CASE STUDY

EX SITU SOIL VAPOUR EXTRACTION REMEDIATION OF THE FORMER WADE ALLOPRENE WORKS, NORTHWICH

Project description

RSK was commissioned by AstraZeneca to remediate a contamination hotspot at the former Wade Alloprene works in Northwich. From 1941 until the plant ceased operations in 1992, the site had been subjected to a range of chemical manufacturing processes resulting in contamination, principally volatile organic compounds (VOCs) including carbon tetrachloride, chloroform (an impurity of the carbon tetrachloride) and small amounts of carbon disulphide.

Features in the immediate vicinity of the site included a small stream, the Shurlagh Brook, to the east, Wade Brook to the north, and Griffiths Park, a remediated landfill site, to the east. A residential area lay approximately 300 m to the south, south-west and west.

A series of site investigations conducted by ABB Limited had identified the presence of the aforementioned contaminants in shallow soils and groundwater beneath the former tank site to depths of 2.5 m. Carbon disulphide was present in the soil but not the groundwater.

The contaminated zone, which contained buried structures, drainage channels and other services, amounted to an area of 846 m^2, while the total mass of existing VOCs was estimated to be 2830 kg, with high concentrations occurring in discrete pockets of Alloprene.

RSK was enlisted to remediate the contaminants to make the site suitable for future development and to protect the local watercourses.

Choice of remediation technique

Based on the nature of the contaminants, the local conditions and an assessment of a variety of remediation technologies, RSK determined that soil vapour extraction (SVE) would be the most viable means with which to meet or exceed the client's remedial targets.

Pilot testing

Pilot testing for an in situ SVE scheme was undertaken to predict whether the proposed remediation scheme would meet remediation targets within economic and time constraints.

Several factors were studied to allow optimisation of operation parameters and establish areas where further data was required before a full-scale SVE system was set up.

The pilot test revealed that a combination of contaminant distribution, soil properties and underground structures compromised the efficacy of an in situ SVE. RSK solved the problem by designing and constructing a large ex situ SVE system.

Ex situ SVE remedial design

The main features of RSK's design were

- a lined treatment bed with integral sump
- soil cover within the treatment bed
- maintenance of hydraulic control in the excavation during soil removal (water treatment requirement)
- SVE off-gas treatment by activated carbon adsorption
- extensive VOC monitoring (real-time photo-ionisation detector (PID), personal dose monitoring, boundary monitoring).

Management of excavation and treatment bed filling

- Excavation area divided using a numbered grid
- Treatment bed divided into 23 numbered cells
- Excavation grid reference was recorded for soils placed in each cell
- Vapour concentrations noted at the 'face' during each grid square excavation
- Six headspace analyses using on-site PID conducted per cell for qualitative assessment of soil contaminant levels

Health and safety

As carbon tetrachloride is extremely volatile and hazardous to human health at very low vapour concentrations, RSK minimised the risk posed to site personnel during the excavation of contaminated soils by devising a working method, approved by the Environment Agency (EA) and the local environmental health officer (EHO), that incorporated real-time monitoring and recording protocols.

Throughout the works, RSK liaised with the EA, EHO and a client safety representative to demonstrate the effectiveness of the environmental and health and safety precautions.

Fugitive emission management

- Working excavation 'face' was kept as small as possible
- PID readings provided real-time vapour concentrations at face during excavation
- Personal protective equipment (PPE) zoning was established to ensure correct respiratory protection worn in high vapour risk areas
- Ongoing assessment of PPE requirements, resulted in full-face positive pressure masks being adopted halfway through first bed fill

Remediation

In summary, the remediation works included:

- civil works to prepare the site for vapour extraction treatment cell
- construction of the treatment cell
- preparation of mobile vapour extraction plant, including groundwater treatment plant
- excavation of contaminated soils from former tankage area, including segregation of highly contaminated and difficult cells
- covering of the filled treatment cell with polythene sheeting
- VOC testing of site atmosphere (continuous during works)
- VOC testing of water on site
- operation of vapour extraction plant, including monitoring of plant and treatment cell
- reinstatement and compaction of treated soils
- disposal of excavated concrete and untreatable soils to landfill
- decommissioning and removal of plant.

Added value

- RSK's remediation approach reduced carbon tetrachloride and chloroform concentration in the soils to an acceptable level in an economically sustainable manner.
- Ex situ remediation ensured speedy delivery of targets: total time for remediation, from drilling of soil vapour extraction boreholes for pilot testing to removal of plant from site took 159 days.
- All client targets were met.

For further information, please contact:

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