

Draft Sewage Sludge Risk Assessment for PFOA and PFOS: Information for Wastewater Treatment Plants

January 2025

This fact sheet contains information that may be useful to operators of wastewater treatment plants (WWTPs) in addressing perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) contamination in sewage sludge.

On January 14, 2025, the U.S. Environmental Protection Agency (EPA) released its Draft Sewage Sludge Risk Assessment for Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic Acid (PFOS). The draft risk assessment indicates that in some scenarios, the EPA's acceptable risk thresholds may be exceeded when sewage sludge containing PFOA and PFOS is land applied for beneficial reuse or surface disposed. The draft risk assessment focuses on people living on or near impacted farms or those that rely primarily on their products. The findings presented in the draft risk assessment are preliminary. The EPA expects to publish a final risk assessment after reviewing public comments and revising the draft risk assessment accordingly. Once finalized, the risk assessment will provide information on risk from use or disposal of sewage sludge and will inform the EPA's potential future regulatory actions under the Clean Water Act (CWA). The EPA is committed to partnering with states, Tribes, territories, and wastewater treatment plants (WWTPs) to reduce risks from PFOA and PFOS that may occur through the management of sewage sludge, including the land application of sewage sludge.

What are sewage sludge and biosolids?

When sewage from households and businesses is sent to a WWTP, the liquids are separated from the solids, producing a nutrient-rich product known as "sewage sludge." The EPA typically uses the term "biosolids" to refer to treated sewage sludge that is intended to be applied to land as a soil conditioner or fertilizer. Sometimes biosolids are distributed to farms. While some states, Tribes, or counties may have additional rules around the use of biosolids, federal rules currently allow biosolids to be applied to pastures, feed crops, and crops for direct human consumption. Biosolids can also be applied to forests, tree farms, golf courses, turf farms, and other types of land. In other cases, biosolids are bagged and sold at stores to the general public and are often used on lawns or in home gardens. Not all WWTPs create biosolids for land application; some incinerate sewage sludge and others send it to a landfill. Biosolids are different from manure or industrial sludge (like pulp from a paper mill), which are also sometimes used as a soil amendment. The EPA does not regulate the land application of manure or industrial sludges in the same manner it does for biosolids.

What are PFOA and PFOS?

PFOA and PFOS are two chemicals in a large class of synthetic chemicals called [per- and polyfluoroalkyl substances \(PFAS\)](#). PFOA and PFOS have been widely studied, and they were once high production volume chemicals within the PFAS chemical class. PFOA and PFOS tend to persist in the environment for long periods of time and have been linked to a variety of adverse human health effects (see the EPA's [Final Toxicity Assessment for PFOA](#) and [Final Toxicity Assessment for PFOS](#)). PFAS manufacturers voluntarily phased out domestic manufacturing of PFOA and PFOS and their uses have been restricted by Significant New Use Rules (SNURs)

issued under the Toxic Substances Control Act (TSCA) (see the EPA's [Risk Management for PFAS under TSCA](#)). Though concentrations of PFOA and PFOS in people's blood have lowered since the voluntary phase out, blood levels can be elevated in communities where there is significant environmental contamination and exposure.

Learn more about [PFAS](#), the [EPA's PFAS Strategic Roadmap](#), and [PFAS exposure in impacted communities](#).

Why is the EPA concerned about the presence of PFOA and PFOS in sewage sludge?

Although domestic manufacturing of PFOA and PFOS have been phased out and their uses restricted, multiple activities still result in PFOA, PFOS, and their precursors being released to WWTPs.¹ Traditional wastewater treatment technology does not remove or destroy PFOA or PFOS, and these chemicals typically accumulate in the sewage sludge. PFOA and PFOS have strong chemical bonds, which means they do not break down on their own in the environment or in our bodies. The chemicals can move from soils to groundwater or nearby lakes or streams, and be taken up into fish, plants, and livestock. These factors combine to raise questions about the potential risks associated with the presence of PFOA or PFOS in sewage sludge that is land applied as a soil conditioner or fertilizer (on agricultural, forested, and other lands), surface disposed, or incinerated.

What are the potential sources of PFOA and PFOS in sewage sludge?

Current and historical activities that can contribute PFOA and PFOS to sewage sludge include industrial releases (e.g., certain types of firefighting foam, pulp and paper plants), commercial releases (e.g., car washes, industrial launderers), and down-the-drain releases from homes (e.g., use of consumer products like after-market water resistant sprays, ski wax, floor finishes, laundering of stain or water-resistant textiles with PFOA or PFOS coatings). If products containing PFOA or PFOS are disposed of at a lined municipal solid waste landfill, because the most common off-site management practice for landfill leachate is to transfer it to a WWTP, then that landfill's leachate could be a source of PFOA and PFOS to a WWTP. Studies have found PFOA and PFOS in sewage sludge even at WWTPs that only receive wastewater from residential and commercial users. At different WWTPs across the country, any of these release mechanisms might play a role in PFAS entering the plant and contaminating sewage sludge.

What is a sewage sludge risk assessment?

Risk assessment is a scientific process that is used to understand health risks to people, livestock, or wildlife across the country. The concentration of pollutants found in sewage sludge varies across space and time, depending on industrial and other inputs to individual WWTPs. The presence of a pollutant in sewage sludge alone does not necessarily mean that there is risk to human health or the environment from its use or disposal. The EPA uses sewage sludge risk assessments to help evaluate whether actions, including regulation, are needed to protect those who may experience risks from sewage sludge use or disposal. In this sewage sludge risk assessment, the EPA estimates potential human exposures and risks in modeled scenarios where sewage sludge has been land applied or surface disposed. The draft risk assessment focuses on risks to humans because available data indicate that people are much more sensitive to exposures to PFOA or PFOS than livestock or wildlife. Finally, this risk assessment does *not* assess risks to people in the general population, who often have a diversity of sources for their foods.

¹ see the EPA's [Preliminary Effluent Guidelines Program Plan 16](#) and [Multi-Industry Per- and Polyfluoroalkyl Substances \(PFAS\) Study – 2021 Preliminary Report](#)

What does this draft sewage sludge risk assessment suggest?

The draft risk assessment focuses on those living on or near impacted sites (*e.g.*, farm families and their neighbors) or those that rely primarily on their products (*e.g.*, food crops, animal products, drinking water); the draft risk assessment does *not* model risks for the general public. Based on the modeling in the draft sewage sludge risk assessment, the EPA finds that there may be human health risks exceeding the EPA's acceptable thresholds for some modeled scenarios when land-applying sewage sludge that contains 1 part per billion (ppb) of PFOA or PFOS. The EPA also finds that there may be human health risks associated with drinking contaminated groundwater sourced near a surface disposal site when sewage sludge containing 1 ppb of PFOA or sewage sludge containing 4 to 5 ppb of PFOS is disposed in an unlined or clay-lined surface disposal unit. The EPA provides a qualitative description of the potential risks to communities living near a sewage sludge incinerator (SSI) in the draft risk assessment but does not provide quantitative risk estimates due to significant data gaps related to the extent to which incineration in an SSI destroys PFOA and PFOS and the health effects of exposure to products of incomplete combustion.

The draft risk calculations are not conservative estimates because (1) they model risk associated with sewage sludge containing 1 ppb PFOA or PFOS, which is on the low end of measured U.S. sewage sludge concentrations (2) reflect median exposure conditions (*e.g.*, 50th percentile drinking water intake rates) rather than high end exposure conditions, (3) do not take into account non-sewage sludge exposures to PFOA and PFOS (*e.g.*, consumer products, other dietary sources), (4) do not account for the combined risk of PFOA and PFOS, and (5) do not account for additional exposures from the transformation of PFOA and PFOS precursors. As such, risk estimates that account from multiple pathways, multiple sources of exposure, and multiple PFAS would be greater than presented in this draft assessment.

What is the recommended analytical method to measure PFOA and PFOS in sewage sludge?

The EPA recommends using EPA Method 1633 to measure 40 PFAS analytes, including PFOA and PFOS, in sewage sludge. EPA Method 1633 finished multi-laboratory validation and was finalized in January 2024. It is planned to be included in the upcoming Methods Update Rule 22, which was proposed in late 2024.

Learn more about [EPA Method 1633](#) and [Methods Update Rules](#).

What plans exist for PFAS monitoring in sewage sludge nationwide?

The EPA is currently planning the next National Sewage Sludge Survey (NSSS) in collaboration with the POTW Influent PFAS Study. The NSSS will focus on obtaining current national occurrence and concentration data for 40 target PFAS analytes using EPA Method 1633. The data generated by the NSSS will help inform future risk assessments and risk management actions for sewage sludge. A Voluntary Data Submission Portal also will be available throughout the duration of the POTW Influent PFAS Study and NSSS to collect more PFAS data nationwide.

Learn more about the [National Sewage Sludge Survey](#) and the [POTW Influent PFAS Study](#).

What does this mean for WWTPs?

The draft risk assessment is not a regulation and does not compel action. The EPA's draft risk assessment indicates that each of the three common use or disposal options may result in elevated risk levels when sewage sludge with typical concentrations of PFOA or PFOS is managed. With the understanding that eliminating these risks is likely not possible at this time, the EPA recommends, in addition to pretreatment to reduce PFAS at the

source, that WWTPs consider management options or practices that can mitigate or lessen risks. The EPA recognizes that WWTPs may have constrained options for sewage sludge management and changes may not be possible, particularly in the near term. The EPA recommends working with your [state and regional biosolids coordinators](#) for support in sewage sludge management planning.

The EPA is continuing to recommend that WWTPs monitor sewage sludge for PFAS contamination, identify likely industrial discharges and other sources of PFAS, and implement industrial pretreatment programs where appropriate. Doing so will help prevent downstream PFAS contamination and lower the concentration of PFAS in sewage sludge as described in Section C of the EPA's December 2022 memorandum entitled, "[Addressing PFAS Discharges in NPDES Permits and Through the Pretreatment Program and Monitoring Programs](#)." Current science indicates that **lower levels of PFAS exposure present less risk**, so these efforts to identify and reduce PFOA and PFOS in sewage sludge help protect public health and the environment.

WWTPs may choose to evaluate whether additional risk mitigation actions are appropriate to reduce risk posed by certain sewage sludge use and disposal activities. To reduce potential risk associated with land application, consider land-applying in areas that may be less sensitive to PFOA and PFOS pollution, like areas far from fishable waters or with deep protected drinking water aquifers. Consider avoiding land application in fields used to graze livestock or grow feed, especially for dairy cows. Fields used to grow fruits and grain may be better alternatives to those growing hay or leafy greens like spinach or kale. To reduce potential risk associated with surface disposal of sewage sludge consider using disposal sites with composite liners and leachate collection and treatment systems (understanding how that leachate will be disposed or treated). To better understand potential risks from incineration of sewage sludge consider performance testing incinerators to gain information about potential releases of PFOA, PFOS, and other PFAS that may be generated through incomplete combustion. For example, a recently released air method, [OTM-50](#), can help test emissions for more volatile products of incomplete combustion, in addition to using [OTM-45](#) to monitor for PFAS emissions. For more information, please refer to the EPA's 2024 [Interim Guidance on the Destruction and Disposal of PFAS and Materials Containing PFAS](#).

Are there innovative technologies available to remove and destroy PFAS in sewage sludge?

There are several emerging PFAS destruction technologies (e.g., supercritical water oxidation, plasma gasification, pyrolysis and gasification coupled with a high-temperature thermal oxidizer) for sewage sludge. Most are still in the pilot-scale stage and further research is needed to evaluate potential products of incomplete destruction and capacity limitations. The EPA's 2024 [Interim Guidance on the Destruction and Disposal of PFAS and Materials Containing PFAS](#) discusses ORD's PFAS Innovative Treatment Team (PITT)'s research on innovative technologies, and includes a technology evaluation framework for further assessing emerging technologies.

Learn more about the EPA's ORD [PITT](#) research effort on innovative PFAS technologies.

Learn more about funding opportunities for capital projects to treat emerging contaminants through the [Clean Water State Revolving Fund Emerging Contaminants](#).

What are the EPA's next steps after the final risk assessment is released?

After the public comment period has closed, the EPA will consider the comments received, revise the draft risk assessment as appropriate, and prepare a final risk assessment. The final risk assessment will help inform the

EPA's potential future regulatory actions under the Clean Water Act (CWA). If the final risk assessment indicates that there are risks above acceptable thresholds when using or disposing of sewage sludge, the EPA expects to propose a regulation under CWA section 405 to manage PFOA and/or PFOS in sewage sludge to protect public health and the environment. During the risk management deliberation process, the results of the final risk assessment may be integrated with other considerations, such as economic costs and treatment feasibility, to reach decisions regarding the need for and practicability of implementing various risk reduction activities.

Learn more about the EPA's recent actions to address [PFAS in sewage sludge](#).

Review the EPA's [Frequently Asked Questions](#) on the Draft Sewage Sludge Risk Assessment for PFOA and PFOS.

Learn more about the [EPA's Draft Sewage Sludge Risk Assessment for PFOA and PFOS](#).