



Figure 1 - Site Prior to Remediation

Site Overview

The site was irregularly shaped with an area of approximately 4 Ha. The site was divided by the public highway, the north of the site being mostly occupied by a pond. The southern part of the site consisted of undergrowth to the east and a former industrial area to the west; it is in this area that the main development area is proposed.

Significant hydrocarbon contamination was identified at this site consistent with its previous industrial usage as a haulage and transport centre, incorporating mechanics garages and various industrial units. A number of underground fuel storage tanks are known to have been present on this site. It was considered that soil and shallow groundwater remediation would be likely to ensure the protection of groundwater, surface waters and end users of the proposed development.

Detailed speciation of the hydrocarbons indicated the presence of a mixture of weathered petrol and diesel species.

Groundwater was encountered within the near surface alluvium at depths of between 1.4m and 3.0m. Analytical results of the groundwater indicated contamination levels of fuel related

hydrocarbons exceeding UK drinking water standards by several orders of magnitude.

Several receptors were identified comprising of major and minor aquifers, a river and site workers / end users.

A planning application has been submitted (2010) for the erection of a retail store and doctors surgery with undercroft car parking, refurbishment of existing mill building for residential flats and ancillary store uses /associated landscaping, access works and linkage improvements.

Objectives

It was considered by the consultants that localised excavation and onsite bioremediation would be appropriate to deal with the significantly contaminated made ground across the central and southeastern parts of the development area.

It was also considered that the hydrocarbon contamination in the near-surface groundwater should be remediated through some form of pump and treat system or alternatively through dual phase vacuum extraction.

Enviro-treat were commissioned by the main contractor, Wastefile, to undertake bioremediation and groundwater remediation. Target levels for bioremediation were determined by the consultant, Geotechnical and Environmental Associates as summarised in Table 1.

Methodology

Identified contaminated soils were excavated and stockpiled for remediation. The sides and bases of the excavations were screened on-site by PID (photo ionised detector) and analysed for speciated petroleum hydrocarbon by an offsite laboratory.

The proposed strategy was ex-situ bioremediation of hydrocarbon impacted soils using controlled biopiles of approximately 2,500m³. The biopiles were constructed to provide optimum performance incorporating specific soil conditioners. The amendments designed were based on treatability trials and evaluation of the analytical data presented within the site investigation report.

Key parameters were monitored throughout the remediation programme and the operating conditions were amended accordingly. These parameters included temperature, gas levels, organism numbers, pH and nutrient levels. The biopile was covered with a breathable membrane to optimise the treatment process.

The strategy also required the removal and offsite disposal of free phase product. Skimmer pumps were employed to remove water and free phase product from an excavated trench. Free phase product was removed from site. Contaminated groundwater was stored and treated on-site utilising a bespoke water treatment unit. Compliant treated groundwater was discharged into the local sewer.

Following successful treatment of the contaminated material, the soil was reused on site as specified in the remediation strategy.

The treated material underwent composite sampling for each 50m³ of material treated. Groundwater quality was monitored at downstream monitoring wells.

Analysis of total soil concentrations was carried out by an external laboratory.

Results

The treatment operation was designed to reduce the concentrations of the identified contaminants through their degradation by micro-organisms. The results demonstrated compliance with end-use target criteria for the site as a whole.

Environmental Consultant



Main Contractor



Table 1 GEA Target Criteria.

Contaminant	Guideline Value (mg/kg)	Source
Benzene	0.056	SGV
Toluene	7	SGV
Ethyl Benzene	21	SGV
Xylene	15	SGV
Aliphatic C5-C6	18	GGV
Aliphatic C7-C8	57	GGV
Aliphatic C9-C10	3.5	GGV
Aliphatic C11-C12	20	GGV
Aliphatic C13-C16	107	GGV
Aliphatic C17-C36	61,400	GGV
Aromatic C6-C7	See benzene	SGV
Aromatic C7-C8	See toluene	SGV
Aromatic C9-C10	2.73	GGV
Aromatic C11-C12	4.83	GGV
Aromatic C13-C16	5.54	GGV
Aromatic C17-C21	132	GGV
Aromatic C22-C35	161	GGV
PRO (C5-C10)	124	GGV
DRO (C12-C28)	61,669	GGV
Lube Oil (C28-C40)	61,561	GGV
Total PAH	41	B(a)P x 35



Figure 2 - Proposed Development.



CASE STUDY

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