FROM LITTLE THINGS BIG THINGS GROW: LESSONS LEARNT FROM AN ENVIRONMENTAL PFAS INVESTIGATION

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ABSTRACT

Per- and polyfluoroalkyl substances (PFAS) are a large family of over 4,000 man-made chemicals, that consist of a carbon chain linked to fluorine atoms. They are characterised by being extremely stable, resisting high temperatures and being able to repel grease and water, making them useful as coatings or ingredients on many household products and have become infamous for their use in firefighting foams causing major contamination at a number of sites in Australia. Sometimes referred to as 'emerging' contaminants, studies have shown that PFAS can be detected in air, water, soil, plants, animals and humans in urban and sometimes in extremely remote regions. The response to these detections and the policy and guidance on how to manage them, however, is still emerging.

To date, PFAS investigations in Australia have primarily focused on contamination caused by aqueous firefighting foams at airports and defence sites. This paper details one of the first PFAS investigations targeted at the water sector and provides insights, key outcomes, and major learnings from the environmental investigation at the City of Gold Coast's Elanora sewage treatment plant (STP) site.

In May 2020, low levels of PFAS were detected at the Elanora STP site, which led to a large scale environmental investigation spanning over a year. The investigation required sampling and analysis of hundreds of soil, groundwater, sediment, surface water and biota samples. The source of the detected PFAS was not linked to current STP operations but hypothesised to be from historical practices of effluent irrigation and biosolids drying during the 1980s. The investigation concluded that 'in its current state, the environmental and human health risk presented by PFAS on and off-site is considered to be low'.

Some technical learnings from this investigation include:

(1) Normal PFAS Assay (28 suite) was sufficient for risk assessment. Additional analysis e.g. QTOF did not provide additional insights due to high limit of reporting.
(2) Cane toads may be a good sacrificial surrogate species, instead of killing native frogs
(3) Gridded approach for soil, sediment and groundwater sampling based on contaminated land guidelines resulted in large sample numbers (in addition to QA/QC). Results indicated that sample numbers can be streamlined for future investigations.

Key learnings from the investigation process include:

(1) Importance of early and ongoing engagement with Department of Environmental Sciences and Queensland Health,
(2) Time allocation for 'double regulation' scenario where the Suitably Qualified Person provides guidance and advice, the Contaminated Land Auditor also comments and then the environment and health regulators also have the opportunity for further discussion,
(3) Positive customer interactions and potential for streamlining the information gathering process,
(4) Preliminary ecological investigations that were required to assess likely risk to local biota, prior to an established source-receptor pathway,
(5) Underestimation of the waste generation from an investigation and waste management that would be required (due to detection at any concentration being considered 'regulated'),
(6) Request for "check-points" for future investigations: e.g. despite evidence presented by the City and university academics (Griffith Uni, UQ and USC) that the risk to biota in the local area was low, the investigation required us to test hundreds of native specimens for PFAS.
(7) As STP's are unlikely to be a single-point-source contamination, the "outside-in" framework may not be directly applicable for the distributed nature of PFAS sources

To understand the sources of PFAS entering our STPs, the City's Source Control program has sampled sewage catchments and some commercial customers. Apart from some point sources, it appears that the majority of the load of PFAS arriving at our four sewage treatment plants is from residential properties. Whilst the two main PFAS (PFOS and PFOA) are being phased out, many other PFAS and their precursors are still in production, and therefore, the water industry is facing a long-term problem. As an industry, we need to work with our regulator to find more efficient ways to react to and manage potential contamination at future sites.

SHORT PRESENTER BIOGRAPHY

Kelly Hopewell is the Coordinator of Process Engineering at the City of Gold Coast. Kelly has worked in the water industry for over twenty years and has a passion for ensuring efficient and sustainable sewage treatment plant processes. Graduating from a Masters of Environmental Engineering in 2017, with focus on PFAS, she put her hand up to internally project manage this Environmental Investigation, alongside the co-authors listed and the City's Professional Services Partners (WSP/Stantec).