Federal Role in Responding to Potential Risks of Per- and Polyfluoroalkyl Substances (PFAS)

Updated August 10, 2022

Congressional Research Service
https://crsreports.congress.gov
R45986

CRS REPORT
Prepared for Members and
Committees of Congress

Congressional Research Service
Informing the legislative debate since 1914

Federal Role in Responding to Potential Risks of Per- and Polyfluoroalkyl Substances (PFAS)

SUMMARY

R45986

August 10, 2022

Elena H. Humphreys, Coordinator
Analyst in Environmental Policy

David M. Bearden
Specialist in Environmental Policy

Laura Gatz
Analyst in Environmental Policy

Lance N. Larson
Analyst in Environmental Policy

Jerry H. Yen
Analyst in Environmental Policy

Per- and polyfluoroalkyl substances (PFAS) are a group of fluorinated compounds that have been used for various purposes, including numerous commercial, industrial, and U.S. military applications. Some common uses include food packaging, nonstick coatings, and stain-resistance fabrics, and as an ingredient in fire suppressants in Aqueous Film Forming Foam (AFFF) used at U.S. military installations and at civilian airports, among other locations, and by state and local fire departments. PFAS persist in the environment and in humans, and studies on several PFAS indicate that exposures above certain levels are associated with various adverse health effects.

Some PFAS—primarily perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS)—have been detected in soil, surface water, groundwater, and drinking water in numerous locations. These detections—associated with releases from federal and industrial facilities, civilian airports, and fire department facilities—have prompted calls for increased federal action and authority to prevent and mitigate releases of and exposures to PFAS.

Federal actions to address potential risks from PFAS have focused mostly on PFOS and PFOA because of past uses, prevalence in the environment, and availability of health effects research. These actions have been taken primarily under the authorities of the Toxic Substances Control Act (TSCA); the Safe Drinking Water Act (SDWA); the Clean Water Act (CWA); and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and related Department of Defense (DOD) response authorities. The U.S. Environmental Protection Agency (EPA) has used various authorities to address PFAS in commerce, public water supplies, surface waters, and in the environment.

Under TSCA, EPA has taken actions to gather and assess existing information on the risks of PFOS, PFOA, and certain other PFAS. The agency has required manufacturers to develop new information to evaluate risks of various PFAS and has issued orders restricting their manufacture, processing, distribution, use, and/or disposal pending the development of new risk information. EPA worked with U.S. manufacturers as they voluntarily phased out production of PFOS, PFOA, and related substances. Under SDWA, EPA determined to regulate PFOA and PFOS in public water supplies in March 2021. The act requires EPA to propose a regulation within 24 months of finalizing a regulatory determination (e.g., by March 2023 for PFOA and PFOS), and finalize the regulation within 18 months of publishing the proposal. Under CWA, EPA has several authorities it may use to address PFAS in surface waters. To date, EPA has not published final limitations for any PFAS, but has taken steps toward doing so. EPA has, in specific instances, used permit authorities to address PFAS concerns at facilities that discharge to surface waters.

DOD and other federal agencies have used CERCLA authorities to respond to releases of various PFAS at federal facilities, although such responses are not statutorily required. DOD administers the vast majority of federal facilities where PFAS have been detected. DOD has been responding to releases of PFOA and PFOS from the use of AFFF at active and decommissioned U.S. military installations under the Defense Environmental Restoration Program. DOD has been phasing out the use of AFFF that contains PFOA or PFOS to reduce the risks of future releases.

Several federal agencies, including EPA and the Agency for Toxic Substances and Disease Registry, have been evaluating potential health effects that may be associated with exposures to various PFAS. The U.S. Food and Drug Administration and the U.S. Department of Agriculture are addressing risks of PFAS in dairy milk, other foods, and food contact applications.

Various stakeholders have urged federal agencies to act more quickly and broadly to address PFAS and to provide assistance to address contamination. In the 117th Congress, Members have introduced more than 60 bills that would address PFAS through various federal agencies and authorities. Two of these bills have been enacted. Division J, Title VI of the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), enacted in November 2021, provides a total of $5 billion in emergency appropriations to EPA from FY2022 through FY2026 to address emerging contaminants (that may include PFAS) in wastewater and drinking water. The National Defense Authorization Act for Fiscal Year 2022 (NDAA FY2022; P.L. 117-81), enacted in December 2021, includes several provisions related to PFAS that build upon certain requirements enacted in prior NDAAs.

Contents

Tables

Appendixes

Contacts

Introduction

Per- and polyfluoroalkyl substances (PFAS) are a large, diverse group of fluorinated compounds that have been used in numerous commercial, industrial, and U.S. military applications. Among other uses, PFAS have been used in fire-fighting foams and in the processing and manufacture of many commercial products (e.g., nonstick cookware, stain- and water-resistant fabrics). PFAS are persistent in the environment, and studies of several PFAS suggest that exposures above certain levels may lead to adverse health effects.[1]

Detections of PFAS contamination in drinking water and the environment have increased in recent years with the availability of new analytical methods and increased monitoring. PFAS have been detected in soil, surface water, groundwater, and public water supplies in numerous locations.[2] These detections have been associated primarily with releases from manufacturing and processing facilities, and from U.S. military installations and other facilities that use firefighting foams (e.g., civilian airports and fire departments). These detections have prompted calls for increased federal action and authority to prevent and mitigate exposures to PFAS.

Federal actions to address potential health and environmental risks of exposure to PFAS have been taken primarily under the authorities of the following federal statutes:

- Toxic Substances Control Act (TSCA);
- Safe Drinking Water Act (SDWA);
- Clean Water Act (CWA); and
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and related U.S. Department of Defense (DOD) response authorities.

The U.S. Environmental Protection Agency (EPA) has used the authorities of these four statutes to take most of its actions to address potential risks of PFAS. DOD and other federal agencies have also used CERCLA authorities to respond to releases of various PFAS at federal facilities. Some federal actions have involved the private sector in complying with reporting and other requirements. Other actions have included voluntary measures taken by some companies.

Although the federal government has taken a range of actions to address PFAS exposure, some policymakers and stakeholders have urged federal agencies to act more quickly and broadly. For instance, some are calling for EPA to issue enforceable drinking water standards for some or all PFAS. Others want EPA to designate all PFAS as hazardous substances (and thus establish liability for responsible parties to pay response costs).

Members have introduced over 160 bills since the 114th Congress to address potential risks of PFAS.[3] The vast majority of bills related to PFAS have not been enacted into law. Multiple bills were enacted in the 115th Congress and 116th Congress that included provisions related to PFAS among other purposes. Each National Defense Authorization Act (NDAA) enacted from FY2018

[1] To date, scientific studies have generally involved a small number of PFAS. These studies have focused mostly on risks associated with ingestion, and less on inhalation or skin contact (i.e., dermal exposure). See discussion under report section on "Health Effects Studies."

[2] Primarily, perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and certain other related perfluoroalkyl substances accounted for most of the historical production of PFAS prior to their phase-out.

[3] CRS identified bills related to PFAS based on a search of Congress.gov using common terms that refer to these chemicals or aqueous film forming foam (AFFF) that contains certain PFAS: *perfluoroalkyl substances*, *polyfluoroalkyl substances*, *perfluorinated compounds*, *PFAS*, *PFOA*, *PFOS*, *GenX*, and *AFFF*. These bills therefore are not necessarily comprehensive of all such legislation, as other bills may use differing terms in reference to PFAS.

through FY2021 has included provisions related to PFAS. These laws directed DOD to take a range of actions to address PFAS. Some of these laws directed EPA and other federal agencies to take additional actions to address PFAS. Members have introduced over 60 bills related to PFAS in the 117th Congress.[4] Some of these bills are similar in scope or purpose to legislation introduced in prior Congresses. In the 117th Congress, enacted legislation containing provisions to address PFAS include the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) and the NDAA for Fiscal Year 2022 (P.L. 117-81).

This report focuses on federal authorities under which EPA and other agencies have taken actions to address potential risks of PFAS. It does not discuss other laws under which EPA or other agencies may take additional actions, or actions under state laws.[5] The report begins with a brief discussion of the chemical properties, uses, and varying risks of PFAS, followed by discussions of federal actions, relevant legislation enacted in the 115th and 116th Congresses, and relevant enacted and proposed legislation in the 117th Congress.

Properties and Uses of PFAS

PFAS are a large group of synthesized chemical compounds that do not occur naturally. Chemical manufacturers have produced various types of PFAS for a range of commercial, industrial, and U.S. military applications since the 1940s. EPA identifies over 1,200 PFAS manufactured in the United States over time.[6] The specific types and quantities of PFAS produced and used have varied over time and continue to change.

PFAS are not a single chemical or a single compound, but refer to a group of compounds that share similar chemical structures. Any compound that has the chemical structure of at least one carbon atom attached to two or more fluorine atoms, or a chain of at least two carbon atoms attached to two or more fluorine atoms, may be considered a PFAS.[7] Individual PFAS vary in terms of the numbers of fluorinated carbon atoms. The extent to which a chain of carbon atoms is fluorinated would determine whether a chemical may be considered a perfluoroalkyl substance or a polyfluoroalkyl substance. Given the possible variations in the length of the carbon chain, number of fluorinated carbon atoms, and other atoms attached to the chain, PFAS potentially could include thousands of chemical compounds if every possible combination were created.[8]

Industry and government sources indicate that manufacturers have focused on producing PFAS with longer fluorinated carbon chains, primarily because they reduce the surface tension of

[4] CRS identified bills related to PFAS based on a search of Congress.gov using common terms that refer to the following chemicals or aqueous film forming foam (AFFF) that contains certain PFAS: *perfluoroalkyl substances*, *polyfluoroalkyl substances*, *perfluorinated compounds*, *PFAS*, *PFOA*, *PFOS*, *GenX*, and *AFFF*. These bills are not necessarily comprehensive of all such legislation, as other bills may use differing terms in reference to PFAS.

[5] Other federal environmental laws also authorize EPA to regulate chemicals or wastes released into the environment (e.g., Clean Air Act and Solid Waste Disposal Act). These laws are noted in the discussion of relevant legislation.

[6] EPA, *EPA's Per-and Polyfluoroalkyl Substances (PFAS) Action Plan*, EPA 823R18004, February 2019, p. 12, https://www.epa.gov/pfas/epas-pfas-action-plan.

[7] For chemical nomenclature principles, rules, and conventions, see Henri A. Favre and Warren H. Powell, *Nomenclature of Organic Chemistry, IUPAC Recommendations and Preferred Names 2013* (Cambridge: Royal Society of Chemistry, 2014). Scientists, industry, and regulators generally have used the recommendations of IUPAC (International Union of Pure and Applied Chemistry) for preferred names to standardize chemical nomenclature.

[8] A chain of fluorinated carbon atoms may be attached to different combinations of other atoms (i.e., functional groups), such as carboxyl, sulfonyl, or sulfonamyl constituents, to form different PFAS.

liquids and resist heat.[9] Some longer-chain PFAS have been used in chemical manufacturing processes to produce fluoropolymers designed for multiple consumer uses, including

- nonstick and heat-resistant coatings for cookware and food packaging, and
- treatment of clothing, leather, and other materials for soil, stain, and water resistance.

In some cases, PFAS may be used only as a processing aid to create a fluoropolymer-based product, and in other cases, PFAS may be a constituent in the resulting product. Fluoropolymer-based products may therefore contain varying amounts of PFAS depending on the manufacturing process. Fluoropolymers containing specific types of PFAS may also transform into other PFAS depending on the conditions.

Some PFAS have also been used as an ingredient in a variety of products, including

- fire suppressants in Aqueous Film Forming Foam (AFFF) used by U.S. military installations, other federal agencies, civilian airports, and local fire departments as Class B agents[10] to extinguish petroleum-based liquid fuel fires; and
- suppressants of oxidizing mist in industrial metal plating operations.

Such products generally contain relatively small concentrations of PFAS that require further dilution of the product for its intended use. For example, AFFF products that contain PFAS are designed to be diluted with water in their application to form an aqueous film that restricts oxygen to extinguish petroleum-based liquid fuel fires.[11]

Perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA), and certain other related perfluoroalkyl substances accounted for most of the historical production of PFAS prior to their phase-out, discussed below in "Regulation of PFAS in Commerce Under TSCA." Manufacturers have transitioned away from these longer-chain PFAS because of their potential toxicity and environmental persistence. Policymakers and stakeholders have continued to raise questions about the relative toxicity and persistence of shorter-chain or less-fluorinated PFAS in comparison to longer-chain PFAS. Some policymakers and stakeholders have also expressed concern about the continued use and disposal of existing stocks of longer-chain PFAS and products containing these chemicals, including the disposal of AFFF stocks by the federal government, civilian airport operators, and local fire departments, as they move to alternative firefighting foams.

[9] For example, see 3M Company, *Fluorochemical Use, Distribution, and Release Overview*, May 26, 1999, https://www.regulations.gov/document?D=EPA-HQ-OPPT-2002-0043-0008, and "Addendum II, Background and Voluntary Activities" to Letter from APFO Users, to Stephen L. Johnson, EPA Assistant Administrator, March 14, 2003, https://www.regulations.gov /document?D=EPA-HQ-OPPT-2003-0012-0012. APFO Users refer to a group of fluoropolymer manufacturers that used a specific PFAS, ammonium perfluorooctanoate (APFO), as a processing aid to produce fluoropolymers. See also Agency for Toxic Substances and Disease Registry (ATSDR), *Toxicological Profile for Perfluoroalkyls*, May 2021, p. 660, https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=1117&tid=237.

[10] Firefighting foams are formulated based on the type of fire that a foam is designed to extinguish. For a description of fire classes, see National Fire Protection Association, "Reporter's Guide: All about Fire," https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/Reporters-Guide-to-Fire-and-NFPA/All-about-fire.

[11] National Fire Protection Association, *NFPA 11, Standard for Low-, Medium-, and High-Expansion Foam*, 2016 ed., https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=11.

Challenges in Assessing Potential Risks

Similar to other commercial chemicals, releases of PFAS may occur in multiple ways that could result in exposures. PFAS may be released from

- chemical manufacturing or processing operations;
- intended uses (such as the application of AFFF as a fire extinguishing agent);
- disposal of products or wastes containing these chemicals; or
- accidental spills or other unexpected incidents.

Occupational exposures may occur among workers in facilities that manufacture or process PFAS, among workers that use products containing these chemicals (such as firefighters who use AFFF), or among workers involved in disposal.

Exposures among the general public would depend on whether a release may move through the environment in a manner that an individual could come into contact with these chemicals. Exposures may also occur among individuals who use a product containing these chemicals. As with any chemical, potential risks to human health and the environment would depend on the properties of the specific PFAS, the conditions under which exposure may occur, and the characteristics of the exposed individual.

How PFAS interact in the environment and in humans or animals would vary depending on the structure, toxicity, persistence, and other properties of the individual chemical. The rate at which a particular chemical once released may break down into other chemicals would determine how long it persists before reacting with other chemicals in the environment or in a human or animal that would produce new chemicals with different properties. Although some have characterized PFAS as "forever chemicals," various studies have observed that persistence varies among longer-chain and shorter-chain PFAS, and among more-fluorinated and less-fluorinated PFAS.[12] Persistence among chemicals generally would vary depending on their respective molecular structures and compositions. Toxicity and potential health effects may also vary. Whereas persistence would affect how long the properties of the chemical remain intact, the potential risks associated with exposure would depend on the toxicity of the specific chemical, the exposure pathway, and other exposure factors. Given this variability, evaluating the potential risks of all PFAS as a singular category presents scientific (and regulatory) challenges.

Similarly, regulating all PFAS as a singular category would present challenges in developing a singular risk-based standard (i.e., a singular concentration level). Because of the diversity of the potential universe of these chemicals, designating all PFAS as a singular category for regulatory or reporting purposes would also present challenges in implementation to identify which chemicals would be subject to applicable requirements.

Studies of the potential human health and environmental effects of PFAS have focused on PFOA, PFOS, and certain other longer-chain perfluoroalkyls because of their more predominant manufacture and use. Fewer studies have examined shorter-chain perfluoroalkyls or polyfluoroalkyls. Although scientific understanding of the potential risks of these chemicals has been evolving, uncertainties remain about health effects that may be associated with exposures to

[12] See, for example, EPA, *Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study—2021 Preliminary Report*, EPA-821-R-21-004, September 2021, pp. 3-9 to 3-11, https://www.epa.gov/system/files/documents/2021-09/multi-industry-pfas-study_preliminary-2021-report_508_2021.09.08.pdf; and "Section 5.4 Transformations" in Interstate Technology Regulatory Council, *PFAS Technical and Regulatory Guidance Document and Fact Sheets*, June 2022, https://pfas-1.itrcweb.org/5-environmental-fate-and-transport-processes/#5_4.

various PFAS. Much of the attention among policymakers, stakeholders, and the general public has focused on drinking water sources. Studies of these chemicals have mostly focused on drinking water or contaminated food sources. Less is known about risks that may be associated with other exposure pathways, such as dermal contact or inhalation.

The Agency for Toxic Substances and Disease Registry (ATSDR)[13] and EPA[14] have developed guidelines for assessing chemical exposure risks under various agency programs. The National Research Council of the National Academy of Sciences has also established risk assessment guidelines and has examined some of the challenges, such as uncertainty stemming from data quantity and quality.[15] Each of these guidelines outlines factors to evaluate potential risks that may be associated with exposure to a specific chemical, including

- toxicity and other properties of the chemical;
- frequency, concentration, and duration of exposure (i.e., the dose);
- pathway of exposure (e.g., inhalation, ingestion, or skin contact);
- interaction with other chemicals that may be present in the environment; and
- age, overall health, and genetic and behavioral characteristics of the exposed individual.

Federal Actions to Address Potential Risks of PFAS

Federal actions to address potential risks from PFAS have primarily been taken under the authorities of TSCA, SDWA, CWA, and CERCLA. Most of these actions have focused on PFOS and PFOA, because of predominant past uses, prevalence in the environment stemming from these uses, and the greater availability of scientific research on potential health effects than for other PFAS. Congress has also authorized specific federal actions in separate legislation. See the section on "Relevant Legislation" for a list of these laws.

EPA has taken actions under TSCA over the past few decades to gather and assess existing information on the risks of PFOS, PFOA, and certain other PFAS. Based on the findings, TSCA authorizes EPA to require manufacturers to submit more information if needed to further evaluate potential risks, and the agency has done so. EPA has also required, or worked with, manufacturers to develop new information when existing information on a substance is insufficient to evaluate the risks. If EPA determines that the risks would meet the statutory threshold of "unreasonable" under TSCA, TSCA authorizes EPA to establish various regulatory controls if no other statute addresses the risks. EPA has not rendered a finding of unreasonable risk for any PFAS to date.

Following a series of voluntary industry phase-outs in the United States for the manufacture of PFOS, PFOA, and other related substances, EPA used TSCA authority to promulgate multiple significant new use rules (SNURs) that require manufacturers to notify the agency prior to reintroducing these substances into commerce. TSCA also requires manufacturers to notify EPA of the intent to produce any new PFAS. When information on potential risks is insufficient, EPA

[13] Agency for Toxic Substances and Disease Registry, *Public Health Assessment Guidance Manual*, 2005 Update, http://www.atsdr.cdc.gov/hac/PHAManual/toc.html.

[14] EPA has developed several guidance documents for assessing human health exposure risks that may be associated with chemical releases, available at https://www.epa.gov/risk/risk-assessment-guidelines.

[15] National Academy of Sciences, National Research Council, *Science and Decisions: Advancing Risk Assessment*, 2009, National Academies Press, Washington, DC, at http://www.nap.edu/catalog/12209/science-and-decisions-advancing-risk-assessment. This report updates the previous National Research Council risk assessment guidelines issued in 1983.

has issued orders that restrict the manufacture, processing, distribution, use, disposal, or any combination of these activities pending the development of new information on risks. EPA has used information on PFAS gathered under TSCA to inform its actions under SDWA, CWA, and CERCLA.

For over a decade, EPA has been evaluating PFOA, PFOS, and other PFAS under SDWA authorities to determine whether an enforceable Maximum Contaminant Level (MCL) for drinking water provided by public water systems may be warranted. In 2009, EPA issued provisional health advisories for short-term exposures to PFOA and PFOS in drinking water. In 2016, EPA issued additional health advisories for exposures to these chemicals in drinking water over an individual's lifetime. In 2021, EPA determined to regulate PFOA and PFOS in public water supplies, and began developing drinking water regulations for these substances. In 2022, EPA issued interim health advisories for PFOA and PFOS, and final health advisories for perfluorobutane sulfonic acid (PFBS) and for hexafluoropropylene oxide (HFPO) dimer acid and its ammonium salt (also known as "GenX chemicals"). These health advisories are not enforceable standards for public water systems. However, SDWA grants EPA "emergency powers" to issue enforceable orders to abate an imminent and substantial endangerment to health from a contaminant in drinking water—whether or not the contaminant is regulated under the act. EPA has issued such orders at certain sites where releases of PFOA or PFOS have threatened drinking water sources.

EPA has several CWA authorities it may use to address contaminants of emerging concern, such as PFAS. Under the CWA, a primary mechanism to control contaminants in surface waters is through permits. These permits incorporate technology-based and water-quality-based requirements. To date, EPA has not published technology-based effluent limits or water quality criteria that include limitations for any PFAS, but has taken steps toward doing so. As discussed below, EPA has, in specific instances, used certain permit authorities to manage PFAS, and has taken steps to encourage the use of those authorities when appropriate.

EPA and other federal agencies have also responded to releases of PFAS under CERCLA. DOD administers the vast majority of federal facilities where PFAS have been detected. DOD has been responding to releases of PFOA and PFOS from the use of AFFF at active and decommissioned U.S. military installations under the Defense Environmental Restoration Program. DOD has been phasing out the use of AFFF that contains PFOA or PFOS to reduce the risks of future releases. EPA has responded to releases of PFOA and PFOS under the Superfund program at some sites located on nonfederal lands, in coordination with the states in which these sites are located. Sites addressed under the Superfund program have varied in terms of manufacturing or uses of PFAS.

In February 2019, EPA issued a *PFAS Action Plan* that established an administrative framework for multiple planned actions under TSCA, SDWA, CWA, CERCLA, and other related authorities, including

- determining whether to establish an MCL for PFOA and PFOS;
- proposing SDWA monitoring for additional PFAS under the fifth Unregulated Contaminant Monitoring Rule (UCMR5);
- proposing the designation of PFOA and PFOS as hazardous substances under CERCLA (or other related laws that trigger such designation);
- developing "groundwater cleanup recommendations" to guide decisions at Superfund sites and federal facilities under CERCLA (proposed in April 2019);
- proposing additional SNURs under TSCA for potential new uses;
- taking enforcement actions "as appropriate" under available authorities; and

- developing toxicity values and other risk assessment tools to inform decisions under multiple statutes.[16]

In February 2020, EPA updated its *PFAS Action Plan* to identify the agency's progress on the planned actions.[17] In April 2021, the agency established an internal agency Council on PFAS to coordinate the agency's activities to address PFAS across the EPA offices that are involved in this effort.[18] On October 18, 2021, the EPA Council on PFAS issued a revised agency plan, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*.[19] The *PFAS Strategic Roadmap* identifies planned actions under TSCA, SDWA, CWA, and CERCLA, and related authorities, including

- issuing an order to require health and environmental effects testing of selected PFAS;
- accelerating time frames for proposing and finalizing a drinking water regulation for PFOS and PFOA, issuing health advisories for additional PFAS, and prioritizing additional PFAS for nationwide unregulated contaminant monitoring in public water supplies, among other actions;
- outlining timelines for establishing technology-based effluent limits and water quality criteria for certain PFAS, and for completing a risk assessment for PFOA and PFOS in biosolids; and
- outlining a time frame for designating PFOA and PFOS as hazardous substances under CERCLA.

The status of federal actions to address potential risks of PFAS under TSCA, SDWA, CWA, CERCLA, and other related authorities are discussed in greater detail below.

Health Effects Studies

For more than two decades, EPA and other federal agencies have been evaluating potential human health effects that may be associated with exposures to various PFAS. These agencies have revised some of their findings over time to reflect the developing scientific literature. EPA has gathered information about certain PFAS from manufacturers and others to evaluate whether regulation is warranted under TSCA. EPA has also been evaluating whether regulation is warranted under SDWA and CWA, and whether response actions are warranted under CERCLA at sites where certain PFAS have been released into the environment. Furthermore, Section 7362 of the National Defense Authorization Act for Fiscal Year 2020 (P.L. 116-92) directs EPA, through its Office of Research and Development, to further examine the effects of PFAS on human health and the environment among other research and development activities related to PFAS.[20]

---

[16] EPA, *EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan*, EPA 823R18004, February 2019, https://www.epa.gov/pfas/epas-pfas-action-plan.

[17] EPA, *EPA's PFAS Action Plan: Program Update*, EPA 100K20002, February 2020, https://www.epa.gov/sites/default/files/2020-01/documents/pfas_action_plan_feb2020.pdf.

[18] Michael S. Regan, EPA Administrator, "Memorandum Regarding Per- and Polyfluoroalkyl Substances," April 27, 2021, https://www.epa.gov/sites/default/files/2021-04/documents/per-and_polyfluoroalkyl_substances.memo_.signed.pdf.

[19] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action, 2021-2024*, October 2021, p. 10, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf.

[20] 15 U.S.C. §8962.

In 2016, EPA reported that studies of exposures to PFOA and PFOS in laboratory animals have identified reproductive and developmental, liver and kidney, and immunological effects, and that exposures to both chemicals have caused tumors in laboratory animals.[21] EPA has also referenced human epidemiology studies observing increased cholesterol levels among exposed populations, with more limited findings related to infant birth weights, effects on the immune system, cancer (for PFOA), and thyroid hormone disruption (for PFOS).[22] Although some studies have identified potential cancer risks, EPA has not classified any PFAS as a likely or known human carcinogen.

For other PFAS, EPA has continued to evaluate studies to determine potential health effects that may be associated with exposure. For example, EPA finalized its toxicity assessment for PFBS in April 2021 and for GenX chemicals in October 2021.[23] While EPA found that exposure to PFBS and the GenX chemicals was associated with similar health effects identified for PFOS and PFOA, the extent to which exposure is associated with such effects may be different by orders of magnitude because the chemicals are different. EPA is developing toxicity assessments for five additional PFAS—perfluorobutyrate (PFBA), perfluorodecanoate (PFDA), perfluorohexanoic acid (PFHxA), perfluorohexane sulfonic acid (PFHxS), and perfluorononanoate (PFNA)—under its Integrated Risk Information System.[24]

Other federal agencies have also been evaluating the risks of certain PFAS. As discussed in the next section, the Centers for Disease Control and Prevention (CDC) has collected blood serum levels and other biomonitoring data from individuals selected for a long-term study of the prevalence of exposures to a range of chemicals, including several PFAS. The ATSDR, National Institute of Environmental Health Sciences (NIEHS), and the interagency National Toxicology Program (NTP) have also been researching potential health effects that may be associated with exposures to certain PFAS. Although the roles of these agencies are not regulatory, data and findings of these studies may be used to inform regulatory decisions of other federal or state agencies.

The following sections discuss the CDC biomonitoring program, ATSDR studies of the toxicological properties of certain PFAS, ATSDR site-specific studies, and related joint CDC/ATSDR studies. EPA's actions to evaluate PFAS are discussed in "Regulation of PFAS in Commerce Under TSCA," "Regulation of PFAS and Other Actions Under SDWA," "Regulation of PFAS and Other Actions Under the CWA," and "Environmental Remediation."

CDC Biomonitoring

For more than two decades, CDC has collected biomonitoring data for multiple environmental chemicals from a group of randomly selected individuals intended to be representative of the

[21] EPA, *Health Effects Support Document for Perfluorooctanoic Acid (PFOA)*, EPA 822-R-16-003, May 2016, pp. ES-1 to ES-4, https://www.epa.gov/sites/default/files/2016-05/documents/pfoa_hesd_final_508.pdf; and EPA, *Health Effects Support Document for Perfluorooctane Sulfonate (PFOS)*, EPA 822-R-16-002, May 2016, pp. ES-1 to ES-2, https://www.epa.gov/sites/default/files/2016-05/documents/pfos_hesd_final_508.pdf.

[22] Ibid.

[23] EPA, *Human Health Toxicity Values for Perfluorobutane Sulfonic Acid (CASRN 375-73-5) and Related Compound Potassium Perfluorobutane Sulfonate (CASRN 29420-49-3)*, April 2021, https://cfpub.epa.gov/ncea/risk/recordisplay.cfm?deid=350888; and EPA, *Human Health Toxicity Values for Hexafluoropropylene Oxide (HFPO) Dimer Acid and its Ammonium Salt (CASRN 13252-13-6 and CASRN 62037-80-3)*, October 2021, https://www.epa.gov/chemical-research/human-health-toxicity-assessments-genx-chemicals.

[24] EPA, *A Message from the IRIS Program, IRIS Program Outlook, June 2022*, https://www.epa.gov/system/files/documents/2022-06/IRIS%20Program%20Outlook_June22.pdf.

general U.S. population.[25] These data have included blood serum levels for PFOA and PFOS and 14 other PFAS. This effort is part of the National Health and Nutrition Examination Survey (NHANES).[26] The biomonitoring data that CDC has collected generally indicate that blood serum levels for the selected group of perfluoroalkyl substances among participating individuals declined between 1999 and 2018 (the most recent year for which biomonitoring data are available for these specific chemicals).[27] Declining blood serum levels for a particular chemical generally indicate reduced exposures. CDC tracks the biomonitoring data by age group, gender, and race/ethnicity, but not occupation. CDC cautions that "finding a measureable amount of PFAS in [blood] serum does not imply that the levels of PFAS cause an adverse health effect."[28] Defining the likelihood that a specific amount of PFAS in blood serum may be associated with an adverse health effect would require further study. The actual levels of PFAS in blood serum among the broader U.S. population are also uncertain, as the sample size is relatively small. In July 2022, the National Academies of Sciences, Engineering, and Medicine published a study requested by CDC, ATSDR, and NIEHS that examined guidance for clinicians about PFAS testing and how test results may inform clinical care.[29] The study examined the potential health effects of PFAS selected for biomonitoring by the NHANES and made recommendations to clinicians regarding PFAS exposure reduction and clinical follow-up for those who may have been exposed to greater levels of PFAS. Additionally, the study advised ATSDR to update, and periodically revise, its guidance on PFAS health effects information and blood testing.

ATSDR Draft Toxicological Profile

Section 104(i) of CERCLA authorizes ATSDR to prepare toxicological profiles for hazardous substances, pollutants, or contaminants found at contaminated sites that warrant federal attention.[30] In May 2021, ATSDR issued a final Toxicological Profile for perfluoroalkyls to identify potential health effects that may be associated with exposures to certain chemicals within this group of compounds. Prior to finalizing this Toxicological Profile, ATSDR had issued three drafts over the last decade to reflect continuing developments in the scientific literature.[31] ATSDR

[25] CDC has collected biomonitoring data for more than 400 "environmental" chemicals, including PFOS, PFOA, and 14 other PFAS. For the most recent presentation of CDC biomonitoring data, see CDC, "Biomonitoring Data Tables for Environmental Chemicals," https://www.cdc.gov/exposurereport/data_tables.html.

[26] CDC began collecting biomonitoring data for NHANES in 1999 and has continued to collect data annually. CDC reports that approximately 7,000 randomly selected individuals across the United States have the opportunity to participate in the latest NHANES each year. CDC indicates that participation in the survey is confidential and voluntary, and that selected participants receive a personal interview with a standardized physical examination. The survey results are intended to provide an objective assessment of the overall health of the general U.S. population based on the group of randomly selected individuals. CDC, "National Health and Nutrition Examination Survey," https://www.cdc.gov/nchs/nhanes/index.htm.

[27] CDC, "Biomonitoring Data Tables for Environmental Chemicals," https://www.cdc.gov/exposurereport/data_tables.html.

[28] CDC, "Per- and Polyfluorinated Substances (PFAS) Factsheet," August 16, 2021, https://www.cdc.gov/biomonitoring/PFAS_FactSheet.html.

[29] National Academies of Sciences, Engineering, and Medicine, *Guidance on PFAS Exposure, Testing, and Clinical Follow-Up* (Washington, D.C.: The National Academies Press, 2022), https://doi.org/10.17226/26156.

[30] 42 U.S.C. §9604(i).

[31] ATSDR issued its first draft Toxicological Profile for perfluoroalkyls in May 2009, its second draft in August 2015, and its third draft in June 2018. ATSDR, *Toxicological Profile for Perfluoroalkyls*, May 2021, https://www.atsdr.cdc.gov/ToxProfiles/tp200.pdf.

typically issues drafts for public comment prior to finalizing a Toxicological Profile for an individual chemical or a group of chemicals.[32]

For the final Toxicological Profile, ATSDR determined that sufficient scientific information was available to evaluate 12 perfluoroalkyls, including PFOA and PFOS. ATSDR observed that scientific studies of this group of perfluoroalkyls have focused mostly on risks associated with ingestion, and less on inhalation or skin contact (i.e., dermal exposure). ATSDR determined that scientific information was sufficient to establish provisional ingestion Minimal Risk Levels (MRLs) for 4 of these 12 perfluoroalkyls:

- PFOA,
- PFOS,
- perfluorohexane sulfonic acid (PFHxS), and
- perfluorononanoic acid (PFNA).[33]

ATSDR determined the following values for these MRLs in milligrams per kilograms per day (mg/kg/day) to quantify an intermediate exposure level (i.e., daily exposure from 15 to 364 days) for each chemical that accounts for variance in bodyweight among exposed individuals.[34]

- PFOA (3×10^{-6} mg/kg/day or 0.000003 mg/kg/day)
- PFOS (2×10^{-6} mg/kg/day or 0.000002 mg/kg/day)
- PFHxS (2×10^{-5} mg/kg/day or 0.00002 mg/kg/day)
- PFNA (3×10^{-6} mg/kg/day or 0.000003 mg/kg/day)

These values are consistent with those proposed in the third draft, but smaller than the first two draft Toxicological Profiles, and are among the smallest MRLs for the body of chemicals that ATSDR has evaluated.[35] Smaller values generally indicate greater toxicity in comparison to chemicals with larger values, given the same exposure. Although the proposed MRLs for the PFAS referenced above are relatively small, the values are based on conservative assumptions and incorporate uncertainty factors. The value of an MRL alone therefore does not necessarily indicate conclusiveness of the level of risk.

MRLs are estimates of daily human exposure to a chemical that is not expected to present an appreciable risk of adverse noncancer health effects over a specified route (i.e., pathway) and duration of exposure.[36] MRLs are intended to serve only as screening levels to identify sites that warrant further evaluation to determine whether actions may be needed to mitigate risks. Some stakeholders have characterized the proposed MRLs as recommended standards for regulation or site remediation. However, ATSDR emphasized in its May 2021 final Toxicological Profile that "MRLs are not intended to define clean-up or action levels."[37]

[32] For information on the development of Toxicological Profiles, see "Additional Resources" on the ATSDR website, https://www.atsdr.cdc.gov/toxprofiledocs/additional_resources.html/#Background.

[33] The eight other PFAS that ATSDR evaluated have chains of fluorinated carbons that range from 4 to 12 carbon atoms.

[34] ATSDR calculates acute exposure levels based on daily exposure from 1 to 14 days, intermediate exposure levels based on daily exposure from 15 to 364 days, and chronic exposure levels based on daily exposure for 1 year or longer.

[35] See ATSDR, *Minimal Risk Levels (MRLs)*, June 2022, https://wwwn.cdc.gov/TSP/MRLS/mrlsListing.aspx.

[36] For more information, see ATSDR, "Minimal Risk Levels (MRLs)," https://www.atsdr.cdc.gov/minimalrisklevels/index.html.

[37] ATSDR, *Toxicological Profile for Perfluoroalkyls*, May 2021, p. A-1.

Although some perfluoroalkyls have been detected in ambient air at certain locations, ATSDR noted in its May 2021 final Toxicological Profile that scientific information on exposure through inhalation is relatively limited.[38] ATSDR concluded that the data were insufficient to establish provisional MRLs for inhalation exposures for any of these 12 perfluoroalkyls.

In its May 2021 final Toxicological Profile, ATSDR also noted that findings from epidemiological studies that examined potential associations between serum PFAS levels and the occurrence of adverse health effects were not consistent across studies.[39] ATSDR examined a range of epidemiological studies, including those in which reported serum PFAS levels were hundreds or thousands of times that of the general population. Because the findings of epidemiological studies were inconsistent, ATSDR relied on animal studies to calculate provisional MRLs.[40]

ATSDR Site-Specific Studies

Under Section 104(i) of CERCLA, ATSDR has also conducted or funded multiple site-specific studies to examine potential health effects where certain PFAS were released into the environment.[41] State health departments performed some of these studies through cooperative agreements with ATSDR. These studies have focused on sites where PFOS, PFOA, and various other PFAS were manufactured, used, or disposed. ATSDR reports that the agency or a state health department has conducted site-specific studies for more than 40 sites across the United States.[42] Some of these sites are federal facilities, such as U.S. military installations, whereas other sites are privately owned.

Joint CDC and ATSDR Studies

In addition to ATSDR site-specific studies under CERCLA, Congress has authorized CDC and ATSDR to conduct joint scientific studies to better understand the potential risks associated with exposure to PFAS. Subject to annual appropriations, Section 316 of the National Defense Authorization Act for Fiscal Year 2018 (P.L. 115-91), as amended, authorizes CDC and ATSDR to conduct a joint study in consultation with DOD on the "human health implications" from potential exposure in "drinking water, ground water, and any other sources of water and relevant exposure pathways." Using appropriations made available to CDC and ATSDR for the joint study, the agencies have worked to develop procedures and methods for studying potential health risks at sites with PFAS contamination. In September 2019, ATSDR announced cooperative agreements to fund the PFAS human health implications study involving multiple sites.[43] Section 316 also authorizes CDC and ATSDR to conduct exposure assessments at no fewer than eight current or former U.S. military installations where PFAS contamination has been discovered in drinking water, groundwater, or any other sources of water, and relevant exposure pathways. In February 2019, CDC and ATSDR announced the selection of communities in the vicinity of eight military installations for such exposure assessments.[44]

[38] Ibid., pp. 680-687 and 747-749.

[39] Ibid., p. 751.

[40] Ibid., pp. A-5 to A-117.

[41] 42 U.S.C. §9604(i).

[42] ATSDR, "How is ATSDR Involved Investigating PFAS in the Environment?" June 2020, https://www.atsdr.cdc.gov/pfas/activities/map.html.

[43] ATSDR, "PFAS Multi-site Study (MSS)," https://www.atsdr.cdc.gov/pfas/activities/studies/multi-site.html.

[44] For a list of these military installations, see ATSDR, "PFAS Exposure Assessment Sites," July 2020,

Regulation of PFAS in Commerce Under TSCA

EPA's PFAS Action Plan states that over 1,200 PFAS are listed on the TSCA Inventory, which includes approximately 85,000 chemical substances.[45] EPA added some of these PFAS to the TSCA inventory soon after the original enactment of TSCA in 1976, and added others over time as manufacturers notified the agency of the intent to introduce new PFAS into commerce. EPA reports that over 600 individual PFAS were produced in varying quantities in the United States between 2006 and 2016.[46]

Using the information-gathering authorities of TSCA, EPA has obtained information on the risks of various PFAS to assess if such risks may be unreasonable to warrant regulation under the statute. In 2000, the sole manufacturer of PFOS and related perfluoroalkyl sulfonate chemicals (3M) reported to EPA that information it had obtained on the potential risks of these chemicals justified a voluntary phase-out of their production.[47] The phase-out occurred over several years. In 2006, EPA reached an agreement with a group of manufacturers that produced PFOA and related perfluoroalkyl carboxylate chemicals for the voluntary phase-out of these chemicals over a 10-year period.[48]

Subsequent to each phase-out, EPA promulgated "significant new use rules" (SNURs) under Section 5(a)(2) of TSCA to require any manufacturer to notify the agency before reintroducing these chemicals into commerce for historical uses.[49] Promulgating SNURs for phased-out uses of existing chemicals is not uncommon. EPA also promulgated SNURs to require notification of entirely new uses of existing PFAS. SNURs give EPA the opportunity to evaluate risks associated with planned uses before they occur.

Under Section 5(a)(1), EPA has also continued to evaluate the risks of new chemicals, including new PFAS, as manufacturers have notified the agency of their intent to produce new chemicals.[50] For some premanufacture notices, EPA has determined that the submitted information is not sufficient to assess whether risks associated with a new PFAS may be unreasonable. In such instances, EPA has issued orders under Section 5(e) to require the manufacturer to produce new information on the chemical.[51] EPA has also used Section 5(e) orders to place restrictions on a new PFAS until the manufacturer submits the requested information to EPA.

Section 6 of TSCA authorizes EPA to establish regulatory controls on any stage of the lifecycle of a chemical (i.e., manufacture, processing, distribution, use, and disposal) only if such controls would be necessary to mitigate "unreasonable risk of injury to health or the environment."[52] To

https://www.atsdr.cdc.gov/pfas/activities/assessments/sites.html.

[45] EPA, *EPA's Per-and Polyfluoroalkyl Substances (PFAS) Action Plan*, EPA 823R18004, February 2019, pp. 11-12, https://www.epa.gov/sites/default/files/2019-02/documents/pfas_action_plan_021319_508compliant_1.pdf.

[46] Ibid.

[47] Letter from William A. Weppner, director of 3M, Specialty Materials Markets Group, Environmental Health, Safety, and Regulatory Affairs, to Charles Auer, EPA Director of Chemical Control Division, Office of Pollution Prevention and Toxics, "Re: Phase-out Plan for POSF-Based Products," July 7, 2000, https://www.regulations.gov/document/EPA-HQ-OPPT-2002-0043-0009.

[48] For more information, see EPA, "Fact Sheet: 2010/2015 PFOA Stewardship Program," March 4, 2021, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/fact-sheet-20102015-pfoa-stewardship-program.

[49] 15 U.S.C. §2604(a)(2).

[50] 15 U.S.C. §2604(a)(1).

[51] 15 U.S.C. §2604(e).

[52] 15 U.S.C. §2605.

date, EPA has not rendered such finding of unreasonable risk for any PFAS to warrant regulatory controls under Section 6.

Voluntary Industry Phase-Out

Chemical manufacturers may choose to phase-out the production of a chemical as a business decision. Following negotiations with EPA, 3M—the sole manufacturer of PFOS and related perfluoroalkyl sulfonate chemicals—announced a voluntary phase-out of these chemicals in 2000 based on risk information that it had gathered.[53] Pursuant to Section 8(e) of TSCA, the manufacturer had submitted this information to EPA after it determined that the information met the statutory criteria for reporting.[54] In 2006, EPA initiated the PFOA Stewardship Program with eight major manufacturers to reduce the extent to which PFOA and related perfluoroalkyl carboxylate chemicals enter the environment by 95% below 2010 levels and to completely phase-out the manufacture of these chemicals by 2015. In 2017, EPA announced that all eight manufacturers had met their phase-out goals.[55]

Information Gathering for Existing PFAS and Present Uses

EPA has used additional authorities in TSCA Section 8 to gather information on existing PFAS and present uses in commerce, and has used TSCA Section 4 for similar purposes. To evaluate chemicals for potential regulation, certain provisions of TSCA Section 8 authorize EPA to gather existing information from manufacturers, processors, and distributors. For example, EPA has used Section 8(a) to gather information on manufacturing volumes of PFAS above particular thresholds at chemical manufacturing facilities.[56] Under Section 8(d), EPA has required that chemical manufacturers, processors, and distributors submit lists of health and safety studies related to PFAS to the agency.[57]

Section 7351 of the National Defense Authorization Act for Fiscal Year 2020 (P.L. 116-92) amended TSCA Section 8(a) to require EPA to promulgate a rule requiring chemical manufacturers to submit specific chemical data to the agency (often referred to as a *data call*) no later than January 1, 2023. This data call applies to manufacturers that produced PFAS since January 1, 2011, and includes certain chemical information intended to help inform the agency's evaluation of potential health and environmental risks associated with PFAS in commerce. Information required under the data call would be limited to existing information and would not require new toxicity or exposure studies. Whether reporting under the data call may expand upon information on PFAS that is presently available to EPA would depend on how this reporting would compare to the information that EPA has previously collected for PFAS under other reporting requirements of TSCA or authorities of other statutes. On June 28, 2021, EPA proposed

[53] EPA, "EPA and 3M Announce Phase Out of PFOS," press release, May 16, 2000, https://archive.epa.gov/epapages/newsroom_archive/newsreleases/33aa946e6cb11f35852568e1005246b4.html.

[54] 15 U.S.C. §2607(e). Section 8(e) requires chemical manufacturers, processors, and distributors to report any available information on "substantial risk of injury to human health or the environment" associated with any chemical that they produce, process, or distribute.

[55] Ibid.

[56] 15 U.S.C. §2607(a).

[57] 15 U.S.C. §2607(d).

the data call rule for PFAS under TSCA Section 8(a), as amended by P.L. 116-92.[58] EPA anticipates finalizing this rule in December 2022.[59]

If EPA finds that existing information is insufficient to evaluate risks, Section 4 of TSCA authorizes EPA to require manufacturers or processors to test a chemical and submit the findings to the agency.[60] In 2005, EPA determined that existing information on fluoropolymers and other fluorinated compounds that contain PFOA and related chemicals was insufficient to assess potential environmental effects.[61] To obtain new information, EPA entered into Section 4 consent orders with two industry organizations requiring them to test various PFAS-containing resins, dispersions, paper, and textiles for environmental effects.[62] In 2015, EPA concluded that the testing data were sufficient at that time to determine that these uses were unlikely to present unreasonable risks.[63]

In October 2020, EPA received a TSCA Section 21 petition from a coalition of environmental advocacy organizations for the agency to promulgate a rule or issue an order under Section 4 to require health and environmental effects testing of 54 PFAS.[64] In January 2021, EPA denied the request, stating that the petitioners had not demonstrated that the rule or order requested was necessary.[65] However, in October 2021, EPA issued its *National PFAS Testing Strategy* and announced plans to issue Section 4 test orders on selected PFAS by the end of 2021.[66] In December 2021, EPA granted the TSCA Section 21 petition after reconsideration and proposed a testing program with respect to the petition.[67] In June 2022, EPA issued a Section 4 test order to manufacturers and processors of 6:2 fluorotelomer sulfonamide betaine (CAS No. 34455-29-3) for certain testing of the chemical.[68] EPA stated that it selected 6:2 fluorotelomer sulfonamide

[58] EPA, "TSCA Section 8(a)(7) Reporting and Recordkeeping Requirements for Perfluoroalkyl and Polyfluoroalkyl Substances," 86 *Federal Register* 33926-33966, June 28, 2021.

[59] See "EPA/OCSPP, RIN: 2070-AK67, Reporting and Recordkeeping for Perfluoroalkyl or Polyfluoroalkyl Substances Under Section 8(a)(7) of the Toxic Substances Control Act (TSCA), Spring 2022" at https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202204&RIN=2070-AK67.

[60] 15 U.S.C. §2603.

[61] EPA, "Final Enforceable Consent Agreement and Testing Consent Order for Two Formulated Composites of Fluorotelomer-based Polymer Chemicals; Export Notification," 70 *Federal Register* 39623-39630, July 8, 2005; and EPA, "Final Enforceable Consent Agreement and Testing Consent Order for Four Formulated Composites of Fluoropolymer Chemicals; Export Notification," 70 *Federal Register* 39630-39637, July 8, 2005.

[62] Ibid.

[63] Letter from Wendy Cleland-Hammett, EPA, to Jessica S. Bowman, FluoroCouncil, "Re: Conclusion of Enforceable Consent Agreement for the Laboratory-Scale Incineration Testing of Fluorotelomer-Based Polymers," July 9, 2015; and Letter from Wendy Cleland-Hammett, EPA, to Jessica S. Bowman, FluoroCouncil, "Re: Conclusion of Enforceable Consent Agreement for the Incineration Testing of Four Formulated Composites of Fluoropolymer Chemicals," July 9, 2015, https://www.regulations.gov/document/EPA-HQ-OPPT-2004-0001-0139.

[64] EPA, "Support Documents for PFAS Testing Section 21 Petition," https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/support-documents-pfas-testing-section-21-petition.

[65] EPA, "TSCA Section 21 Petition for Rulemaking; Reasons for Agency Response; Denial of Requested Rulemaking," 86 *Federal Register* 6602-6611, January 22, 2021.

[66] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action, 2021-2024*, October 2021, p. 10, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf; and EPA, *National PFAS Testing Strategy*, October 2021, https://www.epa.gov/system/files/documents/2021-10/pfas-natl-test-strategy.pdf.

[67] Letter from Michal Freedhoff, EPA Assistant Administrator for the Office of Chemical Safety and Pollution Prevention, to Robert M. Sussman, Sussman and Associates, December 28, 2021, https://www.epa.gov/system/files/documents/2021-12/pfaspetitionresponse.pdf.

[68] EPA, *Order Under Section 4(a)(2) of the Toxic Substances Control Act*, 6:2 Fluorotelomer sulfonamide betaine, June 16, 2022, https://www.epa.gov/system/files/documents/2022-06/9829-01_testorder-6_2_Fluorotelomer_sulfonamide_betaine.pdf.

betaine to help inform the evaluation of PFAS that share similar chemical characteristics as the chemical.

Information Gathering for Significant New Uses of Existing PFAS and New PFAS

EPA has used TSCA Section 5 to gather information on significant new uses of existing PFAS and new PFAS. EPA has promulgated multiple SNURs under TSCA Section 5(a)(2) to require notification of various PFAS for significant new uses.[69] EPA promulgated a SNUR in 1987 for any use of hexafluoropropylene oxide other than as an intermediate in the manufacture of fluorinated chemicals in an enclosed process.[70] Between 2002 and 2007, EPA promulgated SNURs that generally designated all uses of PFOS and 270 related perfluoroalkyl sulfonate chemicals as "significant new uses," except certain specialized existing uses.[71] In 2013, EPA promulgated a SNUR that designated uses of PFOA and related perfluoroalkyl carboyxlate chemicals in carpets or carpet treatments as significant new uses requiring notification.[72] In 2015, EPA proposed a SNUR that would designate all uses of PFOA and related perfluoroalkyl carboyxlate chemicals as "significant new uses."[73] Section 7352 of the National Defense Authorization Act for Fiscal Year 2020 (P.L. 116-92) directed EPA to finalize the 2015 proposed SNUR under TSCA for all uses of PFOA and related perfluoroalkyl carboxylate chemicals by June 22, 2020. On July 27, 2020, EPA finalized this SNUR, with an effective date of September 25, 2020.[74]

Section 5(a)(1) authorizes the primary information-gathering mechanism for new chemicals that have never been manufactured in commerce.[75] Prior to producing a new chemical, a manufacturer must submit a premanufacture notice to EPA. In 1984, EPA determined under Section 5(h)(4) that most polymers entering into commerce do not present unreasonable risks and exempted them from premanufacture notification.[76] This exemption is commonly referred to as the "polymer exemption." In 2010, EPA determined that polymers containing perfluoroalkyl constituents may present unreasonable risk and promulgated a new rule requiring notification prior to their manufacture. This regulatory change became effective in 2012 and is intended to allow EPA to determine whether regulation of such polymers may be warranted.[77] Additionally, in 2021, EPA

[69] SNURs, including those for PFAS, are consolidated and codified in federal regulations at 40 C.F.R. Part 721.

[70] 40 C.F.R. §721.4160.

[71] These rules are consolidated and codified in federal regulation at 40 C.F.R. §721.9582.

[72] 40 C.F.R. §721.10536.

[73] EPA, "Significant New Use Rules: Long-Chain Perfluoroalkyl Carboxylate and Perfluoroalkyl Sulfonate Chemical Substances," proposed rule, 80 *Federal Register* 2885-2898, January 21, 2015.

[74] EPA, "Long-Chain Perfluoroalkyl Carboxylate and Perfluoroalkyl Sulfonate Chemical Substances; Significant New Use Rule," final rule, 85 *Federal Register* 45109-45126, July 27, 2020.

[75] 15 U.S.C. §2604(a)(1).

[76] 15 U.S.C. §2604(h)(4). EPA, "Premanufacture Notification Exemptions; Exemptions for Polymers," final rule, 49 *Federal* Register 46066-46091, November 21, 1984.

[77] EPA, "Premanufacture Notification Exemption for Polymers; Amendment of Polymer Exemption Rule to Exclude Certain Perfluorinated Polymers," 75 *Federal Register* 4295-4305, January 27, 2010. The rule is codified at 40 C.F.R. §723.250. For the purpose of this rule, EPA defined the term *polymer* to mean "a chemical substance consisting of molecules characterized by the sequence of one or more types of monomer units and comprising a simple weight majority of molecules containing at least 3 monomer units which are covalently bound to at least one other monomer unit or other reactant and which consists of less than a simple weight majority of molecules of the same molecular weight. Such molecules must be distributed over a range of molecular weights wherein differences in the molecular weight are primarily attributable to differences in the number of monomer units. In the context of this definition,

initiated a stewardship program to reexamine low volume exemptions involving PFAS.[78] Under Section 5(h)(4), EPA has allowed manufacturers to submit low volume exemption notices to the agency for review in lieu of premanufacture notifications if manufacturing volumes are not expected to exceed 10,000 kilograms per year and the chemical substance does not present an unreasonable risk to human health or the environment. EPA announced that the agency is unlikely to grant new low volume exemptions involving PFAS, and will continue to work with manufacturers to support voluntary withdrawals of existing low volume exemptions involving PFAS.

If EPA were to determine that information provided in a premanufacture notice is insufficient to assess risks, Section 5(e) authorizes EPA to issue an order that requires the manufacturer to develop new information on the new chemical. EPA has issued Section 5(e) orders for specific PFAS. For example, EPA issued a Section 5(e) consent order in 2009 for hexafluoropropylene oxide dimer acid and its ammonium salt (i.e., the GenX chemicals).[79] According to its manufacturer, the GenX chemicals are used to make fluoropolymers without the use of PFOA.[80]

Risk Assessment

EPA has assessed the risks of PFOS, PFOA, and other PFAS on multiple occasions using information that the agency has collected under TSCA. In 2000, EPA's assessment of PFOS consisted of summarizing various animal studies and did not involve a formal determination on whether the risks were considered unreasonable.[81] In 2002, EPA issued a draft assessment for PFOA using a similar approach it took for PFOS.[82] As EPA has gathered more information, the agency has compared the findings of newer studies with those of existing studies to determine if the agency's understanding of the risks of PFAS warranted revision. For instance, EPA submitted an updated draft assessment for PFOA in 2005 to its Science Advisory Board for review.[83] These assessments have informed the agency's subsequent consideration of whether regulation of certain PFAS may be warranted under TSCA.

sequence means that the monomer units under consideration are covalently bound to one another and form a continuous string within the molecule, uninterrupted by units other than monomer units."

[78] EPA, "PFAS Low Volume Exemption Stewardship Program," July 29, 2021, https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/pfas-low-volume-exemption.

[79] EPA, "Regulation of New Chemical Substances Pending Development of Information, In the Matter of DuPont Company, Premanufacture Notice Numbers: P-08-508 and P-08-509, Consent Order and Determinations Supporting Consent Order," January 2009, https://chemview.epa.gov/chemview/proxy?filename=sanitized_consent_order_p_08_0508c.pdf. According to EPA, the agency assigned P-08-508 and P-08-509 to the GenX chemicals.

[80] EPA, Human Health Toxicity Values for Hexafluoropropylene Oxide (HPFO) Dimer Acid and Its Ammonium Salt (CASRN 13252-13-6 and CASRN 62037-80-3) Also Known as "GenX Chemicals," EPA 822R-21-010, October 2021, p. 2, https://www.epa.gov/system/files/documents/2021-10/genx-chemicals-toxicity-assessment_tech-edited_oct-21-508.pdf.

[81] Memorandum from Jennifer Seed, EPA, to Charlie Auer, EPA, "Hazard Assessment of PFOS," August 31, 2000, https://www.regulations.gov/document/EPA-HQ-OPPT-2002-0043-0010.

[82] EPA, *Draft Hazard Assessment of Perfluorooctanoic Acid and its Salts*, February 20, 2002 (corrected April 15, 2002), https://www.regulations.gov/document/EPA-HQ-OPPT-2002-0051-0004.

[83] EPA, Draft Risk Assessment of the Potential Human Health Effects Associated with Exposure to Perfluorooctanoic Acid and its Salts, SAB review draft, January 4, 2005, https://www.regulations.gov/document/EPA-HQ-OPPT-2002-0051-0054.

Regulatory Action

In 2009, EPA announced its intention to consider initiating a Section 6 rulemaking under TSCA to manage risks of long-chain PFAS.[84] EPA noted its intent to develop more detailed assessments to support a finding of unreasonable risk. If EPA were to make such a finding, Section 6 authorizes EPA to promulgate a rule to mitigate the unreasonable risk. In promulgating the rule, EPA may select among several regulatory options, including

- a prohibition or restriction on the manufacture, processing, distribution of the chemical or a limitation on the amount in which the chemical may be manufactured, processed, or distributed for all or particular uses;
- a requirement to label the chemical with clear and adequate warnings and instructions with respect to its use, distribution, or disposal;
- a requirement to track the processes used to manufacture or process the chemical or conduct tests that are reasonable and necessary to assure compliance with the rule;
- a prohibition or restriction on commercial use or disposal of a chemical; or
- a requirement for manufacturers and processors of the chemical to notify distributors, those in possession of, or exposed to, the chemical, and the public of the agency's unreasonable risk finding, and to replace or repurchase the chemical if requested.

If EPA were to find an "unreasonable risk," Section 9 requires EPA to determine whether other federal authorities may be available to mitigate the risk before establishing regulatory controls.[85]

Since its announcement in 2009 to consider a Section 6 rulemaking, EPA has not made an unreasonable risk finding for any PFAS. Additionally, none of the chemicals that EPA has prioritized for risk evaluation under Section 6 are PFAS.[86]

Although EPA has not restricted existing PFAS through Section 6 rulemaking, the agency has issued Section 5(e) orders to restrict the manufacture, processing, distribution, use, and disposal of new PFAS reported to the agency under Section 5(a)(1). These restrictions remain effective until the manufacturer submits the new information requested by EPA. As an example, the Section 5(e) consent order for the two GenX chemicals noted above requires the manufacturer to "recover and capture (destroy) or recycle [both chemicals] at an overall efficiency of 99% from all effluent process streams and the air emissions (point source and fugitive)."[87]

[84] EPA, *Long-Chain Perfluorinated Chemicals (PFCs) Action Plan*, December 30, 2009, https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/long-chain-perfluorinated-chemicals-pfcs-action-plan.

[85] 15 U.S.C. §2608.

[86] EPA, "Chemicals Undergoing Risk Evaluation under TSCA," https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/chemicals-undergoing-risk-evaluation-under-tsca.

[87] EPA, "Regulation of New Chemical Substances Pending Development of Information, In the Matter of DuPont Company, Premanufacture Notice Numbers: P-08-508 and P-08-509, Consent Order and Determinations Supporting Consent Order," January 2009, p. 36, https://chemview.epa.gov/chemview/proxy?filename=sanitized_consent_order_p_08_0508c.pdf.

Enforcement

Although EPA has not established Section 6 regulatory controls on any PFAS, the agency has used its enforcement authorities under TSCA to assess fines and penalties for violations of other statutory requirements. Section 15 of TSCA prohibits certain acts such as

- failure or refusal to comply with any requirement, rule, order, or consent agreement under Title I, or any requirement, rule, or order under Title II;
- use of a chemical for commercial purposes that violates any requirements established under Sections 5, 6, or 7;
- failure or refusal to establish or maintain records, submit reports, notices or other information, or permit access to or copying records, as required by TSCA; and
- failure or refusal to permit entry or inspection under Section 11.[88]

Section 16 authorizes civil and criminal penalties for taking actions that are prohibited under Section 15.[89] In 2005, EPA announced a settlement with DuPont for reporting violations under Section 8(e) of TSCA and the Resource Conservation and Recovery Act (RCRA) that involve PFOA. According to EPA, the settlement required DuPont to pay $10.25 million in civil penalties and perform Supplemental Environmental Projects valued at $6.25 million.[90] EPA has continued to take enforcement actions for other violations related to PFAS. For example, EPA sent a Notice of Violation to Chemours in February 2019 for alleged violations of Sections 5 and 8 of TSCA involving GenX chemicals.[91]

Regulation of PFAS and Other Actions Under SDWA

SDWA authorizes EPA to promulgate national primary drinking water regulations for contaminants in water provided by public water systems.[92] These regulations generally include an enforceable standard (i.e., maximum contaminant level [MCL]) and associated monitoring, treatment, and reporting requirements. For contaminants that are not regulated under SDWA, EPA is authorized to issue health advisories that identify nonenforceable levels of contaminants in drinking water that are expected to be protective of sensitive populations.[93] For both regulated and unregulated contaminants, SDWA emergency powers authorize EPA to take actions to abate an imminent and substantial endangerment to public health.[94]

[88] 15 U.S.C. §2614.

[89] 15 U.S.C. §2615.

[90] EPA, "Reference News Release: EPA Settles PFOA Case Against DuPont for Largest Environmental Administrative Penalty in Agency History," press release, December 14, 2005, https://www.epa.gov/enforcement/reference-news-release-epa-settles-pfoa-case-against-dupont-largest-environmental. Such projects are intended to require the violator to provide an environmental benefit in addition to paying a monetary penalty as a punitive measure. See the discussion of "Supplemental Environmental Projects (SEPs)" in CRS Report RL34384, *Federal Pollution Control Laws: How Are They Enforced?*, by Robert Esworthy.

[91] EPA, "Chemours Toxic Substances Control Act Notice of Violation—February 14, 2019," February 14, 2019, https://www.epa.gov/nc/chemours-toxic-substances-control-act-notice-violation-february-14-2019.

[92] 42 U.S.C. §300g-1. SDWA does not cover residential wells. For more information on regulating contaminants under SDWA, see CRS Report R46652, *Regulating Contaminants Under the Safe Drinking Water Act (SDWA)*, by Elena H. Humphreys.

[93] 42 U.S.C. §300g-1(b)(1)(F).

[94] 42 U.S.C. §300i.

In 2009, EPA listed certain PFAS for formal evaluation under SDWA to determine whether regulations may be warranted.[95] In 2016, the agency issued nonenforceable Lifetime Health Advisories for PFOS and PFOA.[96] In March 2021, EPA made a determination to issue drinking water regulations for PFOA and PFOS.[97] Under SDWA, EPA is required to propose a regulation within 24 months of finalizing a regulatory determination (e.g., by March 2023 for PFOA and PFOS), and finalize the regulation within 18 months of publishing the proposal. In addition, EPA has used SDWA emergency powers to respond to releases of PFOA and PFOS detected in public water systems at several sites. The following sections further discuss these SDWA authorities and related actions.

Health Advisories

SDWA authorizes EPA to issue health advisories for contaminants that are not regulated under the act.[98] Health advisories include nonenforceable concentrations for contaminants in drinking water and often include values for different exposure durations (e.g., one day, a lifetime). These nonregulatory levels are intended to help water suppliers and others address contaminants for which EPA has not promulgated drinking water standards. Advisories provide technical guidance on identifying, measuring, and treating such contaminants. In 2016, EPA established the Lifetime Drinking Water Health Advisory levels for PFOA and PFOS at 70 parts per trillion (ppt or nanograms per liter [ng/L]), separately or combined.[99] Previously in 2009, EPA issued provisional health advisory levels of 400 ppt for PFOA and 200 ppt for PFOS to address short-term exposures to these substances from drinking water.[100]

EPA's 2021 *PFAS Strategic Roadmap* stated that the agency plans to publish health advisories for PFBS and GenX chemicals by spring 2022. To develop health advisory levels for these substances, EPA relied on final toxicity assessments or similar information for PFBS and GenX chemicals.[101]

In June 2022, EPA announced updated health advisories for PFOA and PFOS, as well as new health advisories for PFBS and GenX chemicals.[102] EPA finalized Lifetime Drinking Water Health Advisory levels for PFBS and GenX chemicals at 2,000 ppt and 10 ppt, respectively. EPA

[95] EPA, "Drinking Water Contaminant List 3—Final," 74 *Federal Register* 51850, October 8, 2009. For more information on CCL 3, see EPA, "Contaminant Candidate List 3—CCL 3," https://www.epa.gov/ccl/contaminant-candidate-list-3-ccl-3.

[96] EPA, "Lifetime Health Advisories and Health Effects Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate," 81 *Federal Register* 33250, May 25, 2016. The advisories and related documents are available at https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos.

[97] EPA, "Announcement of Final Regulatory Determinations for Contaminants on the Fourth Drinking Water Contaminant Candidate List," 86 *Federal Register* 12272-12291, March 3, 2021.

[98] 42 U.S.C. §300g-1(b)(1)(F).

[99] EPA, "Lifetime Health Advisories and Health Effects Documents for Perfluorooctanoic Acid and Perfluorooctane Sulfonate," 81 *Federal Register* 33250, May 25, 2016. Further information on the advisories is available at https://www.epa.gov/ground-water-and-drinking-water/drinking-water-health-advisories-pfoa-and-pfos.

[100] In 2009, EPA established a Provisional Health Advisory level of 400 ppt for PFOA and 200 ppt for PFOS. For more information on these health advisories, see EPA, "Provisional Health Advisories for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonate (PFOS)," https://www.epa.gov/sites/production/files/2015-09/documents/pfoa-pfos-provisional.pdf.

[101] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 18, 2021, p. 13, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf.

[102] EPA, "Lifetime Drinking Water Health Advisories for Four Perfluoroalkyl Substances," 87 *Federal Register* 36848, June 21, 2022.

issued interim Lifetime Drinking Water Health Advisory levels at 0.02 ppt for PFOS and 0.004 ppt for PFOS, which are, respectively, two and four orders of magnitude less than the 2016 health advisory levels of 70 ppt, separately or combined.[103] The interim PFOA and PFOS Lifetime Drinking Water Health Advisory levels are based on draft health effect analyses under review by the EPA Science Advisory Board.[104] Using new and existing human epidemiological and experimental animal study data, EPA developed draft health effect analyses that identified a different "most sensitive non-cancer effect" (i.e., decreased immunity) than the health effect (i.e., developmental effects) that the agency used to derive the 2016 Lifetime Drinking Water Health Advisories.[105] As such, EPA notes that the interim levels may change depending on potential revisions after the Science Advisory Board completes its review of the draft health effects analyses, and other feedback. The interim levels are below the level at which the current analytical methods can detect PFOS or PFOA in drinking water.[106]

National Primary Drinking Water Regulations

In March 2021, EPA made a determination to issue drinking water regulations for PFOA and PFOS.[107] EPA's determination followed more than a decade of evaluation to assess whether PFOA and PFOS warranted SDWA regulation. SDWA specifies a multistep process for EPA to follow to evaluate contaminants to determine whether a national regulation is warranted.[108] The evaluation process includes identifying contaminants of potential concern, assessing health risks, collecting occurrence data (and developing reliable analytical methods necessary to do so), and making determinations as to whether or not regulatory action is needed for a contaminant.

Identifying Emerging Contaminants That May Warrant Regulation

Every five years, EPA is required to publish a contaminant candidate list (CCL) that identifies contaminants that are known or anticipated to occur in public water systems and that may require regulation under SDWA.[109] In 2009, EPA placed PFOA and PFOS on the third such list (CCL 3) for evaluation.[110] In 2016, EPA published the fourth list, CCL 4, which carried over PFOA and

[103] EPA, *Technical Fact Sheet: Drinking Water Health Advisories for Four PFAS (PFOA, PFOS, GenX chemicals, and PFBS)*, EPA 822-F-22-002, Washington, DC, June 2022, https://www.epa.gov/system/files/documents/2022-06/technical-factsheet-four-PFAS.pdf. Similar to the 2016 advisories, to calculating the health advisory levels, EPA applied a relative source contribution of 20% (i.e., an assumption that 20% of PFOA, PFOS, PFBS, or GenX chemical exposure is attributable to drinking water and 80% is from diet, dust, air or other sources). These levels are intended to protect the most sensitive subpopulations (e.g., lactating women, childbearing women, or children), with a margin of protection, over a lifetime of daily exposure.

[104] Ibid.

[105] EPA, *Technical Fact Sheet: Drinking Water Health Advisories for Four PFAS (PFOA, PFOS, GenX chemicals, and PFBS)*, EPA 822-F-22-002, Washington, DC, June 2022, https://www.epa.gov/system/files/documents/2022-06/technical-factsheet-four-PFAS.pdf. In May 2016, EPA released health effects support documents for these two PFAS, which summarize the scientific literature that EPA evaluated to establish the 2016 advisories. For the accompanying health effects documents for PFOA and PFOS, see EPA, "Supporting Documents for Drinking Water Health Advisories for PFOA and PFOS."

[106] Ibid.

[107] EPA, "Announcement of Final Regulatory Determinations for Contaminants on the Fourth Drinking Water Contaminant Candidate List," 86 *Federal Register* 12272-12291, March 3, 2021.

[108] 42 U.S.C. §300g-1. The 104th Congress established the current regulatory structure with the Safe Drinking Water Amendments of 1996 (P.L. 104-182). For more information about SDWA regulatory development provisions, see CRS Report R46652, *Regulating Contaminants Under the Safe Drinking Water Act (SDWA)*, by Elena H. Humphreys.

[109] 42 U.S.C. §300g-1(b)(1)(B).

[110] EPA, "Drinking Water Contaminant List 3—Final," 74 *Federal Register* 51850, October 8, 2009. For more

PFOS.[111] EPA carried forward these contaminants to continue evaluating health effects, gathering national occurrence data, and developing analytical methods.[112] In July 2021, EPA issued the draft CCL5, which includes 66 chemicals, 3 chemical groups (PFAS, cyanotoxins, and disinfection byproducts), and 12 microbes.[113]

Monitoring for Emerging Contaminants in Public Water Systems

SDWA Section 1445 requires EPA to promulgate, every five years, an unregulated contaminant monitoring rule (UCMR) that requires public water systems to test for no more than 30 unregulated contaminants.[114] This section generally requires a representative sample of systems serving 10,000 or fewer people to conduct monitoring.[115] As amended in 2018, this provision includes expanded monitoring requirements for water systems serving 3,300-10,000 individuals. Subject to the availability of appropriations for this purpose, and lab capacity to support the expanded monitoring, this section authorizes $15 million to be appropriated for each year in which monitoring is required.

In 2012, EPA issued the third UCMR (UCMR 3), and 4,864 public water systems tested their drinking water for 6 PFAS—including PFOA and PFOS—between January 2013 and December 2015.[116] Overall, 63 of the 4,864 (1.3%) water systems reported at least 1 sample with PFOA and/or PFOS (separately or combined) concentrations exceeding EPA's 2016 health advisory level of 70 ppt.[117] EPA estimated that these 63 water systems serve approximately 5.5 million individuals.[118]

EPA's *PFAS Action Plan* noted that the agency intended to propose monitoring requirements for other PFAS in the next UCMR (UCMR 5).[119] Further, the National Defense Authorization Act for Fiscal Year 2020 (P.L. 116-92) directs EPA to include in UCMR 5 every PFAS for which EPA has identified a validated test method. In March 2021, EPA proposed UCMR 5, which would require all water systems serving 3,300 or more people to monitor for 29 PFAS and one other

information on CCL 3, see EPA, "Contaminant Candidate List 3—CCL 3," https://www.epa.gov/ccl/contaminant-candidate-list-3-ccl-3.

[111] EPA, "Drinking Water Contaminant Candidate List 4—Final," 81 *Federal Register* 81099, November 17, 2016. For more information, see https://www.federalregister.gov/documents/2016/11/17/2016-27667/drinking-water-contaminant-candidate-list-4-final.

[112] EPA, "Drinking Water Contaminant Candidate List 4—Final," 81 *Federal Register* 81099, November 17, 2016.

[113] EPA, "Drinking Water Contaminant Candidate List 5-Draft," 86 *Federal Register* 37948-37972, July 19, 2021.

[114] 42 U.S.C. §300j-4.

[115] 42 U.S.C. §300g-4(a)(2).

[116] EPA, *Data Summary of the Third Unregulated Contaminant Monitoring Rule*, January 2017, p. 11, https://www.epa.gov/dwucmr/data-summary-third-unregulated-contaminant-monitoring-rule. The PFAS monitoring included PFOA, PFOS, perfluorononanoic acid, perfluorohexanesulfonic acid, perfluoroheptanoic acid, and perfluorobutanesulfonic acid (PFBS). For additional details on monitoring requirements, see https://www.epa.gov/dwucmr.

[117] Testimony of Peter Grevatt, Director, Office of Ground Water and Drinking Water, EPA, before the House Committee on Energy and Commerce, Subcommittee on Environment, hearing on *Perfluorinated Chemicals in the Environment: An Update on the Response to Contamination and Challenges Presented*, September 6, 2018. In May 2016, EPA issued nonenforceable health advisory levels for lifetime exposure, with a margin of safety, to PFOA and PFOS in drinking water. EPA established the Lifetime Health Advisory level for PFOA and PFOS at 70 ppt, separately or combined.

[118] Email communication with EPA, May 30, 2019. Monitoring results for individual water systems are available on EPA's UCMR 3 website: https://www.epa.gov/dwucmr/third-unregulated-contaminant-monitoring-rule.

[119] EPA did not require monitoring for any PFAS in UCMR 4.

contaminant, lithium.[120] In December 2021, the EPA Administrator signed the finalized UCMR 5, which will require certain water systems to sample from 2023 to 2025 and report final results through 2026.[121] UCMR 5 would be the first rule for which EPA could require water systems serving between 3,300 and 10,000 individuals to require monitoring, if appropriations were provided for this purpose and lab capacity is sufficient.[122]

Regulatory Determinations

SDWA requires EPA, every five years, to make a regulatory determination (RD) of whether or not to promulgate a drinking water regulation for at least five contaminants on the CCL.[123] In March 2021, EPA finalized positive regulatory determinations for PFOA and PFOS.[124] To make a positive regulatory determination, EPA must find that

- a contaminant may have an adverse health effect;
- it is known to occur or there is a substantial likelihood that it will occur in public water systems with a frequency and at levels of public health concern; and
- in the sole judgment of the EPA Administrator, regulation of the contaminant presents a meaningful opportunity for health risk reduction for persons served by public water systems.[125]

To meet the statutory criteria for making an RD, EPA requires a peer-reviewed risk assessment; a widely available analytical method for monitoring the contaminant; and nationally representative occurrence data.[126]

Standard Setting

Once the EPA Administrator makes a determination to regulate a contaminant, SDWA requires EPA to propose a rule within 24 months (e.g., by March 2023 for PFOA and PFOS), and promulgate a "national primary drinking water regulation" within 18 months after the proposal.[127] When proposing a regulation, EPA must also propose a nonenforceable maximum contaminant level goal (MCLG), at which no known or anticipated adverse health effects are expected to occur

[120] EPA, "Revisions to the Unregulated Contaminant Monitoring Rule (UCMR 5) for Public Water Systems and Announcement of Public Meeting," 86 *Federal Register* 13848, March 11, 2021. SDWA §1445(j); 42 U.S.C. §300j-4(j).

[121] EPA, "EPA Announces Nationwide Monitoring Effort to Better Understand Extent of PFAS in Drinking Water," press release, December 20, 2021, https://www.epa.gov/newsreleases/epa-announces-nationwide-monitoring-effort-better-understand-extent-pfas-drinking.

[122] Section 2021(a) of America's Water Infrastructure Act of 2018 (AWIA; P.L. 115-270) expanded unregulated contaminant monitoring requirements to include public water systems serving 3,300-10,000 individuals—subject to the availability of appropriations for this purpose and lab capacity. This section authorizes $15 million to be appropriated for each year from FY2019 through FY2021 to support the expanded monitoring.

[123] 42 U.S.C. §300g-1(b)(1)(B)(ii).

[124] EPA, "Announcement of Final Regulatory Determinations for Contaminants on the Fourth Drinking Water Contaminant Candidate List," 86 *Federal Register* 12272-12291, March 3, 2021.

[125] 42 U.S.C. §300g-1(b)(1)(A). A determination by the Administrator not to regulate a contaminant is subject to judicial review (42 U.S.C. §300g-1(b)(1)(B)(ii)(IV)).

[126] EPA, "Drinking Water Contaminant Candidate List 4—Final," 81 *Federal Register* 81102-81104, November 17, 2016.

[127] 42 U.S.C. §300g-1(b)(2). EPA may extend the deadline to publish a final rule for up to nine months, by notice in the *Federal Register*.

and which allows an adequate margin of safety.[128] An MCLG is based solely on health effects data and does not reflect cost or technical feasibility considerations. Similar to drinking water health advisories, EPA derives an MCLG based on an estimate of the amount of a contaminant that a person can be exposed to on a daily basis that is not anticipated to cause adverse health effects over a lifetime.[129] This level is further reduced to be protective of sensitive populations.

Though SDWA requires EPA to propose a rule within 24 months and finalize it within 18 months, EPA's 2021 *PFAS Strategic Roadmap* outlines an accelerated timeline for a PFOS and PFOA drinking water regulation. The 2021 *PFAS Strategic Roadmap* states that the agency plans to propose a PFOA and PFOS drinking water regulation by fall 2022, and finalize such regulation by fall 2023.[130]

Drinking water regulations generally include an MCL—an enforceable limit for a contaminant in public water supplies.[131] SDWA requires EPA to set the MCL as close to the MCLG as feasible.[132] When assessing feasibility, the law directs EPA to consider the best available (and field-demonstrated) treatment technologies, taking cost into consideration.[133] Regulations also include monitoring, treatment, and reporting requirements. EPA has promulgated regulations that cover several similar contaminants and typically establishes an individual MCL for each contaminant covered by the regulation.

Regulations generally take effect three years after promulgation. EPA may allow up to two additional years if the Administrator determines that more time is needed for public water systems to make the capital improvements needed for compliance. States have the same authority for individual water systems.[134] The law directs EPA to review—and if necessary revise—each regulation every six years. A revision may maintain or provide greater health protection, but it may not reduce protection.[135]

In addition, the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) provides $4 billion over five fiscal years through the Drinking Water State Revolving Fund to address emerging contaminants in drinking water, with a focus on per- and polyfluoroalkyl substances, as authorized by SDWA Section 1452(a)(2)(G).[136]

---

[128] When developing regulations, EPA is required to (1) use the best available peer-reviewed science and supporting studies and data and (2) make publicly available a risk assessment document that discusses estimated risks, uncertainties, and studies used in the assessment. Concurrent with proposing a regulation, SDWA requires EPA to publish a "health risk reduction and cost analysis." 42 U.S.C. §300g-1(b)(4)(A).

[129] EPA follows this process to evaluate noncarcinogenic effects. For carcinogens and pathogens, EPA typically sets the MCLG at zero.

[130] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 18, 2021, p. 12, https://www.epa.gov/system/files/documents/2021-10/pfas-roadmap_final-508.pdf.

[131] SDWA does not prohibit states from setting stricter standards.

[132] 42 U.S.C. §300g-1(b)(4)(B). If the treatment of a contaminant is not feasible—technologically or economically—EPA may establish a treatment technique in lieu of an MCL (42 U.S.C. §300g-1(b)(7)(A)).

[133] 42 U.S.C. §300g-1(b)(4)(D).

[134] 42 U.S.C. §300g-1(b)(10).

[135] 42 U.S.C. §300g-1(b)(9).

[136] The National Defense Authorization Act (NDAA) for Fiscal Year 2020 (P.L. 116-92) amended SDWA to add Section 1452(a)(2)(G) to authorize a grant program for public water systems to address PFAS and other emerging contaminants. For more information on the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), see CRS Report R46892, *Infrastructure Investment and Jobs Act (IIJA): Drinking Water and Wastewater Infrastructure*, by Elena H. Humphreys and Jonathan L. Ramseur.

Emergency Powers Orders

SDWA Section 1431 grants EPA "emergency powers" to issue orders to abate an imminent and substantial endangerment to public health from "a contaminant that is present in or is likely to enter a public water system or an underground source of drinking water," and if the appropriate state and local authorities have not acted to protect public health.[137] This authority is available to address both regulated and unregulated contaminants. The EPA Administrator "may take such actions as he may deem necessary" to protect the health of persons who may be affected. Actions may include requiring persons who caused or contributed to the endangerment to provide alternative water supplies, or to treat contamination. When using this authority, EPA generally coordinates closely with states.

EPA reports that it has used its emergency powers under Section 1431 to require responses to PFOA and/or PFOS contamination of drinking water supplies in four cases, three of which involved DOD sites.[138] Required actions included treating drinking water, offering connection to a public water system, or providing bottled water where PFOA or PFOS concentrations were above 70 ppt.

SDWA Section 1431 emergency orders can require a person to perform an action to abate an imminent and substantial danger to public health. However, such orders do not establish liability in a manner comparable in scope to CERCLA, nor do such orders create or otherwise trigger liability under CERCLA.

For additional discussion of drinking water issues related to PFAS, see CRS Report R45793, *PFAS and Drinking Water: Selected EPA and Congressional Actions*, by Elena H. Humphreys.

Regulation of PFAS and Other Actions Under the CWA

EPA has several CWA authorities it may use to address contaminants of emerging concern, such as PFAS.[139] Under the CWA, a primary mechanism to control contaminants in surface waters is through permits. The statute prohibits the discharge of pollutants from any point source (i.e., a discrete conveyance) to waters of the United States without a permit.[140] The CWA authorizes EPA and delegated states to limit or prohibit discharges of pollutants in the National Pollutant Discharge Elimination System (NPDES) permits they issue.[141] These permits incorporate technology-based and water-quality-based requirements.

The CWA requires EPA to establish technology-based effluent (i.e., discharge) limits for industrial dischargers, known as Effluent Limitation Guidelines (ELGs),[142] and issue water quality criteria to be used in establishing water quality standards and water-quality-based effluent limitations.[143] The CWA also authorizes EPA to utilize certain NPDES permit authorities to

[137] 42 U.S.C. §300i.

[138] EPA, *EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan*, EPA 823R18004, February 14, 2019, pp. 55-56, https://www.epa.gov/pfas/epas-pfas-action-plan.

[139] For more details on the authorities available to address contaminants of emerging concern, including PFAS, under the CWA, see CRS Report R45998, *Contaminants of Emerging Concern Under the Clean Water Act*, by Laura Gatz. See also CRS In Focus IF12148, *Regulating PFAS Under the Clean Water Act*, by Laura Gatz.

[140] CWA §301; 33 U.S.C. §1311. *Point source* is defined at CWA §502(14); 33 U.S.C. §1362(14).

[141] CWA §402; 33 U.S.C. §1342.

[142] CWA §301(b); 33 U.S.C. §1311(b); CWA §304(b); 33 U.S.C. §1314(b); CWA §306; 33 U.S.C. §1316; CWA §307; 33 U.S.C. §1317.

[143] CWA §304(a).

manage emerging contaminants;[144] to set pollutant limits and monitoring and reporting requirements for contaminants in biosolids if sufficient scientific evidence shows there is potential harm to human health or the environment;[145] and to designate contaminants as toxic or hazardous pollutants.[146]

To date, EPA has not published any final technology-based effluent limits or water quality criteria that include limitations for any PFAS, but has taken steps toward doing so. EPA announced its projected timelines for these actions in its 2021 *PFAS Strategic Roadmap*.[147] EPA has also not established any requirements for PFAS in biosolids, but included an associated action and timeline in the *PFAS Strategic Roadmap*. EPA has in certain instances used specific NPDES permit authorities to manage PFAS, and has taken steps to encourage the use of those authorities when appropriate. EPA has not designated any PFAS as toxic pollutants or hazardous substances. The following sections further discuss these CWA authorities and related actions.

Effluent Limitation Guidelines (ELGs)

The CWA requires EPA to publish ELGs, which are the required minimum standards for industrial wastewater discharges.[148] For industrial facilities that discharge directly to regulated waters (i.e., waters of the United States), delegated states or EPA incorporate the limits established in ELGs into the NPDES permits they issue. For facilities that discharge to publicly owned treatment works (i.e., indirect dischargers), pretreatment standards established in ELGs to prevent pass through and interference at the publicly owned treatment works apply.[149]

The CWA also requires EPA to annually review all existing ELGs and to publish a biennial plan that includes a schedule for review and revision of promulgated ELGs, identifies categories of sources discharging toxic or nonconventional pollutants that do not have ELGs, and establishes a schedule for promulgating ELGs for any newly identified categories.[150]

EPA's most recent biennial plans have included details on the agency's efforts to determine whether the agency should update ELGs for certain industrial source categories to set effluent limitations for PFAS. In these plans, EPA noted that while there has been significant study in recent years of the presence of PFAS in the environment and in drinking water, there has been relatively little study of the discharges of PFAS to surface water and publicly owned treatment

[144] CWA §402(a); 33 U.S.C. §1342(a).

[145] CWA §405(d); 33 U.S.C. §1344(d). "Biosolids" is a term for the sewage sludge from wastewater treatment facilities, which in some cases may be recycled for beneficial use through land application (e.g., to fertilize crops), and in other cases may be disposed of through a surface disposal site or incineration.

[146] CWA §307; 33 U.S.C. §1317; CWA §311; 33 U.S.C. §1321.

[147] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 2021, pp. 13-16, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[148] CWA §301(b); 33 U.S.C. §1311(b); CWA §304(b); 33 U.S.C. §1314(b); CWA §306; 33 U.S.C. §1316; CWA §307; 33 U.S.C. §1317. Since 1972, EPA has developed ELGs for 59 industrial categories.

[149] The national pretreatment program is a component of the NPDES program, which involves federal, state, and local regulatory agencies. Local municipalities are mostly responsible for implementing and enforcing pretreatment requirements. EPA and states authorized to act as the approval authority for publicly owned treatment works (POTW) in their states may approve a POTW's pretreatment program. If approved, the POTW is the control authority responsible for ensuring compliance with pretreatment standards. If a POTW does not have an approved pretreatment program, the control authority is the approved state authorized to act as the approval authority, or in unapproved states, the EPA. See 40 C.F.R. §403, "General Pretreatment Regulations for Existing and New Sources of Pollution."

[150] CWA §304(m); 33 U.S.C. §1314(m).

works.[151] Consequently, "there is limited information about PFAS discharges, including the types of PFAS compounds discharged, concentrations of PFAS discharged, and the significant sources of PFAS discharges."[152] Hence, EPA's recent biennial plans and related actions have included efforts to identify and collect this information.

- EPA's *Preliminary Effluent Guidelines Program Plan 14* and *EPA's PFAS Action Plan*, both published in October 2019, announced that the agency was beginning a detailed multi-industry study of PFAS use, treatment, and discharge to evaluate if certain industrial sources warranted regulation through ELGs.[153]
- EPA's final *Effluent Guidelines Program Plan 14*, published in January 2021, provided an update on the PFAS multi-industry study, which focused on five industrial categories[154]—Organic Chemicals, Plastics, and Synthetic Fibers (OCPSF);[155] Metal Finishing;[156] Pulp, Paper, and Paperboard;[157] Textile Mills;[158] and commercial airports (Airport Deicing category[159]). The final *Effluent Guidelines Program Plan 14* described the type of PFAS information EPA had received thus far, as well as the additional information the agency still planned to collect as part of the study.[160] Of the five industrial categories included in the study, EPA indicated that it had collected more information on the OCPSF category and intended to publish an advanced notice of proposed rulemaking to solicit data and information regarding PFAS manufacturers and formulators, to inform potential future revisions to the ELGs for the OCPSF category.[161] EPA also stated that further study of the remaining four categories was needed before initiating any rulemaking for discharges from those categories.[162] In March 2021, EPA published an advanced notice of proposed rulemaking that provided for public review and comment on the information and data regarding PFAS manufacturers and formulators that EPA had collected for the OCPSF category.[163]

[151] EPA, *Effluent Guidelines Program Plan 14*, EPA-821-R-21-001, January 2021, p. 6-3, https://www.epa.gov/sites/default/files/2021-01/documents/eg-plan-14_jan-2021.pdf. EPA, *Preliminary Effluent Guidelines Program Plan 15*, EPA-821-R-21-003, September 2021, p. 6-3, https://www.epa.gov/system/files/documents/2021-09/ow-prelim-elg-plan-15_508.pdf.

[152] *Preliminary Effluent Guidelines Program Plan 15*, EPA-821-R-21-003, September 2021, p. 6-3, https://www.epa.gov/system/files/documents/2021-09/ow-prelim-elg-plan-15_508.pdf.

[153] EPA, *EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan*, EPA 823R18004, February 14, 2019, pp. 6, 29-30, https://www.epa.gov/pfas/epas-pfas-action-plan. EPA, *Preliminary Effluent Guidelines Program Plan 14*, EPA-821-R-19-005, October 2019, https://www.epa.gov/sites/default/files/2019-10/documents/prelim-eg-plan-14_oct-2019.pdf.

[154] EPA, *Effluent Guidelines Program Plan 14*, EPA-821-R-21-001, January 2021, https://www.epa.gov/sites/default/files/2021-01/documents/eg-plan-14_jan-2021.pdf.

[155] 40 C.F.R. §414.

[156] 40 C.F.R. §433.

[157] 40 C.F.R. §430.

[158] 40 C.F.R. §410.

[159] 40 C.F.R. §449.

[160] Ibid, pp. 6-2-6-3.

[161] Ibid. PFAS formulators are facilities that produce a variety of PFAS products and materials from PFAS feedstocks.

[162] Ibid.

[163] EPA, "Clean Water Act Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category," 86 *Federal Register* 14560, March 17, 2021.

- EPA published its *Preliminary Effluent Guidelines Program Plan 15* as well as the preliminary report for the multi-industry PFAS study in September 2021.[164] In the preliminary plan, EPA announced that it is initiating two rulemakings pertaining to PFAS discharges—revisions to the ELGs for the OCPSF category and the Metal Finishing category to address PFAS.[165] EPA stated that the agency plans to revise the existing ELGs for the OCPSF category to address discharges from facilities manufacturing PFAS, and that it will continue to evaluate the need to develop regulations to address discharges from PFAS formulators.[166] EPA also plans to revise the existing Metal Finishing ELGs to address discharges from chromium electroplating facilities. The agency stated that it will conduct detailed studies on PFAS in wastewater discharges from two other industrial categories—the Landfill and Textile Mill (i.e., textile and carpet manufacturers) categories, and will continue to study the two remaining categories—Airports, and Pulp, Paper, and Paperboard.[167]

In its 2021 *PFAS Strategic Roadmap*, EPA broadened its goals to address PFAS discharges through ELGs and targeted the end of 2024 as the deadline for "significant progress in its ELG regulatory work."[168] Specifically, EPA established timelines for action on nine industrial categories identified in the proposed "PFAS Action Act of 2021" legislation, as well as other industrial categories such as landfills.[169] These categories include OCPSF; Pulp, Paper, and Paperboard; Textile Mills; Electroplating; Metal Finishing; Leather Tanning and Finishing; Paint Formulating; Electrical and Electronic Components; and Plastics Molding and Forming.[170] EPA's planned actions include[171]

- undertaking rulemakings to restrict PFAS discharges from the industrial categories where EPA has sufficient data to do so (OCPSF, Metal Finishing, and Electroplating categories);[172]
- conducting detailed studies for industrial categories for which EPA has preliminary data, but not enough to determine whether rulemaking is warranted (Electrical and Electronic Components, Textile Mills, and Landfills);[173]

[164] EPA, *Preliminary Effluent Guidelines Program Plan 15*, EPA-821-R-21-003, September 2021, https://www.epa.gov/system/files/documents/2021-09/ow-prelim-elg-plan-15_508.pdf. EPA, *Multi-Industry Per- and Polyfluoroalkyl Substances (PFAS) Study - 2021 Preliminary Report*, EPA-HQ-OW-2021-0547, September 2021, https://www.epa.gov/system/files/documents/2021-09/multi-industry-pfas-study_preliminary-2021-report_508_2021.09.08.pdf.

[165] EPA, *Preliminary Effluent Guidelines Program Plan 15*, EPA-821-R-21-003, September 2021, phttps://www.epa.gov/system/files/documents/2021-09/ow-prelim-elg-plan-15_508.pdf.

[166] Ibid, p. 6-4.

[167] Ibid, pp. 5-17, 6-5-6.6. The existing Landfill ELGs are codified at 40 C.F.R. §445.

[168] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 2021, pp. 13-14, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[169] Ibid; H.R. 2467, §17.

[170] H.R. 2467, §17.

[171] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 2021, p. 14, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[172] EPA anticipates a proposed rule for OCPSF by summer 2023 and for Metal Finishing and Electroplating by summer 2024. The existing ELGs for Electroplating are codified at 40 C.F.R. §413.

[173] EPA anticipates these studies to be completed by fall 2022, to inform its decision about a potential rulemaking by the end of 2022. The existing ELGs for Electrical and Electronic Components are codified at 40 C.F.R. §469.

- initiating data reviews for industrial categories for which stakeholders have expressed concern about potential PFAS discharges, but for which there is little known information on such discharges (Leather Tanning and Finishing, Plastics Molding and Forming; and Paint Formulating);[174] and
- monitoring two industrial categories where the phase-out of PFAS is projected by 2024 (Pulp, Paper, and Paperboard and Airports).[175]

NPDES Authorities

In cases where EPA has not established an ELG for a particular industrial category or type of facility, or where pollutants or processes were not considered when an ELG was developed, the permitting authority (EPA or states) may still impose technology-based effluent limits on a case-by-case basis.[176] The permitting authority may also require facilities with NPDES permits to monitor for certain pollutants or conduct special studies as a means to collect data for future limitation development.[177] In addition, the permitting authority may include best management practices in permits on a case-by-case basis to carry out CWA provisions.[178] However, the use of some of these authorities can be limited in cases where analytical methods to detect specific pollutants are not available.

In November 2020, EPA issued an Interim Strategy for PFAS for federally issued NPDES permits.[179] EPA is the NPDES permitting authority in three states (Massachusetts, New Hampshire, and New Mexico), the District of Columbia, most U.S. territories, Indian Country, and certain federal facilities. The strategy recommended that EPA permit writers consider including PFAS monitoring at facilities where PFAS are expected to be present in discharges.[180] The strategy recommended a phased approach to any such monitoring provision, so that monitoring requirements would be triggered as validated EPA analytical methods for detecting specific PFAS in wastewater become available.[181] The interim strategy also recommended that EPA permit writers consider incorporating best management practices into permits, where appropriate, to control or abate the discharge of PFAS.[182]

In its 2021 *PFAS Strategic Roadmap*, EPA also discussed plans to leverage some of these NPDES authorities. Central to these plans is the September 2021 publication of the first EPA-validated laboratory analytical method to test for 40 PFAS compounds in eight different environmental

[174] EPA aims to complete these studies by winter 2023 to inform its decision about whether sufficient data are available to initiate a potential rulemaking. The existing ELGs for Leather Tanning and Finishing are codified at 40 C.F.R. §425; for Plastics Molding and Forming at 40 C.F.R. §463; and for Paint Formulating at 40 C.F.R. §446.

[175] EPA plans to discuss the results of the monitoring and any potential regulatory action in the Final Effluent Limitation Guideline Program Plan 15 in fall 2022.

[176] CWA §402(a)(1)(B); 33 U.S.C. §1342(a)(1)(B); 40 C.F.R. §125.3(c). EPA, *NPDES Permit Writers' Manual*, September 2010, pp. 5-45–5-46, https://www.epa.gov/npdes/npdes-permit-writers-manual.

[177] CWA §402(a)(2); 33 U.S.C. §1342(a)(2). EPA, *NPDES Permit Writers' Manual*, September 2010, pp. 9-2-9-3, https://www.epa.gov/npdes/npdes-permit-writers-manual.

[178] CWA §402(a)(1)-(2).

[179] EPA, Recommendations from the PFAS NPDES Regional Coordinators Committee Interim Strategy for Per- and Polyfluoroalkyl Substances in Federally Issued National Pollutant Discharge Elimination System Permits, November 22, 2020, https://www.epa.gov/pfas/interim-strategy-and-polyfluoroalkyl-substances-federally-issued-national-pollutant-discharge.

[180] Ibid.

[181] Ibid.

[182] Ibid.

media, including surface water and wastewater.[183] Specifically, for federally issued permits, EPA plans to require monitoring at facilities where PFAS are expected or suspected to be present in discharges, using EPA's recently published analytical method.[184] In addition,

> EPA will propose, as appropriate that NDPES permits 1) contain conditions based on product elimination and substitution when a reasonable alternative to using PFAS is available in the industrial process; 2) require best management practices to address PFAS-containing firefighting foams for stormwater permits; 3) require enhanced public notification and engagement with downstream communities and public water systems; and 4) require pretreatment programs to include source control and best management practices to protect wastewater treatment plant discharges and biosolid applications.[185]

EPA also discussed plans, in the *PFAS Strategic Roadmap*, to issue new guidance to state permitting authorities recommending that they leverage the same NPDES authorities where appropriate.[186] To date, both EPA and some states have utilized some of these NPDES authorities. For example, Pennsylvania issued an NPDES permit containing effluent limitations for PFOS and PFOA, and Michigan began, as of October 1, 2021, issuing NDPES permits for certain facilities that include monitoring requirements and effluent limitations for PFOS and PFOA.[187] In Massachusetts, where EPA is the permitting authority, EPA has issued NPDES permits that include requirements to monitor for a number of PFAS compounds.[188]

In April 2022, EPA issued a memorandum, in line with the *PFAS Strategic Roadmap*, which supplanted the 2020 Interim Strategy.[189] The memorandum details how the agency will address PFAS discharges in EPA-issued NPDES permits, and for industrial users (indirect dischargers) where EPA is the pretreatment control authority. The memorandum recommends that EPA permit writers include certain permit conditions for facilities where PFAS is expected or likely to be present in discharges. These conditions include effluent monitoring for each of the 40 PFAS parameters detectable by EPA's draft analytical method and best management practice and pollution prevention conditions (e.g., product elimination or substitution when a reasonable alternative to PFAS is available, minimizing accidental discharge through good housekeeping practices, equipment decontamination or replacement). The memorandum also includes recommended permit conditions for publicly owned treatment works where EPA is the permitting authority and where EPA is the pretreatment control authority, including effluent, influent, and

---

[183] EPA, "EPA Announces First Validated Laboratory Method to Test for PFAS in Wastewater, Surface Water, Groundwater, Soils," press release, September 2, 2021, https://www.epa.gov/newsreleases/epa-announces-first-validated-laboratory-method-test-pfas-wastewater-surface-water.

[184] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 2021, p. 14, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[185] Ibid.

[186] Ibid.

[187] Pennsylvania Department of Environmental Protection, "DEP Issues Discharge Permit with PFAS Limits to Montgomery County Air National Guard Base," press release, March 24, 2021, https://www.media.pa.gov/pages/dep_details.aspx?newsid=1432. Michigan Department of Environment, Great Lakes, and Energy, *Compliance Strategy for Addressing PFAS (PFOS/PFOA) from Industrial Direct Discharges and Industrial Storm Water Discharges*, July 2020, p. 4, https://www.michigan.gov/documents/pfasresponse/Compliance_Strategy_for_Addressing_PFAS_PFOS-PFOA_from_Industrial_Direct_Discharges_and_Industrial_Storm_Water_Discharges_698878_7.pdf.

[188] Massachusetts Department of Environmental Protection, "PFAS in Wastewater Facilities with NPDES-Permitted Discharges," press release, https://www.mass.gov/info-details/per-and-polyfluoroalkyl-substances-pfas#pfas-in-wastewater-facilities-with-npdes-permitted-discharges- (accessed October 21, 2021).

[189] Radhika Fox, Assistant Administrator, Office of Water, *Addressing PFAS Discharges in EPA-Issued Permits and Expectations Where EPA is the Pretreatment Control Authority*, EPA, April 28, 2022, https://www.epa.gov/system/files/documents/2022-04/npdes_pfas-memo.pdf.

biosolids monitoring requirements and best management and pollution prevention practices. In addition, the memorandum details expectations that EPA regions provide notification to potentially affected downstream public water systems of draft permits with PFAS-specific monitoring, best management practices, or other conditions.

Water Quality Criteria

CWA Section 304(a) requires EPA to develop and publish and "from time to time thereafter revise" criteria for water quality that accurately reflect the latest scientific knowledge.[190] Water quality criteria prescribe limits on specific contaminants or conditions in a water body that protect particular designated uses of the water body (e.g., protection of aquatic life, public drinking water supply, recreation, etc.). These criteria are recommendations to states and tribal governments for use in developing their own water quality standards, which they use to protect and restore waters and to inform water-quality-based effluent limits in permits.[191] EPA has developed several different types of criteria targeted to protect different designated uses, including human health criteria, aquatic life criteria, and recreational criteria.[192]

In EPA's 2019 *PFAS Action Plan*, the agency announced that it was working to determine if available data and research supported the development of CWA Section 304(a) water quality criteria for human health for PFAS.[193] In EPA's 2021 *PFAS Strategic Roadmap*, EPA more definitively announced that it will develop national recommended ambient water quality criteria for PFAS to protect aquatic life and human health.[194] EPA anticipated in the *PFAS Strategic Roadmap* that it would publish recommended aquatic life criteria for PFOA and PFOS and benchmarks for other PFAS that do not have sufficient data to define a recommended aquatic life criteria value by winter 2022 and human health criteria for PFOA and PFOS by the fall of 2024.[195]

In May 2022, EPA published draft recommended aquatic life criteria for PFOA and PFOS for public comment.[196] Following the comment period, EPA intends to issue final PFOA and PFOS recommended criteria, considering public comment and any new toxicity data.[197]

---

[190] CWA §304(a)(1); 33 U.S.C. §1314(a)(1).

[191] When EPA establishes criteria under CWA Section 304(a) for a specific contaminant, that action alone does not necessarily require states to adopt criteria for that contaminant. The CWA requires that states adopt criteria to protect the designated uses of their water bodies into their water quality standards (CWA §303(c)(2)). EPA's regulations provide that if a state does not adopt new or revised criteria for parameters for which EPA has published new or updated recommendations, then the state shall provide an explanation (40 C.F.R. §130.2). States are explicitly required to adopt criteria for a contaminant if EPA designates it as a toxic pollutant under CWA Section 307 and publishes criteria for that contaminant under Section 304(a) (CWA §303(c)(2)(B)).

[192] EPA, "Basic Information on Water Quality Criteria," https://www.epa.gov/wqc/basic-information-water-quality-criteria.

[193] EPA, *EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan*, EPA 823R18004, February 14, 2019, pp. 6, 29, https://www.epa.gov/pfas/epas-pfas-action-plan.

[194] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 2021, p. 15, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[195] Ibid.

[196] EPA, "Draft Recommended Aquatic Life Ambient Water Quality Criteria for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS)," 87 *Federal Register* 26199, May 3, 2022.

[197] EPA, "EPA Delivers on Three Commitments in the Agency's PFAS Strategic Roadmap," press release, April 28, 2022, https://www.epa.gov/newsreleases/epa-delivers-three-water-commitments-agencys-pfas-strategic-roadmap.

Biosolids Requirements

Biosolids, also known as "sewage sludge," are a product of the wastewater treatment process.[198] Biosolids may be applied to land for beneficial purposes, such as for agriculture, or they may be disposed of through incineration or surface disposal. CWA Section 405(d) requires EPA to establish numeric limits and management practices to protect public health and the environment from the reasonably anticipated adverse effects of pollutants during the use or disposal of biosolids.[199] It also requires EPA to review its biosolids regulations at least every two years to identify any additional toxic pollutants that may be present in biosolids and then promulgate regulations for those pollutants if sufficient scientific evidence shows they may adversely affect public health or the environment.[200] EPA's process to determine whether a pollutant may warrant regulation includes sewage sludge surveys (i.e., surveys to identify the presence of pollutants in biosolids using samples taken from wastewater treatment plants), pollutant risk screening for pollutants found in biosolids, and risk assessments for pollutants identified in biosolids that exceed a level of concern.[201]

To date, EPA has not established numeric limits or monitoring or reporting requirements for PFAS in biosolids. However, in EPA's *PFAS Strategic Roadmap*, EPA indicated that it will complete a risk assessment for PFOA and PFOS in biosolids by winter 2024, which it will use to determine whether regulation of these contaminants in biosolids is warranted.[202]

Toxic Pollutant or Hazardous Substance Designations

The CWA authorizes EPA to designate contaminants as toxic pollutants (CWA §307) or as hazardous substances (CWA §311), which may trigger other actions under the CWA and CERCLA.[203] EPA has not designated any PFAS as toxic pollutants or hazardous substances, and did not indicate in either its 2019 *PFAS Action Plan* or the 2021 *PFAS Strategic Roadmap* that it plans to do so.

Environmental Remediation

As with other chemicals, the federal role under CERCLA in remediating environmental contamination from releases of PFAS has focused on releases from federal facilities, and releases at sites on nonfederal lands designated for priority federal attention under the Superfund program in coordination with the states in which the sites are located.[204] EPA, DOD, and other federal agencies generally have used the EPA May 2016 drinking water health advisories for PFOA and PFOS, or applicable state regulatory standards, to determine whether actions may be warranted

[198] After liquids are separated from solids during wastewater treatment, the solids are treated chemically and physically to produce semisolid, nutrient-rich biosolids.

[199] 33 U.S.C. §1344(d). EPA's biosolids regulations are codified at 40 C.F.R. §503.

[200] Ibid.

[201] EPA, "Biosolids Laws and Regulations," https://www.epa.gov/biosolids/biosolids-laws-and-regulations#how.

[202] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 2021, p. 16, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[203] 33 U.S.C. §1317; 33 U.S.C. §1321. Such designations also trigger hazardous substance designations (and liability) under CERCLA. For additional information on these designations and their implications, see CRS Report R45998, *Contaminants of Emerging Concern Under the Clean Water Act*, by Laura Gatz.

[204] For a broader discussion of the authorities of CERCLA, see CRS Report R41039, *Comprehensive Environmental Response, Compensation, and Liability Act: A Summary of Superfund Cleanup Authorities and Related Provisions of the Act*, by David M. Bearden.

under CERCLA to address potential health risks at contaminated sites. The more recent EPA June 2022 interim PFOA and PFOS drinking water health advisories (see "Health Advisories") may raise questions about how the more stringent levels that the agency has recommended may inform future actions.

The vast majority of PFAS known to be released from federal facilities have occurred from the use of AFFF at U.S. military installations, and at some National Guard facilities. DOD has been responding to these PFAS releases under the Defense Environmental Restoration Program, pursuant to CERCLA and SDWA emergency powers orders at some U.S. military installations (see "Emergency Powers Orders"). Other federal agencies also have responded to PFAS releases at certain facilities. For example, the National Aeronautics and Space Administration (NASA) has responded to releases of PFOA and PFOS from the use of AFFF at the Wallops Flight Facility in Virginia.[205] As with other chemicals, the states generally have a more prominent role under state law in responding to releases of PFAS at sites on nonfederal lands that are not designated under the Superfund program.

CERCLA, other related federal authorities, and federal actions to investigate and remediate PFAS contamination under the EPA Superfund program and DOD Defense Environmental Restoration Program, are discussed below.

CERCLA Response Authority

Section 104 of CERCLA authorizes the President to respond to releases of hazardous substances into the environment, and releases of other pollutants or contaminants that may present an imminent and substantial danger to public health or welfare.[206] Response actions may include "removal" actions to address more immediate hazards and stabilize site conditions, and more extensive "remedial" actions intended to provide a more permanent solution. This presidential response authority is delegated by executive order to EPA under the Superfund program for releases at sites on nonfederal lands, and to other agencies that administer federal facilities from which a release occurs.[207] Pursuant to Section 105 of CERCLA, EPA also is responsible for designating sites on the National Priorities List (NPL) to prioritize the investigation and remediation of contamination under the statute.[208] Section 120 of CERCLA authorizes EPA to oversee other federal agencies in carrying out these actions at their facilities on the NPL.[209] The states have the lead role in overseeing these actions at federal facilities not on the NPL.

The federal response framework of CERCLA involves coordination with the states in which the sites are located, and state cost-shares for the use of Superfund appropriations to pay for remedial actions at sites on nonfederal lands. Section 104(c) of CERCLA generally requires states to match 10% of the construction costs of remedial actions, and 100% of the costs of operation and maintenance once a remedial action is in place and operating as intended, with the exception of the treatment of groundwater or surface water for which the federal government may pay 100%

[205] For information on the status of response actions, see NASA, "Background, Latest Information on PFAS at NASA Wallops," https://www.nasa.gov/feature/background-latest-information-on-pfas-at-nasa-wallops.

[206] 42 U.S.C. §9604.

[207] Executive Order 12580, Superfund Implementation, January 23, 1987, 52 *Federal Register* 2923.

[208] 42 U.S.C. §9605. The NPL identifies sites that EPA has designated for priority federal attention in coordination with the states in which the sites are located to investigate potential risks of contamination and determine the type and level of remediation that may be warranted to protect human health and the environment.

[209] 42 U.S.C. §9620.

of the costs for the first 10 years.[210] More limited removal actions are not subject to state cost-shares and may be fully federally funded. Remedial actions to respond to releases from federal facilities or on tribal lands also are not subject to state cost-shares.

The availability of federal funding for CERCLA response actions at Superfund sites or federal facilities is subject to annual appropriations. Section 111 of CERCLA generally restricts the use of Superfund appropriations at federal facilities that are funded with separate appropriations.[211]

CERCLA Liability

Section 107 of CERCLA establishes liability for response costs, natural resource damages, and the costs of ATSDR public health studies for releases of hazardous substances into the environment.[212] Categories of parties who may be held liable for these costs generally include

- current and former site owners and operators;
- persons who arranged for the treatment or disposal of a hazardous substance;
- persons who arranged for the transport of a hazardous substance for treatment or disposal; and
- persons who transported a hazardous substance for treatment or disposal and selected the receiving site.

However, the statute exempts various categories of parties, including

- persons who acquired a site with preexisting contamination in certain circumstances and did not cause or contribute to the contamination;
- persons who contributed very small quantities or only household wastes to a site;
- persons who released a hazardous substance in accordance with a federal permit issued under certain other laws (including state permits issued with delegated federal authorities) referred to as "federally permitted releases"; and
- certain other categories of parties.

Section 107 authorizes actions to recover response costs for which a party is liable. Section 106 also authorizes enforcement orders to require a liable party to perform a response action under federal oversight to avoid the need for federal and state funds upfront.[213] Section 122 authorizes an additional mechanism under which liable parties may enter into negotiated settlements with the federal government to perform or pay for response actions.[214]

The scope of liability under CERCLA is more limited than response authority under the statute. Liability applies only to releases of designated hazardous substances, and not to other pollutants or contaminants. EPA has not designated any PFAS as hazardous substances to date.[215] CERCLA authorizes federal actions to respond to releases of PFAS as pollutants or contaminants, but does

[210] 42 U.S.C. §9604(c).

[211] 42 U.S.C. §9611.

[212] 42 U.S.C. §9607. For a summary of the scope of CERCLA liability, also see CRS In Focus IF11790, *Liability Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)*, by Kate R. Bowers.

[213] 42 U.S.C. §9606.

[214] 42 U.S.C. §9622.

[215] The list of hazardous substances designated under CERCLA, and the reportable quantity for releases of each hazardous substance, are codified in federal regulation at 40 C.F.R. Part 302.

not establish liability for such releases to compel the party that caused or contributed to a release to pay for or perform response actions.

The scope of liability under CERCLA for hazardous substances does not include product liability, or liability for personal injury or property damages, both of which vary under state tort law. The Federal Tort Claims Act (FTCA) authorizes tort claims against the U.S. government for personal injury, death, or property damages that may be caused by negligent or wrongful federal acts or omissions, but authorizes a defense for discretionary functions of federal departments and agencies in carrying out their respective missions.[216]

CERCLA Hazardous Substances

The EPA 2019 *PFAS Action Plan* indicated that the agency was developing a rule to designate PFOA and PFOS as hazardous substances under Section 102 of CERCLA or potentially other related laws that would trigger a hazardous substance designation.[217] The EPA 2021 *PFAS Strategic Roadmap* outlined a time frame for issuing a proposed rule in spring 2022 to designate PFOA and PFOS as hazardous substances, a final rule for this purpose in summer 2023, and a separate advanced notice of proposed rulemaking in spring 2022 to seek public input on designating additional PFAS as hazardous substances.[218] EPA has not proposed either rule to date. The draft of the proposed rule for PFOA and PFOS has been submitted to the White House Office of Management and Budget (OMB) for review.[219] Once proposed, these rules would be subject to the opportunity for public comment prior to being finalized, pursuant to federal rulemaking procedures. EPA expressed its intent to seek additional stakeholder input focused among communities in the vicinity of PFAS-contaminated sites.[220] EPA indicated that it would consider designating additional PFAS as CERCLA hazardous substances, as "more specific information related to the health effects of those PFAS and methods to measure them in groundwater are developed."[221] Potential risks at PFAS-contaminated sites that EPA, DOD, and other agencies have identified at the federal level have centered around impacts of groundwater contamination on drinking water sources.

Section 101(14) of CERCLA defines the term "hazardous substance" to include chemicals designated for regulation or enforcement under the following federal statutes:[222]

- hazardous substances designated under Section 311(b)(2)(A) of the Clean Water Act;[223]

[216] 28 U.S.C. §§2671-2680. For a discussion of this statute, see CRS Report R45732, *The Federal Tort Claims Act (FTCA): A Legal Overview*, by Kevin M. Lewis.

[217] EPA, *EPA's Per- and Polyfluoroalkyl Substances (PFAS) Action Plan*, EPA 823R18004, February 14, 2019, p.2, https://19january2021snapshot.epa.gov/sites/static/files/2019-02/documents/pfas_action_plan_021319_508compliant_1.pdf.

[218] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 18, 2021, p. 17, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[219] For information on the status of this review, see Office of Management and Budget, Office of Information and Regulatory Affairs, "Designating PFOA and PFOS as CERCLA Hazardous Substances," Proposed Rule Stage, RIN: 2050-AH09, https://www.reginfo.gov/public/do/eAgendaViewRule?pubId=202204&RIN=2050-AH09.

[220] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 18, 2021, p. 17, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[221] Ibid.

[222] 42 U.S.C. §9601(14).

[223] 33 U.S.C. §1321(b)(2)(A).

- toxic pollutants designated under Section 307(a) of the Clean Water Act;[224]
- characteristic or listed hazardous wastes under Section 3001 of the Solid Waste Disposal Act (commonly referred to as the Resource Conservation and Recovery Act, or RCRA);[225]
- hazardous air pollutants designated under Section 112 of the Clean Air Act;[226] and
- any imminently hazardous chemical substance or mixture for which EPA has taken a civil action in the appropriate U.S. District Court of jurisdiction under Section 7 of TSCA.[227]

Contaminants for which EPA has promulgated an MCL under SDWA are not included in the statutory definition of a hazardous substance in CERCLA. The designation of an MCL for any PFAS would therefore not trigger a hazardous substance designation under CERCLA.

EPA's authority to designate hazardous substances is not restricted to chemicals listed under the laws referenced in Section 101(14) of CERCLA. Section 102(a) also authorizes EPA to promulgate regulations for designating other chemicals as a hazardous substance if the chemical may present substantial danger to the public health or welfare or the environment when released into the environment.[228] To date, EPA has not used Section 102(a) to designate any hazardous substances; doing so would be the first use of this authority to list a hazardous substance. EPA has so far designated each hazardous substance because of a listing under one or more of the provisions in the CWA, Clean Air Act, or Solid Waste Disposal Act (RCRA) referenced in Section 101(14) of CERCLA. The rulemaking that EPA outlined in its 2021 *PFAS Strategic Roadmap* for designating certain PFAS as hazardous substances would involve the use of Section 102(a) of CERCLA and would not rely on the listing of the same chemicals under any of the other federal statutes referenced in Section 101(14).

If PFAS were designated as hazardous substances, releases into the environment would be subject to liability and release reporting requirements under CERCLA to the same extent as other hazardous substances. Section 120 of CERCLA generally applies liability and other requirements of the statute to federal facilities to the same extent as other entities.[229]

If PFAS were designated as hazardous substances, some potentially responsible parties (PRPs) may include the federal government at U.S. military installations and other federal facilities, civilian airport owners and operators, and local fire departments that released PFAS from the use of AFFF. Owners and operators of landfills could become PRPs if the disposal of PFAS wastes releases these chemicals through leaching that may migrate into the environment. Generators of such wastes sent to landfills for disposal also could become PRPs, with the exception of generators of certain municipal solid wastes who generally are exempt from liability under CERCLA.[230] Chemical manufacturers and processors that release PFAS at sites that they own or operate could also become PRPs. Such liability scenarios are illustrative, but not comprehensive,

[224] 33 U.S.C. §1317(a).

[225] 42 U.S.C. §6921.

[226] 42 U.S.C. §7412.

[227] 15 U.S.C. §2606.

[228] 42 U.S.C. §9602(a).

[229] 42 U.S.C. §9620.

[230] 42 U.S.C. §9607(p).

of all situations in which liability could arise under CERCLA if PFAS were designated as hazardous substances.

CERCLA does not more broadly establish product liability for companies that manufacture or process hazardous substances. Although CERCLA authorizes some exemptions from liability otherwise covered under the statute, these exemptions focus primarily on situations in which the site owner did not cause or contribute to the contamination or the party contributed very small quantities of waste or only household municipal solid wastes to a site. Fertilizer applications of biosolids (i.e., treated sewage sludge) that may contain PFAS would generally not be subject to CERCLA because of the statutory exclusion of the "normal application of fertilizer."[231]

States also may establish liability for releases of PFAS under their own laws. Section 120(a)(4) of CERCLA waives federal sovereign immunity to allow the application of state remediation laws to federal facilities that are not on the NPL.[232] State laws establishing liability for PFAS may be applied to such facilities. Although federal sovereign immunity is not waived at federal facilities on the NPL, Section 121(f) of CERCLA requires the state in which a site is located to be provided the opportunity for involvement in the selection of remedial actions regardless of whether the site is on the NPL.[233] This provision allows states to participate with EPA in the oversight of remedial actions at federal facilities on the NPL, but not to enforce state law at such facilities.

Superfund Program

Historically, EPA has focused the use of its CERCLA response authorities under the Superfund program primarily on hazardous substance releases, in the event that a viable PRP can be identified to enforce liability. EPA has responded to releases of certain PFAS as pollutants or contaminants under the Superfund program at some sites on nonfederal lands, in coordination with the states in which the sites are located. Sites where EPA has been involved under the Superfund program have typically been contaminated not only from PFAS but also releases of hazardous substances. For example, EPA added the Saint-Gobain Performance Plastics site in Hoosick Falls, NY, to the NPL in August 2017 based on potential risks associated with multiple hazardous substances detected at that site, and PFOA as a pollutant or contaminant.[234] Although liability under CERCLA applies only to hazardous substances, EPA may consider potential risks from releases of hazardous substances, pollutants, or contaminants in evaluating the eligibility of a site for listing on the NPL under the Hazard Ranking System.[235]

Subject to annual appropriations, EPA may fund response actions under the Superfund program at eligible sites for releases of pollutants or contaminants, but may not recover its costs for such actions because of the lack of CERCLA liability. In practice, liability potentially could be applied to certain response actions if the constituency of the contamination may include hazardous substances mixed with other pollutants or contaminants. For example, groundwater contamination at a site may contain not only PFAS but also other constituents that are hazardous substances. At such sites, treatment methods, provisions of alternative water supplies, or other response actions for hazardous substances may have the incidental benefit of addressing risks from other pollutants

[231] 42 U.S.C. §9601(22).

[232] 42 U.S.C. §9620(a)(4).

[233] 42 U.S.C. §9621(f).

[234] EPA, "National Priorities List: Final Rule," 82 *Federal Register* 36095-36100, August 23, 2017.

[235] 40 C.F.R. Part 300, Appendix A.

or contaminants. Such response actions may address multiple chemicals, and may present challenges in separating the costs attributed to hazardous substances alone.

Regardless of liability to recover the costs, Section 111 of CERCLA authorizes EPA to use Superfund appropriations for responding to releases of either hazardous substances, pollutants, or contaminants under Section 104 of the statute.[236] Other criteria of CERCLA for carrying out response actions also apply to pollutants or contaminants in the same manner as hazardous substances, including federal and state cost-sharing for remedial actions under Section 104(c),[237] the selection of remedial actions under Section 121,[238] and limitations on funding remedial actions only at NPL sites.[239] EPA may fund removal actions at NPL or non-NPL sites.

EPA has developed guidance for investigating and remediating PFOA and PFOS in groundwater under the Superfund program and other related authorities (see "EPA Groundwater "Cleanup" Recommendations"). EPA based the risk criteria of this guidance primarily on its 2016 drinking health advisories for these chemicals. MCLs that EPA may promulgate for PFOA, PFOS, or potentially other PFAS under SDWA could be applied to remedial actions to protect a current or potential source of drinking water, pursuant to Section 121 of CERCLA.[240] However, EPA could not enforce liability under CERCLA for the costs of those actions (or natural resource damages) without a hazardous substance designation.

The Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58) increased funding for the Superfund program that would be available for responding to releases of either hazardous substances, pollutants, or contaminants (including PFAS) at eligible sites on nonfederal lands. P.L. 117-58 provides $3.5 billion in emergency appropriations for Superfund remedial actions, waives the state cost-share for the use of these funds, reauthorizes Superfund excise taxes on domestic chemical feedstocks and imported chemical derivatives through December 31, 2031, and authorizes EPA to expend these tax receipts from the Superfund Trust Fund for uses authorized under Section 111 of CERCLA without further appropriation.[241]

Other Related EPA Authorities

Certain other federal enforcement authorities also may be available to EPA to require a responsible party to investigate or remediate PFAS contamination in some situations. However, these authorities do not establish broader liability comparable to CERCLA and do not authorize federal funding for EPA to perform the investigation or remediation. SDWA Section 1431 emergency powers are available to EPA for enforcement actions to protect drinking water sources from contaminants that broadly may include PFAS and other emerging contaminants (see

[236] 42 U.S.C. §9611.

[237] 42 U.S.C. §9604(c).

[238] 42 U.S.C. §9621.

[239] 40 C.F.R. §300.425.

[240] 42 U.S.C. §9621. This provision also generally authorizes the application of potentially stricter MCL "goals" under SDWA to the selection of CERCLA remedial actions at sites where "relevant and appropriate under the circumstances of the release or threatened release." However, other criteria of Section 121 of CERCLA also require a remedial action to be cost-effective over the short term and long term, and allow the exclusion of an otherwise applicable standard if attaining it would be "technically impracticable from an engineering perspective." For these reasons, stricter MCL goals that may be technically impracticable or not cost-effective to attain generally have not been applied under CERCLA. SDWA MCLs are enforceable under that statute to regulate the quality of drinking water provided by public water systems, whereas stricter MCL goals may set nonenforceable objectives for improving drinking water quality.

[241] For more information, see CRS In Focus IF11982, *Superfund Tax Legislation in the 117th Congress*, by Anthony A. Cilluffo and David M. Bearden.

"Emergency Powers Orders").[242] RCRA Section 7003 imminent hazard authorities also are available to EPA for enforcement actions to mitigate an imminent or substantial endangerment to human health or the environment resulting from the management or disposal of solid or hazardous wastes.[243] EPA has not listed any PFAS as a hazardous waste to date, but the discarding of PFAS may constitute a solid waste in certain instances given the breadth of what may be considered a solid waste under RCRA (see "Disposal of PFAS Wastes").

EPA Groundwater "Cleanup" Recommendations

On December 19, 2019, EPA's Office of Land and Emergency Management issued interim recommendations for conducting site investigations and taking remedial actions under CERCLA, and corrective actions under RCRA, to address groundwater contaminated with PFOA and PFOS at sites where no state or tribal standards may apply.[244] As noted above, EPA has not listed PFOA, PFOS, or any PFAS as an RCRA hazardous waste to date. The use of these recommendations to enforce RCRA corrective actions for hazardous wastes therefore may be presently limited.

EPA also would not have the authority to compel a PRP to investigate or remediate a site under CERCLA, or pay the costs of these actions, based on decisions using these interim recommendations, unless PFOA or PFOS were designated as hazardous substances under CERCLA. EPA may fund actions under the Superfund program to respond to releases of PFOA or PFOS as CERCLA pollutants or contaminants, but CERCLA limits the use of Superfund appropriations for remedial actions to sites on NPL. These appropriations are subject to a cost-share agreement with the state in which the site is located.

These EPA interim recommendations are guidance for setting a screening level and preliminary remediation goal (PRG) for PFOA and PFOS in groundwater that is a current or potential source of drinking water. The recommended screening level and PRG are nonenforceable, nonregulatory values. These values are intended to inform CERCLA remedial actions under the EPA Superfund program, and RCRA corrective actions that EPA may take in states without delegated RCRA corrective action authority, or in delegated states on a site-specific basis if EPA involvement is warranted. EPA has delegated RCRA corrective action authority to most states.[245] Other federal agencies, states, tribes, and public health officials may choose to use this EPA guidance under their respective authorities, or may take differing approaches.

The 2019 EPA guidance recommends a groundwater screening level of 40 ppt for PFOA or PFOS individually, based on a hazard quotient (HQ)[246] of 0.1. In general, EPA considers that a screening

[242] 42 U.S.C. §300i.

[243] 42 U.S.C. §6973.

[244] U.S. Environmental Protection Agency, *Interim Recommendations to Address Groundwater Contaminated with Perfluorooctanoic Acid and Perfluoroocatanesulfonate,* OLEM Directive No. 9283.1-47, December 19, 2019, https://www.epa.gov/pfas/interim-recommendations-addressing-groundwater-contaminated-pfoa-and-pfos.

[245] EPA reported nine states that did not have delegated RCRA corrective action authority as of March 31, 2021. See EPA, "Corrective Action Management Units and Temporary Units; Corrective Action Provisions Under Subtitle C," p. 186, https://www.epa.gov/sites/default/files/2021-05/documents/authall.pdf.

[246] The Hazard Quotient is unitless value for quantifying noncarcinogenic effects, based on the ratio of the estimated daily intake and the reference dose (RfD). EPA uses separate toxicological approaches for estimating potential health effects associated with exposure from chemicals that are noncarcinogenic and carcinogenic. For PFOS, EPA did not perform a quantitative analysis to assess potential carcinogenic effects, as the agency did not identify sufficient evidence demonstrating tumor incidence and dose. For PFOA, EPA noted there was sufficient evidence to perform a quantitative analysis on potential carcinogenic effects. However, the agency reported that the screening levels established from the noncarcinogenic analysis (40 ppt) were lower than the concentrations established from the results of the carcinogenic analysis.

level based on an HQ of greater than 1 could indicate a possible adverse health effect if exposure were to occur at certain levels. EPA used the HQ of 0.1 for this guidance. EPA considers the more limited purpose of a screening level as a measure of when further investigation may be warranted (not a basis of remediation), of the potential combined toxicity of PFOA and PFOS if both chemicals are present in groundwater, and of the potential for the presence of other toxic chemicals in groundwater at the same site, if no toxicity values may be available. EPA's guidance generally recommends that no further investigation or remedial action is warranted for concentrations detected below 40 ppt, whereas concentrations exceeding 40 ppt would warrant further investigation, but not necessarily remedial action.

In addition, the 2019 EPA guidance recommends a PRG of 70 ppt for PFOA and PFOS individually or combined for groundwater that is a current or potential source of drinking water, and if no state or tribal standards may be applicable. EPA notes that this PRG of 70 ppt is an initial target for groundwater remediation that may warrant adjustment, depending on the site-specific conditions and additional considerations. If remedial action is warranted, a range of methods may be used to remediate the risk, including active groundwater treatment, restrictions on groundwater use, providing alternative water sources, and monitored natural attenuation in some cases. Section 121 of CERCLA authorizes the criteria for selecting remedial actions under that statute, including not only protectiveness but also cost-effectiveness and technical feasibility, among other considerations.[247] RCRA corrective actions are generally based on similar considerations.

In May 2022, EPA also issued additional screening levels for several PFAS that supplement the December 2019 groundwater recommendations.[248] The EPA June 2022 interim PFOA and PFOS health advisories for drinking water may raise additional questions about how or whether the more stringent levels that the agency has recommended may be considered for groundwater investigations and PRGs.

Defense Environmental Restoration Program

DOD has responded to releases of PFAS from the use of AFFF at active and decommissioned U.S. military installations under the Defense Environmental Restoration Program, in conjunction with its delegated CERCLA response authorities. DOD has been remediating environmental contamination, unexploded ordnance (UXO), and certain other hazards under the Defense Environmental Restoration Program for years or even decades at many of these same U.S. military installations. Detections of PFOA or PFOS in groundwater are a more recent development that adds to existing remediation challenges and funding needs.

DOD response actions taken under the Defense Environmental Restoration Program are subject to the requirements of CERCLA.[249] These program authorities generally apply to releases of hazardous substances, pollutants, or contaminants at facilities or sites that are or were owned by, leased to, or otherwise possessed by the federal government, and under the jurisdiction of DOD at

[247] 42 U.S.C. §9621.

[248] EPA, "Regional Screening Levels (RSLs) - What's New," https://www.epa.gov/risk/regional-screening-levels-rsls-whats-new.

[249] 10 U.S.C. §2701. For a discussion of the authorities of the Defense Environmental Restoration Program, see "Cleanup Authorities Specific to Military Facilities" in CRS Report R41039, *Comprehensive Environmental Response, Compensation, and Liability Act: A Summary of Superfund Cleanup Authorities and Related Provisions of the Act*, by David M. Bearden.

the time of the release.[250] Section 316 of the National Defense Authorization Act for FY2020 (P.L. 116-92) clarified the applicability of these DOD response authorities at National Guard facilities specifically for PFOA and PFOS releases.

Since these authorities were enacted in 1986,[251] DOD had been required to respond to releases of hazardous substances at eligible sites under this program, consistent with financial liability under CERCLA applying to such substances. DOD had the discretion to respond to releases of other pollutants or contaminants, but was not required to respond absent liability under CERCLA. Section 316(c) of P.L. 116-92 amended these authorities to require DOD to respond to releases of hazardous substances, pollutants, and contaminants at eligible sites under the Defense Environmental Restoration Program,[252] but did not amend CERCLA to expand liability to pollutants or contaminants. DOD now has the statutory obligation to respond to releases of such chemicals (including PFAS) at eligible sites, but without enforceable liability under CERCLA for pollutants or contaminants. Funding for DOD to carry out its statutory obligation to respond to PFAS releases is subject to annual appropriations and DOD's prioritization of these funds among eligible sites across the United States.

DOD Appropriations Accounts

The availability of funding for DOD to take CERCLA response actions under the Defense Environmental Restoration Program is subject to annual appropriations to several DOD accounts. Each account funds a different inventory of sites that is limited to the specific inventory. The Environmental Restoration accounts of the U.S. Air Force, U.S. Army, U.S. Navy, and Defense-wide sites primarily fund response actions at active U.S. military installations, and certain installations closed after 1986 with dedicated authorities apart from a Base and Realignment Closure (BRAC) process. A fifth Environmental Restoration account funds Formerly Used Defense Sites (FUDS) decommissioned prior to 1986. The Defense Base Closure account funds installations closed under a BRAC process in 1988, 1991, 1993, 1995, and 2005.

Section 343 of the National Defense Authorization Act for FY2020 (P.L. 116-92) also authorizes the use of appropriations in broader DOD Operation and Maintenance accounts to fund alternative water sources or treat water contaminated with PFOA and PFOS at sites where U.S. military activities caused contamination of a water source used to produce agricultural products for human consumption (see "PFAS in Dairy Milk, Foods, and Food Contact Applications").

PFAS Site Inventory

The explanatory statement accompanying the Consolidated Appropriations Act, 2017 (P.L. 115-31) "encouraged" DOD to establish procedures for prompt and cost-effective remediation of contamination from perfluorinated chemicals (PFCs; i.e., PFAS) released as a result of the use of AFFF at active and decommissioned U.S. military installations.[253] The explanatory statement also directed DOD to submit a report to Congress assessing the number of current and former installations where AFFF was or is used, and the impact of contamination in drinking water on surrounding communities. The explanatory statement further directed DOD to develop plans for "prompt" community notification of such contamination and procedures for "timely"

[250] 10 U.S.C. §2701(c).

[251] Title II of the Superfund Amendments and Reauthorization Act of 1986 (P.L. 99-499).

[252] 10 U.S.C. §2701(c).

[253] U.S. Congress, House Committee on Appropriations, *Consolidated Appropriations Act, 2017: Legislative Text and Explanatory Statement*, committee print, 115th Cong., 1st sess., 2017 (Washington: GPO, 2017), pp. 336-337.

remediation. DOD issued this report in October 2017 that identified an initial inventory of PFAS release sites and stated the following:

> Addressing elevated levels of PFOS and PFOA from DoD activities is a priority for DoD. The DoD Components have taken action to ensure safe drinking water for people living and working on their military installations and in the surrounding communities. Following the CERCLA process, DoD is addressing its cleanup responsibility and promptly notifying affected communities. DoD is also taking steps to remove and replace AFFF containing PFOS in the supply chain, and is committed to finding a fluorine-free alternative that safeguards its troops and military assets, meets critical mission requirements, and protects human health and the environment.[254]

In March 2018, DOD issued an update on the status of its actions to respond to releases of PFOA and PFOS.[255] The House Committee on Armed Services directed DOD to provide this update, in its report accompanying the National Defense Authorization Act for FY2018 (P.L. 115-91).[256] DOD updated its initial inventory and identified 401 U.S. military installations in the United States with known or potential releases of PFOA or PFOS from the use of AFFF. DOD detected PFOA or PFOS in groundwater wells above the EPA Lifetime Health Advisory of 70 ppt at 90 of these installations at that time. DOD identified planned actions at these installations under the Defense Environmental Restoration Program, subject to annual appropriations and prioritization of funding among eligible sites.

In July 2019, DOD established an internal PFAS Task Force to coordinate actions across the military departments for responding to PFAS releases under the Defense Environmental Restoration Program, DOD research and development of nonfluorinated alternatives to AFFF (see "Transition to Fluorine-Free Class B Firefighting Foams"), and related activities.[257] The DOD PFAS Task Force issued a "progress" report in March 2020.[258]

The 2020 report identified known or suspected releases of certain PFAS from the use of AFFF at an additional 250 U.S. military installations and National Guard facilities as of the end of FY2019. These additional sites increased the total inventory of U.S. military installations and National Guard facilities with known or potential releases of PFAS from 401 that DOD reported in March 2018 to 651 as of the end of FY2019.[259]

---

[254] Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, *Aqueous Film Forming Foam Report to Congress*, October 2017, cleared for open publication on November 3, 2017, p. 6, https://www.denix.osd.mil/derp/home/documents/aqueous-film-forming-foam-report-to-congress/Aqueous%20Film%20Forming%20Foam%20(AFFF)%20Report%20to%20Congress_DENIX.PDF.

[255] Department of Defense, *Addressing Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA)*, March 2018, https://www.denix.osd.mil/derp/home/documents/pfos-pfoa-briefing-to-the-hasc/FY18%20HASC%20Brief%20on%20PFOS-PFOA_Mar2018.pdf.

[256] U.S. Congress, House Committee on Armed Services, *National Defense Authorization Act for FY2018*, report to accompany H.R. 2810, 115th Cong., 1st sess., July 6, 2017, H.Rept. 115-200 (Washington: GPO, 2017), pp. 117-119.

[257] Department of Defense, Memorandum for Secretaries of the Military Departments, *Per-and Polyfluoroalkyl Substances Task Force*, July 2019, https://media.defense.gov/2019/Aug/09/2002169524/-1/-1/1/PER-AND-POLYFLUOROALKYL-SUBSTANCES-TASK-FORCE.PDF.

[258] Department of Defense, PFAS Task Force, *Per- and Polyfluoroalkyl Substances (PFAS) Task Force Progress Report*, March 2020, https://media.defense.gov/2020/Mar/13/2002264440/-1/-1/1/PFAS_Task_Force_Progress_Report_March_2020.pdf.

[259] For a map and list of these 651 U.S. military installations and National Guard facilities, see Department of Defense, "DOD Releases PFAS Task Force Progress Report," https://www.defense.gov/News/News-Stories/Article/Article/2111631/dod-releases-pfas-task-force-progress-report/.

DOD has since identified additional known or potential releases of certain PFAS at other sites from the use of AFFF, increasing the DOD site inventory to include a total of 700 active U.S. military installations, National Guard facilities, closed BRAC sites, and FUDS as of the end of FY2021.[260] FUDS constitute the smallest portion this inventory, consisting of four sites. FUDS were decommissioned prior to 1986, some of which operated during the World War I and World War II eras. Most FUDS were decommissioned before DOD began to use AFFF in the 1970s. PFAS releases from past DOD activities therefore would have been less common at FUDS.

PFAS Site Investigations and Remediation

DOD has been investigating PFAS releases across this site inventory under the Defense Environmental Restoration Program to determine whether actions are warranted to protect human health and the environment, pursuant to CERCLA and other applicable federal or state laws. DOD actions to respond to potential exposures to PFAS at eligible sites have ranged from providing bottled water or other alternative water supplies to treating contaminated water sources, depending on what actions are deemed warranted based on site-specific investigations.

In April 2022, DOD issued an update of the status of the CERCLA site investigation process at each of the 700 active U.S. military installations, National Guard facilities, closed BRAC sites, and FUDS in its PFAS site inventory.[261] DOD reported that Preliminary Assessments/Site Inspections were completed at 224 installations, Remedial Investigations/Feasibility Studies were under way at 153 installations, and interim Removal actions to address potential exposures were completed or under way at 52 installations, as of the end of December 2021. The House Committee on Armed Services instructed DOD to provide this update in the form of a briefing for the committee, as directed in its report accompanying the National Defense Authorization Act (NDAA) for FY2022.[262]

DOD also has issued a series of other status reports from June 2020 through April 2022 in response to congressional direction in various NDAAs and appropriations bills:

- DOD issued a report in June 2020 that outlined a plan for the investigation and remediation of PFOA and PFOS releases at U.S. military installations and National Guard facilities.[263]

[260] Department of Defense, *Progress at the 700 Installations Being Assessed for PFAS Use or Potential Release*, September 30, 2021, https://media.defense.gov/2022/Jan/24/2002926249/-1/-1/0/DOD-PFAS-PROGRESS-AS-OF-SEPT-30-2021.PDF.

[261] Department of Defense, Office of the Under Secretary of Defense for Acquisition and Sustainment, *Progress of Cleanup Actions Related to Department of Defense-Caused Per-and Polyfluoroalkyl Substances Contamination*: *Briefing for the House Committee on Armed Services pursuant to the House Armed Services Committee Report 117-118, pages 107-108, accompanying the National Defense Authorization Act for Fiscal Year 2022*, April 2022, https://www.denix.osd.mil/derp/featured-content/reports/congress-pfas-brief/DoD%20Progress%20of%20PFAS%20Cleanup%20HASC%20Briefing_508C.pdf.

[262] U.S. Congress, House Committee on Armed Services, *National Defense Authorization Act for Fiscal Year 2022*, report to accompany H.R. 4350, 117th Cong., 1st sess., September 10, 2021, H.Rept. 117-118 (Washington: GPO, 2021), p. 29.

[263] Department of Defense, *Remediation Plan for Cleanup of Water Impacted with Perfluorooctane Sulfonate or Perfluorooctanoic Acid*, June 2020, https://www.denix.osd.mil/derp/featured-content/reports/rprc/Remediation%20Plan%20Report%20to%20Congress.pdf.

- DOD issued a report in June 2021 that estimated the costs of responding to PFOA and PFOS releases at closed BRAC sites funded from the DOD Defense Base Closure account.[264]
- DOD issued a companion report in July 2021 that estimated the costs of responding to PFAS releases at active U.S. military installations, FUDS, and National Guard facilities funded from the DOD Environmental Restoration accounts or other DOD Operation and Maintenance accounts.[265]
- DOD issued a report in July 2021 that disclosed the number of notifications to persons engaged in agricultural operations that rely on water sources potentially affected by PFOA, PFOS, or PFBS releases from U.S. military installations or National Guard facilities (see "PFAS in Dairy Milk, Foods, and Food Contact Applications").[266]
- DOD issued a report in April 2022 on the status of investigating and remediating PFOA and PFOS releases at closed BRAC sites.[267]
- DOD issued an updated report in June 2022 on the costs of investigating and remediating PFOA and PFOS releases at active U.S. military installations, National Guard facilities, and FUDS.[268] This report also referenced additional estimates of future funding needs for closed BRAC sites.

Cost Estimates

In its reports on costs referenced above, DOD estimated a total of over $1 billion (in current dollars) obligated through FY2021 for investigating and remediating PFAS releases at active U.S. military installations, closed BRAC sites, FUDS, and National Guard facilities combined. DOD estimated additional costs of $2.12 billion to complete these actions at all eligible sites from FY2022 into the future. In its June 2022 report, DOD observed that its estimates involve some uncertainty:

> DoD does not track funding by contaminant, and the data in the appendix represents the DoD Components' best estimates of the funding obligated and to be obligated for investigations and cleanup of DoD releases of PFAS as of the end of FY2021. Additionally, based on current information, DoD estimates obligations for beyond FY2022 to exceed $734.7 million for active installations, Formerly Used Defense Sites properties, and National Guard locations, as reported here, for a total of $2.12 billion including Base Realignment and Closure locations. DoD expects this estimate to increase as the DoD

[264] Department of Defense, *Perfluorooctane Sulfonate and Perfluorooctanoic Acid at Base Realignment and Closure Locations*, June 2021, https://www.denix.osd.mil/derp/featured-content/reports/pfos-and-pfoa-at-brac-locations-report-to-congress-june-2021/PFOS%20and.PFOA%20at%20BRAC%20Locationspdf.pdf.

[265] Department of Defense, *Per-and Polyfluoroalkyl Substances Cleanup Costs*, July 2021, https://www.denix.osd.mil/derp/featured-content/reports/pfas-cleanup-cost/PFAS%20Cleanup%20Costs.pdf.

[266] Department of Defense, *Status of Notifications to Agricultural Operations Pursuant to Section 335 of the Fiscal Year 2021 National Defense Authorization Act*, July 2021, https://www.denix.osd.mil/derp/featured-content/reports/operations-report/Agricultural%20Operations%20Notifications%20Report%20to%20Congress.pdf.

[267] Department of Defense, *Perfluorooctane Sulfonate and Perfluorooctanoic Acid at Base Realignment and Closure Locations*, April 2022, https://www.denix.osd.mil/derp/featured-content/reports/pfos-and-pfoa-at-brac-locations-report-to-congress-april-2022/PFOS%20and%20PFOA%20at%20BRAC%20Locations_April%202022.pdf.

[268] Department of Defense, *Report on Per- and Polyfluoroalkyl Substances Active Sites Cleanup Costs*, June 2022, https://www.denix.osd.mil/derp/featured-content/reports/report-on-per-and-polyfluoroalkyl-substances-active-sites-cleanup-costs/PFAS%20Cleanup%20Costs%20Report%20to%20Congress%20June%202022.pdf.

> Components complete the initial assessments and learn more about the extent of the cleanup required. The DoD Components will plan and program for these requirements as they are defined.[269]

DOD estimated these costs based on the present site inventory, existing knowledge of site conditions, and assumptions of actions that may be warranted in the future to address potential risks to human health and the environment. These estimates would involve some uncertainty at sites where investigations are not complete and decisions for remedial actions are not finalized. Federal and state regulatory developments may present additional challenges in estimating these costs because of uncertainties in what future standards would apply to the remediation of PFAS contamination at individual sites.

Identifying past costs incurred for investigating and remediating PFAS releases at DOD sites also presents challenges. DOD noted in its June 2022 report and prior reports on costs that it "does not track funding by contaminant."[270] As a practical matter, contamination in groundwater or other environmental media may consist of varying chemical constituents depending on past activities that may have released multiple chemicals into the environment at the same site. Actions to investigate and remediate contamination at such sites may address multiple constituents at the same time, and not necessarily focus on just one chemical.

For such reasons outlined above, DOD observed in its June 2022 report and prior cost reports that the costs it has reported are "best estimates of the funding obligated and to be obligated" for investigating and remediating PFAS releases across the DOD inventory of sites.[271] The U.S. Government Accountability Office (GAO) issued a report in June 2021 that also examined various challenges in estimating these costs.[272]

DOD's estimate of $2.12 billion in future costs for responding to PFAS releases is 5.9% of its total estimate of funding needs for investigating and remediating all contamination and other hazards at eligible sites covered under the Defense Environmental Restoration Program. As of the end of FY2021, DOD estimated a total of $36.05 billion in future costs to complete the investigation and remediation of all eligible sites under the Defense Environmental Restoration Program.[273] Of this amount, $22.64 billion is primarily attributed to contamination from releases of hazardous substances, pollutants, or contaminants into the environment, and $13.41 billion is attributed to UXO and other munitions hazards at nonoperational ranges and disposal sites.

The availability of funding to investigate and remediate all of these sites would depend on annual appropriations. Funding needs would arise over a span of years or decades among individual sites to carry out the CERCLA site investigation and remediation process, including long-term operations, maintenance, and monitoring once remedial actions are in place at sites where such actions are deemed warranted to protect human health and the environment.

---

[269] Ibid., pp. 1-2.

[270] Ibid.

[271] Ibid.

[272] U.S. Government Accountability Office, *Firefighting Foam Chemicals: DOD Is Investigating PFAS and Responding to Contamination, but Should Report More Cost Information*, GAO-21-421, June 22, 2021, https://www.gao.gov/products/gao-21-421.

[273] Department of Defense, *Agency Financial Report: Fiscal Year 2021*, November 15, 2021, "Note 14. Environmental and Disposal Liabilities," p. 169, https://comptroller.defense.gov/Portals/45/Documents/afr/fy2021/DoD_FY21_Agency_Financial_Report.pdf.

Disposal of PFAS Wastes

Some stakeholders have expressed concern about the potential for environmental contamination and exposures from the disposal of PFAS. As with many other wastes, incineration and landfilling have been the two principal methods of disposal available for PFAS wastes. Incineration offers the potential to reduce the toxicity and volume of wastes but generates air emissions, combustion byproducts, and residual wastes. Thermal capabilities to break down PFAS, and the management of combustion byproducts and residuals, have presented some issues and challenges for the use of incineration. Landfilling may increase if the use of incineration were restricted and other disposal methods do not become more widely available. Potential effects on water quality also have presented challenges for the disposal of wastewater or sewage sludge that contains PFAS.

As industry transitions to shorter-chain PFAS, disposal needs may increase for existing stocks of longer-chain PFAS and products containing these chemicals. DOD, other federal agencies, civilian airport operators, and local fire departments may face disposal needs for existing stocks of AFFF as they transition to alternatives. Waste streams generated from the treatment of PFAS in drinking water, wastewater, or other environmental media, or the remediation of PFAS contamination, also would necessitate disposal.

The disposal of PFAS wastes is regulated under multiple federal and state laws. EPA has not promulgated contaminant-specific standards for the disposal of PFAS wastes to date. The disposal of PFAS wastes has been regulated similarly to other types of wastes for which contaminant-specific standards are not established.

EPA has not listed any PFAS as RCRA hazardous waste that would be subject to regulatory requirements for management, disposal, and corrective actions to remediate environmental contamination. The chemical constituents for characterizing the toxicity of hazardous waste under RCRA also do not include any PFAS. The disposal of PFAS wastes in landfills would generally be subject to RCRA Subtitle D solid waste criteria considering the breadth of the definition of "solid waste" in applying to garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material.[274]

Incineration facilities are also subject to RCRA for the disposal of combustion residuals and to hazardous air pollutant standards under the Clean Air Act (CAA). Whereas these CAA standards are not specific to PFAS, some of them apply to chemicals that may be created during combustion in the incineration process, such as hydrogen fluoride.

The disposal of PFAS in wastewater through surface water discharges also is subject to the Clean Water Act that requires permits for the discharge of any pollutant into U.S. waters. EPA has been evaluating certain PFAS for establishing effluent limitation guidelines and other surface water quality criteria for regulation under the Clean Water Act. For a discussion of regulatory developments under this statute, see "Regulation of PFAS and Other Actions Under the CWA."

The EPA 2021 *PFAS Strategic Roadmap* and earlier agency plans did not indicate the agency's intention to develop a rule to list any PFAS as RCRA hazardous waste. On October 26, 2021,

[274] 42 U.S.C. §6903(27). The term "solid waste" includes "any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 1342 of title 33, or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923) [42 U.S.C. 2011 et seq.]."

EPA separately announced its intention to develop two rulemakings under RCRA related to PFAS, in response to a petition from Governor Grisham of New Mexico.[275] The first rule would propose the listing of PFOA, PFOS, PFBS, and GenX as RCRA hazardous constituents.[276] EPA described this action as being an initial step toward listing these chemicals as RCRA hazardous wastes. The presence of an RCRA hazardous constituent in a solid waste is one of multiple (but not the only) regulatory criteria for listing a solid waste as a hazardous waste under this statute.[277] A hazardous constituent listing therefore would not constitute a hazardous waste listing, and therefore alone also would not trigger a CERCLA hazardous substance designation (see "CERCLA Hazardous Substances").

EPA indicated that the second rule would "clarify" that emerging contaminants (including PFAS) are hazardous wastes if the contaminant satisfies the statutory criteria in Section 1004(5) of RCRA, regardless of whether the contaminant is listed in regulation as a hazardous waste. Section 1004(5) defines a hazardous waste as a subset of solid waste, in terms of certain conditions or characteristics that would present an increased risk of mortality or illness, or other human health or environmental hazards, "when improperly treated, stored, transported, or disposed of, or otherwise managed."[278] An agency rule affirming these existing statutory criteria would not alter the criteria or the information needed to make these determinations. Such a rule therefore may not necessarily alleviate challenges in demonstrating whether PFAS or other emerging contaminants could be hazardous waste by statutory definition in a particular instance.

Section 7361 of the National Defense Authorization Act of FY2020 (P.L. 116-92) directed EPA to publish interim guidance within one year of enactment for the destruction and disposal of certain materials that contain PFAS, and to revise the guidance at least once every three years thereafter. Materials covered in Section 7361 include AFFF, soil and biosolid wastes, textiles treated with PFAS ("other than consumer goods"), and various waste streams generated from the treatment of water sources, collection of landfill leachate, and facilities that manufacture or use PFAS. Section 7361 directs EPA to consider potential releases from destruction or disposal sites and how such releases may affect potentially vulnerable populations near these sites. Section 7361 also requires EPA to recommend methods in the guidance for testing and monitoring such releases.

EPA published its initial interim guidance for these purposes on December 18, 2020.[279] EPA issued a notice on December 22, 2020, to announce the availability of the guidance for public comment through February 22, 2021.[280] The interim guidance examines destruction and disposal options involving thermal treatment (destruction by incineration), landfilling for disposal, and underground injection for disposal (the use of which is limited to certain types of liquid wastes containing PFAS). The guidance also discusses related issues and considerations, pursuant to

[275] EPA, "EPA Responds to New Mexico Governor and Acts to Address PFAS Under Hazardous Waste Law," press release, October 26, 2021, https://www.epa.gov/newsreleases/epa-responds-new-mexico-governor-and-acts-address-pfas-under-hazardous-waste-law.

[276] RCRA hazardous constituents are listed in federal regulation at 40 C.F.R. Part 261, Appendix VIII.

[277] RCRA hazardous waste listing criteria are specified in federal regulation at 40 C.F.R. §261.11.

[278] 42 U.S.C. §6903(5).

[279] EPA, *Interim Guidance on the Destruction and Disposal of Perfluoroalkyl and Polyfluoroalkyl Substances and Materials Containing Perfluoroalkyl and Polyfluoroalkyl Substances: Interim Guidance for Public Comment*, December 18, 2020, https://www.epa.gov/pfas/interim-guidance-destroying-and-disposing-certain-pfas-and-pfas-containing-materials-are-not.

[280] EPA, "Interim PFAS Destruction and Disposal," 85 *Federal Register* 83554, December 22, 2020.

Section 7361 of P.L. 116-92. The EPA 2021 *PFAS Strategic Roadmap* indicates that the agency expects to issue the next version of this disposal guidance by fall 2023.[281]

Section 330 of P.L. 116-92 also established certain criteria to restrict when DOD may continue to use incineration as a method to dispose of "legacy" formulations of AFFF containing PFAS, materials contaminated from the use of AFFF, and materials contaminated with PFAS from the treatment of drinking water sources or the remediation of environmental contamination.

- Incineration must be "conducted at a temperature range adequate to break down PFAS chemicals while also ensuring the maximum degree of reduction in emissions of PFAS, including elimination of such emissions where achievable."
- Incineration also must be conducted in accordance with the requirements of the Clean Air Act, including controls applicable to hydrogen fluoride emissions.
- Any materials containing PFAS that are designated for disposal must be stored in accordance with the RCRA hazardous waste requirements, regardless of whether the waste is hazardous waste.
- Incineration must be conducted at a facility that EPA or a delegated state has permitted to receive RCRA hazardous waste, regardless of whether the waste is hazardous waste.

If satisfying these criteria may present challenges for the use of incineration, DOD may dispose of AFFF and these materials in landfills that are subject to regulatory requirements of RCRA and applicable state law as noted above.

Section 343 of the National Defense Authorization Act for FY2022 (P.L. 117-81) requires DOD to establish a temporary moratorium no later than 120 days after enactment, for prohibiting the use of incineration to dispose of AFFF and certain other PFAS-containing materials. This moratorium would continue until DOD issues guidelines for implementing the above incineration criteria and the EPA interim guidance authorized in P.L. 116-92, or if earlier, until EPA promulgates a final rule for the destruction and disposal of PFAS. This moratorium on incineration would leave landfilling as the principal disposal method available to DOD for PFAS wastes while the moratorium is in effect.

EPA and DOD also have funded research and development of alternative PFAS destruction and disposal technologies. In 2020, EPA established a PFAS Innovative Treatment Team that has examined several currently available technologies to evaluate their effectiveness in destroying PFAS. These technologies include

- electrochemical oxidation;
- mechanochemical degradation;
- pyrolysis and gasification; and
- supercritical water oxidation.[282]

DOD has funded various projects for the research and development of PFAS destruction technologies to support the disposal of its stocks of AFFF, and the remediation of PFAS contamination at U.S. military installations and National Guard facilities under the Defense

[281] EPA, *PFAS Strategic Roadmap: EPA's Commitments to Action 2021-2024*, October 18, 2021, p. 17, https://www.epa.gov/pfas/pfas-strategic-roadmap-epas-commitments-action-2021-2024.

[282] For more information, see EPA, "PFAS Innovative Treatment Team (PITT)," https://www.epa.gov/chemical-research/pfas-innovative-treatment-team-pitt.

Environmental Restoration Program. The outcome of this research and development may be applicable to similar purposes in the civilian sector. DOD has been funding these research and development projects under its Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP).[283]

EPA also has coordinated with these DOD programs and various state agencies and organizations to promote a "challenge" for developing alternative PFAS destruction and disposal technologies, and has awarded cash prizes for the demonstration of new technologies.[284]

Although EPA, DOD, and others have identified some technologies that may be effective in destroying (i.e., breaking down) PFAS for treatment or disposal, the availability of these technologies on a broad scale and their cost-effectiveness may present issues or challenges for use as an alternative to incineration or landfilling.

Toxics Release Inventory

Section 7321 of the National Defense Authorization Act for FY2020 (P.L. 116-92) required EPA to add a subset of PFAS to the list of toxic chemicals that are subject to reporting on the Toxics Release Inventory (TRI) under Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA).[285] Section 7321 of P.L. 116-92 identified several specific PFAS for reporting on the TRI and referenced a larger group of PFAS for which EPA has issued significant new use rules (SNURs) under TSCA (see "Regulation of PFAS in Commerce Under TSCA"). Pursuant to this statutory directive, EPA added a total of 172 PFAS to the list of toxic chemicals subject to reporting on the TRI that became effective on January 1, 2020.[286] Section 7321 of P.L. 116-92 also established several criteria for EPA to add other PFAS to the list of toxic chemicals for reporting on the TRI. Based on these criteria, EPA listed four additional PFAS that became effective in 2021 and another four PFAS that became effective in 2022, increasing the total to 180 PFAS subject to reporting on the TRI.[287] Section 313(d) of EPCRA provides the more general authorities of EPA to add toxic chemicals to the TRI list for reporting releases into the environment.[288] These authorities are available to EPA in addition to Section 7321 of P.L. 116-92.

Enacted in 1986, Section 313 of EPCRA authorized EPA to establish the TRI for the public disclosure of releases of certain toxic chemicals from various classes of industrial facilities. This legislation arose in response to heightened awareness of potential risks to populations in the vicinity of facilities where toxic chemicals may be manufactured, stored, or used. Section 313(a) requires the owner or operator of a facility to submit an annual TRI report to EPA, and to the state in which the facility is located, that identifies the quantities of toxic chemicals released into any

[283] For more information, see Department of Defense, "Per- and Polyfluoroalkyl Substances (PFASs)," https://www.serdp-estcp.org/Featured-Initiatives/Per-and-Polyfluoroalkyl-Substances-PFASs.

[284] For more information, see EPA, "Innovative Ways to Destroy PFAS Challenge," https://www.epa.gov/innovation/innovative-ways-destroy-pfas-challenge.

[285] 42 U.S.C. §11023. TRI reporting requirements are codified in federal regulation at 40 C.F.R. Part 372. For additional information, see EPA, "Toxics Release Inventory (TRI) Program," https://www.epa.gov/toxics-release-inventory-tri-program.

[286] The group of PFAS that EPA added to the list of toxic chemicals for reporting on the TRI is codified in federal regulation at 40 C.F.R. §372.65(d). For additional information, see EPA, "Implementing Statutory Addition of Certain Per- and Polyfluoroalkyl Substances to the TRI Chemical List," https://www.epa.gov/toxics-release-inventory-tri-program/implementing-statutory-addition-certain-and-polyfluoroalkyl.

[287] For a list of the 180 PFAS selected for reporting on the TRI, see EPA, "List of PFAS Added to the TRI by the NDAA," https://www.epa.gov/toxics-release-inventory-tri-program/list-pfas-added-tri-ndaa.

[288] 42 U.S.C. §11023(d).

environmental media from that facility during the previous calendar year.[289] Section 313(b) specifies the covered classes of industrial facilities that are subject to reporting on the TRI.[290] These facilities are diverse in terms of the nature of their operations and the types of chemicals manufactured, processed, or used at each facility.

Neither EPCRA nor Section 7321 of P.L. 116-92 requires federal facilities (including U.S. military installations) to report releases of toxic chemicals for public disclosure on the TRI. A 1993 executive order signed by President Clinton,[291] and subsequent executive orders, have directed executive departments and agencies that administer federal facilities to comply with TRI and other reporting requirements of EPCRA.[292] President Obama signed the most recent of these executive orders in 2015.[293]

Section 313(f)(1) of EPCRA generally requires covered facilities to identify the quantity of each toxic chemical released into the environment during the previous calendar year, if the facility manufactured or processed 25,000 pounds or more of the chemical that year, or used 10,000 pounds or more of the chemical that year.[294] Section 313(b)(1)(C)(i) defines manufacturing to include importation of a toxic chemical.[295] EPA has established different reporting thresholds for certain toxic chemicals, pursuant to Section 313(f)(2).[296] Section 7321 of P.L. 116-92 establishes a TRI reporting threshold of 100 pounds annually for manufacturing, importing, processing, or using any of the PFAS added to the list of toxic chemicals.[297] Section 7321 directs EPA to determine within five years of enactment whether a different reporting threshold may be warranted for any of these PFAS, pursuant to Section 313(f)(2) of EPCRA. Section 7321 also authorizes EPA to protect certain confidential business information of a proprietary nature from public disclosure on the TRI, in accordance with Section 14(f) of TSCA.

The TRI is a mechanism intended to provide public disclosure of releases of certain toxic chemicals into the environment, as an element of the "community right-to-know" objective of EPCRA. A release of a toxic chemical reported on the TRI does not necessarily indicate a violation of a federal or state regulatory requirement, or a particular level of risk to human health or the environment. Such risks would depend on exposures, the properties of the specific chemical, and the exposure conditions. Moreover, releases disclosed on the TRI mostly are estimates that facilities report based on how they manufacture, process, or use certain toxic chemicals, not necessarily measurements from continuous monitoring. The TRI therefore may provide an approximation of the amount of toxic chemicals released into the environment from covered facilities, but may not identify the precise quantities of these releases.

---

[289] 42 U.S.C. §11023(a).

[290] 42 U.S.C. §11023(b). These classes of industrial facilities also are listed in federal regulation at 40 C.F.R. Part 172, Subpart B. For additional information, see EPA, "TRI-Covered Industry Sectors," https://www.epa.gov/toxics-release-inventory-tri-program/tri-covered-industry-sectors.

[291] Executive Order 12856, "Federal Compliance With Right-to-Know Laws and Pollution," 58 *Federal Register* 41981-41987, August 3, 1993.

[292] For information on federal facilities that have reported releases on the TRI, see EPA, "Federal Facilities," https://www.epa.gov/trinationalanalysis/federal-facilities.

[293] Executive Order 13693, "Planning for Federal Sustainability in the Next Decade," 80 *Federal Register* 15871-15884, March 19, 2015.

[294] 42 U.S.C. §11023(f)(1).

[295] 42 U.S.C. §11023(b)(1)(C)(i).

[296] 42 U.S.C. §11023(f)(2). Toxic chemicals for which EPA has established lower TRI reporting thresholds are listed in federal regulation at 40 C.F.R. 372.28.

[297] The TRI reporting threshold of 100 pounds annually for manufacturing, importing, processing, or using any of these PFAS is codified at 40 C.F.R. 372.29.

The purpose of the TRI is informational in nature. EPCRA does not authorize the regulation of chemicals to control releases into the environment, or the remediation of environmental contamination that may occur from a release. As a practical matter, EPA may use TRI data to inform regulatory developments under other federal environmental laws that the agency administers. States similarly may use TRI data for regulatory purposes under their respective laws. Other nonfederal entities also may access publicly available TRI data for their own use.

Transition to Fluorine-Free Class B Firefighting Foams

The United States and some other countries are in various stages of transitioning away from the use of fluorinated AFFF, a type of Class B firefighting foam that contains PFAS. The military and civilian sectors have used fluorinated AFFF for decades because of its performance capabilities to extinguish petroleum-based liquid fuel fires. More recent concerns about potential risks to human health and the environment from PFAS released as a result of the use of AFFF have driven efforts to transition to nonfluorinated (i.e., PFAS-free) Class B firefighting foams that would be suitable for the same types of fires. Whether these nonfluorinated alternatives have comparable performance capabilities has presented safety considerations.

Potential health and environmental risks that may be associated with other chemicals contained in nonfluorinated alternatives have raised additional issues about their relative environmental benefits. The Transportation Research Board (TRB) of the National Academies of Sciences, Engineering, and Medicine issued a report in 2017 that examined the use and potential impacts of fluorinated AFFF in the aviation sector. The report identified potential safety considerations for the use of nonfluorinated alternatives relative to their effectiveness, and potential risks associated with the use of either fluorinated AFFF or nonfluorinated alternatives that contain other chemicals.

> There are commercially produced alternative foam types to AFFF. Most of these alternative foam types contain PFASs (with the exception of the fluorine-free foams). However, all available firefighting foam alternatives exhibit properties that have the potential to impact the environment and/or human health, whether they are fluorotelomer-based or fluorine-free. Recognizing the importance of efficacy and safety in fire protection, these foams will continue to be used. Therefore, it is important to consider preventative approaches and best management practices that limit the discharge of firefighting foams to the environment and protect the individuals using these foams.[298]

At the federal level in the United States, DOD and the Federal Aviation Administration (FAA) have been funding the research and development of nonfluorinated Class B firefighting foams, but so far have not identified an available alternative that would be equally effective as fluorinated AFFF in extinguishing petroleum-based liquid fuel fires.

DOD has revised its Military Specification for AFFF as a step in its transition away from the use of Class B firefighting foams containing PFOA and PFOS. Military Specifications provide instructions to U.S. military departments and agencies that establish standards and parameters for specific products that DOD has determined are suitable for procurement to meet U.S. military needs for DOD to carry out its mission. DOD Military Specifications are internal guidelines developed for U.S. military procurement, and are not binding and enforceable regulations.[299]

[298] National Academies of Sciences, Engineering, and Medicine, Transportation Research Board, *Use and Potential Impacts of AFFF Containing PFASs at Airports*, 2017, p. B-9, https://www.nap.edu/catalog/24800/use-and-potential-impacts-of-afff-containing-pfass-at-airports.

[299] For additional information on DOD Military Specifications, see Defense Logistics Agency, "Types of Defense

DOD initially issued its Military Specification on AFFF (MIL-F-24385) in 1969, specifying the use of "fluorocarbon surfactants" based on their effectiveness in extinguishing petroleum-based liquid fuel fires. DOD subsequently revised MIL-F-24385 for various purposes in the 1970s, 1980s, and 1990s, and thereafter on September 7, 2017, May 7, 2019, and April 7, 2020, to address the amount of PFOA and PFOS in concentrates of AFFF and certain other criteria.[300] DOD guidelines generally require reviews of Military Specifications at least once every five years.[301] The next regularly scheduled review of MIL-PRF-24385F would be on April 6, 2025.

The April 2020 version generally refers to "surfactants and other compounds, as required" to attain the performance specifications for the U.S. military use of AFFF as a Class B fire extinguishing agent, and restricts the maximum content of PFOA or PFOS in AFFF concentrate to 800 parts per billion (ppb; i.e., micrograms per liter).[302] DOD indicates that these concentrations are the lowest amounts that can be detected in AFFF concentrate with current techniques. The April 2020 version does not restrict the content of other PFAS, and does not necessarily require that AFFF contain PFAS if a PFAS-free alternative is available that would attain U.S. military performance specifications. Previous versions of this U.S. military specification stated that AFFF must contain "fluorocarbon surfactants" but did not restrict the concentration of any PFAS.

Section 6.6 of the April 2020 version (and the earlier September 2017 and May 2019 versions) include the following DOD policy statement on the long-term U.S. military objective to transition to the use of nonfluorinated AFFF:

> The DoD's goal is to acquire and use a non-fluorinated AFFF formulation or equivalent firefighting agent to meet the performance requirements for DoD critical firefighting needs. The DoD is funding research to this end, but a viable solution may not be found for several years. In the short term, the DoD intends to acquire and use AFFF with the lowest demonstrable concentrations of two particular PFAS; specifically PFOS and PFOA. The DoD intends to be open and transparent with Congress, the Environmental Protection Agency (EPA), state regulators, and the public at large regarding DoD efforts to address these matters. AFFF manufacturers and vendors are encouraged to determine the levels of PFOS, PFOA, and other PFAS in their products and work to drive these levels toward zero while still meeting all other military specification requirements.[303]

DOD has funded the research and development of nonfluorinated AFFF under its Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP). In June 2018, DOD issued a report examining the status of alternatives to AFFF that contain PFOA and PFOS, and the plans of DOD for the phase-out and disposal of its existing stocks of AFFF that contain these chemicals.[304] The report also discussed projects funded under SERDP and ESTCP. Section 1059 of the National Defense

Standardization Program (DSP) Documents," https://www.dsp.dla.mil/Specs-Standards/Types-of-DSP-Documents/.

[300] The original 1969 U.S. military specification for AFFF and subsequent revisions are available in the Defense Logistics Agency's Assist database, https://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=17270.

[301] DOD Manual 4120.24, *Defense Standardization Program (DSP) Procedures*, September 24, 2014, Incorporating Change 2, Effective October 15, 2018, pp. 47-48, https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodm/412024m.pdf.

[302] DOD, *Performance Specification: Fire Extinguishing Agent, Aqueous Film-Forming Foam (AFFF) Liquid Concentrate, for Fresh and Sea Water*, MIL-PRF-24385F(SH), April 7, 2020 (with Amendment 2).

[303] Ibid., p. 15.

[304] DOD, Office of Under Secretary of Defense for Acquisition and Sustainment, *Alternatives to Aqueous Film Forming Foam Report to Congress*, June 2018, https://www.denix.osd.mil/derp/home/documents/alternatives-to-aqueous-film-forming-foam-report-to-congress/AFFF%20Alt%20Report%20to%20Congress_July2018%20(1).pdf .

Authorization Act for Fiscal Year 2018 (P.L. 115-91) required DOD to issue this report to the House and Senate Committees on Armed Services.

The DOD PFAS Task Force issued a "progress" report in March 2020 that observed available PFAS-free firefighting foams cannot attain U.S. military performance specifications for AFFF. The report noted that DOD budgeted a total of $49 million through FY2025 to fund the research of "an effective firefighting alternative that meets the life-saving performance standards of AFFF and does not have negative health or environmental effects."[305] This research is ongoing.[306]

Section 322 of the National Defense Authorization Act for FY2020 (P.L. 116-92) requires the Secretary of the U.S. Navy by January 31, 2023, to "publish a military specification for a fluorine-free fire-fighting agent for use at all military installations and ensure that such agent is available for use by not later than October 1, 2023." Whether the U.S. Navy will be able to meet this statutory deadline would depend on the availability of nonfluorinated alternatives that are capable of attaining U.S. military performance standards for AFFF to extinguish petroleum-based liquid fuel fires. Section 322 of P.L. 116-92 prohibits DOD after October 1, 2023, from procuring firefighting agents that contain more than 1 part per billion of PFAS, and generally prohibits DOD from using any fluorinated AFFF at U.S. military installations (except for shipboard use) on or after October 1, 2024. However, Section 322 authorizes DOD to issue a waiver for continuing the use of fluorinated AFFF after October 1, 2024, if suitable alternatives are not available. Such waivers are subject to notification of congressional defense committees.

Until an alternative is available, Section 323 of P.L. 116-92 generally prohibits the "uncontrolled" release of fluorinated AFFF at U.S. military installations, with the exception of releases for an emergency response to extinguish a fire, or nonemergency releases for the "testing of equipment or training of personnel, if complete containment, capture, and proper disposal mechanisms are in place to ensure no AFFF is released into the environment." Section 324 of P.L. 116-92 otherwise prohibits the use of fluorinated AFFF for training exercises at U.S. military installations.

The William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (P.L. 116-283) included multiple provisions related to AFFF and firefighting equipment:

- Section 318 requires DOD to report the use or spills of AFFF greater than 10 gallons of concentrate, or greater than 300 gallons of mixed foam (combined with water), and to prepare action plans to mitigate potential risks.
- Section 330 authorizes DOD to issue competitively awarded "prizes" up to $5 million through October 1, 2024, for the development of nonfluorinated firefighting agents for U.S. military use to incentivize nonfederal research.
- Section 331 requires DOD to conduct a survey of hangar flooring systems, firefighting agent delivery systems, containment systems, and other relevant technologies to facilitate the U.S. military phase-out of fluorinated AFFF.
- Section 338 authorizes total appropriations of $20 million from FY2021 through FY2025 for a study of PFAS contained in firefighter protective equipment, exposures among firefighters, and mitigation of potential health risks.

[305] DOD, *Per- and Polyfluoroalkyl Substances (PFAS) Task Force Progress Report*, March 2020, p. 3, https://media.defense.gov/2020/Mar/13/2002264440/-1/-1/1/PFAS_Task_Force_Progress_Report_March_2020.pdf.

[306] For information on the status of this research, see DOD SERDP and ESTCP, "Per- and Polyfluoroalkyl Substances (PFASs)," https://www.serdp-estcp.org/Featured-Initiatives/Per-and-Polyfluoroalkyl-Substances-PFASs.

- Section 4201 authorized appropriations of $25 million in FY2021 for SERDP to continue research and development of nonfluorinated alternatives including grants under Section 334, and an additional $10 million in FY2021 for the role of the ESTCP in this research.

The National Defense Authorization Act for Fiscal Year 2022 (P.L. 117-81) includes several provisions related to AFFF and firefighting equipment. Such provisions build upon certain requirements enacted in prior NDAAs.[307]

- Section 343 requires DOD to establish a temporary moratorium, to begin no later than 120 days after enactment, on the use of incineration to dispose of AFFF and certain other PFAS-containing materials until DOD issues guidelines for implementing incineration criteria and EPA interim guidance on the destruction and disposal of PFAS directed in the FY2020 NDAA,[308] or if earlier, until EPA promulgates a final rule for the destruction and disposal of PFAS.
- Section 344 requires DOD to complete a review, within 180 days of enactment, of its practices for the prevention and mitigation of spills of AFFF, and issue guidance within 90 days after this review to establish best practices.
- Section 346 requires DOD to complete a review, within 180 days of enactment, of its mutual support agreements with other entities that provide fire suppression services at DOD facilities, and issue guidance within 90 days after completion of this review to establish best practices to prevent and mitigate spills of AFFF.
- Section 4201 authorizes appropriations of $20 million for continued research and development of AFFF alternatives and AFFF remediation and disposal technologies, and an additional $25 million for other PFAS remediation and disposal technologies.

FAA has been using the U.S. military specification for AFFF as part of its criteria for civilian airport operators to demonstrate compliance with certification requirements under 14 C.F.R. Part 139 for Class B fire extinguishing agents. Section 332 of the FAA Reauthorization Act of 2018 (P.L. 115-254) directed FAA to stop recommending the use of fluorinated AFFF for civilian airport certification no later than three years from the date of enactment (October 5, 2018).

However, this statutory provision does not prohibit civilian airports from using fluorinated AFFF. As a practical matter, civilian airports may continue to use fluorinated AFFF until a suitable nonfluorinated alternative is available that would meet FAA performance standards. In accordance with P.L. 115-254, FAA issued Cert Alert No. 21-05 on October 4, 2021, announcing that its Part 139 performance standards for AFFF have not changed, but that certificate holders may use either fluorinated or nonfluorinated AFFF to satisfy these standards:

> One acceptable means of satisfying 14 CFR Part 139 requirements is to continue to use the existing approved foam which does contain fluorinated chemicals. However, FAA encourages certificate holders that have identified a different foam that meets the performance standard to seek approval for such foam from the FAA. FAA staff are available to provide assistance or answer questions about how to pursue FAA approval for a foam that meets the performance standard but does not contain fluorinated chemicals...

[307] For a broader discussion of the FY2022 NDAA, see CRS Report R47110, *FY2022 National Defense Authorization Act: Context and Selected Issues for Congress*, by Brendan W. McGarry.

[308] P.L. 116-92, §330 (incineration criteria) and §7361 (EPA guidelines).

> FAA expects that the U.S. Navy will provide a specification for a fluorine-free agent by January 31, 2023, and this specification will subsequently be adopted by the FAA.[309]

The FAA time frame for adopting such a specification by January 31, 2023, is based on the U.S. Navy's requirement to develop a U.S. military specification for nonfluorinated alternatives by that date, as required by Section 322 of P.L. 116-92. As noted above, the availability of a fluorine-free firefighting agent by this date would depend on the outcome of research and development of alternatives to fluorinated AFFF.

PFAS in Dairy Milk, Foods, and Food Contact Applications

Federal efforts to address potential health risks of PFAS have also focused on the potential for these chemicals to be present in foods, which may occur through interactions with environmental contamination or food contact applications. The U.S. Food and Drug Administration (FDA) has been evaluating potential exposures to PFAS in dairy milk, dairy products, other foods, and food contact applications, using its authorities under the Federal Food, Drug, and Cosmetic Act (FFDCA).[310] FDA has not established regulatory standards for specific concentrations of PFAS in milk or other foods, but has regulated certain PFAS in food contact applications. FDA establishes federal safety standards for milk in the Pasteurized Milk Ordinance.[311]

FDA has examined multiple ways in which PFAS may become present in foods:

- PFAS may be present in dairy milk and dairy products from livestock that consume contaminated water.
- PFAS similarly may be present in meat from livestock that consume contaminated water.
- PFAS may be present in food crops if grown in contaminated soils or irrigated with contaminated water sources.
- PFAS may be present in fish and shellfish from contaminated water bodies.
- Food contact applications (e.g., cookware, food packaging, and processing) that contain PFAS are another potential source of contamination in foods.

These situations are not unique to PFAS. They may present potential pathways of human exposure to any contaminant present in the environment that may interact with foods or that may be present in food contact applications. The uptake of PFAS or other chemicals in food would depend on the properties of the specific chemical, the conditions in which interaction with food occurs, and potentially other factors. As with drinking water, potential risks from PFAS or other contaminants in food would depend on the toxicity of the specific chemical, the conditions of exposure, and the characteristics of the exposed individual.

FDA has been assessing PFAS in foods from specific sites where PFAS contamination has been detected, certain foods with an increased likelihood of PFAS contamination not associated with specific sites, and foods more generally.[312] FDA has also regulated the uses of certain PFAS in

[309] FAA, National Part 139 Cert Alert, *Part 139 Extinguishing Agent Requirements*, No. 21-05, October 4, 2021, p. 1, https://www.faa.gov/airports/airport_safety/certalerts/media/part-139-cert-alert-21-05-Extinguishing-Agent-Requirements.pdf.

[310] 21 U.S.C. §301 et seq.

[311] FDA, *Grade "A" Pasteurized Milk Ordinance*, 2019 Revision, https://www.fda.gov/media/140394/download.

[312] FDA, "Testing Food for PFAS and Assessing Dietary Exposure," https://www.fda.gov/food/chemical-contaminants-food/testing-food-pfas-and-assessing-dietary-exposure, and "Analytical Results of Testing Food for PFAS from

food contact applications, and has continued to review these regulations as more information becomes available.[313] As of the date of this report, the FDA website asserts that FDA has found no or relatively low concentrations of PFAS in the foods that it has sampled from the general food supply.[314] FDA risk assessments have generally concluded that sampled foods with detectable concentrations of PFAS were low enough not to present a human health concern that would warrant consumers avoiding any particular foods.[315] FDA has identified certain stocks of dairy milk or other foods with higher levels of PFAS sourced from some agricultural sites with environmental contamination from releases of certain PFAS, but FDA has reported that these foods did not enter the marketplace.[316] In July 2022, FDA made available PFAS testing results from retail seafood samples, and determined that the estimated exposure from PFOA in a sample of canned clams from China as a likely health concern.[317] Following FDA's PFAS testing results, the distributers of the canned clam samples voluntarily recalled such products.[318]

FDA reports that it is coordinating with states to help identify contaminated foods to prevent the foods from entering the marketplace, and is partnering with the U.S. Department of Agriculture (USDA) and other federal agencies in its ongoing research.[319] USDA also has provided financial assistance to certain affected dairy farms through the Dairy Indemnity Payment Program (DIPP) for removing PFAS-contaminated milk from entering the commercial market.[320] Related to these actions, the USDA Agricultural Research Service (ARS) has collaborated with the State of New Mexico to examine blood and tissue samples from contaminated livestock at specific sites where PFAS have been detected in groundwater used for agricultural water sources.[321]

FDA has developed analytical methods for detecting 16 PFAS,[322] and intends to expand the use of these methods to 4 additional PFAS.[323] The ability to assess potential health risks of these or other PFAS in foods would depend on the availability of toxicity information for the specific chemical. FDA risk assessments have primarily focused on six PFAS (PFOA, PFOS, PFNA, PFHxS, a GenX chemical, and PFBS) for which some scientific information on toxicity is available to assess whether levels of these chemicals detected in certain foods may present a health

Environmental Contamination," https://www.fda.gov/food/chemical-contaminants-food/analytical-results-testing-food-pfas-environmental-contamination.

[313] FDA, "Authorized Uses of PFAS in Food Contact Applications," https://www.fda.gov/food/chemical-contaminants-food/authorized-uses-pfas-food-contact-applications.

[314] FDA, "Per- and Polyfluoroalkyl Substances (PFAS)," https://www.fda.gov/food/chemical-contaminants-food/and-polyfluoroalkyl-substances-pfas.

[315] Ibid.

[316] Ibid.

[317] FDA, "FDA Shares Results on PFAS Testing in Seafood," https://www.fda.gov/food/cfsan-constituent-updates/fda-shares-results-pfas-testing-seafood.

[318] Ibid.

[319] FDA, "Per- and Polyfluoroalkyl Substances (PFAS)," https://www.fda.gov/food/chemical-contaminants-food/and-polyfluoroalkyl-substances-pfas.

[320] DIPP assistance is available for any milk or milk product where the presence of chemical or toxic residue warrants its removal from the market. 7 U.S.C. §§4551-4553.

[321] USDA, Agricultural Research Service, "Research Project: Evaluation of Blood and Tissue PFAs Levels in Unintentionally Contaminated Dairy Animals," https://www.ars.usda.gov/research/project/?accnNo=436179.

[322] FDA, *Determination of 16 Per and Polyfluoroalkyl Substances (PFAS) in Processed Food using Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)*, Method Number: C-010.02, December 19, 2021, https://www.fda.gov/media/131510/download.

[323] FDA, "Testing Food for PFAS and Assessing Dietary Exposure," https://www.fda.gov/food/chemical-contaminants-food/testing-food-pfas-and-assessing-dietary-exposure.

concern.[324] The development of toxicological reference values for PFAS is an area of ongoing scientific research among several federal agencies that are examining different exposure scenarios.

FDA has not promulgated regulatory standards for any PFAS in foods. Risk assessments for other exposure scenarios would not necessarily be suitable to regulate PFAS in foods. For example, the EPA May 2016 drinking water health advisories for PFOA and PFOS, or the EPA June 2022 drinking water health advisories, are not intended to address other exposure scenarios involving ingestion or other exposure routes. EPA has not recommended an acceptable concentration of PFAS in milk or other foods. EPA stated in November 2016 that drinking water health advisories "only apply to exposure scenarios involving drinking water" and "are not appropriate for use in identifying risk levels for ingestion of food sources, including: fish, meat produced from livestock that consumes contaminated water, or crops irrigated with contaminated water."[325] In a November 2016 agency memorandum, EPA also clarified drinking water health advisories in relation to food:

> In the development of the health advisories, EPA took into consideration sources of exposure to PFOA and PFOS other than drinking water, including: air, food, dust, and consumer products. Thus, to be protective of exposure, the calculation of the health advisory accounts for the relative exposure to PFOA and PFOS from a variety of sources, including food. Calculation of specific risk levels for foods would require development of entirely different exposure assumptions and is not a part of the HA [health advisory] derivation methodology.[326]

Potential impacts of PFAS releases on agricultural water sources have been an additional issue. Section 343 of the National Defense Authorization Act for Fiscal Year 2020 (P.L. 116-92) authorizes the use of appropriations to the DOD Operation and Maintenance accounts to fund alternative water sources or treat water contaminated with PFOA and PFOS at sites where U.S. military activities caused contamination of a water source used to produce agricultural products for human consumption. Subject to the availability of appropriations, DOD may fund such actions at sites where PFOA or PFOS are detected in an agricultural water source at a concentration that exceeds

- EPA's May 2016 health advisories for PFOA or PFOS in drinking water, or
- FDA standards for PFOA or PFOS in raw agricultural commodities and milk, if such standards are established in the future.

From a scientific standpoint, the use of drinking water health advisories designed for human consumption as risk thresholds for livestock consumption or irrigation of crops from a contaminated water source may present issues, as noted above.

Section 335 of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (P.L. 116-283) also requires DOD to notify agricultural operations within 1 mile down-gradient of a U.S. military installation or National Guard facility where PFOA, PFOS, or PFBS

[324] FDA, "Analytical Results of Testing Food for PFAS from Environmental Contamination," https://www.fda.gov/food/chemical-contaminants-food/analytical-results-testing-food-pfas-environmental-contamination.

[325] EPA, *Fact Sheet: PFOA & PFOS Drinking Water Health Advisories*, EPA 800-F-16-003, November 2016, p. 4, https://www.epa.gov/sites/production/files/2016-06/documents/drinkingwaterhealthadvisories_pfoa_pfos_updated_5.31.16.pdf.

[326] EPA, Office of Ground Water and Drinking Water, *Clarification about the Appropriate Application of the PFOA and PFOS Drinking Water Health Advisories*, November 15, 2016, https://www.epa.gov/sites/production/files/2016-11/documents/clarification_memo_pfoapfos_dw_has.pdf.

are detected in groundwater. Notification is required if such PFAS are detected in groundwater that is hydrologically linked to an agricultural or drinking water source above specific concentrations. The concentration for PFOA or PFOS is 70 ppt individually or combined, and for PFBS is 40 parts per billion (ppb). Section 335 requires DOD to report annually to the Senate Committee on Agriculture, Nutrition, and Forestry, and the House Committee on Agriculture, to disclose any such notifications to agricultural operations. DOD issued a report in July 2021 disclosing that notifications were sent to 2,143 agricultural operations through March 2021.[327]

Related to potential dietary exposures, Section 329 of P.L. 116-92 prohibits the DOD Defense Logistics Agency beginning on October 1, 2021, from procuring meals ready-to-eat (MREs) that contain PFAS in food contact substances used in assembling or packaging MREs. Section 333 of P.L. 116-283 also restricts the Defense Logistics Agency beginning on April 1, 2023, from procuring nonstick cookware or cooking utensils that contain PFOA or PFAS (and certain other items not related to dietary exposure, including furniture, carpets, and rugs that have been treated with stain-resistant coatings containing PFOA or PFOS).

Relevant Legislation

In general, some Members began to introduce legislation to address potential risks of PFAS around the time that EPA issued its 2016 lifetime health advisories for PFOA and PFOS that recommended more stringent limitations on the concentrations of these chemicals in drinking water than the agency's provisional health advisories in 2009. The tightening of these recommendations raised concern that potential risks to human health were greater than previously understood. Detections of PFOA, PFOS, and certain other PFAS in some public water systems and groundwater sources also identified the prevalence of these chemicals in the environment and the potential for exposures. Other potential routes of human exposure to PFAS released into the environment, and potential ecological risks, also have received attention in Congress.

As these issues have evolved, Members have introduced over 140 bills since the 114th Congress to address potential risks of PFAS.[328] Most of these bills have not been enacted into law. These bills vary widely in their respective scope and purposes. Many of these bills have focused on risks related to drinking water, and the remediation of environmental contamination that may threaten drinking water sources. Some bills also have focused on restricting the use of AFFF or other products that contain PFAS to prevent releases into the environment, and transitioning to alternatives that do not contain PFAS. Certain bills also would address occupational exposures among firefighters and emergency responders who use AFFF or protective equipment that contains PFAS. Other bills have focused on potential risks of PFAS from additional sources, including wastewater discharges, air emissions from certain industrial activities, or disposal of PFAS wastes. Some bills also have focused on potential dietary exposures to PFAS in dairy milk or certain foods produced with contaminated agricultural water sources or contaminated soils, or PFAS that may be present in various food contact applications.

[327] DOD, *Status of Notifications to Agricultural Operations Pursuant to Section 335 of the Fiscal Year 2021 National Defense Authorization Act*, July 2021, https://www.denix.osd.mil/derp/featured-content/reports/operations-report/Agricultural%20Operations%20Notifications%20Report%20to%20Congress.pdf.

[328] CRS identified bills related to PFAS based on a search of legislation in Congress.gov from the 114th Congress through the 117th Congress using common terms that refer to these chemicals or aqueous film forming foam (AFFF): *perfluoroalkyl substances*, *polyfluoroalkyl substances*, *perfluorinated compounds*, *PFAS*, *PFOA*, *PFOS*, *GenX*, and *AFFF*. The bills identified with the use of these search terms may not necessarily be comprehensive of all such legislation, as other bills may use differing terms in reference to PFAS.

This body of legislation illustrates a range of issues and challenges that in certain respects are unique to these chemicals because of their toxicity, physical properties, or uses. In other respects, any emerging contaminant may present similar issues and challenges in addressing potential risks if scientific information on toxicity, and detection and treatment technologies, is relatively limited. Technical practicality and cost considerations also may present issues and challenges in addressing potential risks not only for PFAS but also other emerging contaminants.

Congress has authorized certain procedures and criteria for regulating chemicals or remediating environmental contamination under various federal environmental statutes, based on considerations of potential risks, available technologies, technical practicality, costs, and other factors, depending on the statute. Proposed and enacted legislation to direct regulation or environmental remediation on a chemical-specific basis has been less common. Whether to address the potential risks of specific chemicals through directives in legislation, or through agency implementation of procedures and criteria authorized in current law, would present policy considerations for Congress.

Legislation related to PFAS enacted from the 115th Congress through the 117th Congress is discussed below. Other bills related to PFAS that passed the House or Senate in the 117th Congress also are summarized below. Most of the enacted legislation related to PFAS has been incorporated into National Defense Authorization Acts (NDAAs) enacted from FY2018 through FY2022. Various annual appropriations acts enacted since the 115th Congress have also specified funding for the investigation and remediation of PFAS contamination at U.S. military installations and National Guard facilities, research and development of nonfluorinated alternatives to AFFF, ongoing CDC/ATSDR PFAS health effects studies and exposure assessments, ongoing EPA research and regulatory developments related to PFAS, and certain other federal actions. Legislation discussed in this report focuses on authorizing legislation and does not include a compilation of enacted appropriations for federal actions related to PFAS.

Legislation Enacted in the 115th Congress and 116th Congress

Multiple bills were enacted in the 115th Congress and 116th Congress that included provisions related to PFAS among other purposes. Some of these provisions are similar in scope or objective to other bills introduced as stand-alone measures. The NDAAs enacted for FY2018 through FY2021 included numerous PFAS provisions that directed DOD to investigate and remediate PFAS contamination at U.S. military installations and National Guard facilities, restrict the use of AFFF and certain other products containing PFAS, transition to alternative firefighting foams that do not contain PFAS, and take other related actions. Some of the NDAA provisions also directed EPA, CDC, ATSDR, U.S. Geological Survey (USGS), and other federal agencies to take additional actions to address PFAS. The FAA Reauthorization Act of 2018 (P.L. 115-254) also allowed the use of fluorine-free firefighting foams for civilian airport certification, and the 2018 "Farm Bill" (P.L. 115-334) authorized technical assistance for rural water systems to address PFAS.

The **Appendix** to this report presents a summary of provisions related to PFAS in each of the laws enacted in the 115th Congress and 116th Congress. See the discussion of "Federal Actions to Address Potential Risks of PFAS" for the status of certain actions taken by DOD, EPA, CDC, ATSDR, and certain other federal agencies authorized in these laws.

Legislation in the 117th Congress

As of the date of this report, Members have introduced over 70 bills related to PFAS in the 117th Congress.[329] Some of these bills are similar in scope or purpose to legislation introduced (but not enacted) in prior Congresses. Legislation related to PFAS that has been enacted, or passed by the House or Senate, in the 117th Congress is summarized below. Most other bills related to PFAS that have been introduced in the 117th Congress have not received committee or floor action to date, but some of these bills are similar in purpose to provisions included in the FY2022 NDAA discussed below.

National Defense Authorization Act for Fiscal Year 2022

The National Defense Authorization Act for Fiscal Year 2022 (P.L. 117-81), enacted on December 27, 2021, includes several provisions related to PFAS that build upon certain requirements enacted in prior NDAAs.[330] P.L. 117-81 is based on earlier House and Senate versions of this legislation (H.R. 4350 and S. 2792). Some of the PFAS provisions originated in the House bill, and others originated in the Senate bill. Enacted provisions in P.L. 117-181 related to PFAS are in Division A, Title III, Subtitle D, Sections 341-349. These provisions codify the membership and functions of the DOD PFAS Task Force and direct DOD to take various actions. A summary of these provisions follows:

- Section 341 codifies the membership and functions of the DOD PFAS Task Force and requires DOD to complete Preliminary Assessments and Site Inspections[331] within two years of enactment at DOD and National Guard facilities in the United States where DOD has identified PFAS releases as of March 31, 2021.
- Section 342 extends the authority for DOD to transfer funding through FY2023 to the CDC and ATSDR for an ongoing PFAS multisite health effects study and PFAS exposure assessments, pursuant to the FY2018 NDAA as amended.[332]
- Section 343 requires DOD to establish a temporary moratorium, to begin no later than 120 days after enactment, on the use of incineration to dispose of AFFF and certain other PFAS-containing materials until DOD issues guidelines for implementing incineration criteria and EPA interim guidance on the destruction and disposal of PFAS directed in the FY2020 NDAA,[333] or if earlier, until EPA promulgates a final rule for the destruction and disposal of PFAS.
- Section 344 requires DOD to complete a review, within 180 days of enactment, of its practices for the prevention and mitigation of spills of AFFF, and issue guidance within 90 days after this review to establish best practices.

[329] CRS identified bills related to PFAS in the 117th Congress based on a search of legislation in Congress.gov using common terms that refer to these chemicals or aqueous film forming foam (AFFF): *perfluoroalkyl substances*, *polyfluoroalkyl substances*, *perfluorinated compounds*, *PFAS*, *PFOA*, *PFOS*, *GenX*, and *AFFF*. The bills identified with the use of these search terms may not necessarily be comprehensive of all such legislation, if other bills may use differing terms in reference to PFAS.

[330] For a broader discussion of the FY2022 NDAA, see CRS Report R47110, *FY2022 National Defense Authorization Act: Context and Selected Issues for Congress*, by Brendan W. McGarry.

[331] Preliminary Assessments and Site Inspections are the initial steps of the site investigation phase for remedial actions under CERCLA, pursuant to 40 C.F.R. §300.420.

[332] P.L. 115-91, §316, as amended.

[333] P.L. 116-92, §330 (incineration criteria) and §7361 (EPA guidelines).

- Section 345 requires public disclosure of DOD testing results for PFAS in contaminated water, pursuant to the FY2020 NDAA.[334]
- Section 346 requires DOD to complete a review, within 180 days of enactment, of its mutual support agreements with other entities that provide fire suppression services at DOD facilities, and issue guidance within 90 days after completion of this review to establish best practices to prevent and mitigate spills of AFFF.
- Section 347 directs the Government Accountability Office (GAO) to conduct a study of certain materials procured by DOD that contain various PFAS.
- Section 348 requires DOD to report, within 270 days of enactment, on the estimated schedule and costs of remediating PFAS releases at DOD and National Guard facilities, and Formerly Used Defense Sites (FUDS), in the United States at which DOD identified PFAS releases as of March 31, 2021.
- Section 349 requires DOD to report, within 60 days of enactment, on the status of investigating and remediating PFAS releases at 50 DOD and National Guard facilities in the United States listed in that provision.
- Section 4201 authorizes appropriations of $20 million for continued research and development of AFFF alternatives and AFFF remediation and disposal technologies, and an additional $25 million for other PFAS remediation and disposal technologies.
- Section 4301 authorizes $357.1 million in the DOD Environmental Restoration accounts for the continuing investigation and remediation of PFAS releases ($175.0 million for the Air Force, $98.8 million for the Army, $167.3 million for the Navy, and $74.0 million for FUDS).

DOD procurement of PFAS-containing materials also received attention during the debate of the FY2022 NDAA. The FY2021 NDAA prohibits DOD, as of April 1, 2023, from procuring certain items containing PFOA or PFOS (nonstick cookware, cooking utensils, and upholstered furniture, carpets, and rugs that have been treated with stain-resistant coatings).[335] The House-passed FY2022 NDAA (§317) would have broadened this prohibition to include additional items and applied it to any PFAS.[336] The Administration expressed concern with this broader House provision and argued in part that it "would prohibit DOD from procuring a wide range of items that may contain PFAS" and, if implemented, "would not be feasible for DOD to test all of these items to determine if they contain PFAS."[337] The enacted FY2022 NDAA did not include this House provision and instead directed GAO in Section 347 to conduct a study as noted above, and provide a briefing to the House and Senate Committees on Armed Services regarding DOD procurement of certain items containing PFAS.

The explanatory statement for the FY2022 NDAA also included language directing DOD to continue research of phytoremediation and other remediation technologies, and to report to the House and Senate Committees on Armed Services regarding the acquisition and remediation of

[334] P.L. 116-92, §331.

[335] P.L. 116-283, §333.

[336] H.R. 4350, §317.

[337] White House, *Statement of Administration Policy* to H.R. 4350, September 21, 2021, p. 2.

off-base properties contaminated with PFOA or PFOS from Air Force activities.[338] The FY2020 NDAA authorized the criteria for these property acquisitions.[339]

Infrastructure Investment and Jobs Act

Division J, Title VI of the Infrastructure Investment and Jobs Act (IIJA; P.L. 117-58), enacted on November 15, 2021, provided a total of $5 billion in emergency supplemental appropriations to EPA over a five-year period from FY2022 through FY2026 to address emerging contaminants (that may include PFAS) through existing wastewater and drinking water infrastructure programs.[340] This $5 billion includes

- a total of $1 billion for Clean Water State Revolving Fund (SRF) capitalization grants to assist local wastewater treatment facilities; and
- a total of $4 billion for Drinking Water SRF capitalization grants to assist public water systems.[341]

Federal PFAS Research Evaluation Act

As passed by the House on July 26, 2022, the Federal PFAS Research Evaluation Act (H.R. 7289) would authorize $3 million to be appropriated to EPA for FY2023 to enter into agreements with the National Academies of Sciences, Engineering, and Medicine (National Academies) to conduct two PFAS research assessments, in consultation with other federal agencies with relevant expertise.[342] The bill would require EPA to enter into an agreement with the National Academies for each research assessment within 90 days after the $3 million is subsequently appropriated (if so enacted). The bill would require the National Academies to submit a report to Congress on the findings and recommendations of each assessment within 540 days after an agreement with EPA is finalized and to make this report publicly available on its website.

One assessment would focus on research and "knowledge gaps" identified by the "Federal Government Human Health PFAS Research Workshop" held on October 26 and 27, 2020,[343] and additional research and development that may be needed to identify, categorize, evaluate, and address individual or total PFAS, including an estimation of human exposure to PFAS. EPA would be required to enter into an agreement with the National Academies for this assessment in consultation with the National Science Foundation, DOD, National Institutes of Health, and other federal agencies with expertise relevant to understanding PFAS exposure, behavior, and toxicity.

The other assessment would focus on additional research and development that may be needed to advance understanding of the extent and implications of PFAS contamination in the environment, how to manage and treat such contamination, and the development of safe alternatives to PFAS.

---

[338] *Congressional Record*, vol. 167, no. 211, December 7, 2021, Book II, p. H7278.

[339] P.L. 116-92, §344.

[340] For further discussion, see CRS Report R46892, *Infrastructure Investment and Jobs Act (IIJA): Drinking Water and Wastewater Infrastructure*, by Elena H. Humphreys and Jonathan L. Ramseur.

[341] P.L. 116-92, §7312, authorized total appropriations of $500 million from FY2020 through FY2024 for this purpose.

[342] In the Senate, a bill of the same title, Federal PFAS Research Evaluation Act (S. 4492), was introduced on June 23, 2022. This bill is similar in purpose but differs from H.R. 7289 in some respects, including agency roles in the agreements with the National Academies, and the scope, organization, and timing of the research assessments. S. 4492 does not include an authorization of appropriations to fund the research assessments and other related activities.

[343] For a summary of the proceedings, see National Academies of Sciences, Engineering, and Medicine, *Federal Government Human Health PFAS Research Workshop: Proceedings of a Workshop–in Brief*, October 26-27, 2020, https://nap.nationalacademies.org/catalog/26054/federal-government-human-health-pfas-research-workshop-proceedings-of-a.

EPA and the National Science Foundation would be required to jointly enter into an agreement with the National Academies for this assessment, in consultation with DOD and other federal agencies with expertise relevant to the development of PFAS alternatives and the management and treatment of PFAS.

H.R. 7289 also would require the White House Office of Science and Technology Policy (OSTP) to coordinate with all relevant federal agencies to prepare an implementation plan for increased collaboration and coordination of federal research, development, and demonstration activities related to PFAS, taking into consideration the recommendations of the National Academies in the research assessments directed in the bill. OSTP would be required to submit this plan to Congress within 180 days after the National Academies submits its reports on the research assessments.

National Defense Authorization Act for Fiscal Year 2023

As passed by the House on July 14, 2022, the National Defense Authorization Act for Fiscal Year 2023 (H.R. 7900) includes several provisions related to PFAS incorporated into various titles of the bill. These provisions are summarized below, organized by section number. Some of these provisions would amend or expand upon provisions for similar purposes enacted in prior NDAAs.

- Section 323 would require the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD A&S) to report, within 180 days of enactment, to the congressional defense committees on the progress of DOD in implementing onsite PFAS destruction technologies that do not utilize incineration; issue guidance, within one year of enactment, on best practices and preferred methods for PFAS waste disposal and destruction with an emphasis on alternatives to incineration; and extend the temporary moratorium under the FY2022 NDAA[344] on the use of incineration to dispose of AFFF and certain other PFAS-containing materials until DOD issues the new guidance on PFAS waste disposal and destruction under Section 323.
- Section 341 would amend the FY2021 NDAA[345] to expand the purposes of monetary "prizes" competitively awarded by DOD to nonfederal entities for the development of nonfluorinated firefighting agents for U.S. military use to include the development of certain types of personal protective firefighting equipment (e.g., jackets, coats, pants, or coveralls) that does not contain any "intentionally added" PFAS (i.e., in contrast to PFAS that may be present as unintentional impurities from the use of PFAS as processing agents). Section 341 also would modify the definition of PFAS for the purpose of these prizes to distinguish perfluoroalkyl substances from polyfluoroalkyl substances.
- Section 342 would amend the FY2021 NDAA[346] to (1) broaden the restriction that prohibits the DOD Defense Logistics Agency from procuring certain items that contain PFOA or PFOS to include such items that contain any PFAS; (2) expand items covered under the restriction to include food service ware, food packaging materials, cleaning products, curtains, sunscreen, shoes and clothing treated with PFAS that "is not necessary for an essential function," and other items DOD may select, in addition to nonstick cookware, cooking utensils, and upholstered furniture, carpets, and rugs treated with PFAS that are currently

[344] P.L. 117-81, §343.

[345] P.L. 116-283, §330.

[346] P.L. 116-283, §333.

restricted; and (3) require DOD to report to the House and Senate Committees on Armed Services, within 270 days of enactment and annually thereafter, on identifying and limiting procurement of these items containing any PFAS.

- Section 343 would establish an additional procurement restriction to prohibit DOD from entering into any contracts, beginning on October 1, 2025, to purchase personal protective firefighting equipment for use by DOD firefighters if the equipment contains any PFAS, unless DOD determines that such equipment without any PFAS is unavailable for purchase that would meet all other applicable worker standards and provide the same level of worker protection as equipment that contains PFAS. In implementing this restriction, DOD would not be required to test personal protective firefighting equipment to confirm the absence of PFAS, and therefore could rely on available information.
- Section 344 would alter the standard selection process of CERCLA for responding to releases of PFOA, PFOS, and seven other specific PFAS[347] into any environmental media at DOD and National Guard facilities.[348] This provision would apply to either remedial or removal actions taken under Section 104 of CERCLA[349] to respond to releases of these PFAS and would require DOD to comply with the most stringent of the following standards: (1) a promulgated state standard (of the state where the response action is taken), as described in Section 121(d)(2)(A)(ii) of CERCLA,[350] regardless of whether the standard is applicable, relevant, or appropriate to the response action; (2) a federal standard, as described in Section 121(d)(2)(A)(i) of CERCLA,[351] that *is* applicable, relevant, or appropriate to the response action; or (3) a federal drinking water health advisory issued by EPA under SDWA.[352]
- Section 345 would direct DOD to report to the House and Senate Committees on Armed Services by June 1, 2023, a list of each known U.S. military use of PFAS that DOD has deemed essential for which the use of a replacement substance is impossible or impracticable, and a supporting explanation. Additionally, DOD would be required to brief the House and Senate Committees on Armed Services within 270 days of enactment, and annually thereafter, on steps taken to (1) identify and limit DOD procurement of certain items containing PFOA or PFOS, including nonstick cookware, other cooking utensils, and upholstered furniture, carpets, and rugs treated with stain-resistant coatings (restricted from procurement by the FY2021 NDAA noted above), and (2) identify products and vendors of these items that do not contain PFOA or PFOS.

[347] These seven other PFAS include perfluorononanoic acid (PFNA), perfluorohexanoic acid (PFHxA), perfluorohexane sulfonate (PFHxS), perfluorobutane sulfonic acid (PFBS), perfluoroheptanoic acid (PFHpA), perfluorodecanoic acid (PFDA), and fluorotelomer sulfonamide betaine.

[348] Section 121(d) of CERCLA (42 U.S.C. §9621(d)) generally requires remedial actions to be based on applicable, relevant, or appropriate requirements (ARARS) of other federal or state laws, and allows the exclusion of an otherwise applicable federal or state standard if attaining the standard at a site would be technically impracticable from an engineering perspective and in certain other situations. Section 121(d) does not apply to removal actions, but ARARs may be applied to removal actions if practicable, depending on the site-specific situation.

[349] 42 U.S.C. §9604.

[350] 42 U.S.C. §9621(d)(2)(A)(ii).

[351] 42 U.S.C. §9621(d)(2)(A)(i).

[352] For a discussion of CERCLA, see "Environmental Remediation." For a discussion of SDWA health advisories, see "Health Advisories."

- Section 373 would require DOD to report, within one year of enactment, to Congress on the development of a process for "alerting" (i.e., notifying) active and retired servicemembers and their families of possible exposures to PFOA or PFOS contamination on military bases at concentrations detected above EPA's June 2022 interim drinking water health advisory levels for these chemicals, and potential health risks that may be associated with these exposures.
- Section 375 would require OUSD A&S to issue two reports, within one year of enactment, to the congressional defense committees: (1) a progress report on "any certification efforts" to replace fluorinated AFFF with a fluorine-free fire-fighting agent as required by the FY2020 NDAA[353] no later than October 1, 2024, unless alternatives are unavailable (and excluding shipboard use); and (2) a report identifying the locations of known or suspected PFAS contamination "on or around" U.S. military installations from sources other than AFFF.
- Section 761 would require DOD periodic health assessments, separation history and physical examinations, and deployment assessments for members of the Armed Forces to include an assessment of whether the individual was based or stationed at a military installation where a known or suspected release of PFAS occurred or whether the individual was exposed to PFAS, and to provide blood testing to determine and document exposures among individuals for whom a "positive determination of potential exposure" to PFAS is identified in any of these health evaluations. DOD would be required to submit, within one year of enactment, a plan to the House and Senate Committees on Armed Services to analyze blood testing results from these health evaluations, or DOD firefighter physical examinations pursuant to the FY2020 NDAA,[354] and report, within two years of enactment and annually thereafter, on the blood testing results.
- Section 762 would require DOD to ensure mandatory training of each DOD medical provider regarding the potential health effects of exposures to PFAS.
- Section 5110 would require the Department of Veterans Affairs (VA) to coordinate with DOD, within one year of enactment, to (1) establish a registry of individuals who may be exposed to PFAS released from the use of AFFF that met the military performance specification for PFAS content, (2) collect additional information to include in the registry for ascertaining and monitoring potential health effects from exposures, (3) publicize the availability of the registry and how to register, and (4) periodically notify registered individuals of developments related to the registry and treatment of conditions associated with exposure to PFAS. Section 5110 also would require the VA to report to Congress, within two years of enactment, on the implementation of the registry, and a follow-up report to Congress five years thereafter, including an assessment of whether information in the registry remains current and scientifically accurate.
- Section 5803 would authorize a transfer of $20 million annually for FY2023 and FY2024 from the DOD Operation and Maintenance Defense-wide account to the Department of Health and Human Services to continue and expand a joint CDC and ATSDR PFAS multisite health effects study and additional PFAS exposure assessments at selected U.S. military installations, as authorized in the FY2018

[353] P.L. 116-92, §322.

[354] P.L. 116-92, §707.

NDAA and subsequent amendments.[355] Section 5803 would require the CDC and ATSDR to expand the PFAS multisite health effects study by an unspecified number of sites that could include U.S. military installations, DOD Education Activity schools, communities, or other sites, and the PFAS exposure assessments to include at least an additional 10 current or former U.S. military installations. CDC and ATSDR would be required to submit a series of reports on the progress of the expanded PFAS multisite health effects study, and release the findings of the PFAS exposure assessments, to the congressional defense committees and certain other committees of jurisdiction.

- Section 5810 would direct DOD to establish a program, within one year of enactment and in coordination with EPA, to (1) test drinking water at schools operated by the DOD Education Activity for PFAS, make the testing results publicly available, and notify relevant parent, teacher, and employee organizations of the results; and (2) install and maintain (including disposal of) "water filtration systems" to reduce PFAS to levels of an MCL under SDWA, or an applicable state standard (of the state where the school is located) if more stringent than an applicable federal MCL.
- Section 5816 would amend TSCA Section 8(a)(7), as added by the FY2020 NDAA,[356] to expand the group of PFAS subject to a data call authorized in that provision of TSCA. Section 5816 would define the term "perfluoroalkyl or polyfluoroalkyl substance" for the purpose of the data call broadly to be any chemical that contains "at least one fully fluorinated carbon atom." In June 2021, EPA proposed the use of a narrower scientific definition of PFAS consistent with how the agency has categorized these chemicals for reporting on the existing TSCA inventory in current regulation.[357]
- Section 5883 would direct EPA to (1) publish CWA human health surface water quality criteria for "measurable" PFAS within three years of enactment; (2) publish final rules to establish CWA effluent limitation guidelines (ELGs) for nine industrial categories for discharges of such PFAS by specified deadlines (ranging from June 2024 to December 2026); (3) require PFAS monitoring in permits for two additional industrial categories effective on the date of enactment, make a determination as to whether ELGs are feasible for those categories by December 2023, and publish ELGs for them, if determined to be feasible, by December 2027; and (4) notify the relevant congressional committees of jurisdiction when each required rule is published. Section 5883 would authorize appropriations of $12 million for FY2023 to remain available until expended to carry out these actions.

Build Back Better Act

As passed by the House on November 19, 2021, Section 90004 of the Build Back Better Act (H.R. 5376) would appropriate $95 million in FY2022 to the Federal Emergency Management Agency (FEMA) for "personal protective firefighting equipment and firefighting foam" that does not contain PFAS, to the extent that such alternatives are commercially available. FEMA

[355] P.L. 115-91, §316, as amended.

[356] P.L. 116-92, §7351.

[357] For a discussion of TSCA Section 8, see "Information Gathering."

administers the Assistance to Firefighters Grants (AFG) Program that provides certain types of assistance to local fire departments and various other eligible entities.[358] In some jurisdictions, local fire departments also may provide firefighting services to civilian airports, U.S. military installations, or National Guard facilities under facility-specific service agreements.

Protecting Firefighters from Adverse Substances Act

As passed by the Senate on July 29, 2021, the Protecting Firefighters from Adverse Substances Act (S. 231) would require the Department of Homeland Security (DHS) to develop guidance and a curriculum within one year of enactment for firefighters and other emergency responders to identify methods for minimizing and preventing releases of, and exposures to, PFAS contained in firefighting foam and personal protective equipment, and PFAS-free alternatives. S. 231 would require DHS to update the guidance and curriculum as appropriate at least once every three years, maintain an "online public repository" of related tools and best practices, and consult with the U.S. Fire Administration; EPA; National Institute for Occupational Safety and Health; and heads of other relevant federal agencies, states, and certain nonfederal entities in preparing and maintaining this guidance, curriculum, and related information.

PFAS Action Act of 2021

As passed by the House on July 21, 2021, the PFAS Action Act of 2021 (H.R. 2467) would require EPA to regulate PFAS under certain federal environmental laws, issue related guidance, and carry out various other actions related to PFAS. The bill also would authorize additional EPA grants to address PFAS in drinking water and wastewater, subject to annual appropriations. Some of the planned actions that EPA outlined in its 2021 *PFAS Strategic Roadmap* are similar in purpose to certain actions described in the bill.

H.R. 2467 would require EPA to

- finalize a rule within one year of enactment to designate PFOA and PFOS as hazardous substances under Section 102(a) of CERCLA (with certain civilian airports exempt from liability under the statute for releases of these PFAS), and submit a report to the House Committee on Energy and Commerce and Senate Committee on Environment and Public Works, no later than five years after enactment, on the agency's actions to "clean up" (i.e., remediate) contamination from releases of PFOA and PFOS under CERCLA or related authorities;
- propose a testing rule under Section 4 of TSCA within six months of enactment to require manufacturers and processors of PFAS to provide certain information on potential risks based on "comprehensive toxicity testing" and to finalize the rule within two years of enactment;
- require notifications under Section 5 of TSCA for the premanufacture or significant new use of any PFAS (except for use in certain drugs and devices), deem that any such PFAS (for which these notices are submitted within five years of enactment) present "an unreasonable risk of injury to health or the environment," and issue an order under TSCA to prohibit the "manufacture, processing, and distribution in commerce" of such substances;
- promulgate a rule under SDWA Section 1412(b) within two years of enactment to establish a national primary drinking water regulation for PFAS that "at a

[358] For information on the purpose and eligibility of this program, see CRS Report RL32341, *Assistance to Firefighters Program: Distribution of Fire Grant Funding*, by Lennard G. Kruger and Jill C. Gallagher.

minimum" shall include standards for PFOA and PFOS, allow public water system operators five years to comply with these regulations without assessing financial penalties for noncompliance, and issue drinking water health advisories for PFAS that are unregulated under the statute for which toxicity values and validated test methods are available;

- award grants under SDWA to assist "community water systems" with the capital costs of acquiring technologies for the treatment of PFAS in drinking water, for which the bill would authorize appropriations of $500 million annually from FY2022 through FY2026;
- award grants under SDWA to local educational agencies or states for testing PFAS in drinking water in schools, for drinking water filtration systems to reduce PFAS concentrations to applicable federal or more stringent state standards, and for disposal of "spent" water filtration equipment, for which the bill would authorize appropriations of $100 million annually from FY2022 through FY2026;
- set aside 2% of the funding authorized in SDWA Section 1452(t) for Drinking Water SRF capitalization grants to U.S. territories for addressing emerging contaminants "with a focus" on PFAS;
- publish CWA human health surface water quality criteria for "measurable" PFAS within three years of enactment, publish final rules to establish CWA effluent limitation guidelines (ELGs) for nine industrial categories for discharges of such PFAS within four years of enactment, and award grants to owners and operators of publicly owned treatment works for complying with these ELGs and standards for which the bill would authorize appropriations of $200 million annually from FY2022 through FY2026;
- prohibit discharges of PFAS from industrial sources into publicly owned treatment works, unless the owner or operator of the industrial source notifies the owner or operator of the treatment works to disclose the identify, quantity, and treatability of the particular PFAS, and the potential interference of the substance with the operation of the treatment works, subject to enforcement for noncompliance pursuant to CWA Section 307(b);
- finalize a rule within 180 days of enactment to list PFOA and PFOS as hazardous air pollutants under Section 112 of the Clean Air Act, determine within five years of enactment whether to list additional PFAS as hazardous air pollutants, and within one year of listing any PFAS as hazardous air pollutants, identify categories and subcategories of major and area sources for such pollutants;
- finalize a rule under Section 3004 of the Solid Waste Disposal Act within six months of enactment to regulate the use of incineration for the disposal of AFFF and other PFAS wastes in a manner that would eliminate PFAS in the waste during combustion while minimizing air emissions, compliance with Clean Air Act requirements for air emissions of hydrogen fluoride and other pollutants, and subject to certain other criteria;
- revise standards for the Safer Choice Program (a voluntary partnership with industry) within one year of enactment to prohibit the labeling of certain commercial products as "Safer Choice" under this program if the product contains PFAS, or develop other labeling that a manufacturer may use for products that EPA has reviewed and found do not contain any PFAS;

- issue guidance within one year of enactment in consultation with the U.S. Fire Administration, FAA, other relevant federal agencies, states, and local governments for minimizing the use of firefighting foam or protective equipment that contains PFAS and preventing exposures among firefighters and emergency responders without "jeopardizing" firefighting efforts, and report to Congress within two years of enactment and annually thereafter on the implementation of this guidance, and within one year of enactment on federal efforts to develop alternative firefighting foam and protective equipment that do not contain PFAS;
- "investigate methods and means" to prevent contamination from discharges of GenX into surface waters, including source waters used for drinking water;
- develop a publicly available website within one year of enactment in coordination with the Department of Health and Human Services, Department of Agriculture, and relevant state agencies to provide information on methods and resources for testing, treatment, and potential health risks of PFAS in household well water;
- develop a national "risk-communication strategy" in consultation with states to inform the public about potential risks of exposure to PFAS; and
- require manufacturers of PFAS within 180 days of enactment to submit an "analytical reference standard" to EPA for each PFAS manufactured within the past 10 years prior to enactment.

Appendix.

Table A-1. Authorizing Legislation Related to PFAS Enacted in the 115th Congress and 116th Congress

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
P.L. 115-91	National Defense Authorization Act for Fiscal Year 2018	December 12, 2017	—
Section 316	—	—	Authorizes a joint CDC and ATSDR multisite study of potential health effects from exposure to PFAS in water, and PFAS exposures assessments at eight or more U.S. military installations.
Section 1059	—	—	Requires DOD to report to the House and Senate Armed Services Committees on alternatives to PFOS- or PFOA-containing firefighting foams.
P.L. 115-141 Section 8131	Consolidated Appropriations Act, 2018	March 23, 2018	Amends Section 316 of P.L. 115-91 to expand the authorization of appropriations for both of the CDC and ATSDR studies related to PFAS.
P.L. 115-232 Section 315	John S. McCain National Defense Authorization Act for Fiscal Year 2019	August 13, 2018	Requires DOD to report to the congressional defense committees on a plan to remediate releases of PFAS at U.S. military installations if EPA were to promulgate a regulation for PFAS in drinking water. Requires DOD to study potential health effects from exposure to PFAS among U.S. military personnel and the feasibility of establishing a registry of exposed individuals.
P.L. 115-254 Section 332	FAA Reauthorization Act of 2018	October 5, 2018	Requires the FAA to allow the use of nonfluorinated firefighting foam for civilian airport certification, within three years of enactment.
P.L. 115-334 Section 6404	Agriculture Improvement Act of 2018 (commonly referred to as the 2018 "Farm Bill")	December 20, 2018	Authorizes rural water technical assistance and training to address emerging contaminants, such as PFAS, in drinking water and surface water supplies.

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
P.L. 116-92	National Defense Authorization Act for Fiscal Year 2020	December 20, 2019	—
Section 239	—	—	Among other purposes, authorizes $10 million for the DOD Strategic Environmental Research and Development Program for "the development, demonstration, and validation of non-fluorine based firefighting foams."
Section 316	—	—	Clarifies the authority of DOD to respond to PFOA or PFOS releases at National Guard facilities under the Defense Environmental Restoration Program, and adds CERCLA pollutants or contaminants to the statutory responsibilities of DOD for responding to releases from U.S. military installations or National Guard facilities at eligible sites under this program.
Section 321	—	—	Extends DOD authority to transfer $10 million annually from the Defense-wide Operation and Maintenance account through FY2021 to support a joint CDC and ATSDR PFAS multisite health effects study and PFAS exposure assessments at selected U.S. military installations, as authorized in Section 316 of the National Defense Authorization Act for FY2018 (P.L. 115-91), as amended.
Section 322	—	—	Requires the U.S. Navy to publish a military specification for use of fluorine-free firefighting agents at U.S. military installations by January 31, 2023, and develop a plan for transitioning to fluorine-free agents by October 1, 2023; prohibits DOD from procuring firefighting foam that contains more than 1 part per billion of PFAS after October 1, 2023; and prohibits the use of fluorinated AFFF at U.S. military installations (except for shipboard use) on or after October 1, 2024, unless DOD issues a waiver because of the lack of alternatives and notifies congressional defense committees of the waiver and the basis for the continued use of fluorinated AFFF.
Section 323	—	—	Prohibits the uncontrolled release of fluorinated AFFF at U.S. military installations, except for situations involving (1) an emergency response to a fire, or (2) nonemergency purposes for the testing of equipment or training of personnel if containment, capture, and disposal mechanisms are in place to ensure that no AFFF is released into the environment.
Section 324	—	—	Except as provided in Section 323, generally prohibits the use of fluorinated AFFF for training exercises at U.S. military installations.

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
Section 329	—	—	Prohibits the DOD Defense Logistics Agency, beginning on October 1, 2021, from procuring meals ready-to-eat (MREs) if they are packaged or assembled with any food contact substances that contain PFAS.
Section 330	—	—	Establishes certain criteria to restrict when DOD may continue to use incineration as a method to dispose of "legacy" formulations of AFFF containing PFAS, materials contaminated from the use of AFFF, and materials contaminated with PFAS from the treatment of drinking water sources or the remediation of environmental contamination.
Section 331	—	—	Requires DOD to seek to enter into agreements with municipalities or municipal drinking water utilities located adjacent to U.S. military installations to share monitoring data on PFAS or other emerging contaminants of concern. Also requires DOD to maintain a publicly available website to provide information on PFAS exposures, testing, cleanup, and treatment methods for releases at U.S. military installations.
Section 332	—	—	Upon the request of a state, requires DOD to "work expeditiously" toward finalizing or amending a cooperative agreement under existing authorities at 10 U.S.C. 2701(d) to fund testing, monitoring, removal, or remedial actions for PFAS contamination in drinking water, groundwater, or surface water originating from DOD activities at an active or decommissioned U.S. military installation, or a National Guard facility. To determine actions funded under such agreements, applies the most stringent applicable standard among (1) an enforceable state standard described in Section 121(d) of CERCLA in effect in that state, (2) an enforceable federal standard described in Section 121(d) of CERCLA, or (3) a SDWA federal health advisory. Requires DOD to report annually, beginning on February 1, 2020, to the congressional defense committees and Members representing the state and district where a site is located, if a cooperative agreement is not finalized within one year of a state's request. Authorizes DOD to enter into additional cooperative agreements, grants agreements, or contracts with state, local, or tribal governments, or local water authorities with "jurisdiction" over a contaminated site, to fund eligible DOD response actions for groundwater or surface water contaminated from releases of perfluorinated compounds.

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
Section 343	—	—	Authorizes the expenditure of appropriations to the DOD Operation and Maintenance accounts to fund alternative water sources or treat water contaminated with PFOA or PFOS at sites where U.S. military activities caused contamination of a water source used to produce agricultural products for human consumption, if the concentration of PFOA or PFOS in a water source exceeds the EPA May 2016 lifetime health advisories for drinking water, or FDA standards if established for PFOA or PFOS in raw agricultural commodities and milk.
Section 344	—	—	Authorizes the U.S. Air Force to use FY2020 appropriations, or unobligated balances of prior appropriations, for military construction to acquire real property (including improvements and personal property) and provide federal relocation assistance for acquired real property within the vicinity of an Air Force base that has "shown signs" of PFOA and PFOS contamination due to activities on base, if the acquisition would expand the contiguous geographic footprint of the base and increase force protection standoff near critical infrastructure and runways. Subject to annual appropriations, requires the U.S. Air Force to remediate PFOA and PFOS contamination on acquired real property as necessary.
Section 345	—	—	Requires DOD, within 180 days of enactment, to submit to Congress a remediation plan for "cleanup of all water at or adjacent to a military installation that is contaminated with PFOA or PFOS." Requires DOD to conduct a study of PFOA or PFOS contamination in water at such installations to inform the plan. Directs the President's annual budget requests to include funding to "address remediation efforts" under the plan, but does not direct the level or type of remediation that may be warranted at individual sites. CERCLA applies to the investigation and remediation of environmental contamination (including PFAS) at eligible sites under the Defense Environmental Restoration Program.
Section 707	—	—	Beginning on October 1, 2020, requires DOD to offer testing for PFAS in blood among military firefighters during the DOD annual physical exam for each firefighter.
Section 7311	—	—	Requires EPA to add to Unregulated Contaminant Monitoring Rule (UCMR) 5 all PFAS or categories of PFAS for monitoring such contaminants in drinking water supplied by public water systems that are subject to SDWA. Limits these monitoring requirements to PFAS for which EPA has validated methods to detect and measure these substances in drinking water. Authorizes exemptions from these monitoring requirements for certain smaller public water systems if laboratory capacity is limited to evaluate drinking water samples.

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
Section 7312	—	—	Authorizes a new grant program within the broader EPA Drinking Water State Revolving Fund (SRF) capitalization grant program. The new program is dedicated to assistance for public water systems to address emerging contaminants in drinking water, with a "focus" on PFAS. Authorizes appropriations of $100 million annually from FY2020 through FY2024 for this purpose.
Section 7321	—	—	Requires EPA to add a certain subset of PFAS to the list of toxic chemicals subject to reporting on the Toxics Release Inventory (TRI) under Section 313 of EPCRA, for public disclosure of releases into the environment. These reporting requirements apply to certain classes of industrial facilities that manufacture, import, process, or use 100 pounds or more of these PFAS on an annual basis. Within five years of enactment, requires EPA to determine whether revision of this reporting threshold is warranted for any of these PFAS. Establishes criteria for EPA to add other PFAS to the list of toxic chemicals subject to TRI reporting. Authorizes EPA to protect confidential business information of a proprietary nature from public disclosure on the TRI, in accordance with Section 14(f) of TSCA.
Sections 7331-7335	—	—	Requires USGS to (1) establish a performance standard in consultation with EPA for detecting "highly fluorinated compounds" in the environment, (2) conduct representative nationwide sampling of these compounds in "estuaries, lakes, streams, springs, wells, wetlands, rivers, aquifers, and soil" using this standard, and (3) consult with EPA and states in prioritizing areas for such sampling. Requires USGS to submit a report on the results of this sampling to certain congressional committees of jurisdiction, and to provide the sampling data to EPA, and other federal and state regulatory agencies upon request. The stated purpose of the sampling data is to "inform and enhance assessments of exposure, likely health and environmental impacts, and remediation priorities" at the federal or state level.
Sections 7341-7342	—	—	Directs EPA to develop a strategic plan to improve federal efforts to develop monitoring and treatment methods and assist states in responding to health risks posed by emerging contaminants (including PFAS). Directs EPA and the Department of Health and Human Services to establish a federal interagency working group to coordinate the assessment of public health effects of emerging contaminants in drinking water. Directs the White House Office of Science and Technology Policy to establish a National Emerging Contaminant Research Initiative in coordination with EPA, certain other federal agencies, and the National Science Foundation.

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
Section 7351	—	—	Amends Section 8 of TSCA to direct EPA, by January 1, 2023, to promulgate a rule requiring manufacturers of PFAS since January 1, 2011, to report certain chemical-specific information to the agency.
Section 7352	—	—	Directs EPA, not later than June 22, 2020, to take final action on a proposed "significant new use rule" under TSCA (80 *Federal Register* 2885, January 21, 2015) that would require notification to the agency for resuming the manufacturing or processing of long-chain perfluoroalkyl carboxylate chemical substances for uses that had previously been phased out in the United States.
Section 7361	—	—	Requires EPA to publish interim guidance within one year of enactment for the destruction and disposal of certain materials that contain PFAS, and to revise the guidance at least once every three years. Materials covered include AFFF, soil and biosolid wastes, textiles treated with PFAS ("other than consumer goods"), and various waste streams generated from the treatment of water sources, collection of landfill leachate, and facilities that manufacture or use PFAS. Directs EPA to consider potential releases from destruction or disposal sites and how such releases may affect potentially vulnerable populations, and to recommend methods for testing and monitoring such releases.
Section 7362	—	—	Directs EPA's Office of Research and Development to (1) further examine the effects of PFAS on human health and the environment, (2) develop a process to prioritize individual PFAS or classes of PFAS for further research, (3) develop new tools to detect and characterize PFAS released into the environment, (4) evaluate approaches to remediating environmental contamination from PFAS releases, and (5) develop and implement new tools and materials to communicate with the public about PFAS. Authorizes appropriations of $15 million annually from FY2020 through FY2024 to support these activities.
P.L. 116-283	William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021	January 1, 2021	—
Section 318	—	—	Requires DOD to report the use or spills of AFFF greater than 10 gallons of concentrate, or greater than 300 gallons of mixed foam (concentrate combined with water), and to prepare action plans to mitigate potential risks.

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
Section 330	—	—	Authorizes DOD to issue competitively awarded "prizes" up to $5 million through October 1, 2024, for the development of nonfluorinated firefighting agents for U.S. military use to incentivize nonfederal research.
Section 331	—	—	Requires DOD to conduct a survey of available hangar flooring systems, firefighting agent delivery systems, containment systems, and other relevant technologies to facilitate the U.S. military phase-out of fluorinated AFFF.
Section 332	—	—	Directs the White House Office of Science and Technology Policy to establish an interagency working group (including DOD) to coordinate federal research and development activities related to PFAS focused on certain goals, including (1) removal of PFAS from the environment, (2) safe destruction or degradation of PFAS, (3) development and deployment of "safer and more environmentally friendly alternative substances" that can serve similar functions, (4) understanding of sources of PFAS contamination in the environment and pathways of human exposure, and (5) understanding of the toxicity of PFAS to humans and animals.
Section 333	—	—	Restricts the DOD Defense Logistics Agency beginning on April 1, 2023, from procuring nonstick cookware or cooking utensils that contain PFOA or PFAS, and certain other items that contain these chemicals not related to potential dietary exposure, including furniture, carpets, and rugs that have been treated with stain-resistant coatings containing PFOA or PFOS.
Section 334	—	—	Authorizes the DOD Strategic Environmental Research and Development Program to award grants for the continued research and development of a replacement for fluorinated AFFF to facilitate the development of a U.S. military specification for nonfluorinated firefighting agents to extinguish petroleum-based liquid fuel fires. (Section 4201 authorizes appropriations of $25 million in FY2021 for such research, and $10 million in FY2021 for the DOD Environmental Security Technology Certification Program to support related research.)
Section 335	—	—	Requires DOD to notify agricultural operations within 1 mile down-gradient of a U.S. military installation or National Guard facility where PFOA, PFOS, or PFBS are detected in groundwater. Notification is required if such PFAS are detected in groundwater that is hydrologically linked to an agricultural or drinking water source above specific concentrations (70 ppt individually or combined for PFOA and PFOS, and 40 ppb for PFBS).

Public Law and Relevant Sections	Short Title	Date of Enactment	Purpose
Section 337	—	—	Increases the authorization of appropriations from $10 million to $15 million in FY2021 to continue a joint CDC and ATSDR PFAS multisite health effects study and PFAS exposure assessments at selected U.S. military installations, as authorized in Section 316 of the National Defense Authorization Act for FY2018 (P.L. 115-91), as amended.
Section 338	—	—	Authorizes appropriations of $20 million (in total from FY2021 through FY2025) for a study of PFAS contained in firefighter protective equipment, exposures among firefighters, and mitigation of potential health risks.
Section 4201	—	—	Authorizes total appropriations of $50 million in FY2021 ($25 million each for the Strategic Environmental Research and Development Program and Environmental Security Technology Certification Program) to develop technologies for the disposal of PFAS and remediation of environmental contamination.

Source: CRS identified the enacted authorizing legislation listed in the table above based on a search of Congress.gov using common terms that refer to these chemicals or aqueous film forming foam (AFFF) that contains certain PFAS: *perfluoroalkyl substances*, *polyfluoroalkyl substances*, *perfluorinated compounds*, *PFAS*, *PFOA*, *PFOS*, *GenX*, and *AFFF*. These laws therefore are not necessarily comprehensive of all such enacted legislation, as other laws may use differing terms in reference to PFAS.

Author Information

Elena H. Humphreys, Coordinator
Analyst in Environmental Policy

David M. Bearden
Specialist in Environmental Policy

Laura Gatz
Analyst in Environmental Policy

Lance N. Larson
Analyst in Environmental Policy

Jerry H. Yen
Analyst in Environmental Policy

Disclaimer

This document was prepared by the Congressional Research Service (CRS). CRS serves as nonpartisan shared staff to congressional committees and Members of Congress. It operates solely at the behest of and under the direction of Congress. Information in a CRS Report should not be relied upon for purposes other than public understanding of information that has been provided by CRS to Members of Congress in connection with CRS's institutional role. CRS Reports, as a work of the United States Government, are not subject to copyright protection in the United States. Any CRS Report may be reproduced and distributed in its entirety without permission from CRS. However, as a CRS Report may include copyrighted images or material from a third party, you may need to obtain the permission of the copyright holder if you wish to copy or otherwise use copyrighted material.