

# Remediation

## Dual Phase Extraction & BioSparging - Hampshire

A loss of 2000 litres of heating oil occurred adjacent to a grade A chalk stream in Hampshire. The property is located on a chalk stream flood plain. The flint gravels underlying the site allowed the rapid migration of the oil to the chalk stream, which runs through the garden of the property.

Ecologia undertook a detailed survey to assess the spread of the contamination and to delineate the plume. The plume was found to have migrated beneath an engineered section of the river to the opposite side. Free product was also found to have migrated beneath a listed building which precluded excavation of the contaminants. A traditional dual phase extraction system would not be effective in the highly permeable gravels, so the development of an innovative technique was required.

Ecologia implemented an *in-situ* remediation method, coupled with detailed monitoring, to allow the free product to be removed and the adsorbed and dissolved oils to be biodegraded. An aquifer test was undertaken, involving monitoring of groundwater table movement during pumping and after rainfall events. The hydraulic conductivity was found to be very high, requiring that several extraction pipes would need to be incorporated into the remedial design. This produced a problem of how to select the correct extraction pipe as the groundwater levels changed rapidly following rainfall. Ecologia overcame this difficulty by designing an automated system which monitored the groundwater depth every minute. This provided direct feedback to the treatment unit control system so that the unit would automatically select the extraction pipe at the correct depth, ensuring removal of the free phase oil.

The next obstacle which was overcome on this project was the discharge of the contaminated groundwater. The extracted groundwater was treated in a multi-stage reactor to drinking water standard. Ecologia were required by the Environment Agency to sample the discharge to the river daily (no sewer connection was available). Ecologia installed an automated Total Organic Carbon analyser to monitor the discharge continuously and to provide direct feedback to our office via telemetry. The use of this automated discharge monitoring had a cost saving for the client of £20,000 and provided much better 'real time' data than manual sampling. The treatment unit was fully automated so that if the discharge breached the consent limit it would shut down to halt discharge of contaminated water to the river.

Following the successful removal of the free product, the remediation system was modified to facilitate in-situ bioremediation of the dissolved oil in the groundwater by sparging oxygen into the groundwater. The horizontal extraction pipes were used to inject compressed air into the groundwater while the extraction continued in an adjacent trench, thus allowing the oxygenated groundwater to be 'pulled' between the trenches. Work prior to the installation of the system had identified that the oxygen concentration within the groundwater was the main limiting factor to in-situ biodegradation.

Operation of the system was accompanied by a detailed monitoring and evaluation programme, in close collaboration with the Environment Agency. The increase in the oxygen concentration levels led to the effective degradation of the remaining hydrocarbons to a level acceptable to the regulators, thereby removing the risk. Ecologia achieved an agreed sign-off for the project in September 2005.

