

In Situ PFAS Remediation Protects Offsite Environment at Airport in Norway

SourceStop Barrier Prevents PFAS Contaminant
Migration During Impacted Soil Excavation





Summary

SourceStop®, a colloidal activated carbon (CAC), was applied as a permeable sorptive barrier to reduce PFAS migration hydraulically, downgradient of a source area at an airport in Norway where highly contaminated soils were removed. Through nine months of monitoring, the two primary PFAS of concern, PFOA and PFOS, have been reduced by 96% and 98%, respectively, while Total PFAS has been reduced by 94%.

Background

Large PFAS Source Area Remediation Implemented at Airport in Norway

At Haugesund Airport in Norway, Avinor and their environmental consultant COWI implemented a remediation plan to reduce the migration of PFAS (per- and polyfluoroalkyl substances) in groundwater from a fire training ground where aqueous film-forming foam (AFFF) was used. The remediation included excavating approximately 7,400 tons of contaminated soil from the source area, containing an estimated 14 kilograms (kg) of PFAS, and transporting it to a PFAS landfill.

It was anticipated that excavation of the PFAS-impacted soils could lead to further desorption into the groundwater through disturbance. This mass, plus that already existing in the groundwater beyond the excavation limits required remediation to protect the downgradient environment. Consequently, COWI requested an in situ remediation solution to minimise the further migration of PFAS in groundwater during and after the source removal measures were completed.



Avinor is a state-owned limited company and operator of 43 Norwegian airports.





In Situ Remediation

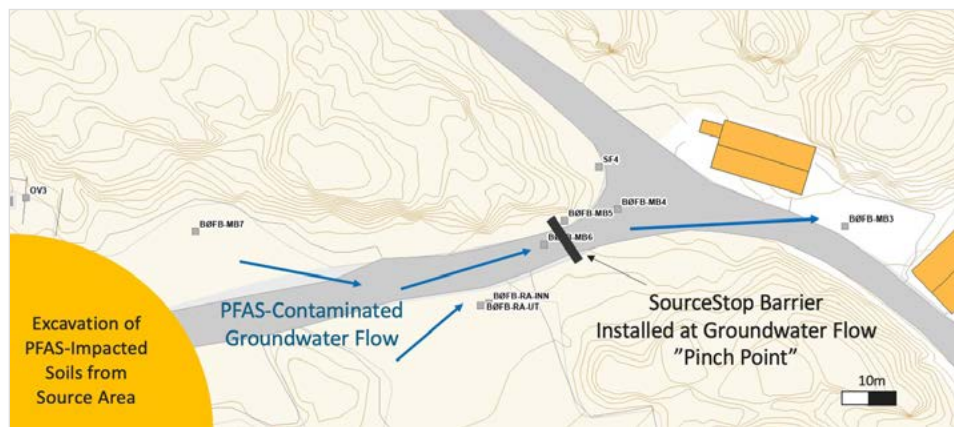
SourceStop Permeable Sorptive Barrier Implemented to Reduce PFAS Migration in Groundwater During and After Source Area Removal

A SourceStop CAC permeable sorptive barrier was designed and implemented downstream of the excavation area to mitigate the ongoing dissolved-phase transport of PFAS during and post-excavation. The selected location for the barrier was within a narrow gap (i.e., 'pinch point') in the crystalline bedrock through which the groundwater flowed beneath an airport roadway.

Figure 1

SourceStop Barrier Location

Map depicting location of SourceStop barrier.





Excavation where the SourceStop barrier was implemented, shows crystalline bedrock geology.

The barrier was constructed by excavating the surface materials and broken crystalline bedrock to a depth of 1m, spanning the hydrologic pinch point. SourceStop was thoroughly mixed with imported sand using an excavator and placed into the excavation. Care was taken to ensure that the SourceStop was evenly distributed throughout the barrier treatment zone. Following the barrier's installation, sub-base granular material was placed on top, and the roadway was restored.

The final barrier dimensions were 10 m long by 3 m deep by 1 m wide (along flow). The barrier was installed two months before the excavation took place. Installation was rapid, requiring only two days in the field for completion.

The intention of the barrier was to adsorb the influx of PFAS contaminants while permitting groundwater to flow through it unimpeded. As such, the SourceStop CAC barrier effectively operates as an in situ purifying filter for PFAS.





Results

SourceStop Barrier Reduces PFAS Mass Flux in Groundwater by 94% to 98% Through 9-Months of Performance Monitoring

In the nine months since the SourceStop barrier was installed, the average PFOS concentration was reduced by 96% and PFOA by 98% compared to the ingress concentrations. The total PFAS (sum of 35 analysed PFAS) concentration was reduced by 94%. These results demonstrate the achievement of the remedial goal.

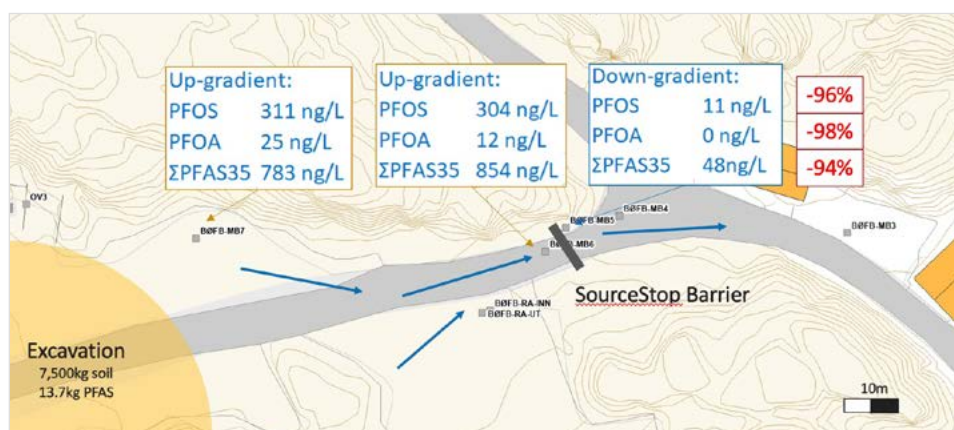
Higher PFAS concentrations further downgradient of the barrier are expected to decline over time as the removal of source mass and reduction of residual PFAS mass flux by the SourceStop barrier upgradient begin to be reflected by these more distant wells.

Figure 2

Performance Data

PFAS concentrations are shown upgradient and downgradient (treated) of the SourceStop barrier through nine months following the SourceStop barrier installation

Credit: COWI

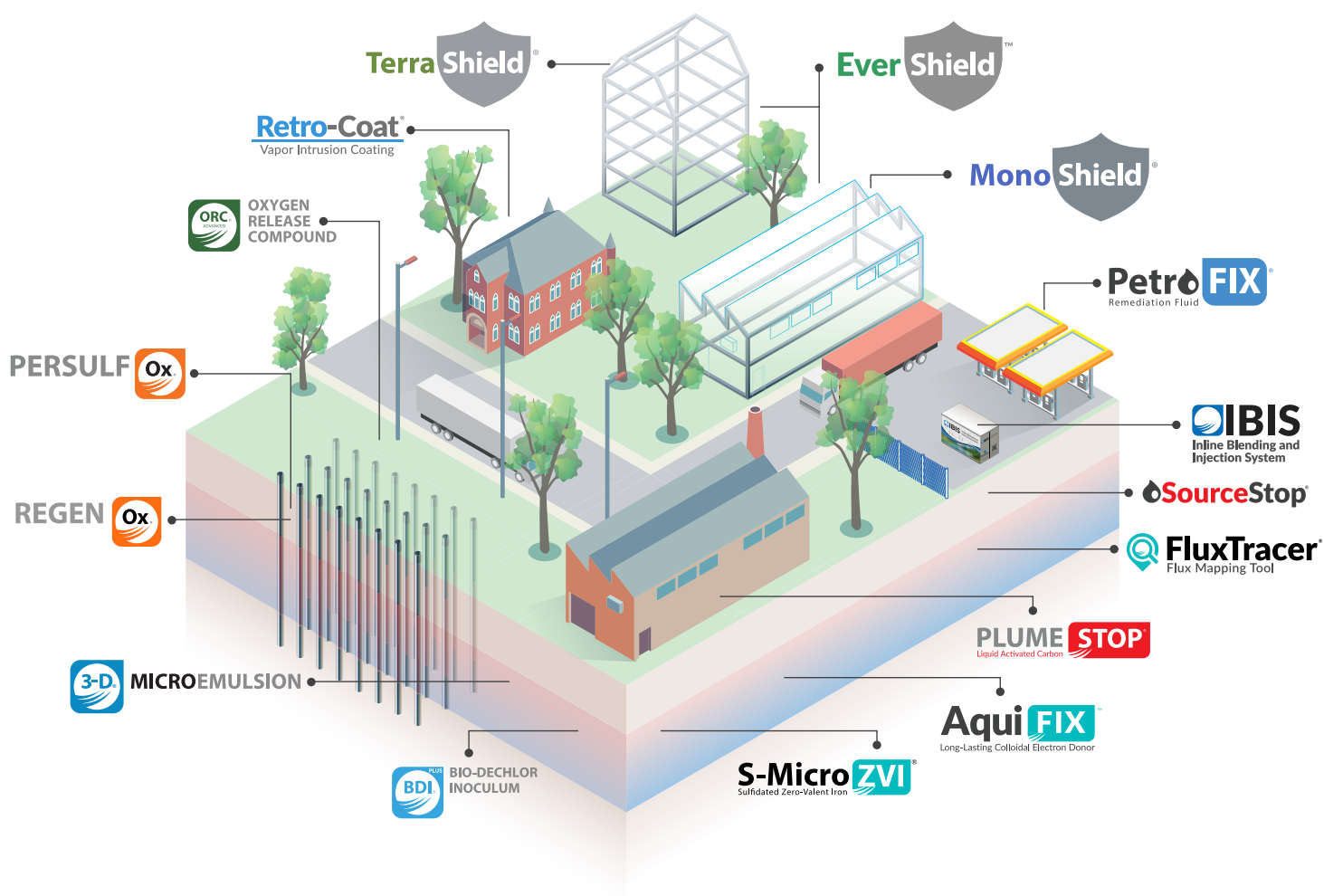


Conclusion

SourceStop Will Continue to Treat PFAS-Impacted Groundwater with No Pumping or Waste Produced

The SourceStop CAC barrier was rapidly implemented and has since remained effective at preventing PFAS migration, achieving the project objective. The performance monitoring wells will continue to be used by COWI for long-term monitoring. The permeable sorptive barrier filters PFAS out an estimated 2,500 litres per day, providing ongoing protection of the downgradient environment without pumping, an external power source, or waste generation.





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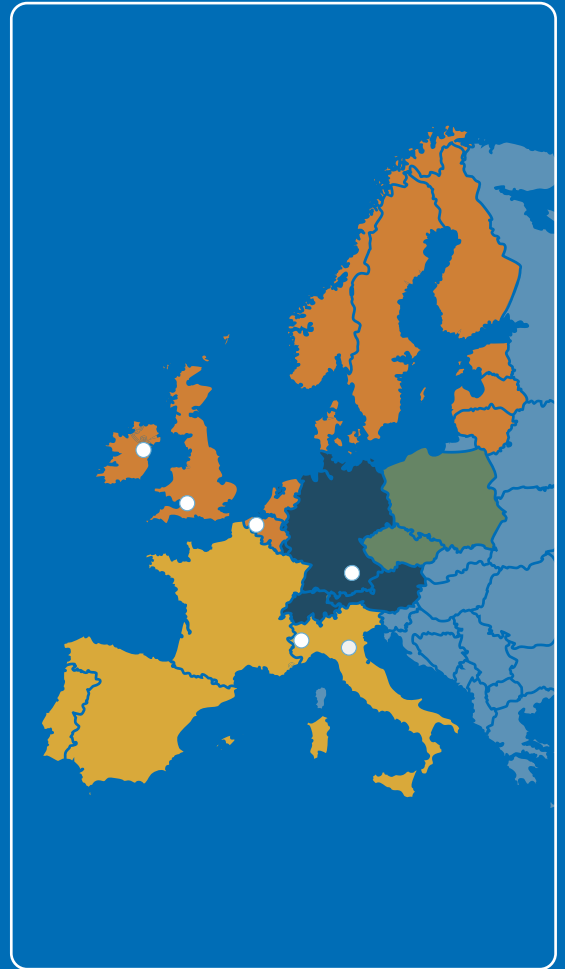
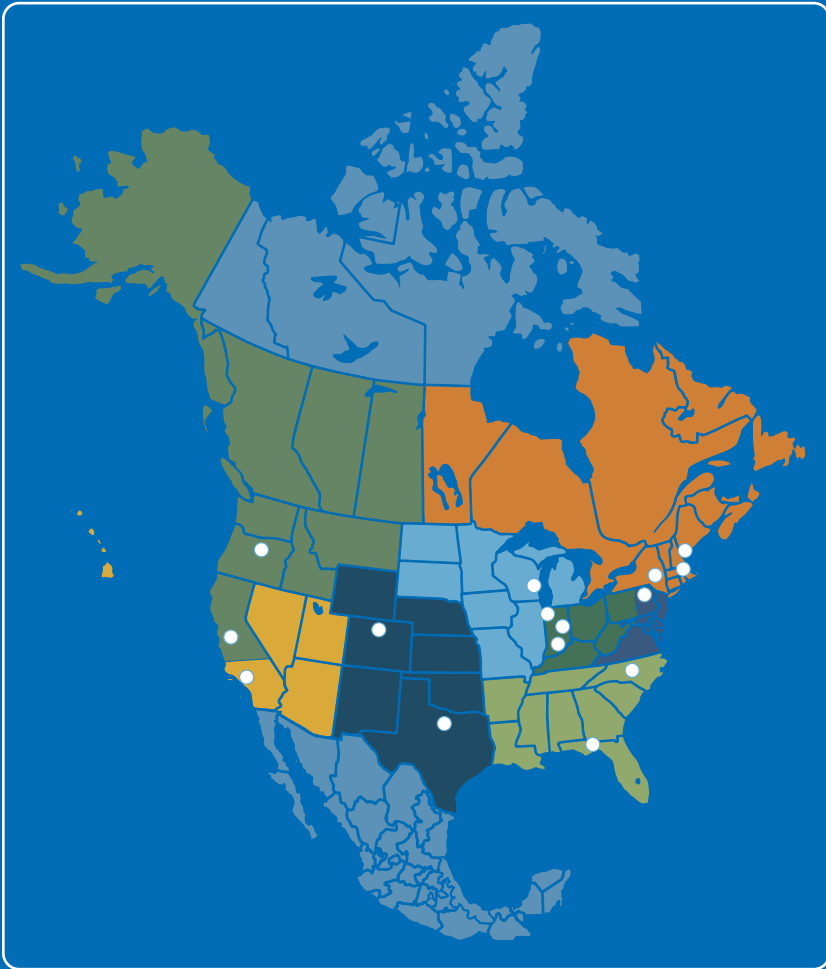
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