CASE STUDY

E-Clay Source an Groundwater Treatment

Housing Development

Client

midland heart
housing, care and more

Main Contractor

GallifordTry

Environmental Consultants

asl

Site Background & History

The site is located to the immediate south-east of the main Lichfield Railway Station. The site is an irregular shape with maximum dimensions of approximately 70m by 50m.

It is understood that the proposed development will comprise of the construction of approximately twenty four, two storey residential houses and apartments, together with associated gardens, landscaped areas and car parking.

Figure 1 – Proposed Development.

The historical usage of the site dates back to 1883 and encompasses a wide range of industrial activities including malthouses, general works, railway sidings, a coal depot and a goods yard. There have been several structures on the site over this period. The site was historically bordered by other industrial sites and the Lichfield City railway station and sidings

The site investigations undertaken by ASL identified the presence of hydrocarbon contamination on the site (reflecting the previous usage of the site for industrial purposes). The chemical test results confirmed the presence of hydrocarbon pollutants in both soil and groundwater. The prime contaminants of concern were identified as total petroleum hydrocarbons, polycyclic aromatic hydro-carbons and BTEX.

ASL developed a Conceptual Site Model highlighting risks to identified receptors, namely, human health (site workers / end users), groundwater (The Bromsgrove Sandstone which is classified by the EA as a 'principal aquifer') and offsite receptors (un-named pond and Trunkfield Brook).

In respect to human health risk, ASL stated, "*It is recommended that mitigation measures are incorporated into the proposed development comprising a cover system in all gardens and areas of soft landscaping and gas protection measures including a hydrocarbon resistant membrane into the proposed residential development.*"

In respect to groundwater, ALS stated that, "*The quantitative risk assessment has identified the need for remediation of soil and groundwater to mitigate the potential risk to controlled waters.*"

Envirotreat was engaged by Galliford Try together with ASL to develop an integrated remediation strategy to address the residual source contamination and to protect controlled water receptors.

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Envirotreat proposed an integrated treatment strategy comprising source treatment by E-Clay Stabilisation in combination with groundwater treatment.

Methodology

The initial remediation works involved source treatment of an area of previously identified hydrocarbon contamination.

The extent of hydrocarbon contamination within the vicinity of WS1 (ASL borehole) was fully delineated by Envirotreat through the excavation of a series of trial pits around the periphery of the area to determine / confirm the lateral / vertical extent of the contamination, validation sampling was undertaken to demonstrate this.

In view of the depth of the identified contamination, the location of the proposed remediation area (i.e.in close proximity to the public highway) and the presence of identified services it was considered that the most practical approach would be to carry out treatment *in-situ*.

Figure 2 – In-situ source treatment.

The delineated area was reduced in depth to above the contamination, the area was sub-divided into sections to enable assessment of required volumes. Within each section pre-determined volumes of E-Clay slurry were added and soil mixed to the required depth. Each section was treated in turn until the whole delineated area had been treated.

Previously set aside un-contaminated soils (reduced dig) were reinstated.

Figure 3 – Source Treatment Area following Completion of Remediation Works.

Area The on-site production of E-Clay slurry typically requires up to 2,000litre of water per batch, the quality of this water is not critical on the basis the contamination loading within the water is significantly less than source. Therefore it is beneficial to use contaminated groundwater where available as it negates the need for mains water and facilitates the groundwater remediation when undertaken under controlled conditions.

At Lichfield groundwater quality improvement was key to the success of the overall integrated remediation approach adopted, therefore installed two further deep extraction wells on site to enable the extraction of groundwater. Groundwater was extracted from the two newly installed borehole wells and stored onsite for use in the treatment process.

To supplement the groundwater extraction and source treatment, small repeated volumes of E-Clay slurry added to the groundwater in-situ via the extraction wells (analogous to groundwater treatment by E-Clay Permeable Reactive Barrier Systems) – the prime objective was to provide a source of treatment medium to mitigate possible contamination ‘rebound’ (which was considered to be a distinct possibility resulting from ingress of contaminated groundwater from offsite sources) - the permeable E-Clay formulation

would adhere to the substrate and act as a source of E-Clay for further groundwater improvement.

Validation

A number of composite samples were prepared from samples taken from each batch treated. These were leach tested and compared with the designated remediation target criteria. All samples tested were shown to be compliant with the remediation target criteria. The treated material was therefore considered suitable for reuse onsite.

Additionally groundwater samples were taken post remediation to determine groundwater quality and the potential effects of rebound within the extraction wells. The groundwater samples exhibited very low pollutant concentrations in comparison with a groundwater sample pre-remediation and the results confirmed that the groundwater treatment was carried out successfully

Conclusions

Envirotreat were able to demonstrate through a comprehensive Validation Report that the remediation strategy had been successfully implemented.

The prime drivers for the remediation works were the protection of human health and controlled waters.