

Case Study: Use of Lines of Evidence to Identify Multiple Sources of a Chlorinated Solvents Plume

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Background/Objectives. The area of concern is a former industrial unit, where chlorinated solvents were stored and manipulated. Since 2003, the site has been disabled. Its neighborhood is a residential and commercial area.

When Geoklock assumed the case there were environmental investigation data that pointed out the existence of a chlorinated solvents plume, which extended beyond the property boundaries. The chloroethene's concentrations were identified immediately downstream, but also around 150m away from the known source, in monitoring wells installed right after a commercial facility.

The concentrations identified 150m downstream were at the same order of magnitude of the site hotspot (therefore above SSTLs for residential receptors), despite the fact that the local groundwater flow velocity was expected to be fairly low (clayey soils). Due to that a possible source inside the commercial area could not be discarded.

This case study aims at presenting the use of lines of evidence to identify multiple sources of a chlorinated solvents plume.

Approach/Activities. The study approach was to combine different lines of evidence in order to clarify whether it was or not a multiple sources case.

The first step was a forensic investigation, comprising of a stable isotope analysis and a mathematical modelling for the area of study, based on the existing wells surrounding the known hotspot, as well as the plumes at downstream boundary. The obtained results demonstrated the need for further investigations within the commercial facility.

The second step was an environmental auditing of the commercial facility to identify potential sources, besides a horizontal screening using soil vapor passive samplers.

Based on the generated data, the local environmental agency has demanded access to the commercial facility. After that it was possible to locate additional points of investigation within it, including boreholes for soil sampling and monitoring wells installation.

Results/Lessons Learned. The forensic lines of evidence proved that it was necessary to investigate the commercial facility. While the mathematical modelling indicated that it was unlikely that the known source could have generated the concentrations identified at 150m downstream, the isotopic study showed a higher degradation degree in the hotspot area in comparison to the downstream border. That was considered a strong evidence of the existence of an additional source inside the commercial area.

That evidence was later confirmed through a traditional investigation approach.

The adopted approach, combining multiple lines of evidence, provided a more realistic and comprehensive conceptual site model.