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CASE STUDY

E-Clay Stabilisation

Residential Development
Former Pitwines (Poole) Gas Works

Client

Crest NICHOLSON

Main Contractor

ANDERSON GROUP

Environmental Consultants

Waterman

Site Background & History

The site was formerly occupied by Pitwines Gas Works located in close proximity to Poole Harbour which is classified as a Site of Special Scientific Interest (SSSI). The site occupies an area of 4.23 hectares and has remained vacant for 20 years.

The developer [Crest Nicholson (South) Limited] has been granted planning consent for the construction of 500 residential units on the site. The proposed site development is shown in Figure 1 below.

Figure 1 – Proposed Residential Development

The site is bounded by a combination of residential, retail and commercial buildings. The surrounding land has been reclaimed from the sea (typically utilising waste materials including gas works waste).

The identified contamination on the site reflected the previous usage of the site as a gas works. The prime contaminants of concern were heavy metal pollutants, total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, phenols, ammonia and 'total' cyanides (free and complex).

Objectives

The remediation strategy for the site was designed to address the identified source contamination with the intention of protecting both human health and groundwater / surface water receptors (in particular Poole Harbour located 330m from the site).

The sensitive location of the site and the proposed redevelopment of the site for a residential end use necessitated close liaison with the main contractor, the environmental consultant and the regulatory bodies (Environment Agency and the Borough of Poole Council).

Methodology

The *ex-situ* remediation works involved the treatment of circa 11,000m^3 of contaminated soils and gas works waste.

The contamination was primarily identified within the 60m diameter gas holder (see Figure 2 below), the retort house and other localised hotspots across the site. The soils were excavated, stockpiled and treated on-site utilising E-Clay Stabilisation.

The treatment was carried out utilising three slurry production and mixing units operating in parallel to achieve the target throughput objective of 450m^3 – 600m^3 per day. The slurry production units are shown in Figure 3 below.

Figure 2 – Excavated Gas Holder

Figure 3 – Slurry Production Units

The E-Clay slurry was pumped across to the mixing zone. The contaminated soils were then treated in the mixing zone by adding the designated volumes / amounts of E-Clay slurry and cementitious materials to the contaminated soils (see Figure 4 below). The treatment materials and soils were then mixed in 10m^3 batches to produce a homogeneous treated [E-Clay Stabilised] material utilising excavators mounted with conventional buckets as shown in Figure 5 below.

Figure 4 – Addition of E-Clay Slurry

Figure 5 – Treatment (Mixing) Process

Representative samples were taken throughout the treatment process – these samples were combined to produce composite samples for validation purposes.

The treated soils were temporarily stockpiled before being reused on-site as a substitute for imported clean fill.

The works were conducted over a 6 week period under the auspices of Envirotreat's Mobile Process Licence (MPL). Specialist technology, materials and supervision were supplied by Envirotreat, whilst Anderson Group (3R) supplied all plant, labour, odour control and general management required for the process.

Validation

Validation of the treated material was carried out on 44 composite samples of the treated contaminated soils (equating to one composite sample for every 250m^3 of treated soils). Samples were leached and analysed by a UKAS accredited laboratory.

Results

The leachate testing was carried out to validate the treated material for each of the identified contaminants of concern. The results show the mean average and 95th percentile leachate results for the identified contaminants of concern.

The leachate results are summarised in Table 1 below.

Table 1 – Leachate Results

Contaminant of Concern	C_o Target Value ($\mu g l^{-1}$)	Leachate of Treated Soil ($\mu g l^{-1}$)	
		Mean Average	95th Percentile
Arsenic	211	10.3	12.0
Cadmium	42.2	0.6	0.5
Chromium	127	10.0	10.0
Lead	211	50.0	50.0
Mercury	2.5	0.2	0.31
Selenium	84.4	3.2	4.86
Copper	42.2	13.4	25.0
Nickel	253	20.0	20.0
Zinc	337	10.7	14.0
Free Cyanide	422	87.5	206.5
Ammonium	5.66E+08	179.2	653.5
PAH's (Total of 6) *	7,560	0.622	1.465
TPH	3.78E+05	956.7	2360
Phenol	6.9E+101	61.2	173

* fluoranthene, benzo-3,4-fluoranthene, benzo-11,12-fluoranthene, benzo-3,4-pyrene, benzo-1,12-perylene and indeno (1,2,3-cd) pyrene

Conclusions

The remediation works were carried out successfully in the required timeframe utilising multi-treatment processing units operating in parallel.

The leachate values were fully compliant with the agreed Site Specific Target Levels (C_o Target Values) thereby enabling the treated soils to be reused on-site for a beneficial purpose.

The residential development is shown in Figure 6 below.

Figure 6 – Residential Development