

# Treatment of Chlorinated Solvents in Bedrock, Germany

## HRC Barriers Treat Contamination in Sandstone under a School

with consultant: AMEC

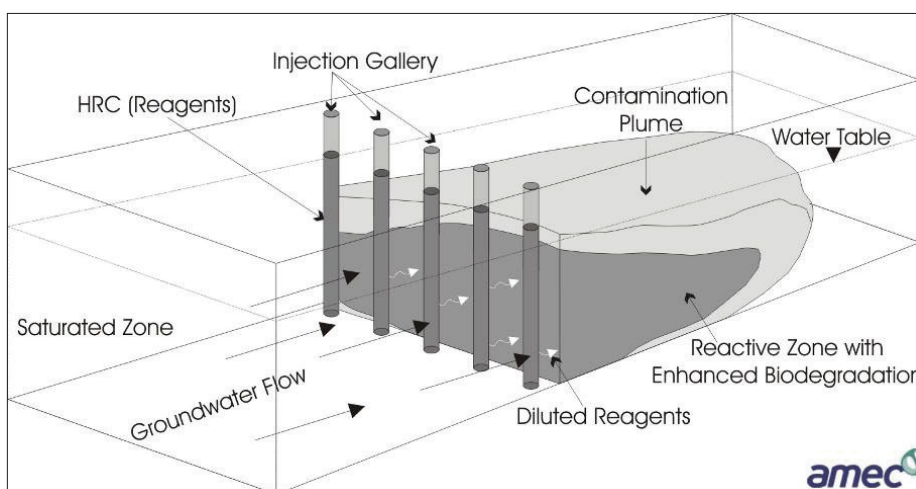


### Summary

Due to an industrial spill, high concentrations of chlorinated solvents were measured in a sandstone bedrock in southwest Germany. The plume was found to extend beneath a primary school and remediation was required in order to reduce the risk posed to human health.

### Treatment

Four rows of application wells were drilled into the bedrock across the site, perpendicular to the groundwater flow. HRC and HRC X were gravity-fed into the wells in order to disperse and diffuse into the surrounding bedrock. This created and maintained four optimum zones of enhanced reductive dechlorination, through which groundwater would pass, but the chlorinated solvent contamination would be degraded.



### Remediation Details

#### Site Type:

Industrial and Residential

#### Remediation Driver:

Human Health

#### Remediation Approach:

Gravity application into drilled wells in rows to form barriers

#### Remediation Technologies:

HRC® and HRC X®

#### Geology

X	Bedrock
	Gravel
	Sand
	Silt
	Clay

#### Medium

X	Groundwater
	Saturated Soil
	Vadose Zone

#### COC

	Petro HCs
	Petro LNAPL
X	Chlorinated VOCs
	Metals

#### COC Concentration Levels:

Up to 11,000 µg/L PCE

#### Treatment Depth:

3-9 m BGL

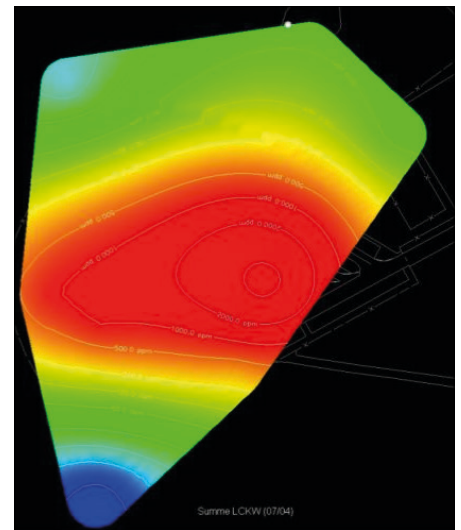
#### Treatment Area:

3 Hectares

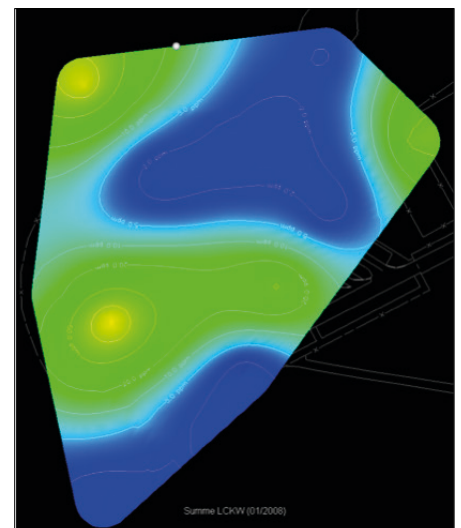
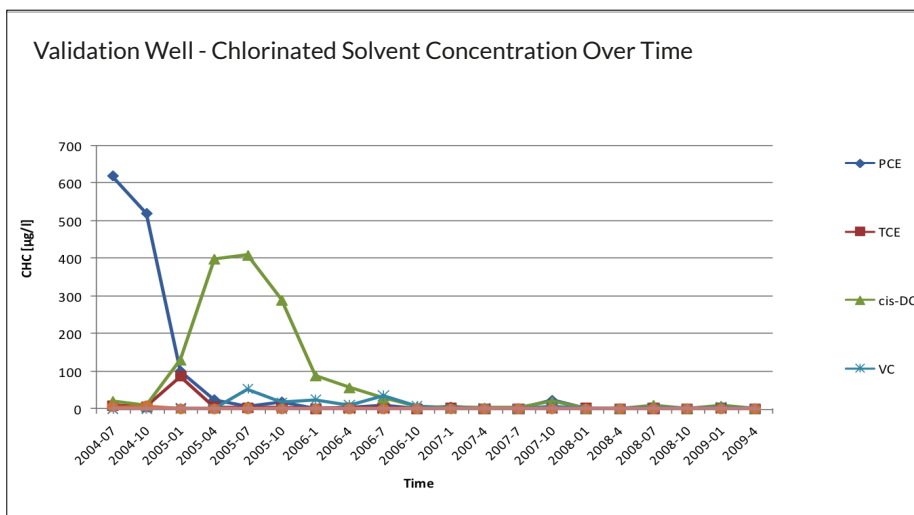
**Injection points: 86**

## What's Special?

- The groundwater in the sandstone bedrock was cost effectively treated using enhanced reductive dechlorination.
- The contamination was fully dechlorinated, with no build-up of break-down products occurring.
- The HRC and HRC X application did not affect the permeability of the fracture-flow dominated bedrock; instead the products created anaerobic treatment zones through which groundwater could flow and be remediated.
- The treatment minimised site disturbance, with only a short period of drilling and application by pouring into the wells. After which the slow-release of electron donor from the HRC provided years of treatment in situ.



Total CHC, July 2004



Total CHC, Jan 2008

## Results

After 5 years of remediation, of the 6 validation wells used for compliance:

- 4 monitoring wells below detection limit
- 2 monitoring wells below 3 µg/l

## Conclusions

- Stimulation of anaerobic degradation worked in fractured bedrock to remediate high CHC concentrations
- Good distribution of electron donor with simple injection method
- No disturbance on site with very sensitive site use
- Remediation was finished within expected time frame and within budget despite the complex conditions

For more information or to discuss your project, please contact:

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