EHC® Plume Treatment for TCE and Catabolites, installed in 2008

Site: **Former Delta Metals Site, Birmingham, UK**
Lead Consultant/Contractor: **WSP Remediation Ltd.**

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PROJECT CASE STUDY SERIES

Summary

The Meteor Park Development, formerly the Delta Metals engineering facility (Figure 1), lies close to Birmingham city centre. In the years prior to 2006, development had been marginal due to spiraling remediation costs associated with significant impacts to site groundwater and soil.

The lead consultant and remediation contractor (WSP Remediation Ltd.) adopted a combination of sustainable on-site treatment technologies to address a complex mixture of contaminants across a variety of media. This work was carried out as a fixed price contract.

EHC®

The Original Injectable ISCR Reagent for Groundwater Applications

Figure 1: The former Delta Metals engineering facility lies close to Birmingham city centre.

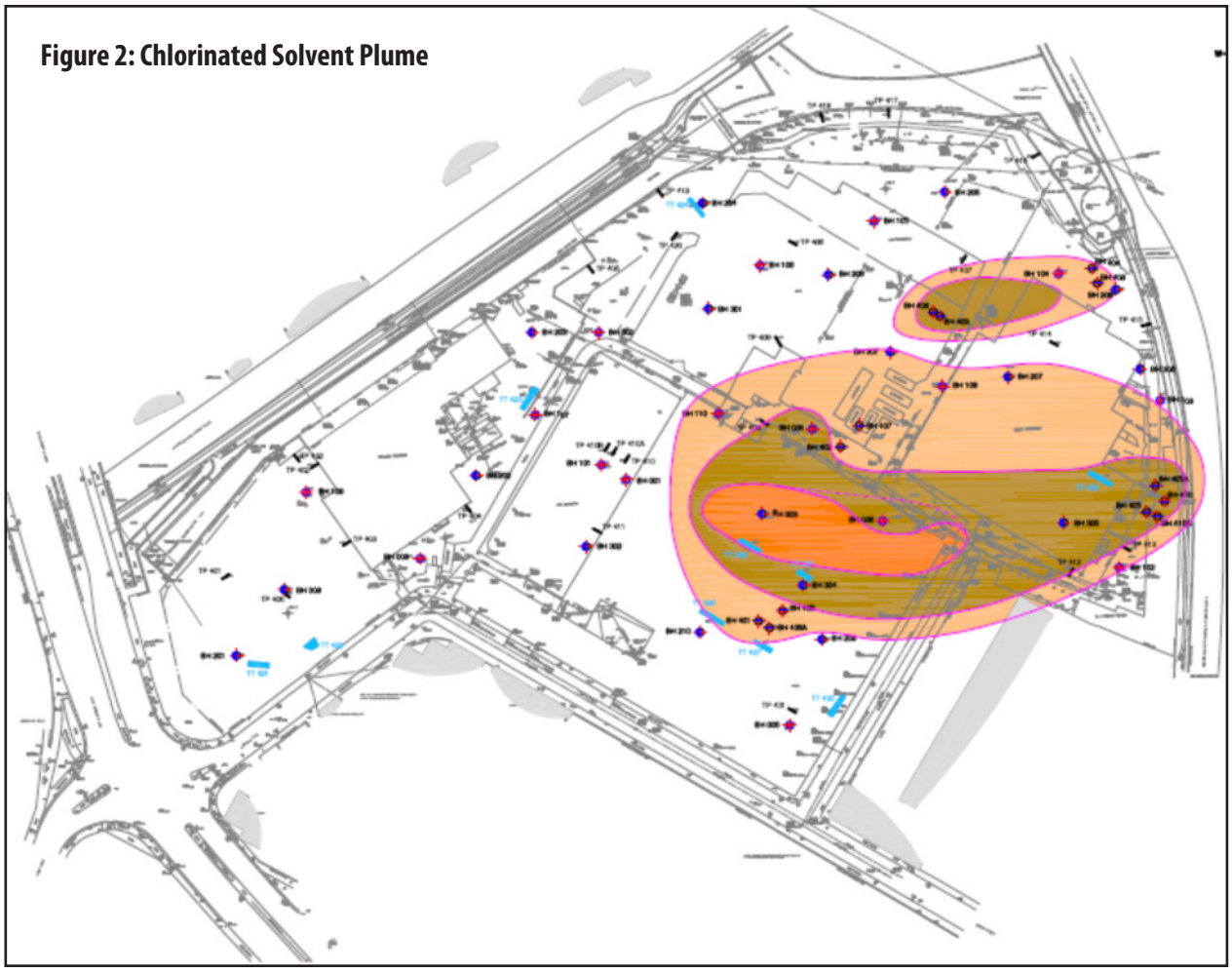
The Challenge

The site was heavily impacted by more than 60 years of heavy industrial use associated with the machining and manufacture of vehicle components. Extending over 4.4 hectares of land, the site is located above a major aquifer (the Sherwood Sandstone) and adjacent to the River Tame. These water resources are the most sensitive environmental receptors in the area. Below a layer of granular made ground, the site consists of organic alluvial clays, and river terrace sands and gravels underlain by the sandstone aquifer.

Site investigations identified various impacted areas/media: diesel-oil hydrocarbons and chlorinated solvents in the made ground and alluvial soils; localized free product / LNAPL within perched water and sands, and widespread dissolved phase chlorinated solvent impacts within the underlying sands and gravel aquifer (Figure 2). This plume covered an area of approximately 3,150 m^2. The contaminants of concern were Trichloroethene (TCE) with a maximum concentration of 103 mg/L, and degradation products cis 1,2-Dichloroethene (DCE) and Vinyl Chloride (VC).

Previous proposed remediation strategies for the dissolved groundwater plume focussed on containment, incorporating treatment via a Permeable Reactive Barrier (PRB) setup as a funnel and gate system. This strategy however, presented several weaknesses and inefficiencies, due to the areal extent of the

Figure 2: Chlorinated Solvent Plume



contamination, the absence of a demonstrable aquitard, the questionable long-term efficacy of a containment strategy given the potential for vertical migration of the solvent contamination into the underlying aquifer and requirement for an ongoing monitoring and maintenance programme.

The Solution

Following more detailed investigations and trials, the technology chosen for remediation of the plume in the sand and gravels was In Situ Chemical Reduction (ISCR) using Adventus' EHC® product. The combined effect of organic carbon and zero-valent iron in this product are designed to provide both chemical and biological treatment.

Treatment comprised of the injection of approximately 105,300 litres of slurry, formed by mixing the remediation substrate EHC® with water. In order to ensure complete plume coverage, EHC® was injected via more than 100 injection points installed at depths between 3-6 m below ground surface using a direct push drilling rig.

After substrate injection, the plume was monitored via a network of 20 wells. Field redox measurements and laboratory monitoring of chlorides, dissolved ethane and ethene were used to confirm the complete degradation of TCE, DCE, and VC.

Validation monitoring confirmed that the TCE concentrations had reduced to less than 0.05 mg/L in all monitoring wells, a value substantially below the agreed remediation standard of 10 mg/L for both TCE and DCE.

Conclusions

In addition to its success in removing the contamination beyond the levels expected, the ISCR/EHC® approach also proved to be a very cost effective since this approach provided a substantial cost saving versus the previously proposed Permeable Reactive Barrier. Also it was assessed to be a zero-waste process that resulted in the removal of the pollution burden within an impressive timescale. The minimal surface disruption caused by the in-situ approach also allowed for an optimized construction programme and phased release of the site to the owner's construction contractor.

This project was short-listed in the UK's Brownfield Briefing Remediation Innovation Awards in the category of 'Best Use of a Combination of Remediation Techniques'.

Reference

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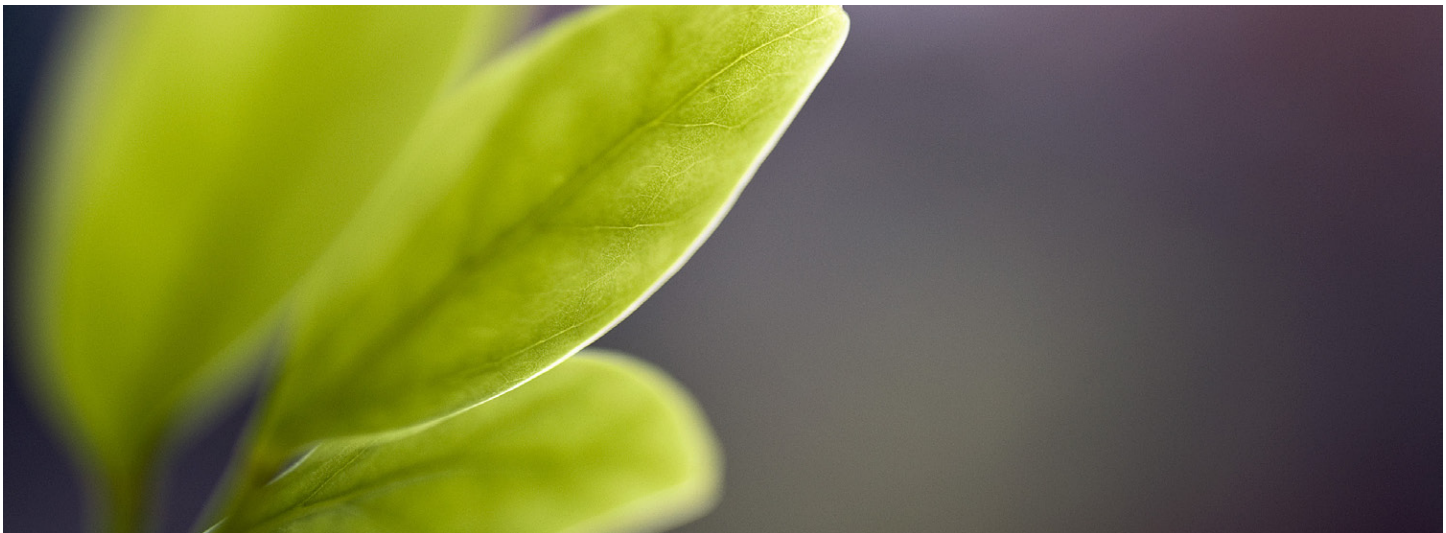

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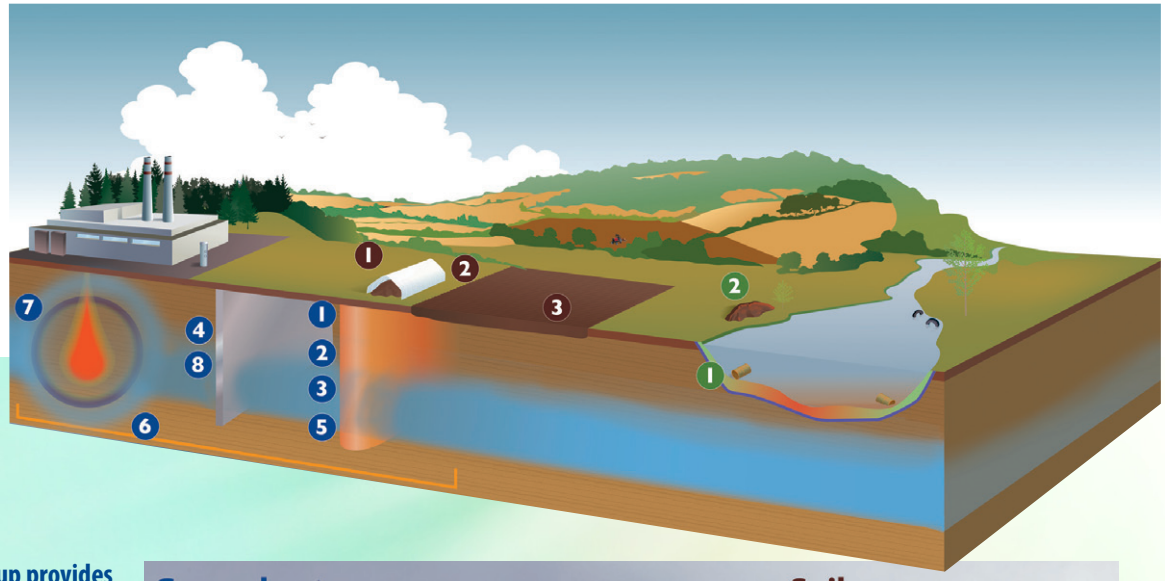

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Groundwater
In Situ Chemical Reduction (ISCR) Technologies

1. **EHC®** injectable controlled release carbon plus ZVI
2. **EHC®-L** injectable concentrated, buffered, microemulsion
3. **EHC®-M** injectable immobilization of heavy metals
4. **ZVI PRBs** patent holding innovators

Other Groundwater Solutions

5. **EHC-O™** injectable controlled release oxygen compound with nutrients
6. **mGCW™** reactive groundwater circulation wells
7. **ISGS™** *In Situ* Geochemical Stabilization for sources zones / flux reduction
8. **ZVI-Clay** *In Situ* treatment of DNAPL source zones

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- **O-SOX™** aerobic biodegradation in ground water wells
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Soil
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The Adventus Group provides a growing portfolio of leading environmental remediation technologies, including patented products, and is best known for leadership in the area of in situ chemical reduction (ISCR) with the EHC® family of products. Adventus pioneered ISCR in the early 90's to effectively and economically treat soil and groundwater contaminated with a wide variety of organic constituents and/or metals amenable to biological and chemical reduction. Other Adventus products are also used to address problems that require oxidation processes and contaminant flux management. We support site owners, consultants, regulators, and others by providing unbiased design, and selection of the most cost-effective remediation strategies. Adventus has a world-wide presence and a strong record of sharing its achievements across more than 500 technical abstracts and publications.