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Design considerations for a field experiment using sorbents for in-situ stabilization of per- and polyfluoroalkyl substances (PFASs) in groundwater at a contaminated site

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Per- and polyfluoroalkyl substances (PFASs) have been used in numerous products such as fire-fighting foams. Due to their exceptional chemical stability, they are very difficult to degrade and are extremely persistent and widespread in the environment. The potential toxicity of many PFASs has caused an urgent need to protect water resources and stop further spreading of PFASs from contaminated hot spots. However, there are currently no established methods for PFAS in-situ remediation. Instead, long-term pumping with treatment of contaminated water is common. As the first step towards effective in-situ remediation, the StopPFAS project aims at developing efficient methods to sorb and immobilize PFASs in plumes in groundwater originating from hot spot areas. As part of the project, a pilot-scale field experiment with sorbents will be performed at a PFAS contaminated former fire-fighting training site in Arboga, Sweden. Liquid activated carbon, PlumeStop®, will be directly injected to the soil to immobilize PFASs and stop further migration. A challenge is to design the pilot-scale experiment so that the effect of the injected sorbents on PFAS migration can be thoroughly evaluated and generalized to a larger area. This study presents the on-going characterization of the contaminated site together with analyses and implications for successful design and planning of the pilot-scale test. Laboratory batch- and column tests using sorbents and field soils are being performed in parallel as well as reactive transport modelling of the PFAS migration and sorption also aiding the field test design. Understanding the geology of the field site, the groundwater flow pattern and the migration of the contaminant plume, including several PFASs with different sorption characteristics are important for the design of the pilot-scale experiment.