

# Remediation on Track at Former 'Dirtiest Site in Europe'

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The Avenue former coking works located 3km south of Chesterfield, Derbyshire, England is a prominent site known internationally by the remediation and civil engineering sectors. Much has changed both on the site and in waste management / environmental permitting since Construction News, in July 2006, described The Avenue as 'The dirtiest site in Europe.'

[www.theavenueproject.co.uk](http://www.theavenueproject.co.uk)

Exceeding 80 hectares, the site operated for 36 years as a coking works and had a long and varied industrial history prior to this use. In addition to the production of smokeless fuels the site also processed the by-products from this process and as well as receiving wastes from other National Coal Boards sites in the region. As such, the site possibly lives up to the Construction News tag by being contaminated with a range of sulphur compounds, creosote, blended fuel wastes, benzoles, tars, asbestos and spent oxides.

The last charge of coke was processed in September 1992 with the works closing shortly after in the October. Ownership passed through English Partnerships (now the Homes and Communities Agency – HCA) to East Midlands Development Agency (emda) which is managing the remediation and landscape works that are being funded by the HCA as part of their National Coalfields Regeneration Programme.

VSD - a joint venture consortium comprising DEC (DEME Environmental Contractors – the Belgian based Environmental Contractor), Sita Remediation (a Dutch based thermal desorption specialist) & Volker Stevin (the civil engineering contractor) were awarded the £82million remediation and landscaping contract in July 2009 and works commenced in earnest during the summer of 2010.

The analysis of environmental samples is being undertaken by ALcontrol using a web-based system known as '@mis' which enables the scheduling of analytical work and provides live access to laboratory results.

## Remediation strategy

The key objective of the remediation is to remove the existing site contamination through onsite treatment and to deliver a restored landform which will provide significant benefits for the local



community along with the provision of environmental enhancement and a flood alleviation scheme protecting areas of Chesterfield from future flooding. The restored landform will include a development platform and significant areas of public open space including sports pitches, public footpaths and other public amenity facilities. This new landform has been designed to be sympathetic to the surrounding environment and to create habitats that will further encourage a diverse wildlife population including many protected species which will be encouraged to make the restored site their new home. The remediation and landscaping packages will be completed in 2014.

Before the remediation works commenced, a large amount of enabling works were carried out. As well as works to divert existing services within the site, one of the most visible elements of works has been the construction of a large coffer dam and a temporary river crossing in the floodplain area of the River Rother at the northern end of the site.

The volumes and types of contamination associated with the project have not previously been seen in the UK - over two million cubic metres of material are being excavated with a significant volume of this having to be processed. The majority of the material requiring processing arises from the two contaminated settlement lagoons and the formerly licensed waste-tip.

The lagoons alone require over 200,000m<sup>3</sup> of very heavily contaminated sediments to be excavated and processed. To add to the complexity of this activity, the lagoons were not only built either side of the river Rother, but the waste tip had also been formed above one of the lagoons.

Due to the toxic nature of the contaminants present in the material from both the lagoons and the waste tip, thermal desorption has been identified as the most appropriate treatment method. This sees the sediments put through a kiln at temperatures of up to 500°C to remove contaminants, which volatilises the contaminants of concern. The off-gases are further oxidised, scrubbed and filtered to comply with stringent emission limits.



The thermal desorption plant is the largest ever used in the UK. Due to the high temperatures associated with operating the plant, it operates 24 hours a day and will run until the autumn of 2012, only stopping for maintenance.

The windrowing of a further 75,000m<sup>3</sup> of hydrocarbon contaminated material has commenced and will operate for the majority of the project.

Groundwater on the site is contaminated with phenols, thiocyanates, benzene and ammonia; where this presents at surface it is treated on site using a bespoke water treatment facility which uses a combination of chemical dosing, active filtration and biological treatment. This ensures that the contaminated waters that are collected can be discharged safely.





The excavation of the waste tip started in the summer of 2010 and around 327,000 m<sup>3</sup> of materials from the former licensed waste tip are being passed through the sorting process.

The remediation strategy has been designed to ensure the maximum amount of material can be reused on site; bioremediation and thermal treatments all ensure that the resulting materials can form part of the final landform. This on site material recycling ensures that there is minimal requirement for lorry movements to and from the site.

## The role of analytical chemistry



Quick and easy access to test data combined with the ability to schedule analytical work is helping VSD Avenue to maximise the efficiency of remediation work.

Project Director Marcus Fowweather says: "Over the lifespan of this project ALcontrol will have tested in excess of 10,000 samples for between 5 and 18 species. This data is critical to the ongoing management of the remediation activities, enabling us to identify soils for treatment and to check that cleaning operations comply with the required specifications. Almost all process management decisions are therefore affected by test

data, so the ability to access results through ALcontrol's online @mis system has been a fundamentally important part of the project's success."

Soil and water analysis at the Avenue performs two key functions. Firstly, to inform the management of the treatment processes and secondly to provide verification that either treated soils meet with the required specification or that treated water complies with the site's discharge permit.

"The turnaround time for analysis is critical," says earthwork planning engineer Steve Dobson. "Results for most of the analyses are required within 5 days, so that we can plan remediation activities accordingly. It has been necessary, therefore, to work in close partnership with the technical staff at ALcontrol to ensure the delivery of timely analytical data.

"The web-based @mis system has helped enormously to provide us with fast results from what we call 'sentencing testing' – tests that help determine the appropriate method and level of remediation. In addition, the facility to schedule analytical work means that we get the data we need to maximise the efficiency of the remediation work, which helps to minimise costs.

"We worked very closely with ALcontrol to develop a bespoke testing strategy to ensure compliance with the project's requirements and the ability of the @mis system to export in AGS format has helped us to manage the enormous volume of data that is being produced."

## Regulatory Issues

Since the site was tagged 'dirtiest site in Europe' in 2006, much progress has been made on-site and significant changes have occurred in the way waste management activities have been regulated. The treatment of soil by mobile plant, which formerly was regulated under the Waste Management Licensing (WML) Regulations (in England and Wales), is now regulated under the Environmental Permitting (EP) regime. The Environmental Permit Deployment Form associated with the bioremediation, complex sorting, and associated activities was approved by the EA on 14th September 2009 with the thermal desorption activities being approved later on the 4th August 2010. These approvals allowed the commencement of treatment activities and complimented the approval of the original Planning Application received from Derbyshire County Council.

With all the Planning and soil treatment approvals in place, all that remained to be obtained was the approval to deposit fills for the attainment of landform. The Waste Framework Directive (European Directive 75/442/EC as amended) defines waste as an object the holder discards, intends to discard or is required to discard. The definition has historically meant that activities by remediation and civil engineering contractors have had the potential to be affected by the Waste Management Licensing regime.

Where material is required to be moved but not treated, the onus has been upon contractor to prove (a) that the material is suitable, (b) that it will be used as described and (c) that it is of the correct volume for the purpose. Exemptions to the Waste Management Licensing regime had to be used, these typically being...

- 7a (becoming U10/11) – spreading of waste for agriculture or ecological benefit
- 9a (becoming U10/11) – spreading of waste on land in connection with land improvement
- 19a (becoming U1/3) – use of waste for relevant construction works

If the materials were hazardous or contained dangerous substances the exemptions could not be used outright, or at all, and it was then for the contractor to demonstrate to the EA that the use of the material was fit for purpose presented no harm to human health or the environment. Such agreements with the EA (known as enforcement positions) were arranged in an unstructured way and were managed in a manner that appeared to differ from one EA Office to another. Where soils have required treatment it has been historically difficult to use exemptions and the only route for re-use has been by using enforcement positions.

Recently Standard Rule Environmental Permits have been introduced for the use of wastes for the reclamation of land and are implemented and managed in a similar way to the exemptions and contain similar rigid constraints.

Because of the complexities described, in the autumn of 2008 a Code of Practice was issued by CL:AIRE (Contaminated Land Applications In Real Environments), supported by the EA. The Code of Practice (CoP) has been embraced by the remediation and civil engineering sectors and its use has been widespread since its introduction. Following 'The Definition of Waste: Development Industry Code of Practice' negates the requirements for the use of WML/EP Exemptions, Environmental Permits, arrangements with local Environment Agency Offices and reduces the regulatory burden of the Environment Agency.

The Avenue Project is the largest single site to have used the CoP to demonstrate the appropriate use of site materials and to have discharged waste obligations by adhering to it.

The adherence to the CoP ensures that all the evidence is present to demonstrate suitability of use, certainty of use and quantity; the key considerations of the Waste Framework Directive's determination of what is non-waste. The information is reviewed and signed-off by an independent professional 'Qualified Person'. A list of Qualified Persons is available from CL:AIRE. A Materials Management Plan (MMP) must be produced and submitted along with supporting documentation to the Qualified Person who confirms to the EA, via a declaration, that all the documentation required is present and correct.

The MMP itself contains the following information / documentation...

- Disclosure of the parties responsible for the management of materials and the details of the parties responsible for the regulation and delivery of the project
- Details of the site and the materials within it (chemical and geotechnical specifications and zonings)
- Materials movement schematic
- Mass balance, consolidation and topography details
- Sentencing procedures
- Tracking procedures
- Validation / verification procedures

The additional documentation examined by the Qualified Person includes...

- Groundwater Risk Assessment and associated EA approval
- Human Health Risk Assessment and associated Local Authority approval
- The Remediation Strategy / Design Statement
- Planning Application, approval and Conditions

For the Avenue project the groundwater and human health risk assessments, produced by Jacobs Babte, emda's technical consultants, derived targets which were presented in the tender documents to the competing contracting partnerships, during what is referred to as Stage 1. VSD, supported by their retained consultant Entec, demonstrated that the specialist techniques and experience held by the individual parties within the joint venture and consultancy were the parties that could be trusted to achieve the specifications presented and were duly awarded the preferred bidder status.

During stage 2 a period of value engineering, the further development of earthwork balances, further treatability trials and confirmation of verification procedures ensued to confirm the specific cost of the project. The Planning Application, driven by Entec, was submitted and approved during this stage.

During these stages the majority of components, albeit some in an embryonic stage, required by the CoP, were prepared. Stage 3 followed the formal contract award to VSD and the components required by the CoP were formalised and compiled into a coherent document - the MMP plus appendices.

The Code of Practice will result in diminished reliance on exemptions, reduced burden on the regulators and has become the third essential document (along with the Planning Application and EP Deployment Form for the mobile treatment of soils) that is prepared ahead of a successful remediation project.