

Client



Main Contractor



Environmental Consultants



ROLTON GROUP
ENGINEERING THE FUTURE

Figure 1 – Former Pianoforte site circa 1950's



Prior to closure the company still employed 600 employees mainly producing car components. These were manufactured using rolled sections, pressings, extrusions and injection mouldings, which were then anodised, plated or powder-coated.

Persimmon Homes propose to develop the site for residential purposes with the construction of over 290 low rise properties on the site.

The anodising and plating activities were carried out in a dedicated Plating Shop – the components undergoing anodising and plating were initially cleaned in an adjoining Degreasing Room (see separate Case Study). A number of investigative trial pits were excavated in the vicinity of the Former Plating Shop Area which showed that the underlying soils were impacted with heavy metal and cyanide contamination, derived from former plating activities. The prime contaminant of concern was identified to be hexavalent chromium (Cr VI).

Hexavalent chromium typically exists in an anionic form (for example chromate) and is consequently very soluble and mobile within groundwater.

Envirotrat utilise ChromeSorb® for the treatment of both hexavalent and trivalent chromium (in addition to other pollutants such as cyanide and cationic heavy metals). ChromeSorb is a form of E-Clay Technology.

Site Background & History

The former Pianoforte factory site is located to the south of the village of Roade in Northamptonshire.

The site was closed in 2010. The site at closure covered over 11 hectares, consisting of a range of offices, warehouses and workshops.

Industrial activity on the site started in or around 1910, mainly specialising in the manufacture of piano parts. Following a major fire in the 1930's the facility was rebuilt. During the Second World War the company switched to making parts for aircraft and road vehicles as part of the war effort. Post war the company expanded into the growing automotive and aviation non-ferrous castings market. In the 1960s employment peaked at around 1,800 workers, falling to 700 in 1980, the year after the firm stopped making piano strings.

The site in the 1950's is shown in Figure 1 below.

The Cuddy Group [Cuddy] commissioned Envirotreat to provide the treatment capability to address the identified plating shop contamination.

The Rolton Group [Rolton] were engaged by Persimmon to provide consultancy services which included carrying out the requisite risk assessments for the protection of human health and groundwater – Rolton produced a Remediation Strategy and a Detailed Quantitative Risk Assessment [DQRA] in relation to the identified chromium and cyanide contamination. Rolton also determined remediation target criteria [RTC] for the remediation works (for the protection of human health and controlled waters) based on the conclusions from the DQRA.

Rolton Group were also engaged by Persimmon to carry out delineation of plating shop contaminated soils (to determine whether treatment would be required or not in accordance with the designated RTC).

Methodology

The remediation works comprised of three distinct stages:

Stage 1 – Treatment of the residual surface contamination on the plating shop floor and walls

Stage 2 – Installation of a permeable reactive barrier system to address contaminated groundwater potentially migrating from the Former Plating Shop Area

Stage 3 – Treatment of the source contamination in the Former Plating Shop Area (predominantly contaminated soils)

Stage 1 Remediation Works:

There was visual evidence of contamination of plating shop derived contamination (particularly Cr VI) on the plating shop floor and on the surfaces of the walls as shown in Figure 2 below.

Figure 2 – Visual Evidence of Contamination Associated with former Plating Shop Activities



To protect ground workers during the demolition process (undertaken by Cuddy) and to mitigate the risk of identified pollutants vertically migrating into the underlying groundwater during the demolition process (as a consequence of being exposed to rainfall) it was decided to treat the surface contamination on both the floors and the walls by applying ChromeSorb in slurry form to all the affected surfaces – see Figure 3 below. The treated surface contamination was controlled by utilising the existing floor drainage system (gullies) – this gully system terminated in a collection / reception pit where any treated slurry wash-off was collected and subsequently utilised in the treatment process – see below.

Figure 3 – Plating Shop Following the Application of ChromeSorb (compare picture to Figure 2).



Stage 2 Remediation Works:

It was decided to install a permeable reactive barrier [PRB] directly downstream of the Former Plating Shop Area to address the potential risk of highly soluble and mobile Cr VI and cyanide pollutants migrating from the area in the underlying groundwater (once the plating shop structure was demolished and the associated floor slab was lifted exposing the area to potential rainfall).

Envirotrear were able to design a barrier system using available groundwater data and known groundwater contours supplemented by the findings from the trial pitting investigations.

The PRB was installed in December 2015 over a two-week period (along the southern and western boundaries of the Former Plating Shop Area). The PRB was installed by trenching and soil mixing techniques – the treatment medium was a highly pillared ChromeSorb formulation designed to chemically sorb and immobilise anionic Cr VI and cyanide in groundwater – the PRB installation was 100m in length and installed to the required depth to intercept migrating groundwater (toeing into the underlying Rutland Formation).

The alignment of the PRB is shown in Figure 4 below and the PRB installation is shown in Figure 5 below.

Figure 4 – Schematic Showing Alignment of the Installed PRB

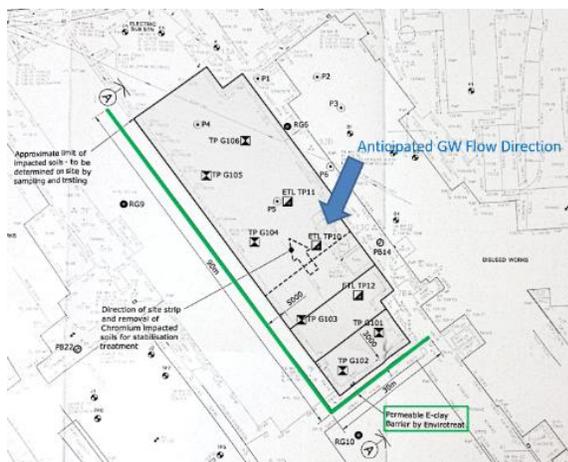


Figure 5 – Excavating Barrier Trench to Enable Barrier Installation by Soil Mixing Techniques



Stage 3 Remediation Works:

Following demolition of the plating shop building and the removal of the floor slab, Cuddy then excavated the soils within the vicinity of the former plating shop. The excavations were carried out utilising a grid system whereby the contaminated soils were delineated by Rolton utilising a concentration threshold value of 10mg/kg Cr VI - Rolton established an on-site testing facility to carry out the designated delineation process.

Soils which were shown to require treatment (i.e. exceeding the 10mg/kg Cr VI threshold value) were stockpiled for subsequent treatment for compliance with the designated RTC [leachate values] derived from the DQRA. These RTC values were 1mg/l total chromium, 0.3 mg/l Cr VI, total cyanide 10mg/l and easily liberatable (free) cyanide 1mg/l.

Soils which were shown not to require treatment (i.e. not exceeding the 10mg/kg Cr VI threshold value) were reused on-site at suitable locations.

Enviro-treat were commissioned by the Cuddy Group to undertake the *ex-situ* treatment of the stockpiled contaminated soils (and contaminated crushed concrete where identified) to enable reuse on site (in a purpose designed excavated burrow pit).

Enviro-treat utilised a stabilisation medium comprised of a suitable ChromeSorb formulation and cementitious materials (OPC) – the ChromeSorb formulation was designed to address the identified contamination loadings taking into account the high solubility and mobility of CrVI and cyanide.

Enviro-treat treated the contaminated materials in 10m³ batches over a seven-week period. In total 4,330m³ of contaminated materials were treated. The *ex-situ* treatment operation is shown in Figure 6 below (treatment of contaminated soils).

Figure 6 – *Ex-Situ* Treatment of Contaminated Soils



Enviro-treat were able to utilise contaminated water contained within a reception pit used to historically collect contaminated rinse water from the former plating shop (prior to treatment in the former effluent treatment plant). This water was incorporated into the treatment process and was utilised as an alternative water supply for the treatment process. Other contaminated water on the site was also incorporated into the treatment process. The reception pit is shown in Figure 7 below.

Figure 7 – Former Plating Shop Reception Pit (Contaminated Rinse Waters)



Validation

Enviro-treat collected representative samples from each batch of treated material. Following a suitable ‘curing’ period, representative composite samples were prepared and submitted to i2 Analytical Laboratories for analysis (leachate testing). The leachate results for both total chromium and hexavalent chromium were fully compliant – all leachate values were below the 0.3mg/l hexavalent chromium target value – the leachate values showed that the leachable chromium was exclusively in the hexavalent form as expected. The leachate values for cyanide were also fully compliant.

Conclusions

Enviro-treat were able to demonstrate through a comprehensive Validation Report that the plating shop remediation works had been successfully implemented. The prime drivers for the remediation works were the protection of human health and controlled waters.