

Per- and polyfluoroalkyl substances (PFAS) in drinking water supplies: A review of source, pathway, and fate for selected compounds

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About PFAS

Per- and polyfluoroalkyl substances (PFAS) are a large group of synthetic substances often referred to as forever chemicals, with many industrial and domestic applications. They have been linked to cancer, impacts on child development, and immune system disorders. In Scotland, a drinking water standard of 0.1 µg/l for the sum of 20 PFAS compounds was introduced in January 2023.

Purpose of the project

There are many unknowns about the origin, movement, and fate of PFAS in the environment. This project addressed four knowledge gaps to support better understanding of PFAS behaviour in drinking water sources:

- PFAS substances imported and used in the UK
- Atmospheric transport of PFAS
- Sea spray aerosols and PFAS
- Mobility of PFAS in freshwaters

What we did

Scientific reports and papers were reviewed to understand the current state of knowledge on these four topics. Results from Scottish Water's national monitoring of raw water were analysed to better understand PFAS concentrations and compositions (PFAS "fingerprints") in Scotland. This supported an assessment of where higher concentrations of PFAS might be found in Scotland based on potential sources of pollution.

What we found

Many different PFAS chemicals are present in Scotland. Some, absent from the 2023 standard, would be candidate substances for additional monitoring. As well as being derived from local pollution sources such as landfills, wastewater, and industry uses, PFAS can be transported through the air over long distances. PFAS may also be brought to land from the ocean on sea spray aerosols. They can reach freshwater directly, or move through soils to groundwater and surface water. The types of PFAS found (and relative mixtures) can indicate their origin.

What it means

Higher risk for PFAS pollution of freshwater in Scotland has been identified for areas in the Northeast, Central Belt, and South of Scotland due to industrial activity and higher population densities, but also for some regions on the West coast. Although measured concentrations of PFAS currently remain well below the drinking water standard, the findings can support a systematic monitoring of identified higher risk areas to further understand PFAS pollution in the Scottish environment.



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This project is a follow-on of the CREW commissioned project:



Developing risk assessment approaches for PFAS and watch list parameters under the recast Drinking Water Directive

PFAS, 17 β -estradiol, nonylphenol

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