Stabilization of PFAS Soil at a Swedish Military Site - Reducing the Carbon Footprint

Background

The installation of a new petroleum storage tank was planned at an active fire training area at a military site in Sweden. Routine fire-fighting training has resulted in the area being contaminated with Per- and Polyfluoroalkyl substances (PFAS). For the tank installation, a total of 1,000 tonnes of excavated soil required management, with total PFAS concentrations ranging between 140 and 1,100 µg/kg.

Historically, construction projects of this type have been carried out using a dig-and-dump strategy. This involves categorising the soil as a waste (which prevents it from being reused onsite) and transporting it to a remote landfill site that accepts PFAS. Virgin fill material is then imported to site. Not only is this strategy unsustainable, but it has a relatively high carbon footprint.

Methodology

For this project, a new, more sustainable approach was proposed by Envytech. The soil was excavated and categorised as usual, but then it was stabilized with 1 to 2% RemBind, a proven sorbent, that reduces the leachability of PFAS in soil.

Outcomes

Treatment of the soil with RemBind resulted in significant reductions in leachability of all PFAS species tested, as determined by test method EN12457/3 (L/S 2). The main PFAS analyte, PFOS, was reduced by >99.9% from 400,000 ng/L to <10 ng/L (Table 1). This allowed the soil to be re-categorised and reused as fill material on site.

Table 1: PFAS leachability before and after stabilization

PFAS Analytes	Units	Untreated Soil	Treated Soil	Reduction in Leachability
6:2 FTS	ng/l	1300	<10.0	>99%
PFBA	ng/l	220	<10.0	>98%
PFBS	ng/l	120	<10.0	>96%
PFDA	ng/l	<100	<10,0	>95%
PFHpA	ng/l	270	<10,0	>98%
PFHxA	ng/l	1200	23 ±7	>98%
PFHxS	ng/l	500	<10,0	>99%
PFNA	ng/l	<100	<10,0	>95%
PFOA	ng/l	830	<10,0	>99%
PFOS	ng/l	400 000	<10,0	>99%
PFPeA	ng/l	480	<10,0	>99%

Note 1: Method EN12457/3 (L/S 2) was used to test PFAS leachability.
Note 2: Where a measurement was below level of reporting (LOR), a value of 50% of the LOR was used.

Conclusions

Overall, the solution adopted by Envytech saved the project owner significant time and money and had a lower carbon footprint than the normal dig-and-dump process. This paves the way for a more sustainable approach to these types of projects going forward, consistent with the principles of a Circular Economy.

Figure 1: PFAS being immobilized with RemBind at a Swedish military site

Z096-01 03/23