

Immobilization of Per- and Polyfluorinated Alkyl Substances (PFASs) in Fourteen Soils from Airport Sites across Australia

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Background/Objectives. Aqueous film forming foams (AFFFs) are a class of fire-fighting foams that contain per- and polyfluorinated alkyl substances (PFASs). In 2009, some PFASs were listed as persistent organic pollutants (POPs) by the Stockholm Convention due to their potential toxicity effects. PFASs are highly soluble in water and so tend to readily leach from contaminated soil into groundwater, thus posing a potential risk to human health and the environment.

Immobilization of PFAS contaminants in soil provides a rapid remediation method to reduce source leaching at site or to mitigate long-term leaching in landfill. In this study, the ability of a novel aluminum hydroxide-based adsorption product, RemBind™ Plus, to reduce PFAS leachability in these soils was tested.

Approach/Activities. The 14 test soils were air-dried, de-agglomerated, screened and thoroughly homogenized before analysis. Duplicate samples of each soil were sent to Australian Laboratory Services (ALS) and analyzed for an extended suite of 20 PFAS compounds, including perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA), using LC-MS/MS for total concentrations (mg/kg) and leachable concentrations ($\mu\text{g/L}$). Leachates were prepared using the Toxicity Characteristic Leaching Procedure (TCLP; USEPA Method 1311) at pH 5 and 7.

Based on the baseline analysis, duplicate sub samples of each soil were treated with various addition rates of the commercial adsorbent and sent for leachability analysis as above. Selected samples were also analyzed using the stringent Multiple Extraction Procedure (MEP; USEPA Method 1320) simulating 1,000 years of acid rain in an improperly lined sanitary landfill.

Results/Lessons Learned. In all cases, the commercial adsorbent was able to reduce the concentrations of PFOS and PFOA in soil leachates to below the Minnesota Department of Health drinking water guideline of $0.3 \mu\text{g/L}$ at relatively low addition rates.

Immobilization using RemBind Plus therefore provides a rapid, easy and cost-effective and effective remediation strategy for mitigating the impact of PFAS on the environment with proven long-term stability. The main disadvantage of this approach is that it does not destroy the PFAS contaminants but oxidation processes for these compounds are energy intensive and relatively expensive.

