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CASE STUDY

E-Clay Stabilisation

Development of Site for Semi-Permanent Mobile Homes

Client:
Clyde Gateway

Developer:
RJ McLEOD

Environmental Consultants:
Halcrow

Site Background & History

The 3.8 hectare site was previously occupied by the former Parkhead Forge Rolling Mills and Steelworks on the western area of the site and Carntyne Dyewood Mills on the eastern area of the site. The local area has a history of heavy industrialisation as shown in Figure 1. The site was cleared in 1982.

Figure 1 – Aerial View from the North-West (1950)

The Camlachie Burn flows across the site (initially in an open channel and subsequently within a culvert). Shallow groundwater was present within the made ground - the groundwater was locally discontinuous and perched in places - monitoring data highlighted the potential for localised flows towards the north west of the site (in the north) and towards the west (in the southern area of the site).

Soils and groundwaters within the western area of the site had been shown to be impacted by hydrocarbon contamination (including free product) and were considered to represent a significant risk to the water environment beneath the site. It was estimated that the affected soils covered an approximate area of 2,850m^2.

Figure 2 – Typical Site Contamination

The affected soils were recorded to be encountered at depths of between 0.6m and 1.7m bgl, extending to between 1.1m and 2.2m bgl and exhibiting an overall average thickness of 0.6m. Shallow groundwater was recorded at an average depth in the region of 1.3m bgl in this area, with thin layers of free-phase product recorded on the groundwater surface at various locations.

The identified contaminants of concern were predominantly Total Petroleum Hydrocarbons (TPH) and BTEX. The groundwater within the centre of the identified contamination area was shown to be significantly impacted by very elevated concentrations of TPHs – with a maximum total TPH concentration of 5,500mg/l.

Halcrow considered the following remediation measures.

- Excavation and removal for disposal at landfill

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- On-site treatment to achieve a lower waste classification (for reduced cost disposal at landfill)
- On-site treatment to reduce the contamination to acceptable levels for retention / re-use on-site

Having assessed the potential options it was concluded that the on-site treatment of the impacted material for retention and re-use on-site was the most practical, cost-effective and environmentally sustainable solution.

Remediation Objectives

Envirotreat were commissioned by RJ McLeod to undertake the following:

1. Formulation and approval of a remediation strategy to satisfy regulatory requirements.
2. Management and implementation of the agreed remediation strategy for the treatment of contaminated soils and associated groundwaters utilising E-Clay Stabilisation.
3. Preparation and submission of a comprehensive validation report to satisfy the requirements of Glasgow City Council and SEPA.

Methodology

The remediation target [leachate] criteria were determined by Halcrow and comprised 22ug/l for individual TPH bandings, and 2ug/l for total PAH's [0.02ug/l for Benzo(a) Pyrene]. These target criteria were agreed with the Council and SEPA and were implemented as site reuse criteria for the treated materials.

Prior to commencement of the remediation works Envirotreat undertook treatability trials to confirm the suitability of the proposed site-specific E-Clay Stabilisation formulation [for compliance with the site reuse criteria].

Envirotreat produced a Site-Specific Working Plan outlining the site history, identified contamination issues, proposed remediation strategy & technical rationale, environmental protection measures required during the remediation works and validation protocols for the treatment element of the works. Following liaison with Glasgow City Council and SEPA, approval was gained to undertake the treatment element of the works.

The proposed remediation works comprised of excavation, *ex-situ* stabilisation and re-emplacement.

The excavation of soils within the identified contamination area (and validation of excavations) was undertaken by RJ McLeod in conjunction with Halcrow. Contaminated soils were stockpiled pending treatment by Envirotreat.

The contaminated soils were treated *ex-situ* utilising the designated E-Clay Stabilisation formulation. The soils were treated in 15m^3 batches utilising a mixing bin - see Figure 3. The treatment process involved mixing the soils with the designated E-Clay in slurry form and cementitious materials added in dry form. The soils were mixed with the treatment materials to produce a homogeneous mass. Representative samples were taken throughout the treatment process – these samples were combined to produce composite samples for validation purposes.

Figure 3 – Contaminated Soil Treatment

Contaminated groundwater was extensively encountered during the excavation stage of the works (due to the excavations extending

vertically below the water table) – see Figure 4. Envirotreat utilised circa 1,000m^3 of contaminated groundwater in the treatment process (as an alternative to utilising a conventional water supply) – this treatment capability provided a dual benefit in cost saving in terms of water usage and disposal costs for contaminated groundwaters.

Figure 4 – Contaminated Groundwater (Reused in the Treatment Process)

Approximately 6,500m^3 of contaminated soils were excavated, treated and re-used on site.

The remediation works were undertaken within a six-week timescale.

Validation

The works were undertaken in accordance with the approved Site-Specific Working Plan. It was

agreed that the suitability of treated material for reuse on site would be determined by compliance with designated leachate target values.

The treated materials were seen as a necessary part of the works - the material would replace the requirement to utilise imported fill to return the site to pre-remediation formation levels. The material was identified as having a specific purpose with any deficit of material resulting in the necessity to import fill.

Following a suitable period of "curing" representative composite samples of treated soils were leach tested and compared with the derived leachate target criteria. A total of 41 samples were tested and all leachate values were compliant with the designated remediation criteria. The treated material was therefore considered suitable for reuse on site and re-emplaced in the void spaces created by the validated excavations as a substitute for imported fill.

Conclusions

Envirotreat were able to demonstrate through a comprehensive Validation Report that the overall remediation strategy had been successfully implemented.

The prime drivers for the remediation works were the protection of human health and controlled waters.