

PetroFix remediation under an operational petrol filling station

REGENESIS

CASE STUDY

Injectable permeable reactive barrier
prevents offsite risk

INTRODUCTION



Fuel losses at an operational petrol filling station (PFS) in the UK resulted in light non-aqueous phase liquid (LNAPL) seasonally building up under the forecourt. High levels of dissolved phase contamination was shown to be migrating beyond the site boundary and providing a potential off-site liability.

It was decided that voluntary remediation should be completed to prevent offsite advection and **SLR Consulting** concluded that the most sustainable remedial design for the site would be the installation of an injectable permeable reactive barrier (IPRB) using **PetroFix[®]** colloidal activated carbon. SLR partnered with **REGENESIS** to design and apply the solution.

Fig. 1 Plan view showing the contaminant plume (purple), PetroFix IPRB (orange) and groundwater direction (blue) ©SLR Consulting



APPLICATION

A 15m long PetroFix barrier was installed on the downgradient site boundary, from the top of the groundwater at 1mBGL to the base of the sand and gravel layer at 5mBGL.

Injection was completed using a Direct Push Technology (DPT) rig, injecting 16 points across the target zone. Prior to installation, each injection location was cleared of buried services through a survey, concrete coring and hand-excavation to 1.2mBGL, then backfilled with bentonite. The existing monitoring well array was maintained and used for validation purposes.

The application works took REGENESIS Remediation Services only 15 days, with the PFS remaining operational throughout and only the fuel dispensers nearest to the remediation works being closed off to the public.

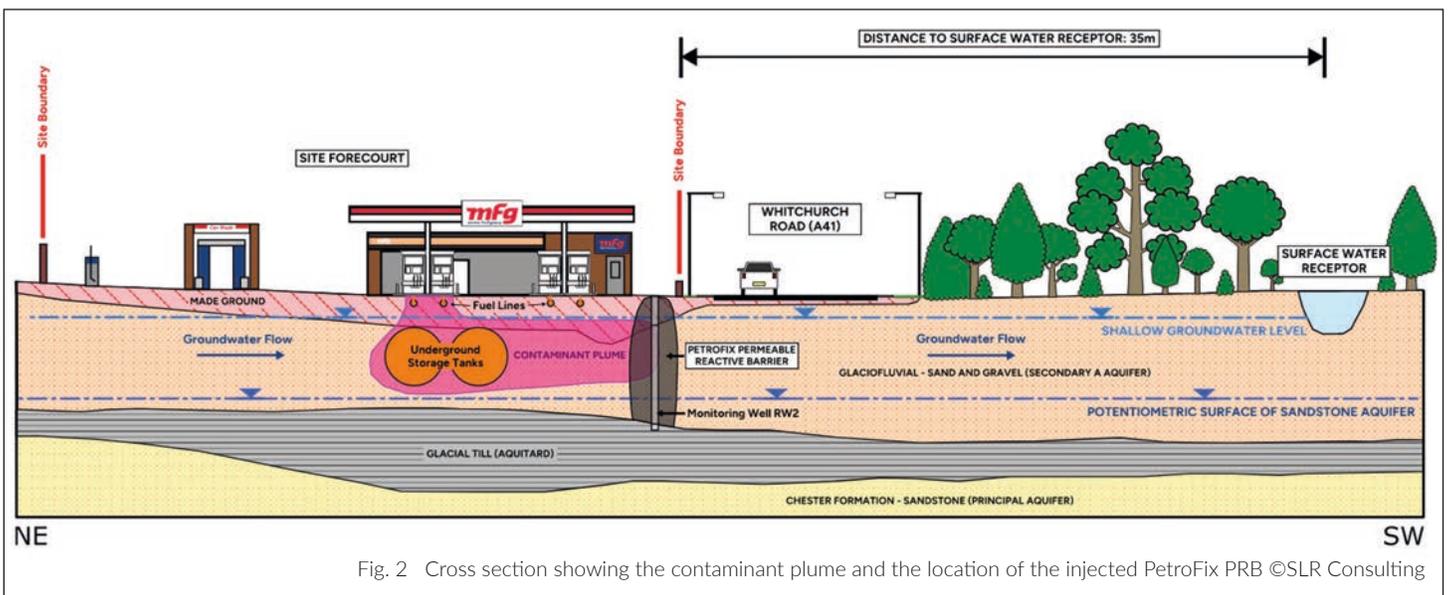


Fig. 2 Cross section showing the contaminant plume and the location of the injected PetroFix PRB ©SLR Consulting



Fig. 3 The PFS maintained operational during the remediation works ©SLR Consulting

RESULTS

Validation of the IPRB's performance was completed by performing six groundwater monitoring visits over the following 12-month period to evaluate dissolved phase concentrations within the downgradient monitoring wells.

Validation showed that terminal electron acceptors supplied by the PetroFix had increased significantly: nitrate, from 0.09mg/l pre installation to 56mg/l post installation, sulphate 0.5mg /l pre installation to 620mg/l post installation.

The validation groundwater monitoring recorded an average 98% reduction in Total Petroleum Hydrocarbons (TPH), 96% reduction in BTEX and a 96% reduction in benzene concentrations.

The recorded concentrations in the validation groundwater samples were below the derived Site Specific Acceptance Criteria (SSAC) and demonstrated that all remedial objectives had been met.

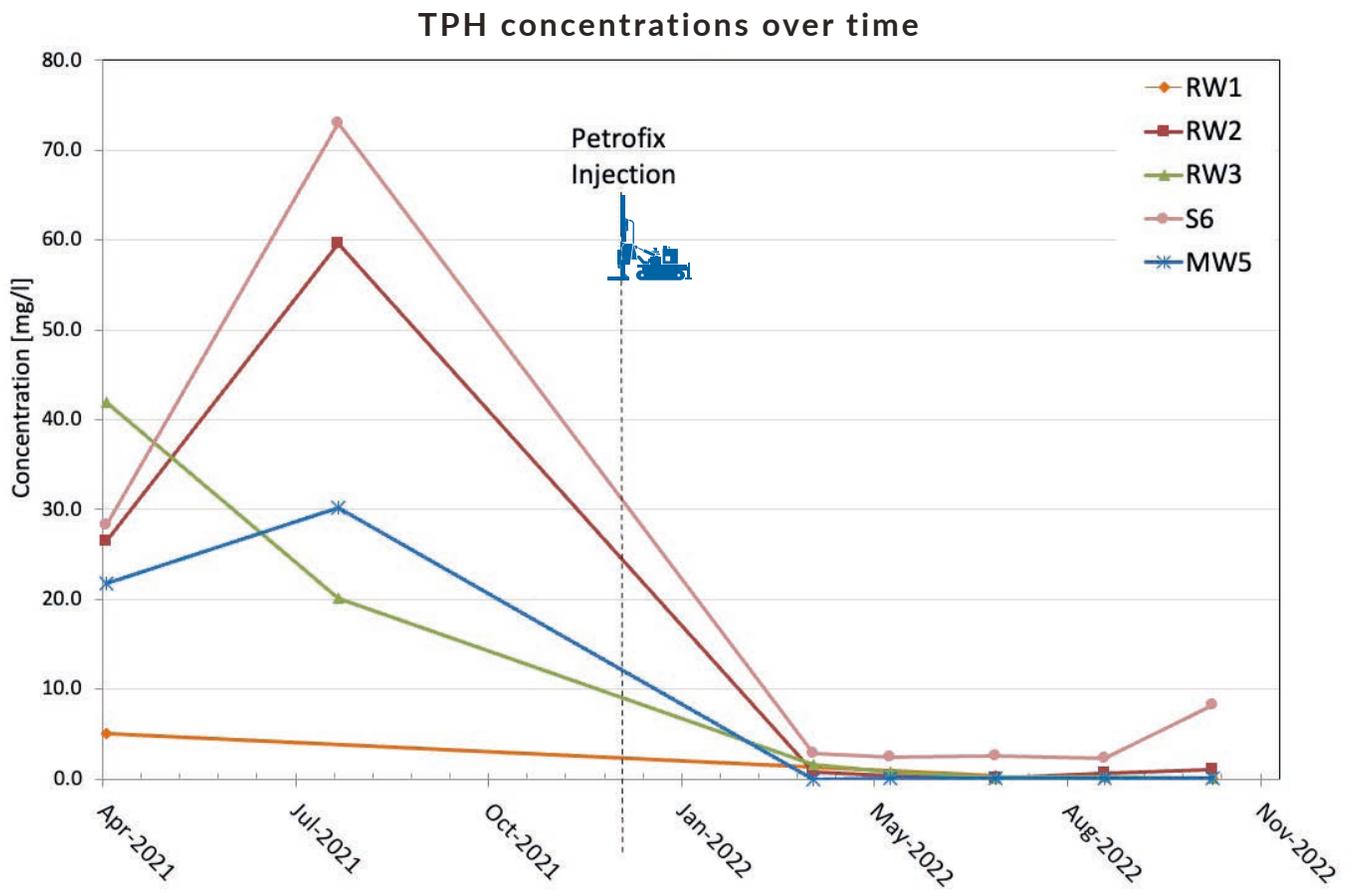


Fig. 4 TPH concentrations over time ©SLR Consulting

Benzene concentrations over time

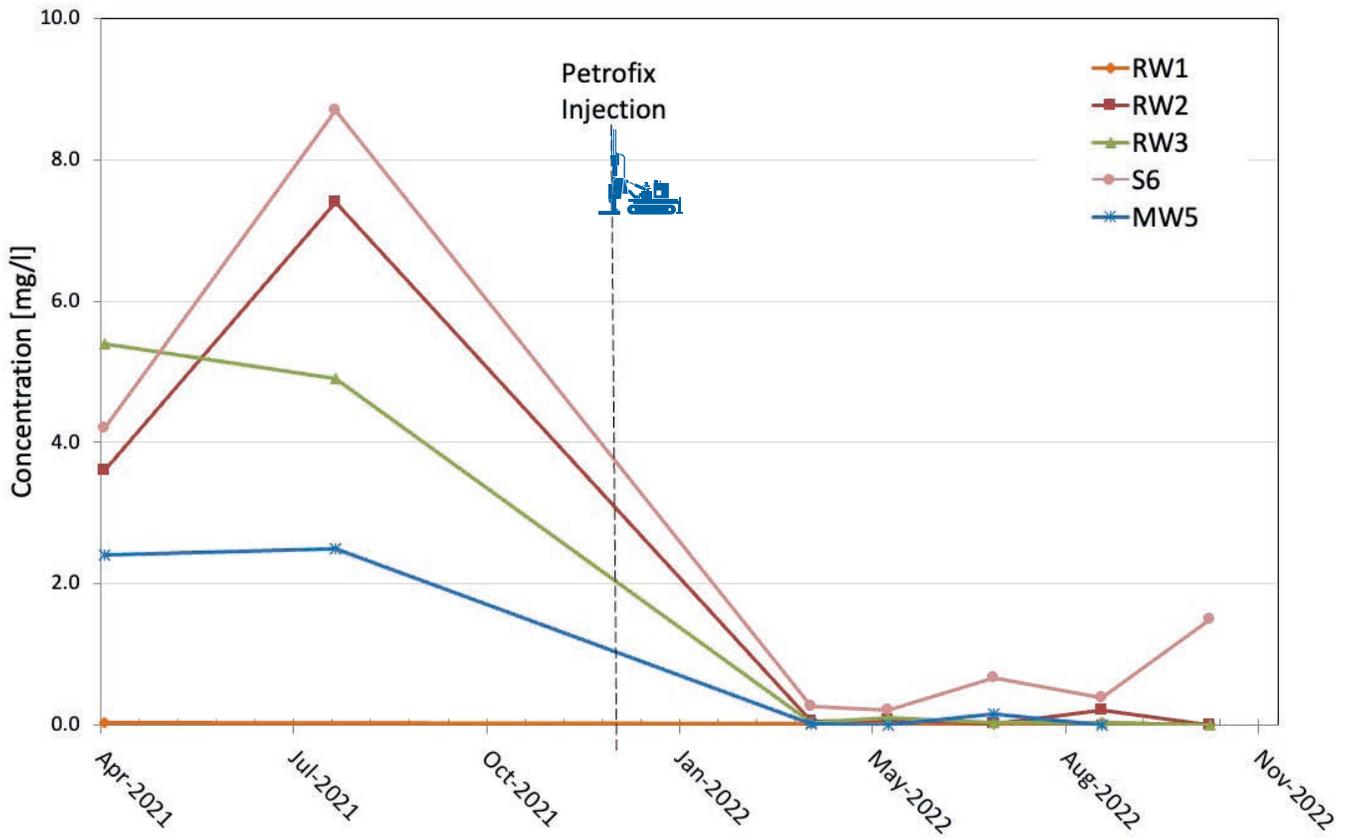


Fig. 5 Benzene concentrations over time ©SLR Consulting

BTEX concentrations over time

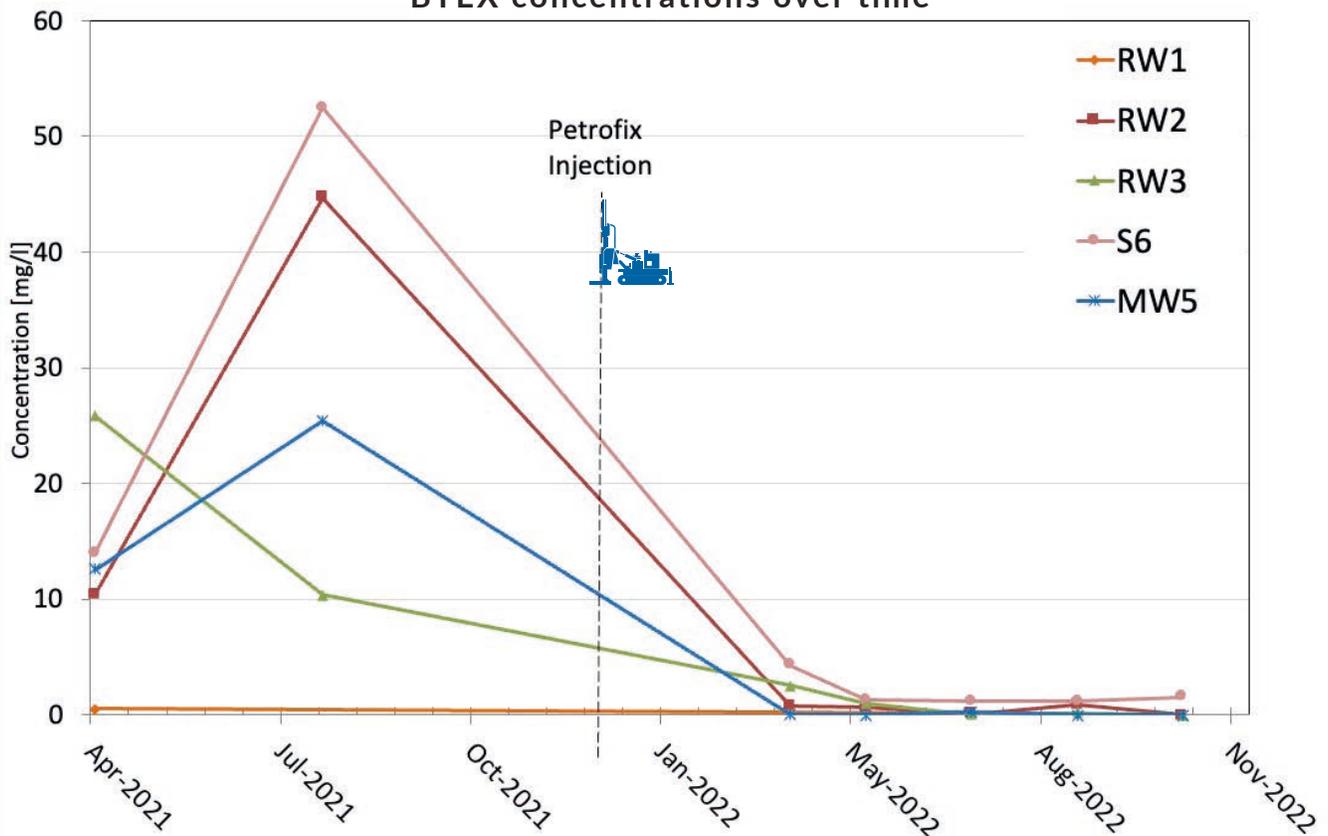


Fig. 6 BTEX concentrations over time ©SLR Consulting

CONCLUSION

The works were completed and met the objectives within 12 months. The project was **delivered for <£100K, with only minimal disruption to site operations**. This remediation method was completed at significantly lower cost and in less time than alternative traditional techniques, such as excavation and pump and treat.

The PetroFix IPRB was **the most sustainable option for the site**: Compared to a source excavation approach, the project prevented up to 55 wagon loads of soil disposal. Substantial energy savings were also made when compared with operating a groundwater treatment plant.



SLR considers that the use of PetroFix colloidal activated carbon IPRBs provide an ideal sustainable remedial solution for managing legacy groundwater liabilities on operational PFS sites, particularly during the uncertainties associated with energy transition and the changing role of PFS sites.

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