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CASE STUDY

Cowdenbeath Wetlands
Barhale

Main Contractor	Barhale
Client	Scottish Water
Building Type	Remediation and associated earthworks
Procurement Route	Negotiated Tender
Contract Award	January 2014
Contract Completion	March 2014
Anticipated Duration	60 Days
Key milestones	Formation of new visitor car park and access road to facilitate the works Construction of a new fire water storage pond for the distillery Construction of temporary suds and surface water management system Phased handover of the building platform to other trades
Works Complete	Earthworks, Ground Improvement / Soil Stabilisation, Screening and Processing, Mass Soil Mixing
Quantities	Excavation and processing – 16,000m3 Mass soil mixing for solidification – 7,000m3 Stabilisation / solidification– 16,000m3

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PROJECT DESCRIPTION

Our earthworks and soil stabilisation methods played a key strategic role in the delivery of the Cowdenbeath Wetlands Project This multi-million project has created a sustainable wetland that allows Scottish Water to treat storm water overflows and provides a habitat for a wide variety of wildlife.

We were appointed by the principal contractor Barhale, along with Atkins (consultant engineers and designers), to create an alternative on-site remediation strategy that would work both in a geotechnical and environmental capacity to create the embankments which form the sides of the 2.5m high perimeter wetland bund to form a totally impermeable material to contain the wetlands. We also engaged in extensive consultation during the design and construction process with the Scottish Environmental Protection Agency to ensure that our scheme gained their approval.

Our remediation solution involved screening, sorting and classifying the excavated materials from the storage tank. Plastics, metals and timber were removed and sent to landfill.

Specialist solidification techniques were then used on 16,000m3 of soil to lock-in the contaminants by combining the soil with a pulverised fuel ash (PFA) and cement binder, which is a by-product from the nearby Longannet Power Station, thus rendering them immobile.

The treated material was then used to create the embankments which form the sides of the 2.5m high perimeter wetland bund to form a totally impermeable material to contain the wetlands.

The soft formation under the base of the wetlands was also solidified to create an impermeable capping layer across the wetland by utilising our deep soil mixing system. This is the first time this technique has been utilised by Scottish Water because they have used more traditional systems of contaminated land remediation in the past.

7,000m3 of ground was treated to an average depth of 1.5m using the deep soil mixing technique. A large mechanical mixer arm operated from a 40 tonne excavator which was positioned vertically into the soil. The deep soil mixing technique was repeated across a grid system over the base of the wetland.

The columns are self-compacting and able to withstand shear loadings and therefore create a stable, solid base spread across the columns which will reduce any potential differential settlement. The resulting platform is also impermeable, reducing the risk of surface water migrating through the contaminated soil and towards a groundwater source.

THE RESULTS

Once the soil had been solidified and compacted it achieved a California Bearing Ratio (CBR) value in excess of 30%, a permeability of 10-7 and a phi angle of 35o. This technique was also used to stabilise the formation level of the retaining wall.

This solution was found to be the most cost-effective approach which also delivered significant programme savings compared to other options considered by the team. The approach saved the disposal of circa 16,000m3 of contaminated soil to landfill and the importation of the equivalent volume of granular material.

As well as the environmental and economic benefits, the solution avoided 3,200 truck movements through the neighbouring housing estate saving a significant amount of customer disruption.

We estimate that the overall cost saving for this project, using deep soil mixing and soil stabilisation compared with a conventional dig and dump approach, was around £2million.