

PFAS AND BIOSOLIDS

PRODUCED BY CWWA'S BIOSOLIDS COMMITTEE

Information Sheet Objective

The objective is to provide CWWA members and their communications teams with clear, evidence-based information on PFAS in wastewater and biosolids, current Canadian regulatory context, and practical actions (monitoring and source control) that support the safe, continued beneficial reuse of biosolids.



PFAS: Properties, Uses, and Environmental Persistence

Per- and polyfluoroalkyl substances, commonly referred to as “PFAS”, are a family of thousands of human-made compounds that contain linked fluorine and carbon atoms. They have been manufactured globally for over 70 years. These fluorine-carbon bonds in PFAS are exceptionally strong they and resistant to degradation in the environment, which is why they are called “forever chemicals”. Although there are thousands of forms of PFAS, perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) were two of the most manufactured and studied compounds.

The properties of PFAS make them excellent for use as lubricants, repellents, and surfactants and they are found in many commonly used products. PFAS are in food packaging, non-stick cookware, cleaning products, cosmetics, dental floss, textiles, firefighting foams, and many other products that are used in our daily lives.

PFAS Sources



Key Issues Associated With PFAS

PFAS do not break down easily in the environment and are ever present around the world. They are in most soils, sediments, and water. They can also bioaccumulate in people and wildlife leading to adverse health effects.

Health Canada states that PFAS may affect:

- the liver, kidney and thyroid
- bodyweight and metabolism
- the immune and nervous systems
- development and the reproductive system

Definition of Biosolids

When we flush our toilets, all that wastewater is collected at a municipal wastewater treatment plant. After most of the liquid is removed, the solids are recovered and treated to create “biosolids”. Biosolids are rich in nutrients and organics and can be applied to land as a soil amendment. Biosolids must be treated to meet specific Federal and Provincial standards and guidelines through engineering best practices that include the reduction of pathogens, vector attraction, and contaminants.

The Beneficial Use of Biosolids

The land application of biosolids has tremendous value as a nutrient-rich fertilizer on agricultural lands, enriching the soil, sequestering carbon, and positively contributing to a circular economy.

Alternative Approaches to the Agricultural use of Biosolids

In addition to land application, alternative biosolids management options include landfilling and incineration. Transporting biosolids to a landfill for disposal is one method; however, the substantial daily volume of biosolids would rapidly occupy landfill space, increase greenhouse gas emissions, squander essential nutrients such as nitrogen and phosphorus, and result in localized concentrations of PFAS. Incineration, which involves burning biosolids to generate energy, is another option. This process, however, is expensive, requires high temperatures and supplementary fossil fuels to ensure complete combustion, produces greenhouse gases, destroys valuable nutrients, and does not necessarily eliminate PFAS compounds.

Potential Sources of PFAS in Wastewater and Biosolids

Additional inputs can include landfill leachate and contaminated-site treatment waters hauled to WWTPs (with elevated biosolids PFOS observed at plants receiving landfill leachate), historical aqueous film forming foam (AFFF) impacted sites (airports, military bases, training facilities), urban runoff and infiltration/inflow (including impacted groundwater), and hauled wastes such as septage, depending on acceptance controls (Gewurtz et al., 2024; Government of Canada, 2026).



Historical wastewater treatment methods were not designed to address PFAS. New innovative methods are being developed to either destroy or remove PFAS from wastewater, but at this point, are still unproven.

Municipal wastewater treatment plants do not use or produce PFAS. PFAS can enter wastewater collection systems from many upstream sources, including routine household use and washing of PFAS-containing items (e.g., textiles, cosmetics/personal care products, cleaning products, and food packaging residues), as well as discharges from commercial and institutional facilities (e.g., restaurants/food service, hospitals and laboratories, schools, and office buildings).

Canadian Regulatory Limits for PFAS in Biosolids

At the federal level, the Canadian Food Inspection Agency (CFIA) is enforcing an interim standard for PFAS in commercial biosolids imported or sold in Canada as fertilizers, using PFOS as an indicator compound. Effective October 18, 2024, biosolids must contain less than 50 ppb ($\mu\text{g}/\text{kg}$) PFOS (dry weight basis) to be imported or sold as fertilizer (CFIA, Notice to industry: Implementation of an interim standard for PFAS in commercial biosolids, June 18, 2024; CFIA guidance T-4-132).

In Canada, biosolids land application is regulated provincially/territorially (e.g., through permits/licences and beneficial use standards), and approaches to PFAS are still evolving and vary by jurisdiction.

Most provinces/territories do not yet have biosolids-specific numeric PFAS limits, and instead manage PFAS as a contaminant of emerging concern through targeted monitoring, investigation of elevated results, and source control; where PFAS are assessed for land application decisions, it is commonly done using a risk- and pathway-based approach (e.g., expected soil loading and comparison to soil/groundwater guidelines). Quebec is a leading example of a province with explicit PFAS requirements for land-applied residuals (e.g., pulp and paper residuals, municipal biosolids, etc.): its Fertilizing Residual Materials (FRM) Management Code (in force November 1, 2025) sets limits for 13 PFAS, including PFOS (11 ppb) and PFOA (8 ppb) for Class 1 (high-quality fertilizing residuals) materials (Gouvernement du Québec, 2025).

Relative PFAS concentrations in Canadian Biosolids

Since 2009, PFAS levels have been monitored in Canadian biosolids under Environment and Climate Change Canada's Wastewater Monitoring Program (Gewurtz et al., 2024; Government of Canada, 2026). In 2024, 40 PFAS were measured in 33 biosolids samples collected from 11 WWTPs across Canada. The samples were analysed using USEPA Method 1633 (USEPA, 2024). PFOS appeared in all samples (concentrations measured ranged 2.0 –77 ppb), while PFOA was found in 97% of samples (in concentrations up to 5.1 ppb). Most PFOS concentrations were below the CFIA's interim standard of 50 ppb, except two samples from a plant receiving landfill leachate. Dominant PFAS types varied by WWTP, but 5:3 perfluorooctanoate (5:3 FTCA), N-ethylperfluoro-octanesulfonamidoacetic acid (EtFOSAA), short-chain perfluoroalkyl carboxylates, PFOA, and PFOS were consistently detected across sites.

Comparison of PFAS Presence in Biosolids and Alternative Sources

PFAS are widely present in everyday products and environmental media. As a result, wastewater treatment plants typically receive PFAS from households, businesses and, in some cases, industrial dischargers. During treatment, some PFAS compounds may partition into biosolids.

Published studies also show that PFAS are present in other organic soil amendments and consumer products, and concentrations can vary widely by product type and whether there are specific upstream sources of PFAS (Lazcano et al., 2020; Rulseh, 2024).

- **Canadian municipal biosolids (PFOS):** 2.0–77 ppb (dry weight) in 2024 (Gewurtz et al., 2024; Government of Canada, 2026).
- **Food contact papers/packaging:** detectable PFAS have been reported in some food-contact papers at approximately 700–2220 ppb for a set of seven PFCAs (Xu et al., 2013, as cited in ECCC & HC, 2025a).
- **Agricultural pesticide products (example—some insecticide formulations):** PFOS was reported in 6 of 10 insecticide formulations tested at 3,092–19,200 ppb product (Lasee et al., 2022). PFAS in pesticides may originate from ingredients/impurities and, in some cases, from PFAS formed during fluorination of certain plastic containers used for pesticide packaging (Donley et al., 2024; USEPA, 2023).
- **Cosmetics/personal care products (North America):** In a targeted subset of products with measurable fluorine, total PFAS concentrations ranged from 22 to 10,500 ppb product weight (Whitehead et al., 2021). PFAS were detected most as fluorotelomer-based compounds (precursors) in categories such as foundations, mascaras, and lip products.

- **Household dust (homes):** Indoor dust can contain a mixture of PFAS released from treated consumer products and building materials; in one North American study, fluorotelomer alcohols and diPAPs were among the most prevalent PFAS in house dust, with median concentrations on the order of ~100 ppb dust (or higher) (Hall et al., 2020).
- **Key takeaway:** PFAS concentrations in household and personal care products vary widely by product type and formulation; PFAS may be intentionally added (e.g., to improve water resistance/feel) or present as impurities or degradation products and can contribute to PFAS entering wastewater via washing and routine use (Whitehead et al., 2021; Hall et al., 2020).

Source / matrix (analyte basis varies by study)	Concentration	Reference
Canadian municipal biosolids (PFOS; dry weight)	2.0–77 ppb	Gewurtz et al., 2024; Government of Canada, 2026
Food contact papers/packaging (7 PFCAs)	700–2220 ppb	Xu et al., 2013, as cited in ECCC & HC, 2025a
Agricultural pesticide products (PFOS in some insecticide formulations)	3,920–19,200 ppb	Lasee et al., 2022
Cosmetics/personal care products (total PFAS; product weight)	22–10,500 ppb	Whitehead et al., 2021
Household dust (various PFAS; median level)	~100 ppb	Hall et al., 2020

Disclaimer: This comparison combines data from various studies, analytes (e.g., PFOS vs PFAS), matrices, and methods. Values are shown in ppb (ug/kg) for visual reference only and should not be considered directly comparable risk metrics.

Determining Responsibility for PFAS Management

The CWWA and Canada's municipal utilities share the growing concern about PFAS chemicals in our communities and in our environment. Municipal wastewater treatment plants do not use or produce PFAS. They may, however, receive PFAS compounds in wastewater from residents and industry. The true responsibility for PFAS must be with the manufacturers and users of PFAS chemicals. These companies must be encouraged to eliminate or reduce the use of PFAS, and to be responsible for the safe handling of PFAS waste within their own operations before it can be released to our waters or environment. Any legal claims for harm inflicted by PFAS chemicals must be directed to the producers of these chemicals, not to the receivers.

Meanwhile, it is the task of Canada's municipalities to collect wastewater from the homes and businesses in their communities, to treat that wastewater to the best of their abilities, and to manage the treated effluent and biosolids in an environmentally sound and practical method. To do this, utilities will need government policies and funding (federal and provincial) to support continuing research into PFAS treatment and removal technologies and funding to support the implementation of this innovation.



Required Actions and Next Steps

- **Eliminate or dramatically reduce the production and use of PFAS.** Governments must continue to ban, regulate, and enforce the elimination of PFAS from our communities.
- **Demand corporate stewardship of PFAS.** The users of PFAS must be held responsible for the safe handling and disposal of PFAS. These corporations must be required to pre-treat their waste onsite and not allow the release of PFAS to wastewater systems or to the environment.
- **Continue to test and react to results.** It is recommended that all utilities implement a program for routine testing of PFAS in wastewater and biosolids. The appropriate frequency of testing should be guided by local factors such as identified PFAS risks, historical data, and the availability and affordability of testing facilities. Utilities should use consistent sampling plans, specify analytes (PFOS, PFOA, or broader PFAS groups as needed), work with accredited labs, and document QA/QC to ensure reliable decisions. Regular PFAS testing will:
 - Improve stakeholder (public) confidence and reduced reputational risk during public inquiries or media attention.
 - Reduce PFAS loadings at the source—often far more cost-effective than downstream treatment or biosolids disposal changes.
 - Allows utilities to anticipate and respond proactively to evolving regulation (reducing regulatory shock), stronger defensibility in permits and approvals and fewer unexpected disruptions to biosolids management programs.
 - Support data-driven decision-making that helps preserve land application and other beneficial reuse options where appropriate or supports timely transitions to alternatives before program failure occurs.

- Allow better protection of agricultural lands, water resources, and food systems—reducing the likelihood of off-site impacts, community harm, or downstream remediation liability.
- Routine PFAS testing is not just a compliance exercise, it is a risk management, program protection, and governance tool that helps utilities stay ahead of regulatory change, protect beneficial reuse, control liabilities and maintain public trust.
- **Call on governments for support of research and innovation.**
We call on federal and provincial governments to support continuing research into practical and affordable PFAS detection and to financially support the costs of testing. Support innovation and implementation.



References

Gewurtz, S.B., Auyeung, A.S., De Silva, A.O., Teslic, S., Smyth, S.A., 2024. Per- and polyfluoroalkyl substances (PFAS) in Canadian municipal wastewater and biosolids: Recent patterns and time trends 2009 to 2021. *Sci. Total Environ.* 912, 168638.

Government of Canada, 2026. Chemicals Management Plan Wastewater Monitoring Program [WWW Document]. URL <https://data-donnees.az.ec.gc.ca/data/substances/monitor/chemicals-management-plan-wastewater-monitoring-program/?lang=en> (accessed 2.20.26).

Lazcano, R.K., Choi, Y.J., Mashtare, M.L., Lee, L.S., 2020. Characterizing and comparing per- and polyfluoroalkyl substances in commercially available biosolid and organic non-biosolid-based products. *Environmental Science & Technology* 54(14), 8640–8648. <https://doi.org/10.1021/acs.est.9b07281>

Hall, S.M., Patton, S., Petreas, M., Zhang, S., Phillips, A.L., Hoffman, K., Stapleton, H.M., 2020. Per- and polyfluoroalkyl substances (PFAS) in dust collected from residential homes and fire stations in North America. *Environmental Science & Technology* 54(22), 14558–14567. <https://doi.org/10.1021/acs.est.0c04869>

Whitehead, H.D., Venier, M., Wu, Y., Eastman, E., Urbanik, S., Diamond, M.L., Shalin, A., Schwartz-Narbonne, H., Bruton, T.A., Blum, A., Wang, Z., Green, M., Tighe, M., Wilkinson, J.T., McGuinness, S., Peaslee, G.F., 2021. Fluorinated compounds in North American cosmetics. *Environmental Science & Technology Letters* 8, 538–544. <https://doi.org/10.1021/acs.estlett.1c00240>

Lasee, S., McDermett, K., Kumar, N., Guelfo, J., Payton, P., Yang, Z., Anderson, T.A., 2022. Targeted analysis and total oxidizable precursor assay of several insecticides for PFAS. *Journal of Hazardous Materials Letters* 3, 100067. <https://doi.org/10.1016/j.hazl.2022.100067>

Donley, N., Cox, C., Bennett, K., Temkin, A.M., Andrews, D.Q., Naidenko, O.V., 2024. Forever pesticides: A growing source of PFAS contamination in the environment. *Environmental Health Perspectives* 132(7), 075003. <https://doi.org/10.1289/EHP13954>

United States Environmental Protection Agency (USEPA), 2023. Verification analysis for PFAS in pesticide products (ACB Project B23-05b), memorandum dated May 18, 2023.

Rulseh, T.J., 2024. PFAS in biosolids: How big is the danger? Treatment Plant Operator (December 13, 2024).