of the public health implications of contamination.[125] However, as a nonregulatory agency, ATSDR cannot require external parties to comply with its recommendations.[126]

States can also conduct health consultations under a cooperative agreement with ATSDR to request information about health risks related to a specific site, chemical release, or presence of hazardous material.[127] For example, Arizona's Department of Environmental Quality requested that the Arizona Department of Health Services (ADHS) evaluate the health effects of PFAS from one public water system believed to be contaminated with PFAS from fire-fighting foams.[128] ADHS conducted a health consultation, under a cooperative agreement with ATSDR, and discovered PFAS contamination, including PFOA, PFOS, PFHpA, and PFHxS.[129] This evaluation led to the dissemination of information to the community about PFAS exposure and the presence of PFAS in the water system, as well as a change in groundwater sources to avoid adverse health effects from the contaminated source.[130]

123. ARIZ. DEP'T OF HEALTH SERVICES, HEALTH CONSULTATION (2016), https://www.atsdr.cdc.gov/HAC/pha/OatmanWaterCompany/Oatman_Water_Company_HC_(final)_11-14-2016_508.pdf [https://perma.cc/J2EB-EZVU]; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §9604(i)(4) (2018).

124. *How is ATSDR Involved in Investigating PFAS in the Environment?*, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (June 24, 2020), https://www.atsdr.cdc.gov/pfas/atsdr_sites_involvement.html [https://perma.cc/RUV7-H6DE].

125. *PFAS Exposure Assessments*, AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (June 30, 2020), https://www.atsdr.cdc.gov/pfas/activities/assessments.html [https://perma.cc/SV3A-PKA8].

126. *See* ARIZ. DEP'T OF HEALTH SERVICES, *supra* note 123; ATSDR, *supra* note 124.

127. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §9604(i)(4) (2018); ARIZ. DEP'T OF HEALTH SERVICES, *supra* note 123.

128. ARIZ. DEP'T OF HEALTH SERVICES, *supra* note 123.

129. *Id.*

130. *Id.*; *See* ATSDR, *supra* note 124.

D. Congressional Actions

Congress has recently taken a variety of actions to address growing concerns surrounding PFAS exposure in the United States. The Federal Administration Aviation Reauthorization Act of 2018, passed in October 2018, removed federal requirements that firefighting foams must contain fluorinated chemicals (e.g., PFAS).[131] Another proposed action, introduced in April 2019 and still pending, would require EPA to establish an MCL for PFOA and PFOS under the Safe Drinking Water Act.[132] If passed, the act would create nationally-enforceable standards by requiring EPA to promulgate NPDWR for all PFAS as a class.[133]

The National Defense Authorization Act of 2018 was passed in December 2017, authorizing the Centers for Disease Control and Prevention (CDC) and ATSDR to study the human health implications of PFAS and conduct exposure assessments in communities near "current or former military installations known to have had PFAS contamination in drinking water, ground water, and any other sources of water and relevant exposure pathways."[134] Through these exposure assessments, CDC/ATSDR investigates PFAS exposure in communities near current or former military bases known to have PFAS in the drinking water.[135] CDC/ATSDR randomly selects households in each community and invites individuals to provide blood and urine samples to study and inform communities about their PFAS levels.[136]

131. *FAA Opens One-of-a-Kind Research Facility in Atlantic City*, FED. AVIATION ADMIN. (Jan. 14, 2020), https://www.faa.gov/news/updates/?newsId=94946&omniRss=news_updatesAoc&cid=101_N_U [https://perma.cc/2C6F-LWV9]; *The Federal Role in the Toxic PFAS Chemical Crisis: Hearing Before the Subcomm. on Fed. Spending Oversight & Emergency Mgmt., U.S. S. Homeland Sec. & Gov'tal Affairs Comm.* 115th Cong. (2018) [hereinafter *PFAS Chemical Crisis Hearings*] (statement of Sen. Gary C. Peters, Ranking Member, Subcomm. on Fed. Spending Oversight & Emergency Mgmt.), https://www.hsgac.senate.gov/imo/media/doc/Opening Statement_Senator Peters_PFAS.pdf [https://perma.cc/AKT5-YPWX]; FAA Reauthorization Act of 2018, Pub. L. 115–254, §332a, 132 Stat. 3186, 3273 (2018).

132. Protect Drinking Water from PFAS Act of 2019, H.R. 2377, 116th Cong. (2019).

133. *Id.*

134. National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115-91, § 316, 131 Stat. 1283, 1350–51 (2017).

135. ATSDR, *supra* note 125.

136. *Id.*

These exposure assessments may inform future health studies and provide helpful information to reduce PFAS exposure.[137]

A new piece of federal legislation, the PFAS Action Act of 2019 (H.R. 535), was introduced in the House of Representatives in January 2019.[138] This bill revises certain environmental laws and requires EPA to regulate PFAS.[139] The bill also designates certain PFAS compounds as hazardous substances, which requires the remediation of their release into the environment.[140] This provision, if the bill becomes law, would require EPA to determine within five years whether remaining PFAS compounds should also be designated as hazardous substances.[141] The bill also requires EPA to create a grant program to assist community water systems with the high costs associated with treating PFAS-contaminated water, which would facilitate lower income communities' ability to undertake mitigation activities.[142] Further, the bill requires EPA to publish human health water criteria for certain PFAS compounds within two years.[143] Ultimately, if passed, this bill will require various government actions for testing, eliminating existing contaminants, and preventing future exposures through drinking and surface water, manufacturing, air pollution, and firefighting foam.[144] The bill was passed by the House in January 2020 and is pending action in the Senate.[145]

In addition to proposed and enacted legislation, Congress has also convened hearings to discuss the impact of PFAS on health and the environment, as well as the role of the federal government in mitigating exposure risks.[146] In 2019, Congress convened multiple hearings to

137. ATSDR, *supra* note 125; *Per- and Polyfluoroalkyl Substances (PFAS) and Your Health,* AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) (June 30, 2020), https://www.atsdr.cdc.gov/pfas/related_activities.html#Multi-Site-Health-Study [https://perma.cc/XRQ5-ZD8X].

138. PFAS Action Act of 2019, H.R. 535, 116th Cong. (2019).

139. *Id.*

140. *Id.*; *Summary H.R. 535 -PF Action Act of 2019*, CONGRESS.GOV, https://www.congress.gov/bill/116th-congress/house-bill/535 (last visited Feb. 21, 2021).

141. *Id.*

142. *Id.*

143. *Id.*

144. *Id.*

145. *Id.*

146. Garret Ellison, *DEQ expert who warned of PFAS to testify before U.S. Senate*, MLIVE (updated Jan. 29, 2019), https://www.mlive.com/news/2018/11/peters_pfas_gr_subcommittee_he.html [https://perma.cc/4PDE-QCKK]; *see also The Federal Role in the Toxic PFAS Chemical*

evaluate federal legislative proposals related to PFAS contamination,[147] including four hearings held by the House Oversight and Reform Subcommittee on Environment as a "call for immediate federal action."[148]

III. CURRENT STATE APPROACHES

In addition to federal studies and action on PFAS, states have implemented their own methods for understanding and mitigating the risks of exposure. Some states maintain that their actions are more efficient and effective for addressing contamination than current federal strategies, such as EPA's health advisories.[149]

Some states have established their own binding or enforceable standards for exposure media.[150] While no uniform regulatory mechanism is currently in place at the federal level or across states, some states have taken legal and policy measures to reduce human exposure to PFAS.

Today, several states have used the same values from the EPA HA for concentrations of PFAS in their own laws or policies without explicitly adopting the HA as the state's own policy, while other states affirmatively adopt the EPA HA.[151] Comparatively, some states have

Crisis: Hearing Before the Subcomm. of U.S. S. Comm. on Homeland Sec. & Governmental Affairs, SD-342 (2018).

147. *Hearing on "Protecting Americans at Risk of PFAS Contamination & Exposure*," HOUSE COMMITTEE ON ENERGY & COM., https://energycommerce.house.gov/committee-activity/hearings/hearing-on-protecting-americans-at-risk-of-pfas-contamination-exposure [https://perma.cc/TG5N-74AL]. *See also Hearings,* U.S. S. COMM. ON ENV'T AND PUBLIC WORKS, https://www.epw.senate.gov/public/index.cfm/2019/5/examining-legislation-to-address-the-risks-associated-with-per-and-polyfluoroalkyl-substances-pfas [https://perma.cc/42QG-V6BL].

148. *See Toxic, Forever Chemicals: A Call for Immediate Federal Action on PFAS, H. Oversight and Reform Subcomm. on Env't,* 116th Cong. (2019).

149. Sylvia Carigan, EPA, States Seek Cleanup Options Outside Superfund Program (1), article in *Environment & Energy Report*, BLOOMBERG L. (Feb. 6, 2018), https://www.bloomberglaw.com/bloomberglawnews/environment-and-energy/X36CMV7C000000?bna_news_filter=environment-and-energy [https://perma.cc/RX6E-Q8NV].

150. Matthew Thurlow, Russ Abell, & Stephen Zemba, *PFAS Contamination Remains a Hot-Button Issue: Overview of Recent Regulatory, Litigation, and Technical Developments*, A.B.A. (Dec. 15, 2017), https://www.americanbar.org/groups/environment_energy_resources/publications/eltt/20171215-pfas-contamination/ [https://perma.cc/EPV6-EYRB].

151. John Kindschuh & Thomas Lee, *State-by-State Regulation of Per- and Polyfluoralkyl Substances (PFAS) in Drinking Water*, JDSUPRA

gone further than the EPA HA by issuing more protective guidelines or standards. For example, both New Jersey and Minnesota have more conservative standards than EPA's 70 ppt advisory. New Jersey has increased protections against PFAS exposure in recent years; the New Jersey Department of Environmental Protection implemented MCLs for PFOS of 13 ppt (13 ng/L) in 2018 and established ground water quality standards for PFOS and PFOA of 10 ppt (10 ng/L) in 2019.[152] Similarly, Minnesota's Department of Health changed its health-based values for drinking water in 2019 from 27 ppt to 15 ppt for PFOS, and 35 ppt for PFOA.[153] Minnesota has also set guidance values for related chemicals, including PFBS, PFHxS, and PFBA.[154]

Some states have expanded protections by adding additional PFAS to their laws and policies governing exposure limits, beyond the common PFOA and PFOS standards. Connecticut and Massachusetts have each issued guidelines that incorporate a total of five PFAS: PFOS, PFOA, PFNA, PFHxS, and perfluoroheptanoic acid (PFHpA).[155] Connecticut has adopted the EPA HA action level for PFOS and PFOA, while electing to add the three additional PFAS to ensure that the sum of all five PFAS in drinking water is below 70 ppt.[156] Alaska has also updated its PFAS laws and policies to mitigate health risks; the Alaska Department of Environmental Conservation set action levels for six PFAS compounds in 2018 and updated its guidance

(July 16, 2019), https://www.jdsupra.com/legalnews/state-by-state-regulation-of-per-and-82542/ [https://perma.cc/G9VF-7AHU]; *PFAS: About PFAS*, WASH. ST. DEP'T OF HEALTH, https://www.doh.wa.gov/CommunityandEnvironment/Contaminants/PFAS [https://perma.cc/YWF9-AJMM].

152. *Contaminants of Emerging Concern*, N. J. DEP'T OF ENV'T PROT., https://www.nj.gov/dep/srp/emerging-contaminants/ [https://perma.cc/G3UM-FBVA].

153. MINN. DEP'T OF HEALTH, PERFLUOROALKYL SUBSTANCES (PFAS), https://www.health.state.mn.us/communities/environmenv/hazardous/topics/pfcs.html#safelevels [https://perma.cc/S7TP-B2UR].

154. *Id.*

155. *Per- and Polyfluroroalkyl Substances*, CONN. STATE DEP'T OF HEALTH, https://portal.ct.gov/DPH/Drinking-Water/DWS/Per--and-Polyfluoroalkyl-Substances [https://perma.cc/V2HN-CTRV]; *Per- and Polyfluroroalkyl Substances (PFAS)*, MASS. DEP'T OF ENV'T PROTECTION, https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#massachusetts-drinking-water-standard-and-health-information- [https://perma.cc/B64N-MYRF].

156. *See Per- and Polyfluroroalkyl Substances*, CONN. STATE DEP'T OF HEALTH, *supra* note 155; *Fact Sheet: Interim Guidance on Sampling and Analysis for PFAS at Disposal Sites Regulated under the Massachusetts Contingency Plan,* MASS. DEP'T OF ENV'T PROT. (June 19, 2018), https://www.mass.gov/doc/interim-guidance-on-sampling-and-analysis-for-pfas-at-disposal-sites-regulated-under-the/download [https://perma.cc/R2H6-G25H].

in April 2019 to align with the EPA's Lifetime HA for PFOS and PFOA.[157] These action levels create a threshold indicating the point at which parties must provide water treatment or alternative water sources.[158]

In addition to regulating public water sources, some states have also taken steps to protect individuals who rely on private wells for drinking water. Approximately 13 million households in the United States rely on private wells for their drinking water.[159] Additionally, studies have indicated that in some areas, communities of color are more likely to be excluded from municipal water services and have poorer quality drinking water.[160] Findings from a study in North Carolina revealed that the tap water in predominantly Black communities that were not served by a municipal water service was of poorer microbiological quality than tap water of adjacent neighborhoods served by municipal services.[161] To protect communities that rely on private water sources, some states have enacted laws to cover private water wells. For example, New Jersey's Private Well Testing Act requires testing at the time of a real estate transaction and mandates that landlords test well water at least every five years and give tenants a copy of test results.[162] The original law did not require testing for PFAS, but an amendment adopted in June 2020 explicitly requires testing for PFNA, PFOA, and PFOS.[163] This type of state legislation may assist with researching and remedying the disproportionate effects of PFAS exposure through drinking water.

Many state actions against the harmful health effects of PFAS focus on exposure through drinking water; however, some states have addressed other exposure pathways such as air, soil, fish and milk

157. Technical Memorandum: Action Levels for PFAS in Water and Guidance on Sampling Groundwater and Drinking Water, ALASKA DEP'T OF ENV'T CONSERVATION, at 2 (Oct. 2, 2019), https://dec.alaska.gov/media/15773/pfas-drinking-water-action-levels-technical-memorandum-10-2-19.pdf, [https://perma.cc/K84X-ELYT].

158. *Id.* at 3.

159. *Private Drinking Water Wells*, U.S. ENV'T PROT. AGENCY (July 15, 2020), https://www.epa.gov/privatewells [https://perma.cc/XGL7-NK3U].

160. APHA, *supra* note 19.

161. Frank Stillo & Jacqueline MacDonald Gibson, *Exposure to Contaminated Drinking Water and Health Disparities in North Carolina*, 107 AM. J. PUB. HEALTH 180, 180-81, 183 (2017), https://ajph.aphapublications.org/doi/10.2105/AJPH.2016.303482;
APHA, *supra* note 19.

162. N.J. ADMIN. CODE § 7:9E-1.2 (2020).

163. N.J. ADMIN. CODE § 7:9E-2.1 et seq. (2020).

consumption, or consumer products.[164] For example, Michigan monitors exposure through air by screening for PFOS and PFOA concentrations beyond health protective values and by regulating air emissions of new or modified sources for PFAS.[165] Some states set additional guidelines based on local products and circumstances, such as Vermont's screening level for maple syrup consumption, which is 290 ppt for PFOA.[166]

Some states regulate PFAS in restaurants that use nonstick cooking equipment. To prevent exposure at restaurants, these states, such as Arkansas, require cookware containing perfluorocarbons to be cleaned with nonscoring materials to prevent leaching of PFAS into food.[167] Other states, such as Washington, have started to regulate PFAS chemicals in firefighting foams.[168] Some states have regulated PFAS in other ways that provide consumer protections, such as Oregon's regulation of PFOS in children's products.[169] Overall, states vary widely in whether and to what extent they address these chemicals.

IV. LOOKING FORWARD

State and federal governments have taken a multitude of actions to phase out, study, and regulate PFAS in the United States. However, despite these efforts, new PFAS are continually created to replace those

164. N. J. DEP'T OF ENV'T PROT., INVESTIGATION OF LEVELS OF PERFLUORINATED COMPOUNDS IN NEW JERSEY FISH, SURFACE WATER, AND SEDIMENT (Apr. 9, 2019), https://www.nj.gov/dep/dsr/publications/Investigation%20of%20Levels%20of%20Perfluorinated%20Compounds%20in%20New%20Jersey%20Fish,%20Surface%20Water,%20and%20Sediment.pdf [https://perma.cc/PT46-VTP8]. *See Reducing Human Exposure to Highly Fluorinated Chemicals to Protect Public Health*, AM. PUB. HEALTH ASS'N (Nov. 1, 2016), https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2016/12/21/reducing-human-exposure-to-highly-fluorinated-chemicals [https://perma.cc/QV7B-945Q]. Kevin Miller, *State Says Maine Milk Passes Tests for 'Forever Chemicals'*, PRESS HERALD (June 26, 2019), https://www.pressherald.com/2019/06/26/maine-agriculture-officials-pleased-with-initial-tests-for-pfas-in-milk/ [https://perma.cc/M4YG-E7CK]. *See* WIS. ADIM. CODE § NR 438.03 (2020).

165. *Air Quality Related Issues*, MICH. PFAS ACTION RESPONSE TEAM, https://www.michigan.gov/pfasresponse/0,9038,7-365-86704_94366---,00.html [https://perma.cc/Y27T-VN2A].

166. *Information for Impacted Communities*, VT. DEP'T OF ENV'T CONSERVATION, https://dec.vermont.gov/commissioners-office/pfoa/communities [https://perma.cc/V6CB-X94S].

167. ARK. ADMIN. CODE 007.04.12-006 (2012).

168. REV. CODE WASH. § 70A.400 (2019).

169. *See* OR. ADMIN. R. 333-016-2035 (2021).

being phased out of production and use.[170] These alternative compounds are within the PFAS family of chemicals and have similar chemical structures.[171] With limited toxicological and ecological data on these new alternative chemicals, their use raises similar safety and health concerns.[172]

Many lawyers have predicted more state regulation of PFAS in the future.[173] However, regulatory approaches remain varied, with some states following EPA guidelines, some setting more protective levels, and others opining that the lower levels are not necessary.[174] Debate continues about the most appropriate level for protecting communities against PFAS exposure.[175] Some states' environmental agencies have noted that decisions to adopt statewide limits would take several years and "'millions and millions of dollars'," when accounting for the costs that water suppliers would incur in monitoring and treating water for newly regulated chemicals.[176] Other states have found that negotiating with companies for voluntary compliance with recommendations may be more efficient than pursing enforcement of legal mechanisms.[177] Some states and interest groups have filed lawsuits against manufacturers for practices claimed to have led to PFAS contamination in drinking or groundwaters.[178]

The challenges the United States faces regarding PFAS use and exposure are not likely to go away quickly, and actions to address these

170. APHA, *supra* note 16.

171. *Id.*

172. APHA, *supra* note 16; Kevin Loria, *Should You Be Concerned About PFAS Chemicals?*, CONSUMER REPS. (Apr. 8, 2019), https://www.consumerreports.org/toxic-chemicals-substances/pfas-chemicals-should-you-be-concerned/ [https://perma.cc/GN6G-GEX9].

173. Adam Bass et al., *PFAS: All signs point to more regulation and enforcement in 2018*, https://s3.amazonaws.com/documents.lexology.com/295e5e11-2902-40ed-b87e-9965ba54336b.pdf?AWSAccessKeyId=AKIAVYILUYJ754JTDY6T&Expires=1613931870&Signature=RrCBA%2B%2B%2F0%2F6u1D%2BSuXcxfLr8wwY%3D [https://perma.cc/C5LJ-RLVV].

174. *See id.*; *PFAS Chemical Crisis Hearings*, *supra* note 131.

175. *Id.*

176. John Hurdle, *PA Environmental Regulators to Consider Health Limits for PFOA*, STATE IMPACT PA. (Aug. 17, 2017), https://stateimpact.npr.org/pennsylvania/2017/08/17/pa-environmental-regulators-to-consider-health-limits-for-pfoa/ [https://perma.cc/3R7L-JMXZ].

177. Carigan, *supra* note 149.

178. Complaint at 1, Minnesota et. al v. 3M Company, (4th Cir. Minn. Dec. 30, 2010); Sebastien Malo, *Water Association with 31,000 Members Sues PFAS Suppliers, Claiming Water Contamination*, REUTERS LEGAL (Feb. 26, 2020).

chemicals are likely to continue for some time.[179] Many organizations track new and proposed laws and policies, with some organizations and subject matter experts noting that these steps, particularly those at the federal level, are likely just the beginning.[180] These organizations have emphasized the need for continued efforts to ensure effective management of this public health concern by "identify[ing] contamination, prevent[ing] exposure, reduc[ing] harm to human health, and . . . expedit[ing] clean-up and assistance for affected communities."[181]

The growing body of knowledge surrounding the negative health effects of PFAS exposure has led to calls for more surveillance and policy development from all levels of government.[182] Such actions could also provide protections to communities of color and low-income populations who may be disproportionately affected by PFAS exposure and potentially associated harmful health effects.[183] It is also critically important that, as attention and PFAS-mitigation funding becomes available, these communities be represented and informed about risks and actions to decrease or prevent exposure. Because PFAS have been so widely used and their chemical properties allow them to travel easily through soil, air, and water, more complete and consistent approaches are needed to adequately address existing contamination and prevent future exposures. Further evaluation is necessary to determine how law and policy can be used as effective tools to protect the public's health from PFAS in the United States.

179. Matthew Thurlow et al., *PFAS Contamination Remains a Hot-Button Issue: Overview of Recent Regulatory, Litigation, and Technical Developments,* 19 ABA ENV'T LITIG. & TOXIC TORTS COMM. NEWSL. 19, 20, 22 (2018).

180. *See, e.g., The Federal Role in the Toxic PFAS Chemical Crisis: Hearing Before the Subcomm. of U.S. S. Comm. on Homeland Sec. & Governmental Affairs*, SD-342 (2018) (statement of Senator Gary C. Peters, Ranking Member).

181. *PFAS Chemical Crisis Hearings*, *supra* note 131.

182. *See, e.g., id.*

183. APHA*, supra* note 16.