

Completion Date:	June 2004
Development:	Residential Development
Developer:	Barratt Homes
Remediation Contractor:	Knight Environmental
Consultant:	Knight Environmental
End Value:	£30M

### Site Overview

The 3 hectare site, in Chelmsford, Essex is a former gravel quarry. The contamination originated from infilling with a variety of wastes as well as use by TXU Energy for storage, workshops and vehicle maintenance.

These historical uses have resulted in soil contamination hotspots across the site (plate 1). The identified contamination includes; Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Zinc, Phenols, PAH's and TPH.



Plate 1: Contaminated soils observed on-site

Following remediation, the site was developed into a housing estate. The development comprised residential housing and flats, with associated gardens and landscaped areas.

### Objective

The remediation strategy for the TXU site was

designed to address the source and indirectly pathway contamination issues, with the intention of protecting both human and groundwater receptors.

### Methodology

Envirotrete employed an *ex-situ* soil mixing remediation strategy for the treatment of over 2750m<sup>3</sup> of contaminated soils.

The works were conducted over a 3 week period under the auspices of Envirotreat's Mobile Process Licence (MPL). Specialist technology, materials and supervision were supplied by Envirotreat, whilst Knight Environmental supplied all the required plant and labour for application of the Envirotreat<sup>®</sup> Process.

The contaminated soils were excavated, stockpiled and treated on-site using the Envirotreat E-clay<sup>®</sup> technology. The Envirotreat treatment plant comprised a slurry production unit and a mixing zone (plate 2).



Plate 2: The mixing zone (foreground) and slurry production unit (background)

The slurry production set up comprised 1 No. 1000L paddle mixer (where the E-clay<sup>®</sup> reagents were combined before being pumped across to the mixing zone) and 1 No. excavator fitted with a specialist processing bucket. The processing bucket has rotating blades at its base which facilitates a high degree of mixing. This bucket was required as the contaminated soils were clay based.

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Plate 3: Combining the E-clay<sup>®</sup> slurry with the contaminated soils

The soils were mixed in 10m<sup>3</sup> batches to allow known quantities of contaminated soils to be combined with known quantities of the E-clay<sup>®</sup> slurry (plate 3). Following treatment, the material was temporarily stockpiled (plate 4).



Plate 4 – Temporary stockpiling of the treated material

### Validation

Validation of the treated material was carried out on 12 No. batch samples, which were leached and analysed on behalf of Envirotreat by a UKAS accredited laboratory.

### Results

Table 1 shows the Maximum Contaminant Levels (MCL) of the identified pollutants prior to remediation and the results of leachate analysis post-treatment. The Site Specific Target Levels (SSTL's) were

derived from a risk assessment.

Contaminant of concern	MCL in soils (mg/kg <sup>-1</sup> )	Leachate ( mgl <sup>-1</sup> )	
		SSTL*	Mean Treated Soil
Phenol	79.9	17.8	1.02
Total TPH	96,000	8.88	4.73
Arsenic	62	0.444	0.019
Cadmium	19	0.0533	0.001
Chromium	2,900	2.22	0.01
Copper	1,900	0.249	0.108
Lead	1,600	0.222	0.01
Nickel	500	1.78	0.035
Zinc	820	4.44	0.014
Total PAH	320	0.726	0.0084

Table 1 – Summary of treated soils leachate results compared to the SSTL's

The remediation project was successfully completed, with the results illustrating that the objective of protecting human health and groundwater receptors had been achieved. The contaminants of concern have been fully addressed with leachate levels falling below the agreed SSTL's.

Successful validation enabled the treated material to be reused on-site as a substitute for imported clean fill (plate 5).



Plate 5: Contaminated hotspot backfilled with treated material.

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