

Development of a former Shell Oil depot, South Wales



Project description

RSK carried out a six-month turnkey bio-remediation programme at a four-acre former oil depot in Llanbradach, mid-Glamorgan, proposed for redevelopment as a housing site. The approach developed by RSK enabled the phased release of two thirds of the site to Taylor Woodrow three months earlier than originally programmed.

A key feature of the remedial programme has been the emphasis on the sustainable reuse of materials, which has enabled treated soil to remain on site and be used to raise the site level to conform to the Environment Agency's flood protection requirements. The remediation project is complete with construction of the houses ongoing with the first completions in July 2007.

Ground investigation and risk assessment

The site had previously been investigated by Wilkinson Associates and White Young Green. This data was reviewed by RSK and further groundwater sampling was undertaken in 2006 to fill in the data gaps.

RSK then used the information to undertake a quantitative risk assessment. This took into account the sensitive residential end use proposed for the site as well as the potential risk to controlled waters. The risk assessment showed that human health linkages and risk to controlled waters were the drivers for remedial targets.

Remediation

Key remediation requirements were for the site to be suitable for a housing end use. RSK designed a remediation scheme that met these objectives by using an *ex situ* bioremediation method on a designated treatment area in the southern part of the site. This allowed an early start to house building on the northern part of the site to reduce the development time.

Remediation works were implemented by RSK in 2006–7 using its own in-house plant and personnel resources. Initially, all site materials were excavated and screened, with oversize material validated and replaced at the base of the excavation. Contaminated soil was then laid into windrows in a specially designated treatment area and aerated with a windrow turning machine. Bioremediation was enhanced by the addition of Oxygen Release Compound™ (ORC), which improved oxygen availability to the bioremediation process and enhanced the biological processes.

The remediation was successfully implemented and validated, despite the fact that it had to be completed in winter during a period of high rainfall. End point concentrations were substantially below remedial targets, and both the cost and time taken was substantially below the contract allowance.

Remediated soil was replaced in the excavations and used to profile the site for development. Soils excavated and treated at the site were further improved geotechnically by stabilisation with lime. This allowed their use under the site roads and thus saved significant cost in avoiding the import of an engineered fill.

Project details

Managing the client's best interests

RSK's demonstrated managing the client's best interests as follows:

- Understood the client's objectives (including cost, time, remedial outcome) for the development at pre-contract stage
- Proposed a scheme that met all these objectives
- Agreed an activity schedule-based payment mechanism that included fixed price elements for definite works
- Programmed remediation works to deliver early release of the first development phase and keep remedial activities off development critical path
- Solved problems with wet/winter weather and limited space on site using a value engineered process
- Maintained co-operative and open approach to regulatory authorities.

These successful outcomes were recorded on the project:

- Agreement of realistic remedial targets achieved by robust risk assessment
- 8,000 tonnes of waste, and up to 400 lorry movements avoided by treatment-based remediation
- We worked with the local environmental health officers to minimise impact to local residents. Complaints received from residents were dealt with promptly
- The remediation work was kept off the development critical path by an innovative and flexible approach
- We were able to handover two thirds of the site early
- We assisted in reducing the need for import by improving the geotechnical properties of site soils so they were suitable for use under the proposed roads.

Project delivery

RSK was appointed to deliver the risk assessment, remedial design and implementation as a full service turnkey contract. The management of the entire project as an integrated whole enabled a flexible and non-contractual approach to solving problems that arose during the works. There were no injuries or lost time accidents during the remediation works.

Application of risk-based procedures

Risk assessment was used as a remediation design tool as well as a site assessment tool throughout the project. The detailed quantitative risk assessment was reviewed in response to new data obtained during the remediation process. Key uses of the risk assessment included:

- Designing remedial layouts
- Establishing robust but achievable remedial targets
- Using speciated hydrocarbon analysis data to ensure that the risk-driving components were identified and remedial targets expressed in terms of the risk-driving fractions rather than the total hydrocarbon concentrations (as TPH or PAH).

Treatment technologies, initial and residual concentrations

The soils were treated by *ex situ* bioremediation utilising soil windrows turned by a purpose-built soil windrow turner. Windrows were covered by geotextile “fleeces” when not being turned to provide insulation and minimise infiltration of rainfall. Biodegradation of contaminants was achieved by naturally occurring soil bacteria and rate limiting constraints were addressed by ensuring the soil was kept in an aerobic state and that nutrient and organic carbon levels were sufficient. Successful completion of the *ex situ* treatment enabled the site to be handed back three months before originally programmed.

- **Example concentrations:** TPH in soil – initial 6,000mg/kg to 2,000mg/kg, remedial target 500mg/kg, achieved 350mg/kg. Risk-driving fractions reduced to below specific target levels.

Magnitude and range of costs

- Cost of “excavate and dispose” option estimated >£240,000
- Cost estimated in RSK proposal £150,000
- Actual out-turn cost £150,000.

Details of additives used

To help accelerate the remedial timescale ORC™ was added to the soils as a pre-treatment. The ORC™ allowed the introduction of oxygen into the soils before they reached the treatment bed for aeration by the windrow turner. The additives were handled in accordance with RSK’s COSHH assessment.

Material disposed off site

If a traditional Excavate and Dispose solution had been adopted, around 8,000 tonnes of soil – around 400 lorry movements - would have needed to be removed from the site and transported through residential streets. The cost of this option would have amounted to around £240,000.

There was no requirement for any off-site disposal.



Mitigation of negative environmental effects

Close liaison was maintained with the local authority EHO, and the remedial system was designed to minimise potential disturbance to residents. Odour problems from the treatment area were eliminated by keeping stockpiles and windrows covered and the use of a boundary waterborne masking agent applied as a mist spray through a layout of spray lances. All potentially adverse impacts were monitored.

Contact details for the RSK site supervisor were displayed on signs around the site. Three complaints from local residents were received during the remediation works. These related to noise from dewatering pumps on two occasions, and one relating to the odour masking system. In each case, action was taken by RSK’s site staff to address and resolve the issues causing concern.



For further information please contact:

Frank Westcott

Fourways House · 57 Hilton Street
Manchester · M1 2EJ · UK

Tel: +44 (0)161 236 2757 · Email: fwestcott@rsk.co.uk

Richard Croft

Green Farm Business Park · Latteridge Green
Folly Road · Iron Acton · Bristol · BS37 9TS · UK

Tel: +44 (0)1454 227550 · Email: rcroft@rsk.co.uk

