

The Attorneys General of the States of New York, California, Connecticut,  
Delaware, Illinois, Iowa, Maine, Maryland, Massachusetts, Michigan,  
New Jersey, New Mexico, Oregon, Pennsylvania, Rhode Island,  
Virginia, Washington, and Wisconsin

February 3, 2020

*Via Regulations.gov and First Class Mail*  
Document Control Office (7407M)  
Office of Pollution Prevention and Toxics (OPPT)  
Environmental Protection Agency  
1200 Pennsylvania Ave. NW  
Washington, D.C. 20460-0001

Re: Comments on the Advance Notice of Proposed Rulemaking, *Addition of Certain Per- and Polyfluoroalkyl Substances; Community Right-to-Know Toxic Chemical Release Reporting*, 84 Fed. Reg. 66369 (Dec. 4, 2019)

Docket ID No. EPA-HQ-TRI-2019-0375

Dear Administrator Wheeler:

The state attorneys general of New York, California, Connecticut, Delaware, Illinois, Iowa, Maine, Maryland, Massachusetts, Michigan, New Jersey, New Mexico, Oregon, Pennsylvania, Rhode Island, Virginia, Washington, and Wisconsin (the Attorneys General) appreciate the opportunity to offer comments on the Environmental Protection Agency's (EPA) Advance Notice of Proposed Rulemaking, *Addition of Certain Per- and Polyfluoroalkyl Substances; Community Right-to-Know Toxic Chemical Release Reporting* (ANPRM), 84 Fed. Reg. 66369 (Dec. 4, 2019).

In the ANPRM, EPA requests public comments "on which, if any, [*per*-fluoroalkyl and *poly*-fluoroalkyl substances (PFAS)] should be evaluated for listing [on the Toxics Release Inventory (TRI)], how to list them, and what would be appropriate reporting thresholds given their persistence and bioaccumulation potential." *Id.* More specifically, EPA seeks comments on "which of the approximately 600 PFAS currently active in U.S. commerce the Agency should consider evaluating for potential addition to the TRI," and on "whether there are data available to inform how to list PFAS, *i.e.*, as individual chemical listings, as a single category, as multiple categories or as a combination of individual listings and category listings." *Id.* at 66372.

As discussed below, we strongly support an EPA rulemaking to list PFASs on the TRI, both as a single category listing for all PFASs and as individual listings for specific compounds in the category. Considerable information is already known that

demonstrates the acute and chronic harms that certain PFASs pose to human health, and their persistence, bioaccumulation, and significant adverse effects to the environment. Because those PFASs share structural and other similarities with other chemicals in the class, each individual PFAS “can reasonably be anticipated to cause” acute and/or chronic harms to human health and adverse effects to the environment for purposes of adding them under EPA’s TRI Program. Reporting of these chemicals under the Emergency Planning and Community Right to Know Act (EPCRA) and the Pollution Prevention Act (PPA), is feasible because validated and commonly-accepted methods exist to measure the levels of these PFASs.

In addition, the Attorneys General recommend that EPA set a TRI reporting threshold of one pound for PFAS as a category class, for PFASs already listed on the TRI, as well as for the individual PFAS chemicals identified below.

### **Background**

PFASs are known as “forever chemicals” because they resist degradation and are highly persistent in the environment. PFASs have been incorporated into countless consumer products since the 1940s, including textiles treated with Scotchgard, cookware lined with Teflon, and food packaging, among numerous other products and uses. In addition, for decades, PFASs have been incorporated into firefighting foam used across the country, including by the U.S. military and local fire departments. As the ANPRM notes, PFASs present a risk of harm to the environment and to human health, and many PFASs have been found in human blood. *Id.* at 66370. PFASs also bioaccumulate and are linked to serious adverse health effects in humans and animals, including reproductive, developmental, liver, immune, thyroid, cancer, and other effects.

### **The Emergency Planning and Community Right-to-Know Act (1986) and the Pollution Prevention Act (1990)**

Congress created the TRI Program as part of its response to serious chemical releases in the 1980s from Union Carbide facilities in Bhopal, India, and Institute, West Virginia. Through EPCRA, and later, the PPA, Congress sought to support and promote emergency planning and to provide the public with information about releases of toxic chemicals in their communities.

The TRI Program serves an essential function by providing information to federal, state, and local governments about releases of toxic chemicals to the environment, incentivizing companies to improve their environmental performance, and aiding in the development of appropriate regulations, guidelines, and standards for managing toxic chemicals. 42 U.S.C. §11023(h). Section 313 of EPCRA requires certain federal and industrial facilities that manufacture, process, or otherwise use chemicals listed in the TRI above threshold quantities to report, on an annual basis,

the amounts of these chemicals released into the environment and otherwise managed as waste. 42 U.S.C. § 11023. Likewise, the PPA requires regulated facilities to report pollution prevention and recycling data for chemicals on the TRI. 42 U.S.C. § 13106.

Chemicals are included on the TRI by statute or by EPA designation. EPCRA authorizes EPA to add a chemical or a class of chemicals to the TRI based on evidence that the chemical or class is “known to cause or can reasonably be anticipated to cause” acute or chronic adverse human health effects or significant adverse environmental effects. 42 U.S.C. § 11023(d)(2).

### **The National Defense Authorization Act for Fiscal Year 2020 (NDAA)**

In December 2019, Congress amended EPCRA through certain provisions of the NDAA by adding certain individual PFAS chemicals to the TRI Program. NDAA, Pub. Law 116-92 (December 20, 2019). The listed PFASs include PFOA, PFOS, GenX, PFNA, and PFHxS, certain associated salts and other compounds, and approximately 150 other PFASs listed under other statutes and regulations.<sup>1</sup> *Id.*, § 7321(b)(1). The NDAA also amends EPCRA by establishing a reporting threshold for these PFASs of 100 pounds. *Id.*, § 7321(b)(2). Additionally, the NDAA provides for the possible future inclusion of other PFASs into the TRI. *Id.*, § 7321(c).

\* \* \*

The Attorneys General commend Congress for enacting the NDAA as an important action in regulating PFASs at the federal level. The NDAA is significant because, among other things, it adds numerous individual PFAS chemicals to the TRI, enabling governments, communities, and regulated companies to engage in informed decision-making about the lifecycle management of these chemicals at covered facilities. This information is especially important to the state governments we represent because states commonly bear the brunt of remediation costs when chemicals like PFASs are mismanaged or discharged to the environment.

As described below, the Attorneys General now urge EPA to proceed with a rulemaking to cover the entire family of PFASs, along with certain individual PFAS chemicals, each with a reporting threshold of one pound. Our recommendations below echo those conveyed in a July 2019 letter sent by twenty-two state attorneys general, including many of the undersigned, to the U.S. congressional leadership (July 30, 2019 Attorneys General Letter to Congress).<sup>2</sup> Among other things, the letter requested the addition of the entire class of PFASs to the TRI, at a very low reporting level, to help identify new potential sources and areas of contamination. As intended by the TRI Program, the actions we recommend below will provide the public with vital needed information about releases of PFASs in their communities.

## Recommendations

We respectfully make the following recommendations:

### Recommendation 1:

#### **Add all PFASs to the TRI Program as a single category listing.**

EPA should add all PFASs, as a class, to the TRI Program for reporting under EPCRA and the PPA. This recommendation applies to the entire category of PFASs, potentially consisting of thousands to more than 10,000 individual chemicals, including the group of approximately 600 PFASs that EPA, in the ANPRM, identifies as being active in U.S. commerce. Including all PFASs in the TRI Program would account for the many PFASs that, though not purposefully manufactured for commercial use, are nevertheless constituents of commercial products. Including the class of PFASs to the TRI satisfies EPCRA's listing criteria because all PFASs have similar chemical properties that are "known to cause or can reasonably be anticipated to cause" acute and/or chronic harm to human health and significant adverse effects to the environment. EPCRA, section 313(d)(2).<sup>3</sup>

Certain PFASs that were commonly used in commerce in our states, including *per*-fluoroalkyl carboxylates (such as PFOA) and *per*-fluoroalkyl sulfonates (such as PFOS), are known to be toxic at extremely low concentrations (*e.g.*, parts per trillion). These PFASs can show similar indicia of toxicity, persistence in the environment, and tendency to accumulate ubiquitously in the environment and in biota.<sup>4</sup> Increasingly, industry is substituting *poly*-fluoroalkyl substances for *per*-fluoroalkyl substances, which have been used more traditionally in all manner of consumer products. However, some *poly*-fluoroalkyl substances can readily break down or transform to both *per*-fluoroalkyl carboxylates and sulfonates whose toxicity, persistence, and bioaccumulation are well-known.<sup>5</sup> In addition, ultra-short chain PFASs, *i.e.* those with a backbone of less than four carbon molecules, may pose a similar risk to human health and the environment as longer chain PFASs such as PFOA and PFOS. Specifically, these shorter-chain PFASs may share similar characteristics with longer-chain PFASs, including a high degree of fluorination, lack of known degradation mechanism, confirmed environmental occurrence and ubiquity, and reasonably assumed health-based toxicological endpoints.<sup>6</sup> A class-based approach for assessing PFASs is recommended by federal experts, including Dr. Linda Birnbaum, when she was Director of the National Institute of Environmental Health Sciences and the National Toxicology Program.<sup>7</sup>

Though not a criterion for listing, it is notable that commonly-used and widely-accepted commercial techniques are available to identify and quantify short- and long-chain PFAS compounds. Likewise, total and ultra-short PFAS

concentrations can be readily estimated using a combination of commercially available analytical techniques.<sup>8</sup>

EPA has ample experience listing chemical classes as a single category in the TRI Program. For example, the TRI lists all polychlorinated biphenyls (PCBs), a diverse family of compounds, as a single category. EPA has appropriately done so despite the chemical-specific differences in health-based impacts, as well as environmental fate and transport processes, among individual PCBs. PCBs provide an especially helpful example here as they tend to bioaccumulate or demonstrate harm to humans and animals at many of the same health-based endpoints as PFASs, including liver, thyroid, immunological alterations, neuro-developmental changes, reduced birth weight, reproductive toxicity, and cancer.<sup>9</sup> In addition, like many PFASs, PCBs are known to be persistent, bioaccumulative, and toxic.

Finally, EPA should adopt a chemical class-based approach for listing PFASs on the TRI because it will provide critical information to enable the states, other regulators, and facility operators to better understand the extent that PFASs are used at regulated facilities and the potential for their release into the environment. As a result, existing and future waste streams containing PFASs can be appropriately managed, remediated, and regulated, and uncontrolled releases can better be prevented to avoid adverse impacts to public health and the environment. While cost is not a regulatory criterion for adding chemicals to the TRI, it is worth noting that the cost to facilities of reporting on PFASs can be offset by the benefits of reducing environmental releases of these chemicals.

### **Recommendation 2:**

**Add specific PFASs to the TRI Program as individual listings to the extent that: (1) EPA has validated a method to measure the level of each PFAS; and (2) the chemical is not already listed pursuant to the NDAA.**

In addition to listing all PFASs to the TRI as a class, EPA should add the following twenty individual PFAS chemicals to the TRI Program as individual listings: PFBS, PFPeS, PFHpS, PFBA, PFPeA, PFHxA, PFHpA, PFUnA, PFTrDA, 11Cl-PF3OUdS, 9Cl-PF3ONS, ADONA, 4:2FTS, 8:2FTS, NFDHA, PFEESA, PFMBBA, PFMPA, NEtFOSAA, and NMeFOSAA. The recently enacted NDAA added many PFASs to the TRI. Our recommendation supplements the TRI with these additional PFASs.

The proposed twenty additional PFASs may be reasonably anticipated to share some or all of the same hallmarks of persistence, bioaccumulation, and/or toxicity to humans as those already added to the TRI Program through the NDAA, with similar health-based effects at comparable exposure endpoints.<sup>10</sup> The toxicity of PFOA and PFOS, the most studied PFASs to date, to humans and the environment is well known. Like PFASs such as PFOA and PFOS with well-known human health and environmental impacts, these twenty additionally recommended

PFASs have been shown to or may also be anticipated to have similar adverse health effects and/or to accumulate in the environment with wide-ranging contamination in air, water, soil, and multiple biological tissues.<sup>11</sup> Although not a criterion for listing to the TRI, the chemicals we propose adding are readily measurable using validated analytical methods.<sup>12</sup>

These twenty individual PFASs easily meet EPCRA's criteria for listing on the TRI Program. Consistent with the approach implemented by Congress under the NDAA, these individual PFASs should be listed, along with their salt forms and other closely-related chemicals (*e.g.*, linear and branched isomers).

### **Recommendation 3:**

#### **The TRI Reporting Threshold should be one pound for both individual PFAS chemicals and for the PFAS chemical compound category.**

EPCRA establishes general reporting thresholds of 25,000 pounds for facilities involved in manufacturing or processing listed chemicals, and 10,000 pounds for facilities that otherwise use listed chemicals. As the ANPRM notes, however, in the past EPA has established lower reporting thresholds for listed chemicals of special concern. 84 Fed. Reg. at 66371. EPA has lowered reporting thresholds for persistent, bioaccumulative, and/or toxic (PBT) chemicals and chemical compound categories, and in particular, for PBTs with very high persistence and bioaccumulation values. 84 Fed. Reg. at 66371.

As discussed above, many PFASs are well-understood to be highly persistent and bioaccumulative chemicals. Consequently, EPA should add the compound category of PFASs as well as all individually-listed PFASs to the list of chemicals of special concern, 40 C.F.R. § 372.28. Given the high potential of PFASs to cause acute and chronic harm to humans and biota, in addition to their high persistence and bioaccumulative tendencies, the Attorneys General recommend that EPA set a threshold reporting requirement of one pound for the PFAS compound class and for each individual PFAS chemical, including the PFASs that the NDAA added to the TRI at a reporting threshold of 100 pounds.

A lower reporting threshold for PFASs would be consistent with past EPA decisions regarding PBT chemicals. In the past, EPA lowered the threshold reporting requirements for sixteen PBT chemicals and five PBT categories due to the insidious threats PBTs pose to human health and the environment compared to other chemicals in the TRI.<sup>13</sup> Of these, EPA has set reporting thresholds of ten pounds for ten PBT chemicals and one PBT category. Furthermore, EPA lowered the reporting threshold for the PBT chemical compound category of Dioxin and Dioxin-Like Compounds, to one tenth of a gram, which is only 0.0002205 pounds.<sup>14</sup>

A reporting threshold of one pound for the chemical compound category of PFASs and for individual PFAS chemicals is appropriate and warranted. For PCBs, a category of 209 individual PBT chemical compounds, EPA established an updated TRI reporting threshold of ten pounds in 1999. For drinking water, the federal health advisory for PFOA and PFOS (70 ng/L) is approximately one order of magnitude lower than the federal Maximum Contaminant Level for PCBs (500 ng/L). Thus, applying the same ratio, the TRI reporting threshold for PFASs should be an order of magnitude lower than for PCBs, *i.e.*, one pound.<sup>15</sup>

Significantly, studies by the U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) also support a one-pound reporting threshold for PFASs. ATSDR derived a health-based screening level for total PCBs. The agency has proposed draft health-based screening levels for four individual PFASs which are at or an order of magnitude lower than the screening levels previously established for PCBs for similar health effects.<sup>16</sup> This also justifies setting a reporting threshold for PFASs at one pound, roughly an order of magnitude lower than the ten-pound reporting threshold for PCBs.

### **Conclusion**

The Attorneys General appreciate this opportunity to comment on the ANPRM relating to the listing of PFASs to EPA's TRI Program, and respectfully request a future rulemaking that incorporates our recommendations.

Sincerely,

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February 3, 2020

Page 9

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February 3, 2020

Page 10

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## End Notes

<sup>1</sup> Section 7321 of the NDAA added fourteen specific PFASs to the TRI list. The NDAA also added 158 PFAS chemicals, including twelve of those specifically added, that met two criteria: (1) they were subject to a significant new use rule at either 40 CFR 721.9582 or 721.10536 on or before December 20, 2019; and (2) they were identified as active in commerce on the Toxic Substances Control Act (TSCA) Inventory that was published in February 2019 (EPA 2020a).

<sup>2</sup> July 30, 2019 Attorneys General Letter to United States Congressional leadership regarding PFAS legislation (Attorneys General 2019).

<sup>3</sup> For clarity, we take no position as to whether a maximum contaminant level (MCL) for PFASs, as a class, should be established under either federal law or the law of any state, as adding PFASs to the TRI and establishing an MCL may involve different considerations.

<sup>4</sup> Comparison of toxicity for perfluoroalkyl substances is complicated due to limited studies, differences between genders, across species, and in mechanism of endpoint for specific chemicals. However, similarities exist in terms of association of specific health risks to multiple chemicals within the PFASs family. Suggested associations in humans include pregnancy-induced hypertension (PFOA and PFOS), hepatic effects (PFOA, PFOS and PFHxS), cholesterol effects (PFOA, PFOS, PFNA and PFDA), thyroid disease (PFOA and PFOS), antibody response (PFOA, PFOS, PFHxS and PFDA), asthma (PFOA), developmental effects (PFOA and PFOS) and death (PFOA and PFOS) (ATSDR 2018). Multiple replacement PFASs (6:2 chlorinated polyfluorinated ether sulfonate (6:2 Cl-PFESA), HFPO trimer acid (HFPO-TA), HFPO tetramer acid (HFPO-TeA), and 6:2 fluorotelomer sulfonic acid (6:2 FTS)) have been shown to have greater toxic effects on the human liver HL-7702 cell line, as compared to PFOA and PFOS (Sheng et al. 2018a).

ATSDR reviewed 187 animal studies and found that primary effects from exposure to perfluoroalkyl substances included hepatic (PFOA, PFOS, PFBA, PFHxA, PFHpA, PFNA, PFDA, PFUnA, PFDoA, PFBS and PFHxS), developmental (PFOA, PFOS, PFBA, PFHxA, PFNA, PFDA, PFUnA, PFDoA and PFHxS), and immune toxicity (PFOA, PFOS), though not all effects were observed or examined for the fourteen PFASs ATSDR evaluated. Additional effects were also found in laboratory animals relating to the kidney (PFHxA, PFUnA, PFBS and PFHxS), thyroid functioning (PFBA and PFHxS), and death (PFHxA, PFNA and PFDA) (ATSDR 2018). Compared to PFOA, HFPO-TA showed greater liver toxicity and bioaccumulation potential in mice (Sheng et al. 2018b).

Human biomonitoring of blood from European citizens showed PFOA and PFOS levels in blood are decreasing, but levels of novel PFASs are increasing (EEA 2019). In 2009 EPA released an action plan on long-chain PFASs (including perfluoroalkyl sulfonates with six or more carbons (PFHxS and higher homologues) and perfluoroalkyl carboxylates with eight or more carbons (PFOA and high homologues), as well as their salts and precursors), noting long-chains are a concern for children's health, that children have greater exposure than adults, and that "it can reasonably be anticipated that continued exposure could increase body burdens to levels that would result in adverse outcomes" (EPA 2009). The simplest endpoint of all PFASs within the perfluoroalkyl carboxylate family is trifluoroacetic acid (TFA), which is resistant to further degradation, miscible in water, not metabolized in mammalian systems, and can cause liver effects (Bouttonnet et al. 1999). Though health-based toxicological effects vary for individual PFASs in humans or animals, the range of different types of effects for PFASs as a family combined with the similarity of effects for multiple perfluoroalkyl carboxylates and perfluoroalkyl sulfonates warrants attention to and reporting of the whole family of PFASs in the TRI.

PFASs that have been found in the environment (air, water, solids, biota) include all the routinely analyzed perfluoroalkyl carboxylates (four to fourteen carbons; PFBA, PFPeA, PFHxA, PFHpA,

PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTrDA, PFTeDA), all of the routinely analyzed perfluoroalkyl sulfonates (four to ten carbons; PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS), as well as dozens of other PFASs (Rubarth et al. 2011; MIDHHS 2018; NCDEQ 2018; Song et al. 2018; Johnson 2018a; EPA 2019a; MacGillivray 2019; EPA 2019b). New Jersey sampled surface water, sediments and fish and found that PFASs occur as a mixture in those three media; predominately shorter chain PFASs were found in water and longer chain PFASs were found in sediments and fish (NJDEP 2018). Compared to PFOA or PFOS numerous other PFASs were found in New York, co-located and in some samples at equivalent or higher concentrations in either soil, water or fish (Richter and Skinner 2017; Johnson 2018a; Johnson 2018b; Richter and Becker 2018; Becker et al. 2019; Becker 2019; Edwards 2019).

<sup>5</sup> ATSDR summarized relevant research for the perfluoroalkyls they evaluated; human exposure may occur from all contaminated media (air, water, soil, and food), they are very stable in the environment, are persistent in soil and leach into groundwater, and have been detected in oceans and the Arctic, demonstrating the potential for long-range transport (ATSDR 2018). Polyfluoroalkyl substances (precursors) are known to break down or transform to perfluoroalkyl substances (such as perfluoroalkyl carboxylates and perfluoroalkyl sulfonates) due to natural and/or anthropogenically induced industrial, environmental, or metabolic conditions (Buck et al. 2011; CONCAWE 2016). Perfluoroalkyl carboxylates are the terminal degradation (biotic and abiotic) product for numerous families of polyfluoroalkyl substances (Buck et al. 2011). Polyfluoroalkyl substances represent, at a minimum, the same toxicological threat as the endpoint perfluoroalkyl substances which they may degrade or transform in to.

<sup>6</sup> In addition to the routinely analyzed PFASs which are quantified using targeted analysis (LC-MS-MS), non-routine analysis techniques have been used by EPA as well as other researchers to identify thousands of other novel PFASs, including ultra-short-chains, in the environment or at manufacturing sites (EPA 2018). High concentrations (up to tens of parts per billion), of ultra-short-chain perfluoroalkyl carboxylates (TFA and perfluoropropionic acid (PFPrA)) and perfluoroalkyl sulfonates (trifluoromethane sulfonic acid (TFMS), perfluoroethane sulfonic acid (PFEtS), and perfluoropropane sulfonic acid (PFPrS)) were found near suspected point sources in Sweden, representing up to 69% of the total PFASs concentration measured (twenty-nine chemicals) (Björnsdotter et al. 2019). PFEtS and PFPrS have been measured in aqueous film-forming foam (AFFF) (up to 13,000,000 ng/L and 270,000,000 ng/L, respectively), as well as in groundwater from U.S. military bases (up to 7,500 ng/L and 63,000 ng/L, respectively) (Barzen-Hanson and Field 2015). Ultra-short-chain PFASs can also be generated from the breakdown or transformation of longer chain PFASs.

The simplest perfluoroalkyl carboxylate, TFA, as well as other ultra-short-, short-, and long-chain perfluoroalkyl carboxylates (PFPrA, PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTeDA and PFTrDA), are generated from thermal decomposition of polymers (Ellis et al. 2001). EPA Office of Research and Development (ORD) used non-routine analysis to collect in-situ emission samples from a sintering oven used at a manufacturing facility in New York, and found that though no PFOA nor other long-chain PFASs were detected, qualitative characterization of PFASs revealed low process emissions of PFBA, ultra-short-chain perfluoroalkyl carboxylates (TFA and PFPrA), and polyfluoroalkyl substances (4:2 FTOH and fifteen others) (Gentile 2019; EPA 2019b). ORD also found PFPrA, as well as eighty-eight other PFASs, in process emissions from a PFAS manufacturing site in New Hampshire (EPA 2019a). No PFPrA, nor other perfluoroalkyl carboxylates, were present in the raw products which were tested from the site (EPA 2019c). Although not measured in the dispersions or surfactants, it is likely that, based on detected analytes and the qualitative peak concentrations for air emissions and dispersions, the perfluoroalkyl carboxylates measured in air emissions were generated from manufacturing processes which used stock industrial dispersions and surfactants.

<sup>7</sup> “Approaching PFAS as a class for assessing exposure and biological impact is the best way to protect public health.” Testimony of Linda S. Birnbaum at hearing on “The Federal Role in the Toxic PFAS Chemical Crisis” before the Senate Committee on Homeland Security and Governmental Affairs and Subcommittee on Federal Spending Oversight and Emergency Management (Birnbaum 2018).

<sup>8</sup> Analytical techniques (non-targeted and non-routine analysis) have been developed to aid in identification of the presence and chemical formula of unknown PFASs, however the lack of available standards for these chemicals limits the ability to quantitate the chemicals based on currently promulgated analytical methods. PFASs which are able to transform to perfluoroalkyls (precursors) in the environment are quantified using a commercially developed method, the Total Oxidizable Precursor Assay (Buechler 2017). Other commercial techniques have been developed which are able to quantitatively report total organofluorine, a proxy of total PFASs (Eurofins 2018).

<sup>9</sup> ATSDR derived a Minimal Risk Level (MRL) of 0.02 µg/kg/day for PCBs as a family of chemicals. While setting the MRL ATSDR noted that for either humans or animals, health effects associated with PCB mixtures included liver, thyroid, dermal and ocular changes, immunological alterations, neurodevelopmental changes, reduced birth weight, reproductive toxicity and cancer (ATSDR 2000).

<sup>10</sup> PFASs that have been found in humans, or which have had health-based advisory values or standards set for drinking water, include all of the routinely analyzed perfluoroalkyl carboxylates (four to fourteen carbons; PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnA, PFDoA, PFTrDA, PFTeDA), and all of the routinely analyzed perfluoroalkyl sulfonates (four to ten carbons; PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS). Other PFASs have also been found in humans or have health-based advisory values, including PFASs which are routinely analyzed (FOSA, 6:2 FTS, 8:2 FTS, GenX, N-MeFOSAA, N-EtFOSAA) and numerous other chemicals which are not, or are newly, routinely analyzed, including both perfluoroalkyl (perfluoroalkyl carboxylates (sixteen and eighteen carbons; PFHxDA and PFOcDA) and perfluoroalkyl phosphinic acids (PFPIAs)) and polyfluoroalkyl substances (polyfluoroalkyl phosphoric diesters (diPAPs), fluorotelomer alcohols (FTOHs), fluorotelomer unsaturated carboxylic acids (FTUCAs; 6:2, 8:2, and 10:2), fluorotelomer carboxylic acids (FTCAs; 5:3 and 7:3) and perfluoroalkyl sulfonate derivatives – Cl-PFOS, Cl-PFHxS, ketone-PFOS, ether-PFHxS) (ITRC 2020; ATSDR 2018; CA 2015; EPA 2009). End Note four discusses similar exposure endpoints for health-based effects from PFASs.

<sup>11</sup> See End Notes four, five and six.

<sup>12</sup> EPA’s validated Method 533 (November 2019) focuses on short chain PFASs and complements EPA Method 537.1 (November 2018). Using both methods, a total of twenty-nine unique PFASs can be effectively quantified in drinking water, the only media for which EPA has released validated methods of analysis. Of these, we recommend that EPA add to the TRI Program the twenty PFASs that have not already been listed under the NDAA, *i.e.* PFBS, PFPeS, PFHpS, PFBA, PFPeA, PFHxA, PFHpA, PFUnA, PFTrDA, 11Cl-PF3OUdS, 9Cl-PF3ONS, ADONA, 4:2FTS, 8:2FTS, NFDHA, PFEESA, PFMBA, PFMPA, NEtFOSAA, and NMeFOSAA (EPA 2019d).

<sup>13</sup> The reporting threshold for PCBs under the TRI was lowered to ten pounds in 1999, when EPA promulgated the Final Rule on Persistent, Bioaccumulative, and Toxic (PBT) chemicals (EPA 2019e).

<sup>14</sup> There are sixteen PBT chemicals and five PBT chemical compound categories that are subject to TRI reporting (EPA 2020b).

<sup>15</sup> An MCL is the maximum concentration of a chemical in drinking water and has the force of law under the federal Safe Drinking Water Act. The federal MCL for PCBs is 500 parts per trillion (ppt). Federal MCL values consider both health risks and exposure, as well as technological considerations.

No federal MCLs have been set for PFASs, but a health advisory (HA) for PFOA/PFOS of 70 ppt has been established by EPA for drinking water. Although lacking the force of law, a HA is analogous to a MCL. The 70 ppt HA for PFOA/PFOS is roughly an order of magnitude lower than the 500 ppt MCL for PCBs, justifying a reporting threshold for PFASs at one pound, roughly an order of magnitude lower than the ten pound reporting threshold for PCBs.

<sup>16</sup> ATSDR derived a health-based screening level of 0.02 µg/kg/day for total PCBs (ATSDR 2000). ATSDR has proposed draft health-based screening levels for four individual PFASs (PFOA: 0.003 µg/kg/day; PFNA 0.003 µg/kg/day; PFOS: 0.002 µg/kg/day; and PFHxS 0.02 µg/kg/day) (ATSDR 2018).

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February 3, 2020

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February 3, 2020

Page 18

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