Case Study: Low Cost In Situ Remediation on Oil-Contaminated Soil

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Background/Objectives. The area Preem 2 in Karlstad, Sweden is a fuel depot that was demolished in 2007-2008. Since 2008, the consultants at Sweco have conducted a number of site investigations to determine the specific geology, hydrology, contaminant type and level of contamination. The investigations showed that an area of 21 000 m^2 were polluted from 0-3 meters below ground level, in both soil and groundwater, representing a total contaminated soil volume of 64 000 m^3 (100 000 tons). The site investigations resulted in data that were used as a base for planning full-scale remediation work which was done by RGS Nordic.

Approach/Activities. After targeted investigations and pilot testing, RGS Nordic designed and implemented a full-scale in situ remediation in spring 2013, using the remediation methods biosparging and bioslurping. Two-hundred and thirteen biosparging wells and 40 combined biosparging/bioslurping wells were installed within the area. The bioslurping wells were installed where free phase hydrocarbons were located. Bioslurping extracts the free phase oil and treats both the soil, unsaturated zone, of volatile and semi-volatile organic contaminants by creating a mass flow using negative pressure. Biosparging was used to treat volatile organic contaminants around the saturated zone by pushing air into the ground and to favor the aerobic biodegradation process.

Results/Lessons Learned. The system was originally designed to operate for 20 months but operated in approximately 20% of the original area for an extension of 24 months. During 6 months of the originally planned period, the use of metal filters in the biosparging wells did not work as planed since the metal wells became clogged with rust, and new plastic wells had to be installed to obtain efficient remediation effects. The last 16 months of the extended operating time RGS Nordic had completed its commitment to remediate the groundwater but used the time to help the client to also reduce the soil pollution levels within the area.
The contaminant levels within the area are now under the clean-up target for both groundwater and soil. The monitoring showed that all of the free phase in the area was gone in the second year of operation. Using the in situ methods, including minimal excavation in the hot spot source area around the oil containing wastewater pipes and tanks, a minimum of 104,000 kg o foil contamination has been removed from the area. The in situ remediation has to date cost 100 SEK (13 USD) per ton contaminated soil, only 10-15% compared to the cost should the client have chosen remediation by excavation.

By December 2017, verification samples will be taken to check that the levels are still below the remediation target.