BerkeleyLaw
UNIVERSITY OF CALIFORNIA
Environmental Law Clinic

University of California, Berkeley
School of Law
353 Boalt Hall
Berkeley, CA 94720-7200
Tel 510.642.5398
Fax 510.643.4625

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Andrew Wheeler, Administrator
U.S. Environmental Protection Agency
Mail Code: 1101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
Via certified mail

Petition for Rulemaking:
RCRA Regulation of Wastes Containing Long-Chain PFAAs and GenX Chemicals

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I. Introduction

Communities across the country are grappling with widespread contamination of their water, land, and air by per- and polyfluoroalkyl substances (PFAS), a large class of environmentally persistent synthetic chemicals. The unique chemical properties of PFAS make them useful for a range of commercial and industrial applications, including firefighting foams, greaseproof food wrapping, non-stick cookware, and stain- and water-repellent carpets, textiles, and outdoor gear.[1] The harms attending PFAS use unfortunately dwarf their consumer benefits: exposure to the most well-studied of these substances is linked to serious adverse human health impacts, and PFAS persist in the environment. Exposure to certain PFAS has been associated with liver damage, high cholesterol, obesity, diabetes, cancer, thyroid disease, asthma, immune system dysfunction, reduced fertility, low birth weight, and effects on children's cognitive and neurobehavioral development.[2] Because PFAS are environmentally stable and many can leach into groundwater, these chemicals can cause public health and environmental harm long after their release.

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[1] *See PFOA, PFOS, and Other PFASs: Basic Information on PFAS*, EPA, https://www.epa.gov/pfas/basic-information-pfas (last visited June 20, 2019); Agency for Toxic Substances & Disease Registry, Toxicological Profile for Perfluoroalkyls, Draft for Public Comment 1 (June 2018) [hereinafter Draft PFAS Toxicological Profile], https://www.regulations.gov/document?D=ATSDR-2015-0004-0009).

[2] Draft PFAS Toxicological Profile, *supra* note 1, at 23, 25-26; Hearing on Examining the Federal Response to the Risks Associated with Per- and Polyfluoroalkyl Substances (PFAS) Before the S. Comm. on Env. & Pub. Works (2019) [hereinafter Testimony of Linda Birnbaum] (testimony of Linda Birnbaum, Director, National Institute of Environmental Health Services & National Toxicology Program, National Institutes of Health), https://www.epw.senate.gov/public/_cache/files/2/2/22ca7c4b-b1dc-4a12-9264-7a4f16608933/BF2D70A4FB747A3F61E584CC30D58D0A.birnbaum-testimony-03.28.2019.pdf (citing sources discussed *infra* Part IV(A) & note 16).

Despite the environmental and human health risks associated with PFAS, the U.S. Environmental Protection Agency (EPA) has taken little regulatory action to manage and mitigate these risks. Management and disposal of waste PFAS is one area in which the need for federal PFAS regulation is particularly acute. EPA has authority to regulate PFAS wastes under the Resource Conservation and Recovery Act (RCRA),[3] the federal statute designed to ensure that handling of hazardous wastes "minimize[s] . . . present and future threat[s] to human health and the environment."[4] In the absence of EPA regulation of PFAS under RCRA, wastes from industrial processes utilizing these chemicals are released into the environment in large volumes.[5]

More than six million Americans are served by drinking water systems in which harmful levels of PFAS have been detected.[6] PFAS contamination of soil, groundwater and surface water has been documented at hundreds of sites across forty-three states, and the number of known contaminated sites continues to grow.[7]

Petitioners are gravely concerned about the risks of PFAS contamination and exposure across the country, and accordingly request that EPA initiate a rulemaking to regulate management and disposal of certain PFAS wastes under RCRA. Scientific understanding of the toxicity and environmental characteristics of these chemicals is well developed, yet releases of PFAS wastes into water, land, and air continue—unchecked—today. These releases are exactly the type of "present and future threat to human health and the environment" that RCRA was designed to address. The need for RCRA regulation of PFAS wastes is urgent.

II. Requested Action

This petition, submitted pursuant to 42 U.S.C. § 6974(a), contains two requests for EPA action under RCRA.

First, petitioners request that EPA promulgate regulations designating wastes containing PFOA (perfluorooctanoic acid), PFOS (perfluorooctane sulfonic acid), GenX chemicals, and any combination of these, as hazardous wastes subject to the management and disposal requirements of Subtitle C of RCRA. "GenX chemicals" refers to hexafluoropropylene oxide dimer acid and its ammonium salt.

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[3] 42 U.S.C. § 6901, et seq.
[4] 42 U.S.C. § 6902(b).
[5] Draft PFAS Toxicological Profile, *supra* note 1, at 533; EPA, Human Health Toxicity Values for Hexafluoropropylene Oxide Dimer Acid and Its Ammonium Salt, also Known as "GenX Chemicals," Public Comment Draft (Nov. 2018) [hereinafter Draft GenX Assessment], https://www.epa.gov/sites/production/files/2018-11/documents/genx_public_comment_draft_toxicity_assessment_nov2018-508.pdf; *see also PFAS Contamination Site Tracker*, NE. U., https://pfasproject.com/pfas-contamination-site-tracker/ (last visited May 6, 2019).
[6] Xindi 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 J. ENVTL. SCI. & TECH. LETTERS 344 (Aug. 2016).
[7] *PFAS Contamination Site Tracker*, *supra* note 5; *see also* Hu et al., *supra* note 6, at 345.

Second, petitioners request that the RCRA hazardous waste designations for PFOA and PFOS wastes extend to cover the full chemical subclass of each—long-chain perfluoroalkyl carboxylates (LCPFACs) and long-chain perfluoroalkane sulfonates (LCPFASs), respectively—because the characteristics of LCPFACs and LCPFASs demonstrate that class-based regulation is appropriate.[8] LCPFACs refers to perfluoroalkyl carboxylates with seven or more perfluorinated carbons, including the salts and precursors of these perfluorinated carboxylates.[9] LCPFASs refers to perfluoroalkane sulfonates with six or more perfluorinated carbons, including the salts and precursors of these perfluorinated sulfonates.[10] Hereinafter, this petition refers to LCPFACs and LCPFASs collectively as "long-chain perfluoroalkyl acids (PFAAs)."

III. Petitioners' Interests

The Green Science Policy Institute (GSP) is a nonprofit scientific organization based in Berkeley, California, that facilitates the responsible use of chemicals to protect human and ecological health. GSP publishes scientific research and educates and builds partnerships among businesses, government, academia, and citizens groups to develop innovative joint solutions for reducing the use of harmful classes of chemicals. Over the last six years, the Institute has been working to limit the use of PFAS. Based on GSP's published research and active relationships with scientists and policy makers worldwide, it educates federal and state decision makers about PFAS science and policy, including reducing water contamination. GSP also educates large purchasers, trade associations, retailers and manufacturers to limit PFAS in the products they buy, produce, and sell.

Alaska Community Action on Toxics (ACAT) is a nonprofit environmental health and justice research and advocacy organization based in Anchorage, Alaska. In Alaska, as in many states, the improper disposal of PFAS has resulted in extensive contamination of soil and water sources. Alaska is uniquely affected by PFAS, however, for reasons of both geography and demographics. First, since PFAS are highly mobile, they are transported on atmospheric and oceanic currents from lower latitudes to the Arctic. Thus, the Arctic has become a hemispheric sink for PFAS, as it has for other persistent organic pollutants. Second, PFAS bioaccumulate in traditional food animals for Native Alaskans, such as caribou, fish, and marine mammals communities, making communities in the north and Arctic particularly vulnerable to harmful exposures. For Arctic communities, unregulated PFAS waste disposal threatens both human health and traditional ways of life. ACAT's

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[8] *See* 40 C.F.R. § 261.11(b) (authorizing the EPA Administrator to "list classes . . . of solid waste as hazardous waste" where individual waste within these classes "typically or frequently are hazardous").

[9] This definition of LCPFACs is consistent with the classification set forth in EPA's 2013 Significant New Use Rule for Perfluoroalkyl Sulfonates and Long-Chain Perfluoroalkyl Carboxylate Chemical Substances. 78 Fed. Reg. 62,443, 62,445 (Oct. 22, 2013). *See also*, Draft PFAS Toxicological Profile, *supra* note 1, at 534.

[10] This definition of LCPFASs is consistent with the classification set forth on EPA's website. *Risk Management for Per- and Polyfluoroalkyl Substances (PFASs) Under TSCA*, EPA, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-and-polyfluoroalkyl-substances-pfass (last visited May 1, 2019) (defining LCPFAS as those with "six or more carbons, including perfluorohexane sulfonic acid (PFHxS) and perfluorooctane sulfonic acid (PFOS)"). *See also*, Draft PFAS Toxicological Profile, *supra* note 1, at 534.

toxics-reduction mission includes addressing this public health crisis and environmental injustice.

Clean Cape Fear is a grassroots alliance of community leaders, educators, professionals, and citizen advocates working together to restore and protect drinking water and air quality in Southeastern North Carolina. The alliance formed in 2017 after learning that DowDuPont/Chemours contaminated the Cape Fear River basin for nearly 40 years with a chemical cocktail of unregulated PFAS—including GenX. The Lower Cape Fear River is the primary drinking water source for a quarter of a million residents. Communities in the region rely heavily on the local aquatic ecosystem as a source of food, entertainment, and economic stability. The vast majority of PFAS in commercial use have near-zero known safety or toxicity data—yet they are permitted to enter the food supply, drinking water, ecosystems and bodies—without the community's consent. Clean Cape Fear believes that those living at the bottom of an industrialized river system deserve protections from their upstream neighbors. There are nearly 600 residents in Fayetteville, North Carolina alone with contaminated wells—as well as contaminated municipal wells in areas downstream—all of which need remediation of PFAS contamination.

The Buxmont Coalition for Safer Water is a grassroots community organization north of Philadelphia, Pennsylvania that was founded in response to the contamination of the community's drinking water with high levels of harmful PFAS chemicals. The source is firefighting foam used for decades at local military bases. This community has suffered an epidemic of cancer, impacting Coalition members, their loved ones, and their friends and neighbors. The Coalition does not know with certainty that PFAS caused each of these cancers, but it has seen too much devastation to want to continue to roll the dice with unregulated toxics. More than 85,000 thousand people in the area have been impacted by unsafe drinking water. The community's groundwater recently tested at over 4,000 times the EPA advisory level for PFAS in drinking water. Clean-up is nowhere in sight.

The PFAS Alliance is a nonprofit environmental health and advocacy organization based in Grand Rapids, Michigan, that supports the conclusions and recommendations in this Petition. The organization is dedicated to ensuring residents of Michigan have access to safe water by coordinating information, educational programs, regulatory structure, and scientific knowledge about PFAS and other contaminants. In Michigan and throughout the United States, the improper disposal of PFAS has resulted in extensive contamination of drinking and recreational water resources including lakes, streams, wetlands, and critical aquifers. The PFAS Alliance is especially concerned about the public health issues related to the consumption of contaminated drinking water by local residents and PFAS chemicals' persistent resistance to treatment. High quality groundwater is a precious resource in Michigan and it is a critical resource for public and private water supplies, fisheries and wetland habitat, and the Great Lakes. Many streams and lakes have fish consumption and recreational contact advisories related to PFAS. Unregulated PFAS waste disposal threatens both human health and environmental from groundwater, surface water, and the food supply. The regulation of PFAS as a class of hazardous chemicals will be a critical component of protecting and restoring Michigan water resources from the damages these contaminants have caused.

Fountain Valley Clean Water Coalition is a community organization focused on education of citizens and their empowerment through monthly meetings to communicate with

government, including local and federal agencies and water districts in the Southern end of El Paso County in Colorado. Like many other places in the United States, this area of Colorado has been contaminated by PFHxS-based toxic firefighting foam (otherwise known as Aqueous Film-Forming Foam, or AFFF). Colorado School of Public Health received a grant to have 200 people's blood tested; this testing revealed that the area's residents are among the most contaminated. Although there was only funding to test 200 people, the entire area population of over 80,000 residents may be at risk: local PFAS contamination has existed since the 1970s, and is extensive. The community has an extremely high rate of cancer, and no health studies have been done despite the Coalition's ongoing advocacy to obtain basic health effects data. The Fountain Valley community was recently selected as one of eight site locations for additional studies by the Agency for Toxic Substances and Disease Registry/Centers for Disease Control. PFHxS contamination has destroyed the local Widefield Aquifer, surrounding private wells, and smaller surrounding water districts, affecting five water districts in all. Some residents must filter their water; certain private well users have had systems installed by the Department of Defense. Larger public water districts have incurred millions of dollars of debt in locating alternative water supplies while waiting on the Department of Defense to finish setting up a new filtration facility. Although Colorado has passed a state law banning AFFF from use in training exercises, it does not apply to federal use at military bases. Regulating PFAS under RCRA will help prevent further harmful contamination and facilitate clean-up of existing PFAS contamination.

IV. PFAS Overview: Chemical Toxicity, Agency Knowledge, Policy Urgency

A. Long-Chain PFAAs and GenX Chemicals Are Persistent, Mobile, and Toxic.

PFAS are a large class of aliphatic substances containing one or more carbon atoms on which fluorine atoms replace all of the hydrogen atoms present in the nonfluorinated analogues from which they are notionally derived.[11] All PFAS chemicals contain multiple bonds between atoms of carbon and fluorine. Carbon-fluorine bonds are extremely strong, and give PFAS their exceptional chemical and thermal stability. Due to these strong bonds, PFAS (or in some cases, their degradation products) are highly persistent in the environment.[12]

Most research on the environmental fate and toxicity of PFAS has focused on the subclass of PFAAs, including PFOA and PFOS, and more recently, per- and polyfluoroalkylether acids such as GenX chemicals. These well-studied PFAS subgroups are highly water soluble and mobile in the environment.[13] The combination of high persistence and mobility leads to their prevalence as drinking water contaminants.[14] Their persistence and mobility

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[11] Robert C. Buck et al., *Perfluoroalkyl and Polyfluoroalkyl Substances in the Environment: Terminology, Classification, and Origins*, 7 INTEGRATED ENVTL. ASSESSMENT & MGMT. 513 (2011).
[12] Draft PFAS Toxicological Profile, *supra* note 1, at 559.
[13] *See* Zhanyun Wang, *A Never-Ending Story of Per- and Polyfluoroalkyl Substances (PFASs)?* 51 ENVTL. SCI. & TECH. 2508, 2511 (2017).
[14] *See* Gloria B. Post et al., *Key Scientific Issues in Developing Drinking Water Guidelines for Perfluoroalkyl Acids: Contaminants of Emerging Concern,* PLOS BIOLOGY (2017).

also gives these PFAS the potential to spread throughout the global aquatic, atmospheric, and terrestrial environment, including to remote locations far from any point source.[15]

A large and growing body of literature demonstrates that long-chain PFAAs and GenX chemicals are potent multisystem toxicants. The toxicity of these chemicals has been the subject of recent thorough reviews by ATSDR, EPA, and other agencies.[16]

ATSDR's Draft PFAS Toxicological Profile stated that "a large number" of epidemiological and animal studies have evaluated the health effects of PFAS, and these studies have demonstrated that exposure to long-chain PFAAs is associated with: liver damage, high cholesterol, cardiovascular effects, thyroid disease, immune deficiencies, reduced fertility, and low birth weights.[17] According to EPA, "adverse effects observed

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[15] *See* Andrew B. Lindstrom et al., *Polyfluorinated Compounds: Past, Present and Future*, 45 ENVTL. SCI. & TECH. 7954 (2011).

[16] *E.g.*, Draft PFAS Toxicological Profile, *supra* note 1; Draft GenX Assessment, *supra* note 5; Eur. Food Safety Auth., *Risk to Human Health Related to the Presence of Perfluorooctane Sulfonic Acid and Perfluorooctanoic Acid in Food*, EFSA J. (Dec. 2018), https://www.efsa.europa.eu/en/efsajournal/pub/5194 ; Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate, 81 Fed. Reg. 33,250 (May 25, 2016).

[17] Draft PFAS Toxicological Profile, *supra* note 1, at 23, 25-26; see also these primary sources:

- liver damage
  - G. Costa et al., *Thirty Years of Medical Surveillance in Perfluorooctanoic Acid Production Workers*, 51 J. OCCUPATIONAL & ENVTL. MED. 364 (2009).
- high cholesterol
  - Stephanie J. Frisbee et al., *Perfluorooctanoic Acid, Perfluorooctanesulfonate, and Serum Lipids in Children and Adolescents: Results from the C8 Health Project*, 164 ARCHIVES PEDIATRICS & ADOLESCENT MED. 860 (2010).
- cardiovascular effects (pre-eclampsia)
  - Lyndsey A. Darrow et al., *Serum Perfluorooctanoic Acid and Perfluorooctane Sulfonate Concentrations in Relation to Birth Outcomes in the Mid-Ohio Valley, 2005-2010*, 121 ENVTL. HEALTH PERSP. 1207 (2013).
- thyroid disease
  - David Melzer et al., *Association Between Serum Perfluorooctanoic Acid (PFOA) and Thyroid Disease in U.S. National Health and Nutrition Examination Survey*, 118 ENVTL. HEALTH PERSP. 686 (2010).
- reduced fertility
  - Chunyuan Fei et al., *Maternal Levels of Perfluorinated Chemicals and Subfecundity*, 24 HUM. REPROD. 1200 (2009).
- low birth weights
  - Paula I. Johnson et al., *The Navigation Guide—Evidence-Based Medicine Meets Environmental Health: Systematic Review of Human Evidence for PFOA Effects on Fetal Growth*, 122 ENVTL. HEALTH PERSP. 1028 (2014).
- immune deficiencies
  - NAT'L TOXICOLOGY PROGRAM, U.S. DEP'T OF HEALTH & HUMAN SERVS., IMMUNOTOXICITY ASSOCIATED WITH EXPOSURES TO PERFLUOROOCTANOIC ACID OR PERFLUOROOCTANE SULFONATE (2016), https://ntp.niehs.nih.gov/pubhealth/hat/noms/pfoa/index.html.

following exposures to PFOA and PFOS are the same or similar and include effects in humans on serum lipids, birth weight, and serum antibodies."[18] EPA also states that in animal studies, both PFOA and PFOS "show common effects on the liver, neonate development, and responses to immunological challenges."[19] Exposure to long-chain PFAAs has also been associated with obesity, diabetes, asthma, cancer, and effects on children's cognitive and neurobehavioral development.[20] Finally, EPA has already

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- Katrine Kielsen et al., *Antibody Response to Booster Vaccination with Tetanus and Diphtheria in Adults Exposed to Perfluorinated Alkylates*, 13 J. IMMUNOTOXICOLOGY 270 (2015).

[18] EPA, DRINKING WATER HEALTH ADVISORY FOR PERFLUOROOCTANOIC ACID (PFOA) 55 (2016) [hereinafter PFOA LHA], https://www.regulations.gov/document?D=EPA-HQ-OW-2014-0138-0041; see also these representative primary sources:

- serum lipids
  - Andrea Winquist & Kyle Steenland, *Modeled PFOA Exposure and Coronary Artery Disease, Hypertension, and High Cholesterol in Community and Worker Cohorts*, 122 ENVTL. HEALTH PERSP. 1299 (2014).
- birth weight
  - Marc-Andre Verner et al., *Associations of Perfluoroalkyl Substances (PFAS) with Lower Birth Weight: An Evaluation of Potential Confounding by Glomerular Filtration Rate Using a Physiologically Based Pharmacokinetic Model (PBPK)*, 123 ENVTL. HEALTH PERSP. 1317 (2015).
- serum antibodies
  - Philippe Grandjean et al., *Serum Vaccine Antibody Concentrations in Children Exposed to Perfluorinated Compounds*, 307 JAMA 391 (2012).

[19] *Id.*

[20] Testimony of Linda Birnbaum, *supra* note 2 ; see also these primary sources:

- obesity
  - Joseph M. Braun et al., *Prenatal Perfluoroalkyl Substance Exposure and Child Adiposity at 8 Years of Age: The HOME Study*, 24 OBESITY 231 (2016).
  - Ana Maria Mora et al., *Prenatal Exposure to Perfluoroalkyl Substances and Adiposity in Early and Mid-Childhood*, 125 ENVTL. HEALTH PERSP. 467 (2017).
  - Martina Karlsen et al., *Early-Life Exposures to Persistent Organic Pollutants in Relation to Overweight in Preschool Children*, 68 REPROD. TOXICOLOGY 145 (2017).
- diabetes
  - Nuria Matilla-Santander et al., *Exposure to Perfluoroalkyl Substances and Metabolic Outcomes in Pregnant Women: Evidence from the Spanish INMA Birth Cohorts*, 125 ENVTL. HEALTH PERSP. 117004 (2017).
- asthma
  - Yu Zhu et al., *Associations of Serum Perfluoroalkyl Acid Levels with T-Helper Cell-Specific Cytokines in Children: By Gender and Asthma Status*, 559 SCI. TOTAL ENV'T 166 (2016).
- cancer
  - Vaughn Barry et al., *Perfluorooctanoic Acid (PFOA) Exposures and Incident Cancers Among Adults Living Near a Chemical Plant*, 121 ENVTL. HEALTH PERSP. 1313 (2013).

concluded (and taken regulatory action) based on its understanding that long-chain PFAAs have similar toxicological properties.[21]

EPA's own human health toxicity assessment of GenX chemicals reports that exposure to these has been connected to liver toxicity, kidney toxicity, immune effects, and developmental issues (early deliveries and delays in genital development) in rodent studies.[22] The same assessment also concluded that GenX is more potent than PFOA in mice, a sensitive animal species for both compounds.[23] Moreover, recent rodent studies not considered in EPA's draft assessment report that GenX chemicals caused postnatal mortality and delayed mammary gland development; the latter is also known to be a sensitive endpoint of PFOA toxicity.[24] While there are not yet human epidemiological studies of GenX exposure, the similarity of GenX's animal toxicity profile to that of PFOA indicates that GenX is likely to cause human health harm.

B. Despite EPA's Decades-Long Awareness of the Health and Environmental Risks Associated with Certain PFAS, the Agency Has Failed to Take Meaningful Action.

For two decades, EPA has been aware of the health and environmental dangers of certain PFAS. In 1999, EPA began investigating PFOS after receiving data from 3M Company—the sole U.S. manufacturer of PFOS—that the substance is persistent, "unexpectedly toxic," and bioaccumulative.[25] The company's own findings were sufficiently alarming that by 2000, 3M entered into an agreement with EPA promising to phase out all PFOS production.[26] In 2006, eight other major PFAS manufacturers likewise agreed to

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  - Kyle Steenland & Susan Woskie, *Cohort Mortality Study of Workers Exposed to Perfluorooctanoic Acid*, 176 AM. J. EPIDEMIOLOGY 909 (2012).
- cognitive and neurobehavioral development
  - Ann Vuong et al., *Prenatal Polybrominated Diphenyl Ether and Perfluoroalkyl Substance Exposures and Executive Function in School-Age Children*, 147 ENVTL. RES. 556 (2016).

[21] 78 Fed. Reg. 62,443, 62,445 (Oct. 22, 2013), *supra* note 9 (noting that LCPFACs and LCPFASs have demonstrated toxicity in animals, causing reproductive, developmental, and systemic effects).
[22] Draft GenX Assessment, *supra* note 5, at vii, 43-47.
[23] State of N.J., Dep't of Envtl. Prot., Div. of Sci. & Research, Comments on U.S. EPA Draft Human Health Assessment for GenX and PFBS 2 (Jan. 22, 2019) [hereinafter N.J. Comments on U.S. EPA Draft Human Health Assessment], https://www.regulations.gov/document?D=EPA-HQ-OW-2018-0614-0020.
[24] *Id.*
[25] Perfluorinated Acid (PFOA), Fluorinated Telomers; Request for Comment, Solicitation of Interested Parties for Enforceable Consent Agreement Development, and Notice of Public Meeting, 68 Fed. Reg. 18,626, 18,628 (Apr. 16, 2003).
[26] Press Release, EPA, EPA and 3M Announce Phase Out of PFOS (May 16, 2000), https://archive.epa.gov/epapages/newsroom_archive/newsreleases/33aa946e6cb11f35852568e1005246b4.html.

voluntarily phase out PFOA production.[27] The 2006 agreement required manufacturers to reduce PFOA emissions by 95 percent by 2010, and eliminate PFOA from commercial products by 2015.[28]

As long-chain PFAAs were phased out by U.S. manufacturers, however, they were replaced by alternative short-chain and ether-based PFAS such as GenX chemicals. EPA allowed the introduction of GenX chemicals into commerce before key toxicity tests were performed.[29] Although GenX chemicals were marketed as safe replacements for PFOA, they are being found to raise similar health and environmental risks as long-chain PFAAs.[30]

In 2018, EPA released a Draft Health Hazard Assessment that documents GenX chemicals' reproductive, developmental, and carcinogenic effects.[31] EPA's assessment concluded that GenX is more potent than PFOA in mice, a sensitive animal species for both compounds.[32] History is repeating itself, as the fluorochemical production plants that previously caused PFOA contamination are now using GenX chemicals, which are again contaminating the land, air and water of adjacent communities.

EPA has to date done little to address the health and environmental risks of GenX chemicals and long-chain PFAAs, in spite of its knowledge of them. In early 2019, EPA asserted that it has been "actively engaged in preventing risks associated with PFAS," pointing to two agency actions: (1) issuance of health advisories for PFOA and PFOS under the Safe Drinking Water Act, and (2) promulgation of Significant New Use Rules (SNURs) for PFAS under the Toxic Substances Control Act.[33] EPA's Lifetime Health Advisories for PFOA and PFOS are concentrations at or below which adverse human health effects are not anticipated to occur.[34] The Health Advisories are non-binding, however, and are intended primarily to help federal, state, and local officials evaluate risks from drinking water. Because—as their name suggests—"advisories" are unenforceable, [35] they offer only limited protection against PFAS exposure, and do not ensure delivery of safe drinking water to consumers.

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[27] *See* Memorandum from Jim Willis, Dir., Chemical Control Div., EPA, to Docket EPA-HQ-OPPT-2006-0621, PFOA Stewardship Program, July 12, 2006; *EPA Takes First Steps Toward Regulating New PFOA-Type Chemicals*, *Inside EPA Weekly Report* (Mar. 24, 2006).
[28] *Id.*
[29] *See* N.J. Comments on U.S. EPA Draft Human Health Assessment, *supra* note 23, at 3.
[30] *See* Draft GenX Assessment, *supra* note 5, at 43-47; Stephan Brendel et al., *Short-Chain Perfluoroalkyl Acids: Environmental Concerns and a Regulatory Strategy Under REACH*, 30 ENVTL. SCI. EUR. 1 (2018); Melissa I. Gomis et al., *Comparing the Toxic Potency In Vivo of Long-Chain Perfluoroalkyl Acids and Fluorinated Alternatives*, 113 ENV'T INT'L 1 (2018).
[31] Draft GenX Assessment, *supra* note 5.
[32] *Id.*
[33] EPA, EPA'S PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) ACTION PLAN 13 (2019) [hereinafter 2019 PFAS ACTION PLAN], https://www.epa.gov/sites/production/files/2019-02/documents/pfas_action_plan_021319_508compliant_1.pdf.
[34] 81 Fed. Reg. 33,250, *supra* note 16.
[35] Memorandum from Peter C. Grevatt, Dir., Office of Ground Water & Drinking Water, to Water Div. Dirs., Regions I-X (Nov. 15, 2016), https://www.epa.gov/sites/production/files/2016-11/documents/clarification_memo_pfoapfos_dw_has.pdf.

The second EPA action on PFAS—promulgation of SNURs[36]—is more significant, in that it is concrete regulation and applies to several hundred long-chain PFAAs. EPA's initial SNUR in 2002 was for 75 long-chain PFAAs.[37] EPA amended the SNUR in 2007 to add 183 additional long-chain PFAAs.[38] But SNURs are preventative regulations that are confined to restricting future manufacturing and importation.[39] Because SNURs do not directly regulate past or present environmental releases, or contamination and public exposure therefrom, they fail to address substantial sources of PFAS risk. Human exposure to improperly managed and disposed PFAS chemicals poses an urgent public health crisis that EPA's existing regulations and nonregulatory actions are inadequate to meet.

EPA is clearly aware of the need for regulatory action to address PFAS contamination. In its 2019 PFAS Action Plan, EPA stated that it is considering adding PFOA and PFOS to the list of substances covered by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the federal statute that governs cleanup of contaminated sites.[40] However, EPA made no firm commitment to determining which statutory mechanism among several it would choose to pursue for achieving CERCLA hazardous substance designation for these chemicals, suggesting that EPA's evaluation may be at an early stage. The agency has also made no public commitment to issuing a proposed rule to achieve such designation by a date certain.

EPA has known about the problem of widespread PFAS contamination for nearly two decades and failed to take adequate action. This stands in contrast to recent bipartisan Congressional efforts to enact legislation requiring EPA to designate a number of PFAS as hazardous substances under CERCLA.[41]

This accounting of EPA actions demonstrates that the agency has been exceedingly slow in moving towards regulation of long-chain PFAAs and GenX chemicals. EPA's lack of concrete action is unacceptable given the scale and severity of health and environmental risks associated with these chemicals. Petitioners emphasize the urgent need for regulatory action on these PFAS, and request that EPA immediately initiate a rulemaking in response to this petition.

C. Regulating Wastes Containing Long-Chain PFAAs and GenX Chemicals Under RCRA is Critical and Urgent to Protect Communities and the Environment.

Without regulation under RCRA of wastes containing long-chain PFAAs and GenX chemicals, disposal of these wastes is largely unrestricted, and the risk of wide-scale environmental contamination and human exposure is high. In the absence of regulation,

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[36] *See* 15 U.S.C. § 2604(a)(2).
[37] Perfluoroalkyl Sulfonates; Significant New Use Rule, 67 Fed. Reg. 72,854 (Dec. 9, 2002).
[38] Perfluoroalkyl Sulfonates; Significant New Use Rule, 72 Fed. Reg. 57,222, 57,223 (Oct. 9, 2007).
[39] *See, e.g.*, *id.*
[40] 2019 PFAS ACTION PLAN, *supra* note 33, at 15, 28.
[41] PFAS Action Act of 2019, H.R. 535, 116th Cong. (2019).

one common solution for disposal has been to release these substances into city wastewater systems or the environment.[42] For example, carpet manufacturers that used long-chain PFAAs in their products in Dalton, Georgia—the "Carpet Capital of the World"—disposed of these chemicals into the river that supplies water to nearby communities; this led to PFOA and PFOS levels exceeding EPA's health advisories.[43]

Likewise, in Michigan, improper disposal of PFOS-laden wastes by a leather tannery led to the contamination of nearly 800 private drinking water wells with PFOS at concentrations up to hundreds of times higher than the EPA Health Advisory levels.[44] At another site in Michigan, chrome-plating wastewater containing PFOS contaminated municipal wastewater effluent, the river that receives that effluent, and biosolids destined for agricultural reuse.[45] The story is similar in North Carolina, where EPA's Draft Health Hazard Assessment for GenX reported that "GenX chemicals have been discharged into the Cape Fear River for several decades as a byproduct of other manufacturing processes."[46]

Another consequence of unregulated handling of PFAS wastes is that disposal activities may redistribute these chemicals and/or their toxic combustion products geographically or in the environment. For example, the Massachusetts Department of Environmental Protection collected firefighting foams containing long-chain PFAAs from fire departments across the state, and then shipped them to an incineration facility in Ohio with a history of air permit violations.[47] Vermont also collected foams containing long-chain PFAAs and likewise had plans to export these to the same Ohio incineration facility.[48]

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[42] *See, e.g.*, Malachi Barrett, *PFAS Discharged into Kalamazoo River Through Wastewater Plant*, MLIVE (July 15, 2018), https://www.mlive.com/news/kalamazoo/2018/07/sources_of_pfas_compounds_foun.html.

[43] *PFAS Contamination Site Tracker*, *supra* note 5 (Dalton, Georgia location).

[44] Paula Gardner, *When the Biggest Company in Town Poisons the Water*, MLIVE, https://www.mlive.com/news/2019/06/when-the-biggest-company-in-town-poisons-the-water.html (last updated June 12, 2019).

[45] *PFAS Response/Michigan PFAS Sites*, MICHIGAN.GOV (describing PFAS-contaminated biosolids at chrome plating facility), https://www.michigan.gov/pfasresponse/0,9038,7-365-86511_82704-452827--,00.html (last updated June 6, 2019). Although dangerous disposal of PFOA and PFOS is primarily a legacy rather than current disposal problem in light of the phaseout of these chemicals, their listing as hazardous wastes under RCRA would facilitate cleanup of existing contaminated sites. Among the important benefits of a RCRA hazardous waste designation is that would confer automatic listing of designated chemicals as "hazardous substances" under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the federal statute governing cleanup of contaminated sites. *See* 42 U.S.C. § 9601(14)(C) (defining CERCLA hazardous substances to include any acutely hazardous waste, toxic waste, or characteristic waste under RCRA). This would in turn facilitate cleanup activity and allocation of financial responsibility to polluters.

[46] Draft GenX Assessment, *supra* note 5, at 3.

[47] NICHOLAS J. CHILD, MASS. DEP'T OF ENVTL. PROT., MASSDEP LEGACY FIREFIGHTING FOAM TAKE-BACK PROGRAM 2018 PROJECT SUMMARY (2019), https://www.mass.gov/files/documents/2019/02/07/massdep-legacy-firefighting-foam-take-back-program-2018-project-summary.pdf.

[48] Elizabeth Gribkoff, *State Nixes Plan to Send Toxic Foam to Incinerator with Environmental Violations*, VTDIGGER (Nov. 16, 2018), https://vtdigger.org/2018/11/16/state-nixes-plan-to-send-toxic-foam-to-incinerator-with-environmental-violations/.

Thermal destruction of PFAS-containing wastes can lead to additional health and environmental harm, and has not been sufficiently studied. PFAS have high thermal stability and the degree to which different PFAS chemicals are destroyed under different conditions of incineration is uncertain.[49] Incineration of PFAS-containing wastes has the potential to release harmful byproducts including highly toxic hydrogen fluoride gas.[50] Incineration of PFAS wastes should not be considered a safe solution unless and until this technology has been appropriately customized, tested, and made subject to stringent operating conditions. Otherwise, disposal of PFAS may simply change the nature and location of the contamination.

Perhaps one of the most egregious consequences of the lack of regulation of PFAS wastes in the United States is *import* of these substances for disposal and incineration. Absent regulation, disposal of PFAS-containing waste is presently easier and cheaper in the U.S. than it is abroad. In February of 2019, a news article documented that the Chemours Company had been importing GenX wastes from the Netherlands to the United States.[51] Chemours is a spin-off of Dupont, which introduced GenX chemicals as a PFOA alternative in 2009.[52] EPA has been aware of the import of GenX wastes since 2014, but did not object to these practices because it determined that "the waste did not meet the regulatory definition of a RCRA hazardous waste"[53]— a determination whose premise this petition challenges. The notice informing EPA of the GenX waste import suggested that the waste was bound for incineration at a facility in El Dorado, Arkansas, but later reporting indicated that it was sent to Deer Park, TX, for deep well injection.[54] The safety of both of these disposal methods for surrounding communities and the environment is questionable.

These activities— importation, incineration, and dumping of PFAS wastes—demonstrate a critical need for EPA to regulate these wastes under RCRA, which was enacted to ensure that hazardous waste management "minimize[s] the present and future threat to human health and the environment."[55]

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[49] DANISH MINISTRY OF THE ENV'T, SURVEY OF PFOS, PFOA AND OTHER PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES, PART OF THE LOUS-REVIEW, ENVIRONMENTAL PROJECT NO. 1475, 2013 at 80 (2013), https://www2.mst.dk/Udgiv/publications/2013/04/978-87-93026-03-2.pdf

[50] Philip Harold Taylor et al., *Investigation of Waste Incineration of Fluorotelomer-Based Polymers as a Potential Source of PFOA in the Environment*, 110 CHEMOSPHERE 17 (2014).

[51] Sharon Lerner, *Chemours Is Using the U.S. as an Unregulated Dump for Europe's Toxic GenX Waste*, THE INTERCEPT (Feb. 1, 2019), https://theintercept.com/2019/02/01/chemours-genx-north-carolina-netherlands/.

[52] Draft GenX Assessment, *supra* note 5, at 2.

[53] Lerner, *supra* note 51.

[54] *Compare* EPA, Notice of Temporary Objection, EPA Notice ID: 020936/111/18, at 3 (Dec. 19, 2018), https://assets.documentcloud.org/documents/5699173/EPA-Notice-Objection-Chemours-12-19-2018.pdf *with* Lerner, *supra* note 51.

[55] 42 U.S.C. § 6902(b).

V. EPA Should Regulate Wastes Containing Long-Chain PFAAs and Wastes Containing GenX Chemicals Under Subtitle C of RCRA.

Wastes containing either long-chain PFAAs or GenX chemicals meet the criteria for two categories of RCRA hazardous wastes regulated by Subtitle C: Toxicity Characteristic Wastes and Toxic Wastes.[56] Because there is already a substantial body of scientific evidence demonstrating that wastes containing long-chain PFAAs or GenX chemicals are toxic, mobile, and environmentally persistent, and that long-chain PFAAs are bioaccumulative, petitioners request that EPA designate wastes containing these substances as Toxicity Characteristic Wastes, as Toxic Wastes, or both.

A. RCRA Background

Congress enacted RCRA "to promote the protection of health and the environment" by requiring health-protective and environmentally protective hazardous waste management practices.[57] RCRA authorizes EPA to "regulate hazardous wastes from cradle to grave" to ensure that at each stage of their lifecycle, hazardous wastes are safely handled, processed, and disposed.[58]

A "hazardous waste" under RCRA is:

> a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may –
>
> (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
>
> (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.[59]

EPA regulates three categories of hazardous waste under RCRA, two of which—"(Toxicity) Characteristic Waste"[60] and "Toxic Waste"[61]—properly encompass long-chain PFAAs and GenX chemicals.

Toxicity Characteristic Wastes are solid wastes that produce an extract that "contains any of the contaminants listed in [40 C.F.R. § 261.24] [T]able 1 at the concentration equal to or greater than the respective value given in that table."[62] EPA initially promulgated Table 1

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[56] 40 C.F.R. §§ 261.24 (toxicity characteristic waste), 261.11(a)(3) (hazardous waste with toxic constituents).
[57] 42 U.S.C. § 6902(a)(4).
[58] *City of Chicago v. Envtl. Def. Fund*, 511 U.S. 328, 331-32 (1994).
[59] 42 U.S.C. § 6903(5)(A), (B). A "solid waste" is defined under RCRA as any discarded material, regardless of whether the material is actually "solid." *Id.* § 6903(27).
[60] *Id.* §§ 261.11(a)(1); 261.21-.24.
[61] 40 C.F.R. § 261.11(a)(1)-(3).
[62] 40 C.F.R. § 261.24.

to prevent and reduce groundwater contamination by substances that could, "when improperly managed[,] . . . contribute to an increase in morbidity/mortality."[63] Thus, Table 1 focuses on chronic toxicity in designating groundwater contaminants.[64]

Toxic Wastes, as defined in RCRA regulations, must (1) contain at least one of the constituents in Appendix VIII of 40 C.F.R. § 261, *and* (2) be "capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed."[65] Substances in Appendix VIII have "been shown in scientific studies to have toxic, carcinogenic, mutagenic or teratogenic effects on humans or other life forms."[66] In deciding whether wastes containing Appendix VIII constituents should be listed as Toxic Wastes, EPA considers eleven factors, including but not limited to the environmental fate and persistence of the toxic constituents.[67]

As detailed below, there is ample scientific evidence demonstrating that EPA should regulate wastes containing long-chain PFAAs and GenX as Toxicity Characteristic Wastes, Toxic Wastes, or both, under RCRA.

B. EPA Should Designate Wastes Containing Long-Chain PFAAs and Wastes Containing GenX Chemicals as Toxicity Characteristic Wastes Under RCRA.

EPA should add long-chain PFAAs and GenX chemicals to the list of groundwater contaminants in Table 1 of 40 C.F.R. § 261.24, and relatedly, list wastes containing these substances as Toxicity Characteristic Wastes in RCRA regulations at 40 C.F.R. § 261, Subpart D.[68] This action would be consistent with EPA's approach of applying the Toxicity Characteristic Waste category to regulate substances that are likely to leach hazardous concentrations of toxic contaminants into groundwater under conditions of improper management.[69] Because PFAS wastes are currently unregulated under RCRA, there are no "proper" management conditions for them, and they contaminate drinking water supplies of millions of Americans at levels that endanger human health.[70]

To regulate wastes containing long-chain PFAAs and GenX chemicals as Toxicity Characteristic Wastes, EPA must first add these substances to the list of groundwater contaminants in Table 1 of 40 C.F.R. § 261.24.[71] When supplementing the list of groundwater contaminants in Table 1 through amendment, EPA chooses substances for which there is "adequate and verified data" sufficient for (1) establishing a chronic toxicity reference level, and (2) modeling environmental fate and transport.[72] There is "adequate

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[63] Hazardous Waste Guidelines and Regulations, 43 Fed. Reg. 58,946, 58,952 (Dec. 18, 1978).
[64] *Id.*
[65] 40 C.F.R. § 261.11(a)(3).
[66] *Id.*
[67] *Id.*
[68] 40 C.F.R. 261.30-261.34.
[69] *See* Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristics Revisions, 55 Fed. Reg. 11,789, 11,800 (Mar. 29, 1990).
[70] Hu et al., *supra* note 6, at 345–46.
[71] 40 C.F.R. § 261.24.
[72] 55 Fed. Reg., *supra* note 69, at 11,810.

and verified data" on long-chain PFAAs and GenX chemicals sufficient to both establish chronic toxicity reference levels and model environmental fate and transport.

Chronic toxicity reference levels are "levels below which chronic exposure for individual toxicants in drinking water is considered safe."[73] To identify chronic toxicity levels, EPA uses (when possible) human health or regulatory standards—including proposed standards—because "these have already received [a]gency and public review and evaluation."[74] In past decisions to amend Table 1, EPA relied on federal drinking water standards and Reference Doses to set chronic toxicity levels.[75] Reference Doses are EPA's own estimates of "the daily dose of a substance that will result in no adverse effect even after a lifetime of exposure to the substance at that dose."[76]

For long-chain PFAAs and GenX, there is "adequate and verified data" sufficient for determining chronic toxicity levels. EPA has set Lifetime Health Advisories for PFOA and PFOS, i.e., concentrations at or below which adverse human health effects are not anticipated to occur.[77] Additionally, several states have set health-based water standards and guidance levels for PFOA and PFOS that are more stringent than EPA's Health Advisories.[78] States have also promulgated standards and guidance for other long-chain PFAAs, including PFHxS and PFNA.[79] For GenX chemicals, EPA has already issued a proposed Reference Dose.[80] EPA can and should rely upon its own health-based standards and guidance levels, along with those issued by states, as chronic toxicity reference levels for the purposes of listing long-chain PFAAs and GenX chemicals as toxic contaminants in Table 1 of 40 C.F.R. § 261.24.

Additionally, there is sufficient data on long-chain PFAAs and GenX substances to characterize adequately their environmental fate and transport. EPA's own website

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[73] *Id.* at 11,801.
[74] *Id.*
[75] *Id.*
[76] *Id.*
[77] Lifetime Health Advisories and Health Effects Support Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate, 81 Fed. Reg. 33,250 (May 25, 2016).
[78] *See, e.g.*, Cal. Water Bds., Notification Level Issuance (July 13, 2018), https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/pfos_and_pfoa/PFOS_NL_Issuance_signed.pdf (California Notification Levels for PFOS) and Cal. Water Bds., Notification Level Issuance (July 13, 2018), https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/pfos_and_pfoa/PFOA_NL_Issuance_signed.pdf; Minnesota Notification Levels (Minn. Admin. Code 4717.7860 (2019)), https://www.health.state.mn.us/communities/environment/risk/guidance/gw/table.html; Vermont Notification Levels (Vt. Admin. Code 16-3-502, Appendix 1 (2019)).
[79] *See, e.g.*, Vt. Admin. Code 16-3-502, Appendix 1 (2019) (Enforcement Standards and Preventive Action Levels for PFOS, PFOA, PFHxS, PFHpA, and PFNA); N.J. ADMIN. CODE §7:9C Appendix (groundwater quality standards for PFNA); Mass. Dep't of Envtl. Protection, *Health Advisories for Per- and Polyfluoroalkyl Substances* (PFAS) (June 8, 2018), https://www.mass.gov/files/documents/2018/06/11/orsg-pfas-20180608.pdf; Minn. Admin. Code 4717.7860 (2019), https://www.health.state.mn.us/communities/environment/risk/guidance/gw/table.html (updated in 2019 to include PFHxS).
[80] Draft GenX Assessment, *supra* note 5, at vii-viii.

explains that the agency is "particularly concerned about . . . long-chain PFAS chemicals" because they are "persistent in the environment."[81]

EPA summarized the physical and chemical properties of PFOA and PFOS in its 2016 Lifetime Health Advisories for these two substances, concluding that these chemicals are "stable in environmental media," "resistant to environmental degradation processes, such as biodegradation, photolysis, and hydrolysis," and that "[b]ecause of [their] persistence, [PFOA and PFOS] can be transported long distances in air or water."[82] PFOA and PFOS are relatively water soluble, have low volatility,[83] and have a low tendency to adsorb to sediments.[84] As EPA has already acknowledged, other long-chain PFAAs share these problematic environmental fate and transport properties.[85]

With respect to GenX chemicals, EPA's recent health hazard assessment references all of the information and data that led EPA to conclude that these chemicals are "stable to photolysis, hydrolysis, and biodegradation" and "persistent . . . in air, water, soil, and sediments."[86] Additionally, "measured physical-chemical and sorption data" demonstrated to EPA that GenX chemicals run off into surface water and "rapidly leach to groundwater from soil and landfills."[87] EPA also concluded that conventional treatments of drinking water and wastewater will not remove GenX substances.[88]

Taken together, such data, regulatory thresholds, and information on chronic toxicity and environmental fate of long-chain PFAAs and GenX chemicals suffice for EPA to regulate wastes containing these substances as Toxicity Characteristic Wastes under RCRA.

C. EPA Should List Wastes Containing Long-Chain PFAAs and Wastes Containing GenX Chemicals as Toxic Wastes Under RCRA.

Wastes containing long-chain PFAAs, and those containing GenX chemicals, should be listed as "Toxic Wastes." RCRA regulations define "Toxic Wastes" as substances that (1) contain a toxic constituent listed in Appendix VIII to 40 C.F.R. § 261, *and* (2) are "capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed."[89] As described below, long-chain PFAAs and GenX chemicals meet the criteria for designation as "toxic constituents," and wastes containing these constituents meet the eleven-factor regulatory test for management as hazardous wastes.[90]

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[81] EPA, *Risk Management for Per- and Polyfluoroalkyl Substances (PFASs) Under TSCA*, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/risk-management-and-polyfluoroalkyl-substances-pfass (last visited May 1, 2019).
[82] PFOA LHA, *supra* note 18, at 24; EPA, DRINKING WATER HEALTH ADVISORY FOR PERFLUOROOCTANE SULFONATE (PFOS) 16, 25 (2016) [hereinafter PFOS LHA], https://www.regulations.gov/document?D=EPA-HQ-OW-2014-0138-0038.
[83] PFOA LHA, *supra* note 18, at 21; PFOS LHA, *supra* note 82, at 16.
[84] PFOA LHA, *supra* note 18, at 24; PFOS LHA, *supra* note 82, at 25.
[85] 78 Fed. Reg. 62,443, 62,445 (Oct. 22, 2013); 77 Fed. Reg. 48,924, 48,928-29 (Aug. 15, 2012).
[86] Draft GenX Assessment, *supra* note 5, at 6-9.
[87] *Id.* at 8.
[88] *Id.*
[89] 40 C.F.R. § 261.11(a)(3); *see* 66 Fed. Reg. 10,060, 10,065 (Feb. 13, 2001).
[90] 40 C.F.R. § 261.11(a)(3).

1. EPA Should Add Long-Chain PFAAs and GenX Chemicals to the List of Toxic Constituents in Appendix VIII to 40 C.F.R. § 261, Because These Are Toxic Substances.

EPA should list long-chain PFAAs and GenX chemicals as "toxic constituents" in 40 C.F.R. § 261, Appendix VIII, because scientific studies demonstrate that these substances are toxic to humans and animals.[91] These chemical listings would supplement, and are consistent with, the existing Appendix VIII listing for elemental fluorine.[92] EPA lists a new substance in Appendix VIII if the substance has "been shown in scientific studies to have toxic, carcinogenic, mutagenic or teratogenic effects on humans or other life forms."[93] As explained in Part IV(A) of this petition, *supra,* the toxicity of long-chain PFAAs and GenX chemicals has been the subject of recent thorough reviews by ATSDR, EPA, and other agencies. In light of the body of scientific evidence, EPA should add these substances to the list of toxic constituents in Appendix VIII.

2. The Eleven-Factor Analysis Favors Listing Long-Chain PFAAs and GenX Chemical Wastes as Toxic Wastes.

This section offers preliminary analysis[94] of wastes containing long-chain PFAAs and GenX chemicals under the factors for designation of Toxic Wastes under RCRA.[95]

a. Nature of Toxicity[96]

As explained in Part IV(A) of this petition, supra, there is a large body of scientific evidence demonstrating that long-chain PFAAs and GenX are potent multi-system toxicants.

b. Concentration of Toxic Constituent in Waste[97]

Firefighting foams with long-chain PFAA concentrations ranging from two to five percent by volume have been recalled by states and the federal government and are destined for disposal.[98] Without RCRA regulation of long-chain PFAA wastes, the federal government and states like Massachusetts and Vermont have already been turning to incineration as the preferred disposal method.[99] Given the current lack of regulation, this incineration may be

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[91] EPA 2016 PFOA Lifetime Health Advisory at 10; Draft GenX Assessment, *supra* note 5, at vii.
[92] *See* 40 C.F.R. § 261.11(a)(3).
[93] 40 C.F.R. § 261.11(a).
[94] *See infra* Section V(E) (explaining that citizen petitioners have neither the obligation nor, typically, the ability to provide complete information to support promulgation of RCRA regulations—it is EPA's duty to conduct subsequent study and research).
[95] 40 C.F.R. § 261.11(a)(3).
[96] 40 C.F.R. § 261.11(a)(3)(i).
[97] 40 C.F.R. § 261.11(a)(3)(ii).
[98] *E.g.*, Sharon Lerner, *U.S. Military Plans to Keep Incinerating Toxic Firefighting Foam, Despite Health Risks*, THE INTERCEPT (Jan. 27, 2019), https://theintercept.com/2019/01/27/toxic-firefighting-foam-pfas-pfoa/; Child, *supra* note 47; Gribkoff, *supra* note 48.
[99] *See* note 98.

occurring without adequate monitoring and control of air emissions for PFAS or hazardous PFAS combustion products.

There is little publicly available data on the concentration of long-chain PFAAs and GenX chemicals in wastes from industrial processes. For instance, there is no information listed in the Toxics Release Inventory on releases from facilities manufacturing, processing, or otherwise using these substances because PFAS releases have not to date required reporting. However, soil and water at sites where such wastes have been disposed often contain concentrations of these chemicals that are several orders of magnitude higher than relevant drinking water advisories. Part IV(C) offers a few examples of the many instances in which PFAS have been directly deposited into city wastewater systems or the environment.

c. Potential of Toxic Constituents to Migrate into the Environment[100]

Long-chain PFAAs and GenX chemicals are highly water soluble and readily migrate from wastes into the environment. ATSDR's Draft PFAS Toxicological Profile states that PFAS are mobile in soil and easily leach into groundwater.[101] EPA's recent health hazard evaluation of GenX chemicals likewise states that these "rapidly leach to ground water from soil and landfills."[102]

d. Environmental Persistence[103]

Long-chain PFAAs and GenX chemicals are extremely persistent in the environment. Long-chain PFAAs are "very stable compounds" that are resistant to biodegradation, photolysis, atmospheric photooxidation, and hydrolysis.[104] EPA has recognized that GenX chemicals are similarly stable and resist biodegradation, photolysis and hydrolysis, and therefore persistent in air, water, soil, and sediments.[105] And although PFAA precursors (chemicals that break down into PFAAs) are not themselves persistent, their breakdown results in production of highly persistent PFAAs.[106]

The persistence of long-chain PFAAs and GenX chemicals is of particular concern because they are highly mobile and can be transported long distances through oceanic and atmospheric currents.[107] Long-chain PFAAs have spread to the far reaches of the planet.[108]

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[100] 40 C.F.R. § 261.11(a)(3)(iii).
[101] Draft PFAS Toxicological Profile, *supra* note 1, at 534.
[102] Draft GenX Assessment, *supra* note 5, at 8.
[103] 40 C.F.R. § 261.11(a)(3)(iv).
[104] Draft PFAS Toxicological Profile, *supra* note 1, at 534.
[105] Draft GenX Assessment, *supra* note 5, at 7.
[106] Erika Houtz & David Sedlak, *Oxidative Conversion as a Means of Detecting Precursors to Perfluoroalkyl Acids in Urban Runoff*, 46 ENVTL. SCI. & TECH. 9342 (2012).
[107] Wang, *supra* note 13, at 2511.
[108] Draft PFAS Toxicological Profile, *supra* note 1, at 534.

Exposure to long-chain PFAAs has been connected to adverse health effects in remote Arctic communities. [109]

e. Degradation & Rate of Degradation[110]

As explained in Part V(C)(2)(d), supra, long-chain PFAS and GenX are extremely stable and not expected to undergo hydrolysis, photolysis, or biodegradation at appreciable rates under ordinary environmental conditions. There is little-to-no potential for these to degrade naturally at any rate relevant to waste management practices.

Breakdown of PFAA precursors occurs at different rates in different contexts (e.g. in the human body,[111] in microbes,[112] or in the atmosphere[113]), but in all cases results in the production of persistent PFAAs.

f. Bioaccumulation[114]

Long-chain PFAAs are bioaccumulative, with a tendency to accumulate in blood serum and other blood-rich tissues, such as the liver.[115] Especially high levels of long-chain PFAAs have been detected in apex predators such as polar bears.[116] In humans, long-chain PFAAs are eliminated very slowly, on the scale of years.[117]

GenX chemicals are less biopersistent than long-chain PFAAs,[118] but their environmental persistence will lead to accumulation in the environment and consistent exposure. Thus, lack of bioaccumulation does not mean lack of harm.[119]

g. Plausible Types of Improper Management[120]

Part IV(C) details how wastes containing long-chain PFAAs and GenX chemicals are currently handled, in the absence of regulation setting forth any "proper" methods for management and disposal. These ongoing disposal activities—from direct releases into

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[109] Samuel C. Byrne et al., *Exposure to Perfluoroalkyl Substances and Associations with Serum Thyroid Hormones in a Remote Population of Alaska Natives*, 166 ENVTL. RES. 537, 539, 542 (2018).
[110] 40 C.F.R. § 261.11(a)(3)(v).
[111] Jonathan Martin et al., *PFOS or PreFOS? Are Perfluorooctane Sulfonate Precursors (PreFOS) Important Determinants of Human and Environmental Perfluorooctane Sulfonate (PFOS) Exposure?*, 12 J. ENVTL. MONITORING 1979 (2010).
[112] Mary Joyce Dinglasan et al., *Fluorotelomer Alcohol Biodegradation Yields Poly- and Perfluorinated Acids*, 38 ENVTL. SCI. & TECH. 2857 (2004).
[113] David Ellis et al., Degradation of Fluorotelomer Alcohols: A Likely Atmospheric Source of Perfluorinated Carboxylic Acids, 38 ENVTL. SCI. & TECH. 3316 (2004).
[114] 40 C.F.R. § 261.11(a)(3)(vi).
[115] Draft PFAS Toxicological Profile, *supra* note 1, at 535.
[116] *Id.* at 640.
[117] Wang, *supra* note 13, at 2511.
[118] Draft GenX Assessment, *supra* note 5, at 9.
[119] Wang, *supra* note 13, at 2511.
[120] 40 C.F.R. § 261.11(a)(3)(vii).

waterways to ineffective and potentially dangerous incineration—point to the urgent need for regulation of wastes containing long-chain PFAAs and GenX chemicals.

h. Quantities Generated Regionally, Nationally, or at Individual Sites[121]

As of January 2019, the U.S. Department of Defense had reportedly collected over 3 million gallons of firefighting foam containing long-chain PFAAs for disposal.[122] Large amounts of such firefighting foam waste will likely be generated by chemical industry facilities, airports, and state and local firefighters in coming years as more users move to using PFAS-free foams.[123] In the absence of TRI reporting or other tracking obligations, there is little publicly available data on quantities of long-chain PFAAs and GenX chemicals wastes generated by other industrial processes. The quantity of long-chain PFAA-containing foam waste anticipated to be disposed in the near future is, however, alone sufficient to warrant immediate RCRA regulation.

i. Nature and Severity of Existing Human Health & Environmental Damage Resulting From Improper Management[124]

The nature and severity of harms resulting from improper management of wastes containing long-chain PFAAs and GenX chemicals highlights the urgency of regulating these wastes under RCRA. The absence of regulation has led to dangerous practices like direct deposition into water sources and poorly monitored incineration, as discussed in Part IV(C), supra. These activities have contributed to long-chain PFAAs being identified in drinking water supplies for over six million Americans at levels exceeding EPA's Health Advisories.[125] Removing long-chain PFAAs and GenX chemicals from drinking water is difficult and costly.[126] Thus, the nature of PFAS contamination in the United States—widespread, poorly reversible, and at levels that pose serious risks to human health—is a factor that strongly favors regulation of long-chain PFAA and GenX chemicals wastes under RCRA.

j. Other Regulatory Action Based on Health or Environmental Hazard Posed by the Waste or Constituent[127]

EPA has been slow to respond to environmental and health risks of PFAS, but has taken some limited action, as described in Part IV(B), supra. Additionally, EPA's 2019 PFAS

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[121] 40 C.F.R. § 261.11(a)(3)(viii).
[122] *See* Lerner, *supra* note 98.
[123] INDEP. EXPERT PANEL CONVENED BY IPEN (INT'L POPS ELIMINATION NETWORK)), FLUORINE-FREE FIREFIGHTING FOAMS (3F): VIABLE ALTERNATIVES TO FLUORINATED AQUEOUS FILM-FORMING FOAMS (AFFF) (2018), https://ipen.org/sites/default/files/documents/IPEN_F3_Position_Paper_POPRC-14_12September2018d.pdf.
[124] 40 C.F.R. § 261.11(a)(3)(ix).
[125] Hu et al., *supra* note 6, at 345-46.
[126] Ian T. Cousins et al., *The Precautionary Principle and Chemicals Management: The Example of Perfluoroalkyl Acids in Groundwater*, 94 ENV'T INT'L 331, 333 (2016).
[127] 40 C.F.R. § 261.11(a)(3)(x).

Management Plan includes a long list of the agency's stated commitments to short-term and long-term actions to address PFAS risks to human health and the environment.[128]

Meanwhile, states have been active in addressing the health and environmental risks posed by PFAS. Vermont's Department of Environmental Conservation has issued an emergency rule designating five long-chain PFAAs as hazardous substances; this requires corrective action whenever any of these substances are released into the environment.[129] Vermont regulators explained that this emergency rule was necessary "to protect public health and the environment" because "PFAS are associated with numerous adverse health effects."[130] New York's Department of Environmental Conservation has added PFOA, PFAS and their salts to its list of hazardous substances and issued regulations imposing corresponding registration, handling, and storage requirements.[131] New Jersey added PFNA to its state List of Hazardous Substances, and is in the process of doing the same for PFOA and PFOS.[132] California's Office of Environmental Health Hazard Assessment has listed PFOA and PFOS as developmental toxicants under Proposition 65,[133] thereby prohibiting discharge of these into drinking water sources[134] and requiring warnings for exposures to consumers and employees[135] where exposure above a specified risk threshold occurs. Several states have also established drinking water standards and guidance levels for long-chain PFAAs and GenX chemicals, as described in Part V(B), supra.

k. Other Factors[136]

There are two other factors EPA should consider in deciding whether to regulate long-chain PFAAs and GenX chemical wastes under RCRA: the poor reversibility and inequitable impacts of PFAS contamination.

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[128] 2019 PFAS ACTION PLAN, *supra* note 33, app. A, at 48-58.
[129] Agency of Natural Resources, Vermont Department of Environmental Conservation, Emergency Rule Filing: Investigation and Remediation of Contaminated Properties Rule (July 11, 2018), https://dec.vermont.gov/sites/dec/files/documents/ANR%20Rule%20filing%20package%20-%20IRULE.pdf.
[130] *Id.* at 4; Agency of Natural Resources, Vermont Department of Environmental Conservation, Emergency Rule Coversheet: Investigation and Remediation of Contaminated Properties Rule, at 5 (Aug. 14, 2018), https://dec.vermont.gov/sites/dec/files/documents/ANR%20Rule%20filing%20package%20-%20IRULE.pdf.
[131] N.Y. COMP. CODES R. & REGS. tit. 6, part 597.3; *see also Adoption of Final Rule: 6 NYCRR Part 597, Hazardous Substances Identification, Release Prohibition, and Release Reporting, Effective March 3, 2017*, N.Y. STATE DEP'T ENVTL. CONSERVATION, https://www.dec.ny.gov/regulations/104968.html (last visited July 10, 2019).
[132] State of New Jersey Department of Environmental Protection, Statewide PFAS Directive, Information Request and Notice to Insurers 4 (Mar. 25, 2019), https://www.nj.gov/dep/docs/statewide-pfas-directive-20190325.pdf (last visited July 24, 2019).
[133] CAL. CODE REGS. tit. 27, § 27001(c).
[134] CAL. HEALTH & SAFETY CODE § 25249.5.
[135] CAL. HEALTH & SAFETY CODE § 25249.6.
[136] 40 C.F.R. § 261.11(a)(3)(xi).

Due to the environmental persistence of long-chain PFAAs and GenX chemicals, contamination is difficult to reverse, and this process is highly time- and resource-intensive.[137] These chemicals are not removed from drinking water by conventional water treatment technologies.[138] Remediating long-chain PFAAS and GenX chemicals in soil and aquifers is extremely challenging, and such efforts can even be counterproductive by increasing the mobility of the chemicals.[139] Regulation of long-chain PFAA and GenX chemicals wastes would incentivize innovation to improve these processes to make them both more effective and more economical.

Another critical consideration is the inequitable impact of PFAS contamination and exposures. For example, unregulated disposal activity like improper incineration adds to the environmental burden faced by nearby disadvantaged communities, like East Liverpool, Ohio, where there were elevated levels of neurotoxins in the air even before PFAS incineration commenced.[140]

Unregulated disposal also threatens traditional food sources for indigenous communities in the Arctic, compromising both human health and cultural resources. Due to their high mobility, PFAS are transported atmospherically and via the ocean, and they bioaccumulate in animals that are traditional foods for indigenous communities.[141] Exposure to long-chain PFAAs through consumption of traditional foods has been connected to adverse thyroid effects in remote populations of Alaska Natives.[142]

The poor reversibility and inequitable impacts of long-chain PFAA and GenX chemicals contamination demonstrate the need for their regulation under RCRA.

D. EPA Has Authority to Designate Wastes Containing the Class of Long-Chain PFAAs, and GenX Chemicals, as Hazardous Wastes Under RCRA.

RCRA requires EPA to "promulgate regulations . . . listing particular hazardous wastes" that EPA "shall" revise "from time to time . . . as may be appropriate."[143] Scientific investigations of long-chain PFAAs and GenX chemicals have demonstrated that these are toxic, mobile, and environmentally persistent.[144] Thus, timely regulation of these is urgent. Petitioners therefore request that EPA promptly initiate a rulemaking to ensure that wastes containing long-chain PFAAs and GenX chemicals are subject to the waste disposal and management provisions in Subtitle C of RCRA regulations.

Petitioners note that the request to regulate LCPFACs and LCPFASs as chemical subclasses is consistent with RCRA regulations, which explicitly provide for "list[ing] classes or types of solid waste as hazardous waste."[145] EPA has explained that it lists a

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[137] Wang, *supra* note 13, at 2512-13.
[138] Cousins et al., *supra* note126, at 333.
[139] *Id.*
[140] *See* Lerner, *supra* note 98.
[141] Byrne et al., *supra* note 109, at 537.
[142] *Id.* at 539, 542.
[143] 42 U.S.C. § 6921(b)(1).
[144] *See supra* Part IV(A).
[145] 40 C.F.R. § 261.11(b).

group of substances as a class if there is "reason to believe that all wastes within the class or type typically or frequently are hazardous."[146] And EPA already regulates chemical classes such as chloroalkyl ethers, chlorinated fluorocarbons, and nitrosamines under Subtitle C.[147]

EPA has additionally acknowledged that it believes that chemicals in the LCPFAS and LCPFAC subclasses share hazard characteristics, and it has taken regulatory action on this conclusion. In amending the LCPFAS SNUR in 2007 to include 183 additional LCPFAS, EPA cited its concerns about LCPFAS as a subclass, noting the constituent chemicals' similarities in toxicity, bioaccumulation potential, and environmental persistence.[148] Similarly, in 2013, EPA issued a SNUR for the subclass of LCPFACs in carpet manufacturing and treatment.[149] EPA explained its decision to regulate these together by examining the health and environmental properties of LCPFACs collectively, describing chemicals in the subclass as toxic, mobile, and environmentally persistent.[150]

Because RCRA authorizes EPA to regulate classes of substances, and EPA already regulates LCPFAC and LCPFAS as chemical subclasses under TSCA, EPA should likewise use a class approach to regulating these under Subtitle C of RCRA. Regulation of LCPFACs and LCPFASs on a group basis is critical to avoid repeating the history of health and environmental harms that have been created by substitution of new, unsafe PFAS chemicals when toxic ones are regulated. [151]

E. EPA Should Immediately Initiate Rulemaking to Designate Wastes Containing Long-Chain PFAAs and Wastes Containing GenX Chemicals as Hazardous, and Should Ensure Their Safe Disposal.

EPA should immediately begin the process of designating wastes containing long-chain PFAAs and GenX chemicals as hazardous wastes. This process begins with study and investigation of safe management and disposal options for these chemicals[152]—a process that requires public involvement.[153] Involvement of communities affected by current unsafe disposal practices, such as poorly controlled incineration, is particularly critical.[154]

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[146] 45 Fed. Reg. 33,084, 33,107 (May 19, 1980).
[147] 40 C.F.R. § 261, Appendix VIII.
[148] Perfluoroalkyl Sulfonates; Significant New Use Rule, 72 Fed. Reg. at 57,224–25 (Oct. 9, 2007).
[149] Final Significant New Use Rule: Perfluoroalkyl Sulfonates and Long-Chain Perfluoroalkyl Carboxylate Chemical Substances, 78 Fed. Reg. 62,443 (Oct. 22, 2013).
[150] 78 Fed. Reg. at 62,445; Proposed Significant New Use Rule: Perfluoroalkyl Sulfonates and Long-Chain Perfluoroalkyl Carboxylate Chemical Substances, 77 Fed. Reg. 48,924, 48,928-29 (Aug. 15, 2012).
[151] *See* Wang, *supra* note 13, at 2508, 2513.
[152] "To list a waste as hazardous, EPA conducts a detailed industry study, placing particular emphasis on the hazardous constituents contained in specific wastes from the industry being studied . . . . This process involves literature reviews, engineering analyses, surveys and questionnaires, and site visits, including sampling and analysis of wastes." 51 Fed. Reg. 21,648, 21,648 (June 13, 1986).
[153] 42 U.S.C. § 6974(b); 40 C.F.R. § 25.10.
[154] *See supra* Part IV(C).

EPA need not wait until it has comprehensive information about each long-chain PFAA that is a subject of this petition to designate wastes containing LCPFACs and/or LCPFASs as hazardous under RCRA. These chemicals generally raise similar concerns of environmental persistence, mobility, and adverse human health effects, and EPA has already acknowledged this.[155] Thus, understanding the toxicity and environmental fate of some of these substances—e.g., PFOA and PFOS, which are well-studied—can and should inform the regulation of other long-chain PFAAs and GenX chemicals. Vermont and Massachusetts have taken this approach in setting drinking water advisories for several long-chain PFAAs based on recognition of their similarities to PFOA and PFOS.[156]

Even if EPA determines that it has incomplete information about how best to manage and dispose of long-chain PFAAs and GenX chemical wastes, however, it must seek to fill these data gaps, rather than deny the petition based on data insufficiency. In establishing the RCRA petition process, EPA recognized that petitioners will not have the resources or data-collection authority to make sure that rulemaking petitions include "all of the information" necessary to make hazardous waste designations.[157] Thus, EPA committed to "obtain[ing] the supplemental data necessary" to make a determination on a RCRA petition.[158]

Indeed, it is EPA's duty under RCRA to gather the information and develop the methods it needs to regulate wastes. RCRA broadly mandates that EPA "shall" research management practices to ensure that wastes do not cause human health or environmental harms if released into the environment.[159] Specifically, EPA must consider the "adverse health and welfare effects of release into the environment of material present in solid waste" and identify "methods to eliminate such effects."[160]

EPA must also conduct experiments for the purpose of developing and applying new hazardous waste disposal methods.[161] As ATSDR's Draft PFAS Toxicological Profile explains, there is a need for development of new methods that "avoid release of [PFAS] into the open environment and prevent contamination of nearby soil, sediment, and groundwater."[162] In sum, EPA must engage in a public process to investigate and research

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[155] 78 Fed. Reg. 62,443, 62,445 (Oct. 22, 2013); 72 Fed. Reg. 57,222, 57,224–25 (Oct. 9, 2007).
[156] *See* OFFICE OF RESEARCH & STANDARDS, MASS. DEP'T OF ENVTL. PROT., FINAL RECOMMENDATIONS FOR INTERIM TOXICITY AND DRINKING WATER GUIDANCE VALUES FOR PERFLUORINATED ALKYL SUBSTANCES INCLUDED IN THE UNREGULATED CHEMICAL MONITORING RULE 3, at 1-2 (June 8, 2018) https://www.mass.gov/files/documents/2018/06/11/pfas-ors-ucmr3-recs_0.pdf; Memorandum from Mark A. Levine, Comm'r, State of Vt. Dep't of Health, to Emily Boedecker, Comm'r, State of Vt. Dep't of Health 1-2 (July 10, 2018) (Subject: Drinking Water Health Advisory for Five PFAS (per- and polyfluorinated alkyl substances)), http://www.healthvermont.gov/sites/default/files/documents/pdf/ENV_DW_PFAS_HealthAdvisory.pdf.
[157] 45 Fed. Reg. 33,084, 33,090 (May 19, 1980).
[158] *Id.*
[159] 42 U.S.C. § 6981(a).
[160] *Id.* § 6981(a)(1).
[161] *Id.* § 6981(a)(6).
[162] Draft PFAS Toxicological Profile, *supra* note 1, at 636.

PFAS management and disposal practices concurrent with initiating the hazardous waste designation process.

VI. Conclusion

RCRA was enacted to ensure that "hazardous waste be properly managed in the first instance[,] thereby reducing the need for corrective action [in the] future."[163] Regulation of long-chain PFAAs and GenX chemicals is long overdue: some of these substances have been used in industry for nearly seventy years, and EPA has been aware of the serious health and environmental risks associated with several since the late 1990s. EPA's failure to address these risks—for decades—means the "need for corrective action" is high. Communities nationwide are dealing with the effects of unregulated disposal of these chemicals, from improper incineration to direct discharge into drinking water sources.

Unfortunately, cleaning up long-chain PFAAs and GenX chemicals once they are in the environment is expensive, and in many cases, impractical. To protect people and the planet from further harm, it is vital that EPA curtail future contamination by immediately regulating management and disposal of these wastes. Petitioners therefore request that EPA act promptly on this request, and initiate a rulemaking to regulate long-chain PFAAs and GenX chemical wastes under RCRA.

Respectfully submitted,

Claudia Polsky, Director
Purba Mukerjee, Attorney & Clinical Teaching Fellow
Albert Lin, Hayley Landman, and Brendan Layde, Student Clinicians
Environmental Law Clinic
U.C. Berkeley School of Law
353 Boalt Hall
Berkeley, CA 94720-7200
cpolsky@clinical.law.berkeley.edu
(510) 642-5398

On behalf of:

Green Science Policy Institute
P.O. Box 9127
Berkeley, CA 94709

Alaska Community Action on Toxics
1225 East International Airport Road, Suite 220
Anchorage, AK 99518

[163] 42 U.S.C. § 6902(a)(5).

Clean Cape Fear
130 Emberwood Dr.
Winnabow, NC 28479
Buxmont Coalition for Safer Water
115 Samantha Drive
Lansdale, PA 19446

The PFAS Alliance
2701 Reeds Lake Blvd
Grand Rapids, MI, 49506

Fountain Valley Clean Water Coalition
c/o Liz Rosenbaum, Organizer
10031 Avenida Hermosa View
Fountain, Colorado 80817