



Development:	New supermarket, A6 bypass, railway re-location, car parks, new river / rail crossing.
Consultant:	Giffords
Developer:	Birse (bypass / rail / bridges) Bowmer & Kirkland (supermarket)

### Site Overview

Cawdor Quarry is a disused quarry in Matlock, the overall site occupies an area approaching 400 hectares and borders the River Derwent. The site was contaminated with waste materials from historical activities. Part of the site was purchased by Sainsbury's in 2000, with view to build new supermarket.

Following local pressure, the scheme was amended to incorporate the existing A6 Bakewell Road being diverted across the River Derwent and run through the site on the embankment that forms the south bank of the river. The diversion of the A6 included the construction of a new bridge across the River Derwent along with the realignment of the existing railway and also the construction of the

embankment for the carriageway which tied into the existing A6 at Dale Road on the outskirts of Matlock.

Sainsbury's also developed the existing Station Yard and Matlock Bridge car parks to create a new town centre car park. The existing town centre bus station was also relocated to the area.

Main contamination sources identified at the Cawdor Quarry site, were Polycyclic Aromatic Hydrocarbons and Total Petroleum Hydrocarbons.

Enviro-treat were initially commissioned with the remediation of contaminated material from within the bypass, rail and bridge development areas, once remediation had commenced Enviro-treat were also requested to address the remediation issues associated with the supermarket development.



Plate 1 Area prior to development

### Objective

Giffords evaluated numerous remediation strategies and found the Envirotreat ex-situ stabilisation / solidification process as not only being the most cost effective strategy, that it also addressed all the contamination issues in a sustainable manner which allowed re-use of all material on site. The E-clay® designed specifically for the Cawdor Quarry site was a modified pillared inorgan-organoclay, formulated to treat the identified main contaminants of concern. The E-clay® formulation primarily focused on the effective treatment of TPH and PAH.

### Methodology

The works were conducted in two phases under the auspices of Enviro-treat's Mobile Treatment Licence (MPL).

As a result of the versatility of the Enviro-treat process the contaminated materials were able to be treated remotely from the general development area, thereby allowing development to continue unimpeded. Following the mixing process, the treated / recovered material was temporarily stockpiled to enable full curing, prior to being relocated within the development area.



Plate 2 Remote treatment area

Contaminated soils were treated in 5m<sup>3</sup> batches, this allowed a known volume of contaminated material to be mixed with a known volume of treatment slurry, thus enabling a homogenous mix to be produced.

Phase 1 on the project involved treatment of approx 1500m<sup>3</sup> of contaminated material associated with the bypass, rail and bridge development works.

A further 1500m<sup>3</sup> was identified and treated associated with the supermarket development. This additional volume of treated material could not be replaced within this area, given that the area concerned was to remain at the new reduced level. Relocation of the treated material was initially

considered to be an issue. However by working together as a team a need for the treated material was identified within another area of the project site.

Due to the improved geotechnical properties of the treated material, the final treated and cured material proved to be an ideal infill material behind new retaining walls that was under construction as part of the A6 improvement works and therefore approximately 3000m<sup>3</sup> of contaminated material was treated and reused on effectively site



Plate 3 Treated material placed behind A6 bypass retaining wall

### Validation

The *ex-situ* treatment of contaminated soil enabled compliance with the identified Site Specific Target Levels (SSTL) (See Table 1) through the immobilisation of leachable pollutants within the soils. The *ex-situ* treatment operation was designed to fully recover the waste soils in order to produce a raw material suitable for use on site in accordance with predefined and agreed criteria. Validation of the treated, recovered soil was carried out by Enviro-treat Ltd.

Validation testing was carried out to evaluate the efficacy of the treatment process. The sampling protocol for the treatment operation involved the analysis of 5 treated samples. The samples were collected for every 250m<sup>3</sup> of treated material with the intention of utilising CEN Series leaching methodology to demonstrate the behaviour of the treated material. The data from all the analysis was

collated and compared to the derived Site Specific Target Levels.

### Results

The results of the leachate analysis clearly indicate that the main objective of chemically and physically stabilising the excavated 'contaminated' soils from Cawdor Quarry, Matlock has been achieved. The treatment operation was designed to reduce the leaching potential from the identified contamination by the immobilisation of leachable pollutants within the soils.

The validation results show that the contaminants of concern have been immobilised sufficiently within the treated material to below Site Specific Target Levels (see table 2). The overall results are considered compliant with the objectives of the remedial works.



Plate 4 Completed scheme

Table 1 Site Specific Target Levels

Pollutant	Leachate target (mg/l)
TPH	6
PAH (Total)	0.13

Site Specific Target Levels for the treated soil derived from the Quantitative Risk Assessment (QRA) carried out by Gifford

Table 2 - CEN Series Results Summary for Contaminants of Concern

Contaminant of Concern (mg/l)	Birse # 1 (mg/l) <sup>3</sup>	Birse # 2 (mg/l) <sup>3</sup>	Birse # 3 (mg/l) <sup>3</sup>	Birse # 4 (mg/l) <sup>3</sup>	Birse # 5 (mg/l) <sup>3</sup>	Birse # 6 (mg/l) <sup>3</sup>
Total TPH	0.086	0.055	0.04	<0.01	<0.01	<0.01
Total PAHs	0.0089	0.0069	0.0086	0.0035	0.0073	0.0059

Contaminant of Concern (mg/l)	Bowmer #1 (mg/l) <sup>3</sup>	Bowmer #2 (mg/l) <sup>3</sup>	Bowmer #3 (mg/l) <sup>3</sup>	Bowmer #4 (mg/l) <sup>3</sup>	Bowmer #5 (mg/l) <sup>3</sup>
Total TPH	0.18	0.055	0.03	0.23	0.24
Total PAHs	0.022	0.0082	0.025	0.140	0.068

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