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Delivering land you can develop

CASE STUDY

E-Clay Stabilisation / Asbestos Remediation

Norfolk Community Housing Development

Client

orbit group

Developer

chalcroft
construction built on teamwork

Site Background & History

The site comprises of an approximately rectangular parcel of land 70m by 100m situated in the rural village of Stoke Ferry in Norfolk.

Large stockpiles of soil mixed with [probable] fly-tipped waste were present on the site - the largest stockpile was over 3m in height. The fly-tipped waste was widespread across the site surface and was noted to regularly include potential asbestos containing materials (ACMs).

The presence of ACM was confirmed by Phoenix Green Limited who confirmed the presence of Chrysotile, predominantly in the form of cement bound asbestos sheeting.

In general terms Chrysotile (in cement bound asbestos sheeting) presents a lesser risk than other forms of asbestos. The original sheeting had been broken down into small fragments and was widely distributed in the surface layers (due to the sheeting and surface soils being 'churned up' and intermixed by previous site activities). Phoenix reported that "Asbestos cement products have been visually identified throughout the site both in the ground and spoil heaps. Holes and trenches were dug all over the site to assess the extent of contamination. Debris was found at a depth up to 300mm.

The surface distribution of ACM presented a significant risk to human health. The ACM typically found on site is shown in Figure 1.

Figure 1 – ACM Typically Found Onsite

The client had planning permission to develop the site for residential end use (social housing).

Envirotreat was commissioned to undertake remediation of the site in preparation for the construction of the residential development and associated infrastructure.

Although there appeared to be no historical evidence of hazardous chemicals, fuel tanks or wastes being stored on site it was considered that the site was potentially / additionally contaminated with metallic / hydrocarbon pollutants due to the presence of significant fly-tipped material. Whilst ACM did not present a risk to groundwater the presence of other potential contamination necessitated the adoption of precautionary measures to protect the groundwater and underlying chalk aquifer.

A number of remediation options were considered and precluded on the basis of cost and / or inability to achieve site remediation within the required timeframes.

Working closely with Chalcroft and the Kings Lynn & West Norfolk Borough Council, Envirotreat developed a remediation strategy

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which was commercially viable and compliant with designated human health and environmental remediation criteria.

Remediation Objectives

Envirotreat were commissioned by Chalcroft to undertake the following:

- Formulation and approval of a Remediation Strategy / Method Statement to satisfy the requirements of the Council [Environmental Health and Planning] and the Environment Agency [EA]
- Management and validation of all on-site soil excavations
- Management and implementation of the agreed remediation strategy for the excavation and treatment of ACM / contaminated soils
- Management (and implementation) of the reuse of treated and validated soils on site
- Preparation and submission of a comprehensive validation report to satisfy the requirements of the Council and the EA
- Discharge of relevant planning conditions

ACM – Technical Challenges

This project has highlighted the technical challenges of assessing / quantifying the risk that ACM pose to human health, particularly in the absence of clear regulatory guidelines.

Asbestos has been [historically] widely used and is commonly found on most derelict and contaminated sites in various forms.

In most contaminated land investigations, it is important to establish the concentrations of identified contaminants within soils and groundwater. These appraisals are then combined with conceptual site models to determine appropriate numeric risk threshold values for remediation purposes.

This approach is not currently feasible for ACM. As a consequence, it is difficult to carry out a quantitative risk assessment and to establish remediation requirements. The Environment Agency has not published Guideline Values for asbestos, and it is generally considered that clear guidelines will be very difficult to establish. Laboratory analysis (implemented in accordance with HSG 248) only provides, at best, a semi-quantitative assessment of the amount of asbestos in a given sample.

It has proved to be very difficult to establish a practical (and workable) methodology / protocol that can evaluate varying types / sizes / forms of ACM / asbestos in relation to a body of soil taking into account critical soil properties, such as moisture retention.

The treatment methodology utilised by Envirotreat reflected the identified technical challenges associated with ACM remediation.

Methodology

Envirotreat produced a Remediation Method Statement outlining the site history, contamination issues, the proposed remediation strategy & technical rationale, environmental protection measures required during remediation works and validation protocols for the treatment element of the works.

The agreed strategy comprised:

- Removal of all the large stockpiles of fly-tipped material for offsite disposal including the bulk removal of grossly contaminated ACM
- Site clearance – vegetation removal etc.
- Removal of surface soil layer (particularly beneath previous stockpile areas) and stockpiling in anticipation of subsequent treatment
- Validation of underlying soils to confirm removal of ACM (as far as practically possible)
- Physical and chemical [treatment] stabilisation of excavated ACM / contaminated soils
- Validation of treated materials

- Redeposition of the treated materials in an designated area of the site (underneath a proposed car parking area)
- Installation of a capping layer overlying the treated materials

Chalcroft commissioned the bulk removal of the soil stockpiles to a dedicated landfill disposal site. The contaminated surface materials were then excavated across the whole site to a maximum depth of 300mm – the actual depth in each excavation was determined by visual observation / confirmation that all ACM had been effectively removed. The excavated materials were stockpiled pending treatment as shown in Figure 2.

Figure 2 – Stockpiled Soils Pending Treatment

Given the lack of clear guidance it was decided to adopt a precautionary approach. The treatment process incorporated combined physical and chemical stabilisation.

The physical stabilisation element was designed to enhance the encapsulation [physically lock in] of any asbestos fibres. The physical stabilisation element incorporated the use of cement, wetting agent and adhesive. The objective was to bind the fibres into a non-friable monolithic soil mass and then capping off the treated soils, in this instance with a car park.

The chemical stabilisation element was designed to treat other potential pollutants on site which had the potential to pollute the underlying major aquifer. The stabilisation mix formulation also [therefore] incorporated a pillared organoclay [E-Clay] designed to chemically immobilise the potential pollutants of concern (metals and hydrocarbons).

The treatment process was carried out utilising conventional *ex-situ* processing equipment. 10m^3 batches of ACM / contaminated soils soils were placed in a mixing bin (see Figure 3) – a designated volume of a combined E-Clay / additive slurry was added followed by the addition of cement in dry form. The ACM / soils were then mixed with the treatment materials to produce a homogeneous mass. Representative samples were taken throughout the treatment process – composite samples were produced for validation purposes – these samples were submitted to an independent laboratory for analysis. On successful validation, the treated soils were emplaced in a previously excavated pit and compacted in layers to ensure that the material was monolithic and posed no risks to human health (see Figure 4).

Figure 3 – Treating Stockpiled ACM / Contaminated Soils

Figure 4 – Emplacing Treated Soils

All remediation works were undertaken in accordance with guidance, "Protection of Workers and the General Public During the Redevelopment of Contaminated Land" (HS(G)66).

In total Envirotreat processed over 1,200m^3 of excavated ACM /contaminated soils.

Validation

The works were undertaken in accordance with the approved Method Statement.

Following a suitable period of "curing" four composite samples of treated ACM / soils were tested by i2 Analytical Laboratories.

The samples were leached and tested for metals and hydrocarbons. These results were within acceptable limits and not considered to pose a risk to groundwater. Three of the four samples tested confirmed the presence of ACM (in Chrysotile form – as expected) - the maximum concentration recorded within the treated material being 0.018% (by weight).

Conclusions

Envirotreat were able to demonstrate through a comprehensive Validation Report that the requirements of the NHBC and the regulatory bodies had been satisfactorily addressed.

The inorganic and organic leachate levels were within acceptable limits and the asbestos content was below the Environment Agency guidance (WM2 Appendix C 7-H7) which states that Asbestos in waste at a concentration above 0.1% is considered to be hazardous waste in the UK. Dustiness and future release of asbestos fibres was significantly reduced by the treatment process and subsequent capping of the emplacement area.

The relevant planning conditions were discharged by the Council and the NHBC also approved the remediation works.

Figure 5 – Proposed and Actual Development.