# MCI Developments

## Ground Investigation Report

**for**

## Crabtree Lane, Openshaw

**September 2021**

**REPORT NO: 21CHE276/DSGI**

- *Desk Studies and Site Walkovers*
- *Intrusive Contaminated Land Investigations*
- *Geotechnical Appraisals and Ground Investigations*
- *Landfill Gas Assessments and Remedial Design*
- *Remediation Design and Implementation*
- *Remediation Project Management and Supervision*
- *Site Abnormal Assessments (Foundations and Contaminated Land)*

**GEOTECHNICAL - CONTAMINATED LAND - FLOOD RISK**

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## DOCUMENT ISSUE RECORD

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|---|---|
| **Contract No**: | 21CHE267 |
| **Client:** | MCI Developments |
| **Contract:** | Crabtree Lane, Openshaw |
| **Document:** | Desk Study and Initial Ground Investigation Report |

| | |
|---|---|
| **Prepared by:** | K Rodway |
| **Checked by:** | M Fawcett |
| **Authorised by:** | M Fawcett |
| **Date:** | Sept 2021 |

## REVISION RECORD

| Revision | Date | Description | Prepared by |
|---|---|---|---|
| 0 | Sept 2021 | Draft for comments | KR |
| 1 | June 22 | Updated with new layout and full gas data | JS |
| | | | |
| | | | |

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| ID | Location | Type of water feature | Ground level | Permanence | Name |
|---|---|---|---|---|---|
| 5 | 13m N | Lock or flight of locks. An enclosure in a canal or navigable river with gates and sluices at either end. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |

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# 1 EXECUTIVE SUMMARY

***Note –*** *The following summary is not exhaustive and is to be used for guidance purposes only. The full report should be consulted for full details.*

**1. Site Location**

The site located in the north of Openshaw, between Openshaw and Clayton. The site has an approximate address of B&S Massey, Crabtree Ln, Manchester M11 1BR.

**2. Site Description**

The site is irregular in shape but is considered roughly rectangular. The site is formed by three main structures in the west with the remaining areas being largely hardstanding which is also generally heavily vegetated with self-seeded trees and bushes.

Access is made on to the site via the main access road in the south of the site, although access has been made by trespassers through the main building on the western boundary.

The buildings are largely empty however, some machinery remains, as does significant amount of waste. Asbestos was noted at the surface across the site but was focussed on the southern end of the western building. Also, within this building was a large 'oil' spill.

**3. Proposed Development**

Full Planning Application for the development of 115 dwellings (Class C3) with new vehicular accesses from an upgraded Crabtree Lane and associated works, following the demolition of all existing buildings/structures.

**4. Site History**

**On Site**

The earliest available map of site is the 1845 1:10,560 map which shows the site to be largely undeveloped land with a culvert crossing the site.

The 1893 1:10,560 map which shows a change of position of the culvert / stream.

The 1908 1:2,500 map which shows the construction of a number of buildings in the north, and central areas of the site. The northern building is labelled as an iron works. The area to the south of the works is detailed as steep slopes indicating removal of materials. A smaller slope is also present in the southwest.

The 1922 1:2,500 map which shows the construction of additional buildings in the north, and demolition in the south with alterations of the steep slopes.

The 1932-1933 1:2,500 map which shows further construction in the north, and demolition with creation of allotment gardens in the south, again with alterations of the steep slopes.

The 1949-1950 1:1,250 map shows significant extension to the buildings in the north of the site with the introduction of travelling cranes and tanks. An electrical substation is also shown on the western boundary. The steep slopes are shown as a refuse heap along Clayton Brook. Steep slope is still shown around the stream in the southwest.

The 1964-19681:1,250 map shows significant changes across the site, with the extension of existing buildings and construction of new ones.

The 1983-1986 1:1,250 map shows significant changes across the site, with the extension of existing buildings and construction of new ones. Clayton Brook no longer shown.

The 1988-1991 1:1,250 map shows additional tanks in the north and the centre of the site.

There were no significant changes until the 2021 1:10,000 map which shows the site in its current state following


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demolition of several buildings.

**Offsite**
Mixed commercial/industrial and residential setting.

**5. Published Geology**

The BGS map shows the geology beneath the following:

- **Superficial –** Glacial Till – **Diamicton**
- **Solid** – Manchester Marl Formation – **Mudstone**

**6. Hydrogeology and Hydrology**

- The superficial deposits of the Glacial Till are classed as Secondary Undifferentiated (low permeability) and Secondary A Aquifer (moderate permeability).
- The bedrock deposits of the Manchester Marls Formation are classed as a Secondary B Aquifer (low permeability).
- The site does not lie within a Groundwater Source Protection Zone as defined by the Environment Agency.
- The closest listed watercourse is the canal adjacent to the northern boundary. However it is not clear from historical mapping whether Clayton Brook is rerouted away from the site, as historical mapping does show it being culverted across the south of the site.

**7. Summary of Environmental Data**

Possible Contamination Sources

- **Current Site Use – On Site –** Unlikely
- **Historical Land Use – On Site –** Likely
- **Surrounding Land Use – Quarrying –** Possible

Pathways and Receptors

- **Aquifers – Below the Site** – Secondary B Aquifer (solid)
  – Secondary A Aquifer (Superficial)
  – Secondary Undifferentiated (Superficial)

In this qualitative risk assessment, a **Low to Moderate** risk for contamination and ground gas exists across the site. Remedial action is likely to be necessary at the site, the likes of which cannot be confirmed until the geotechnical and contamination ground investigation has been completed.

It is anticipated that elevated risks are generally linked to site history and Made Ground.

**8. Scope of Betts Geo 2020 Investigation**

The initial fieldwork was carried out between 9th-10th August 2021 and comprised the following;

- Seven (7no) machine excavated trial holes to depths between 0.60mbgl (TP4) and 1.95mbgl (TP7).
- Four (4no) window sample boreholes to depths of up to 4.00mbgl.
- Chemical analysis (Metals, PAH's, TPH's) of ten (10no.) samples.
- Analysis of ten (10no.) samples for asbestos analysis.
- Two (2no) samples for geotechnical analysis, including pH, water soluble sulphate and Atterburg limits.

**9. Ground Conditions Encountered**

The prevailing ground conditions at the site can generally be summarised as MADE GROUND of various granular deposits to depths of greater than 2.95mbgl.
MADE GROUND was noted overlying NATURAL strata of CLAY in WS101, and TP1 from 1.20mbgl.


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**10. Contamination Encountered**

Elevated concentrations of various VOCs/SVOCs, metals, asbestos, PAHs and SVOCs have been observed chemical samples in a number of locations across the site, in addition to the surficial, visual and olfactory contamination observed during the site works.

The presence of asbestos within the Made Ground is likely due to poorly managed historical demolition. This is evident from the deposits noted at surface.

**11. Remedial Actions**

**Soils**

This methodology of reusing asbestos impacted soils will require carefully managed soil movements, in conjunction with an MMP (Materials Management Plan) and Local Authority agreement and signoff.

Due to the presence of asbestos, it is recommended that a 600mm clean and inert capping layer with a geotextile break layer is installed to impacted plots, as per NHBC guidance. This however, is location specific.

**Groundwater and Canal**

The underlying aquifer and groundwater are largely protected by cohesive clay strata. No significant mobile contamination has been observed, neither has any perched water.

The risk of contamination to the adjacent canal to the north of the site is deemed low due to the anticipated cohesive superficial geology surrounding the clay preventing any significant contamination migration. A road/access track is also present between the canal and the site, increasing its distance from site.

Protection measures may be required during the construction works to prevent any water ingress during the earthworks and sediment runoff will need to be controlled.

If any unofficial connections are discovered to the canal during the construction works, they will be blocked up to prevent any water from the site draining to the canal.

**12. Off-Site Disposal of Surplus Soil**

It is recommended that the results of the contamination testing (including the history of the site) be presented to the proposed landfills, to obtain their acceptance of the information to date and to determine the actual WAC limits used by them, (see Appendix J for further guidance). Segregation of made ground/topsoil and natural should be possible given the chemical analysis and very different visual identification.

Site waste management plans will be required due to the size and cost of the proposed scheme.

**13. Specialist Ground Gas Measures**

BRE211 (2007) Radon: guidance on protective measures for new buildings shows it is in a lower probability area, as less than 1% of homes are above the action level. Therefore, no Radon protective measures are necessary in building of new structures.

Slightly elevated carbon dioxide (greater than 5%) was noted in WS01 on four out of the six visits. Slightly depleted oxygen was also noted in WS01 and WS03 on four of the six visits. Flow rates remained low across all of the visits (max 0.1l/hr).

The previous third party investigation also identified elevated carbon dioxide in WS11 at a concentration of 8%.

Due to the history of the site and the MADE GROUND encountered during the initial ground investigation, it is proposed Amber 1/CS2 ground gas protection is utilized across site. Additional ground gas monitoring is required in the areas that could not be accessed due to dense vegetation/existing buildings (post demo) during the initial investigation.


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**14. Foundations**

Due to the variability of the ground, a detailed foundation zoning plan should be undertaken once final layouts / levels are known taking in to account the varying ground conditions.

For low-rise properties, strip / trench foundations may be suitable where competent ground is found <2.00mbgl., based on the below;

- Firm CLAY strata with an allowable bearing pressure (ABP) of 100kN/m2
- Stiff CLAY strata with an allowable bearing pressure of 125kN/m2

**15. Highway**

According to the criteria of Highways Agency HD 25/95 Volume 7 Section 2 Part 2 HD 25/94, a CBR value of 3-5% on the Made Ground anticipated, however confirming in-situ CBR's should be undertaken. Placement of geotextiles within the areas of roads / parking could also be designed to minimise the subgrade thickness.

**16. Heave / Shrinkage Potential**

Low plasticity is evident across the materials tested. Foundation design for tree heave protection could be designed accordingly following discussion with the NHBC.

**17. Ground Floor Construction**

Suspended floor construction e.g. either in-situ RC slabs or block and beam flooring is recommended as per NHBC guidance.

**18. Control of Groundwater**

Shallow perched groundwater has not been observed. The provision of pumping/shuttering may still be necessary during excavation of foundation trenches, especially during wet weather, close to surface water features and to deeper excavations for sewers etc. It is good practice to have such equipment on standby in case of seasonal / abnormal weather conditions.

**19. Concrete Design**

It is considered for concrete design purposes that a brownfield site and mobile groundwater conditions are applicable, and the results are summarised below:

Area Around WS101

- Design Sulphate Class: DS-1s, ACEC Class: AC-2, Design Chemical Class: DC-2

Rest of Site

- Design Sulphate Class: DS-1s, ACEC Class: AC-1, Design Chemical Class: DC-1


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# 2 SITE DESCRIPTION

## 2.1 Introduction

This investigation was carried out on the instruction of MCI Developments Homes. The purpose of the work was to undertake an initial ground investigation works to provide geotechnical and contamination risk information for the proposed construction of 115 dwellings (Class C3) with new vehicular accesses from an upgraded Crabtree Lane and associated works, following the demolition of all existing buildings/structures

## 2.2 Site Location

The site located in the north of Openshaw, between Openshaw and Clayton. The site has an approximate address of B&S Massey, Crabtree Ln, Manchester M11 1BR. A site location plan is shown in Appendix A.

The proposed site layout is shown below;





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## 2.3 Site Description

### 2.3.1 On Site

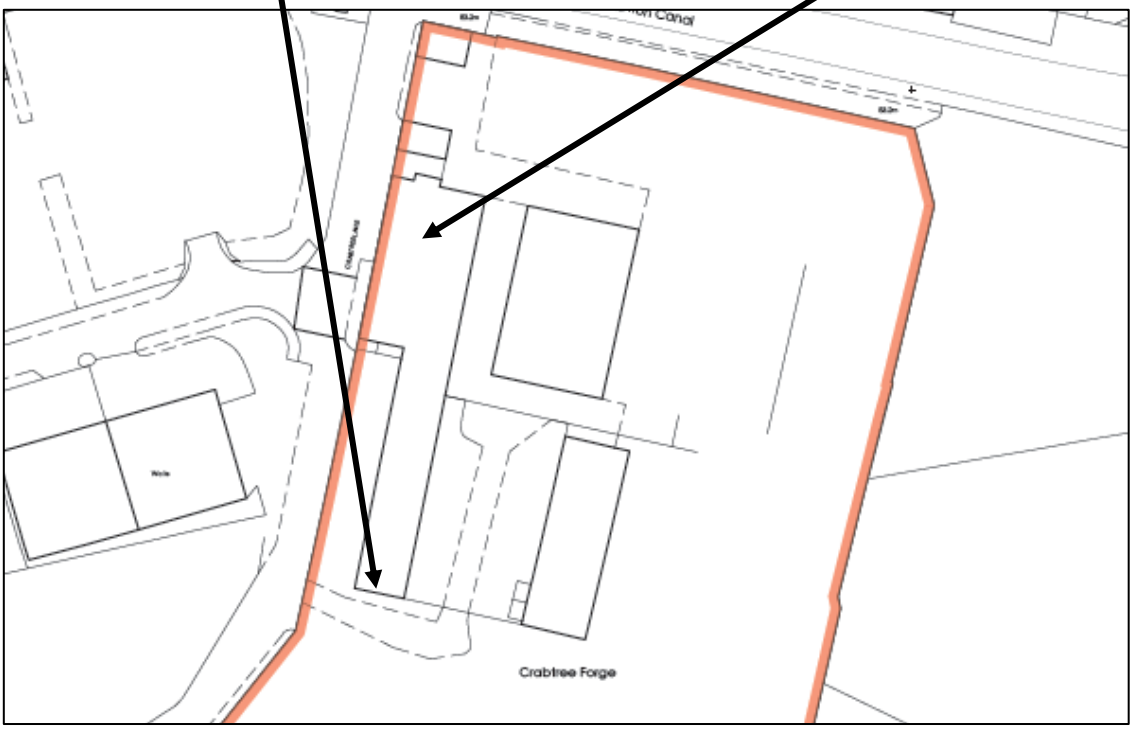
The site is irregular in shape but is considered roughly rectangular. The site is formed by three main structures in the west with the remaining areas being largely hardstanding which is also generally heavily vegetated with self-seeded trees and bushes.

Access is made on to the site via the main access road in the south of the site, although access has been made by trespassers through the main building on the western boundary.

The buildings are largely empty however, some machinery remains, as does significant amount of waste. Asbestos was noted at the surface across the site but was focussed on the southern end of the western building. Also, within this building was a large 'oil' spill. These are shown on the photos below;









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## Surrounding Area

- **North** – Ashton canal, commercial / industrial units with residential beyond.
- **East** – Open waste land and possible materials processing / recycling site.
- **South** – Residential development
- **West** – Commercial / Industrial properties


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# 3 SITE HISTORY

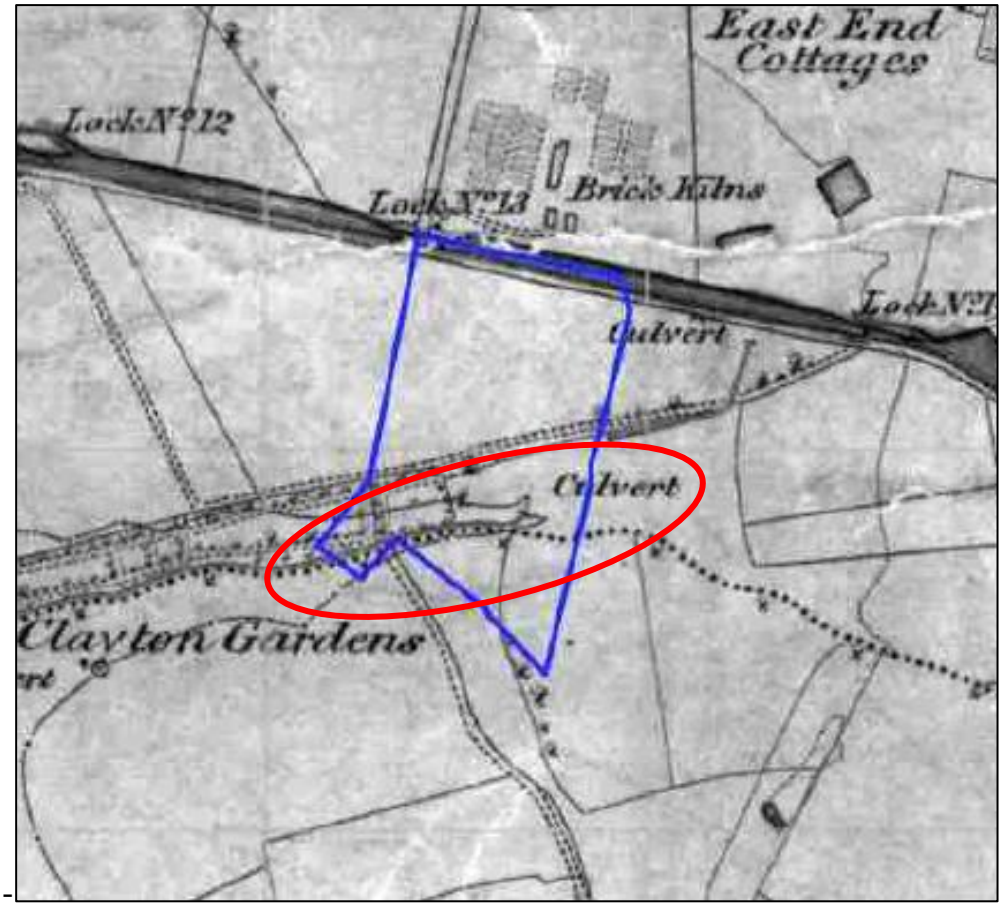
A search of available historic maps was undertaken to establish the land use history of the site. Extracts of the maps discussed below and can be found in full in Appendix F of this report. All maps are Ordnance Survey unless otherwise stated. All distances quoted on OS maps are taken from the site boundary, which is marked on the map, and are approximate.

## 3.1 Summary of Site History

### 3.1.1 On Site

The earliest available map of site is the 1845 1:10,560 map which shows the site to be largely undeveloped land with a culvert crossing the site. An extract of this map is shown below;

**1845 1:10,560 Map**

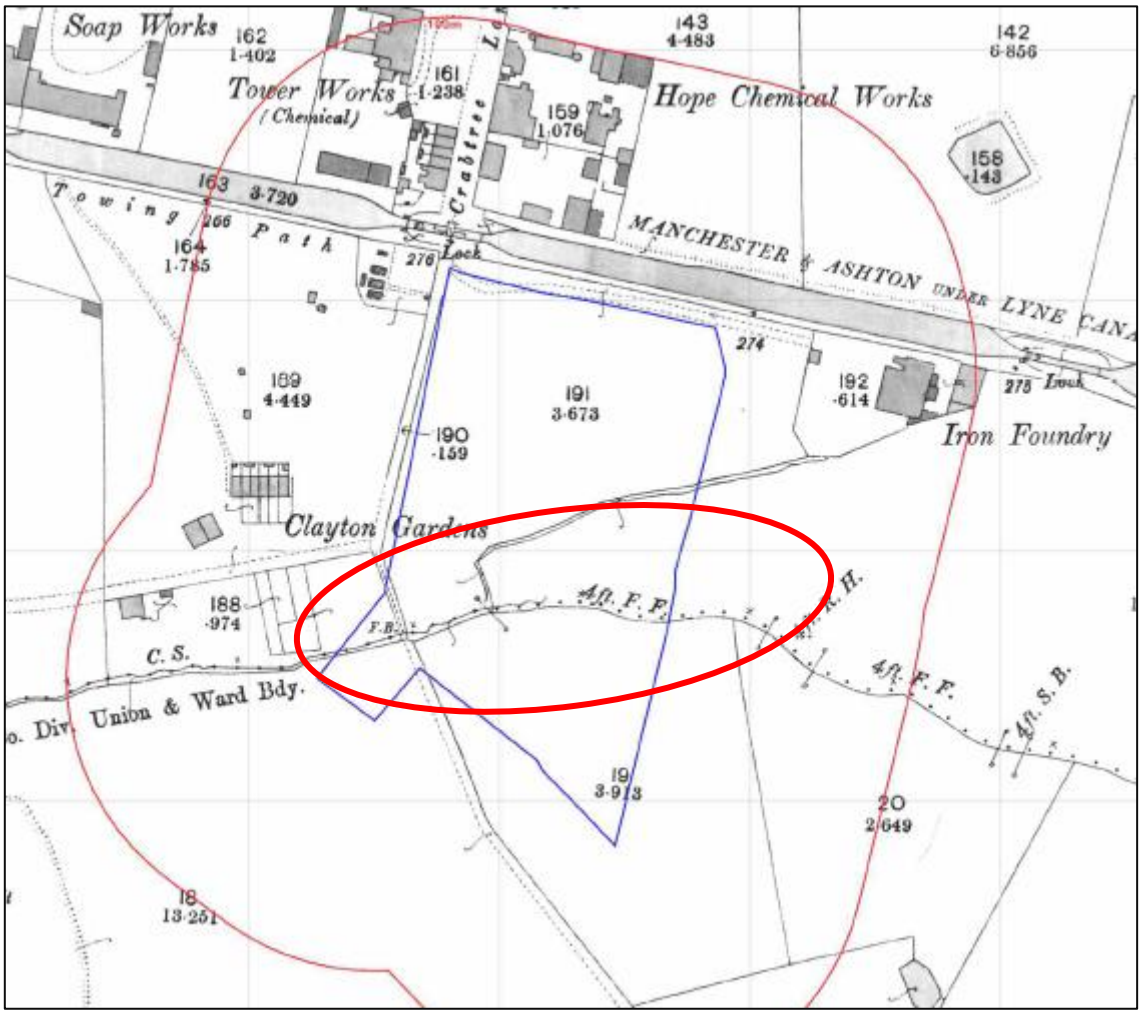




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The 1893 1:10,560 map which shows a change of position of the culvert / stream. An extract of this map is shown below;

**1893 1:2,500 Map**

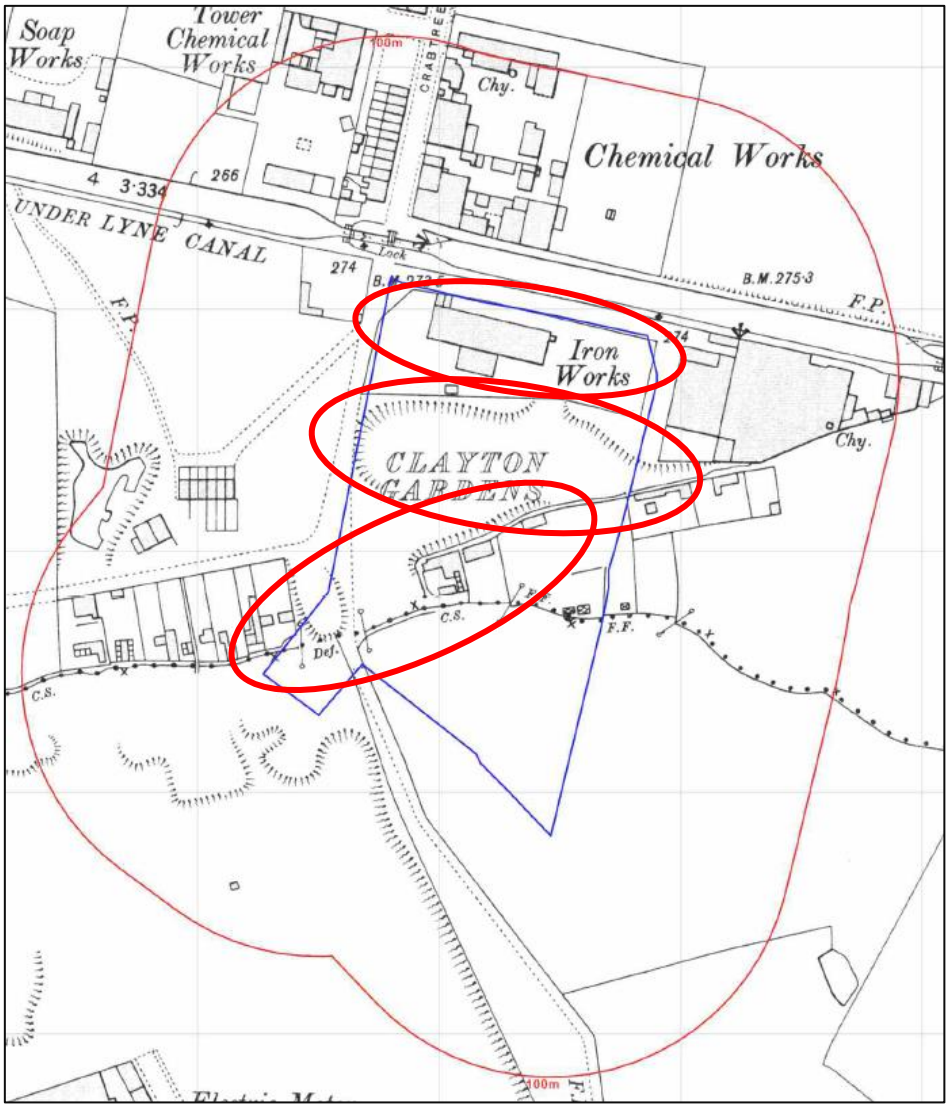




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The 1908 1:2,500 map which shows the construction of a number of buildings in the north, and central areas of the site. The northern building is labelled as an iron works. The area to the south of the works is detailed as steep slopes indicating removal of materials. A smaller slope is also present in the southwest. An extract of this map is shown below;

**1908 1:2,500 Map**

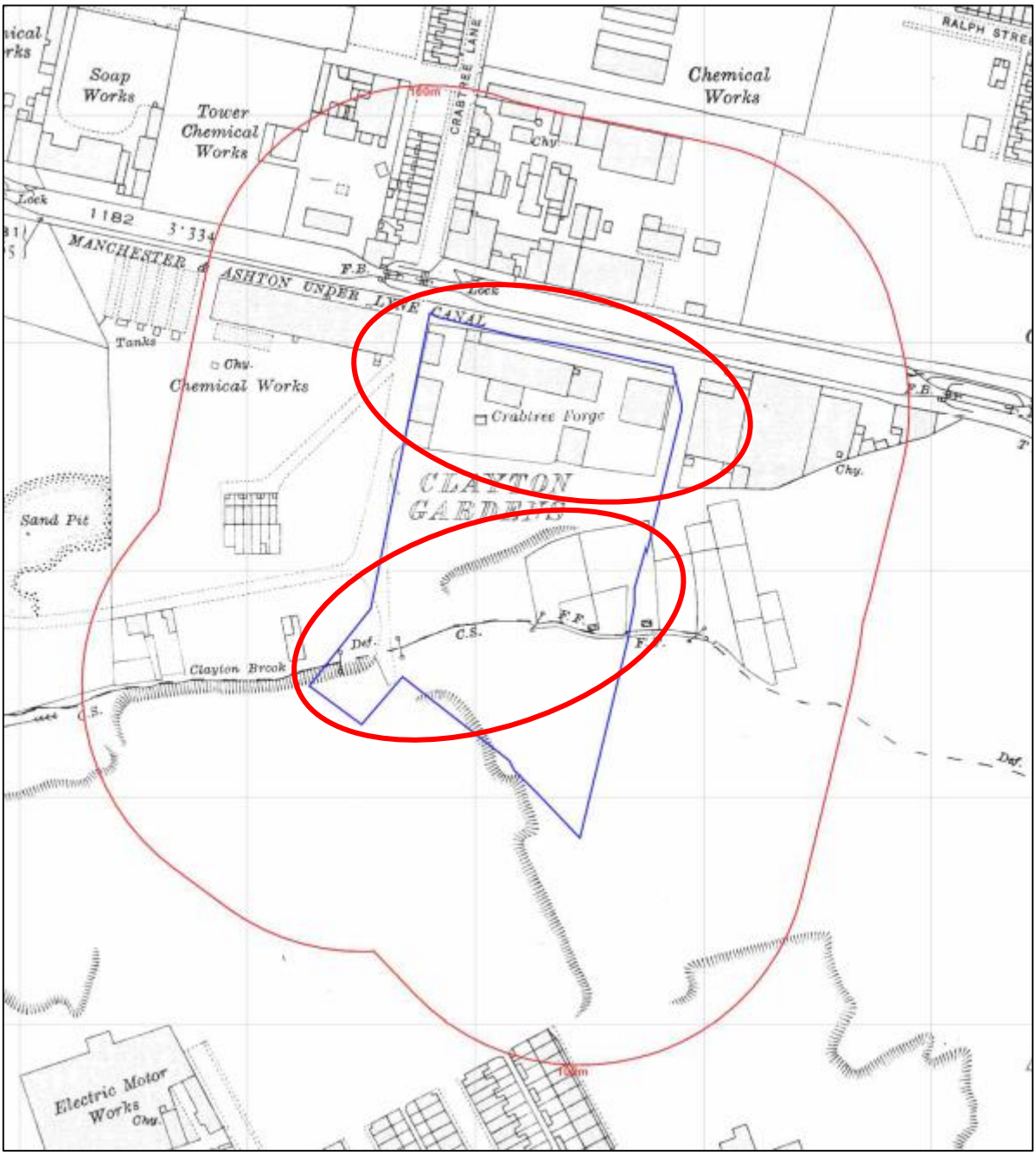




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The 1922 1:2,500 map which shows the construction of additional buildings in the north, and demolition in the south with alterations of the steep slopes. An extract of this map is shown below;

**1922 1:2,500 Map**

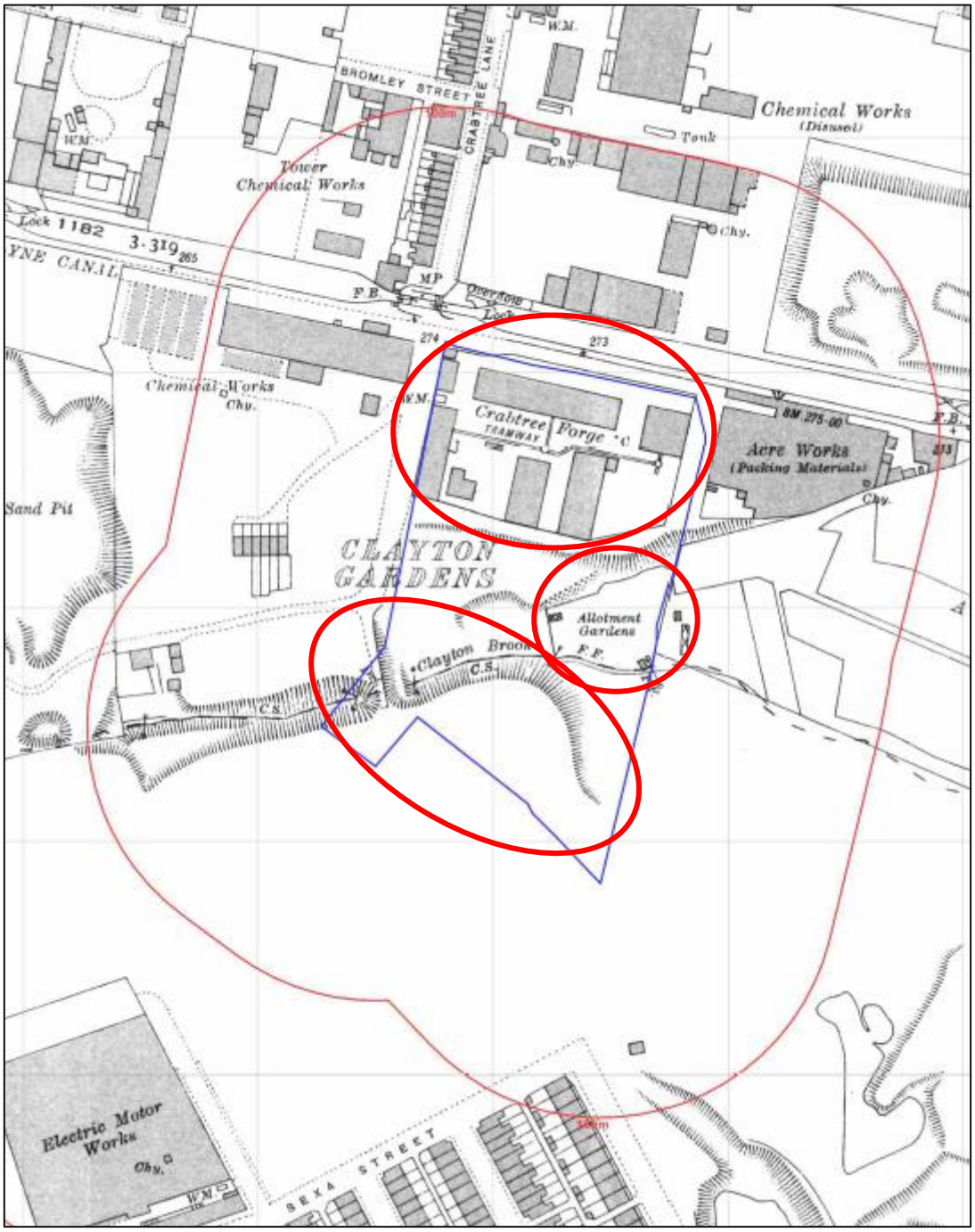




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The 1932-1933 1:2,500 map which shows further construction in the north, and demolition with creation of allotment gardens in the south, again with alterations of the steep slopes. An extract of this map is shown below;

**1932-1933 1:2,500 Map**

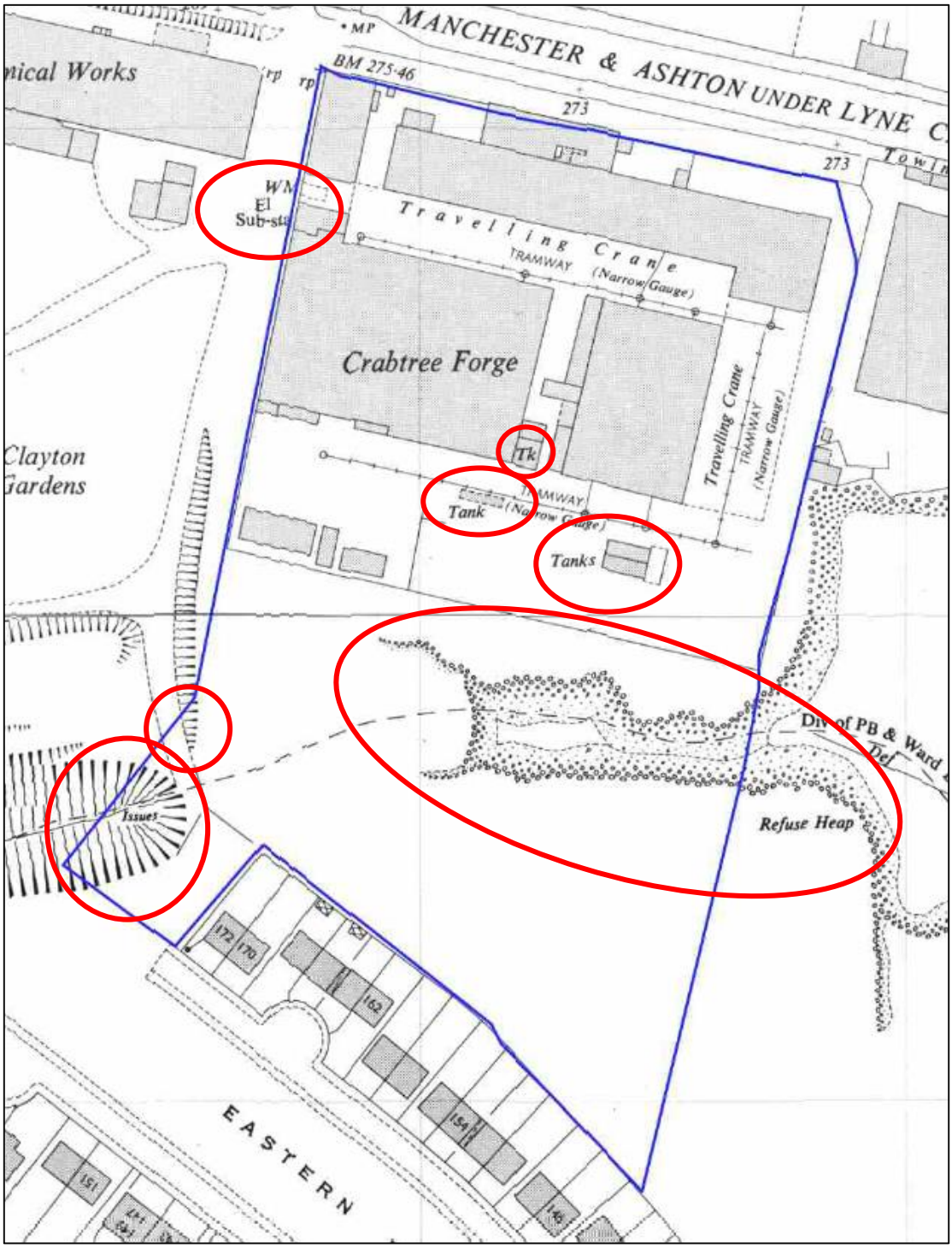




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The 1949-1950 1:1,250 map shows significant extension to the buildings in the north of the site with the introduction of travelling cranes and tanks. An electrical substation is also shown on the western boundary. The steep slopes are shown as a refuse heap along Clayton Brook. Steep slope is still shown around the stream in the southwest. An extract of this map is shown below;

**1949-1950 1:1,250 Map**

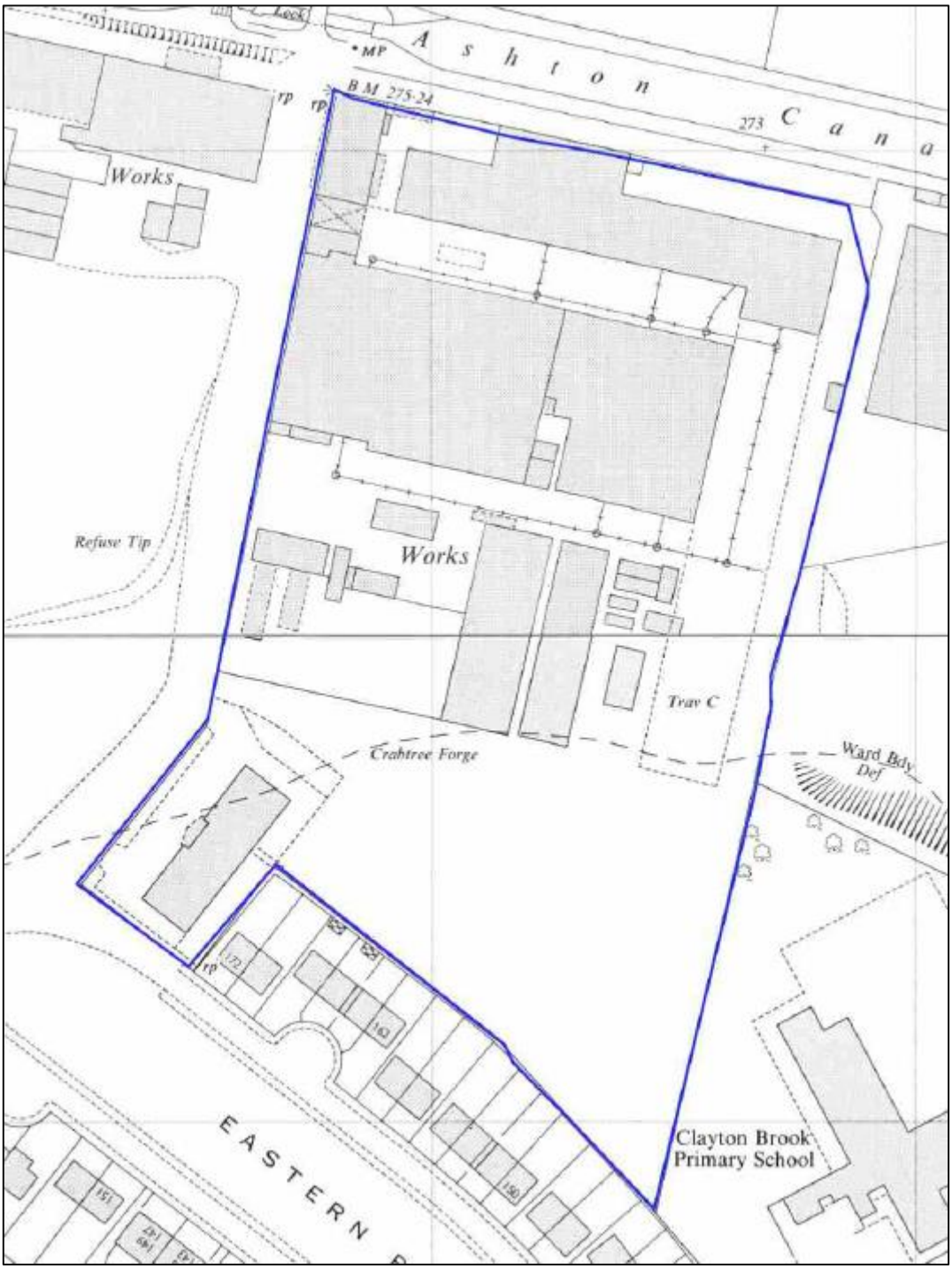




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The 1964-19681:1,250 map shows significant changes across the site, with the extension of existing buildings and construction of new ones. An extract of this map is shown below;

**1964-1968 1:1,250 Map**

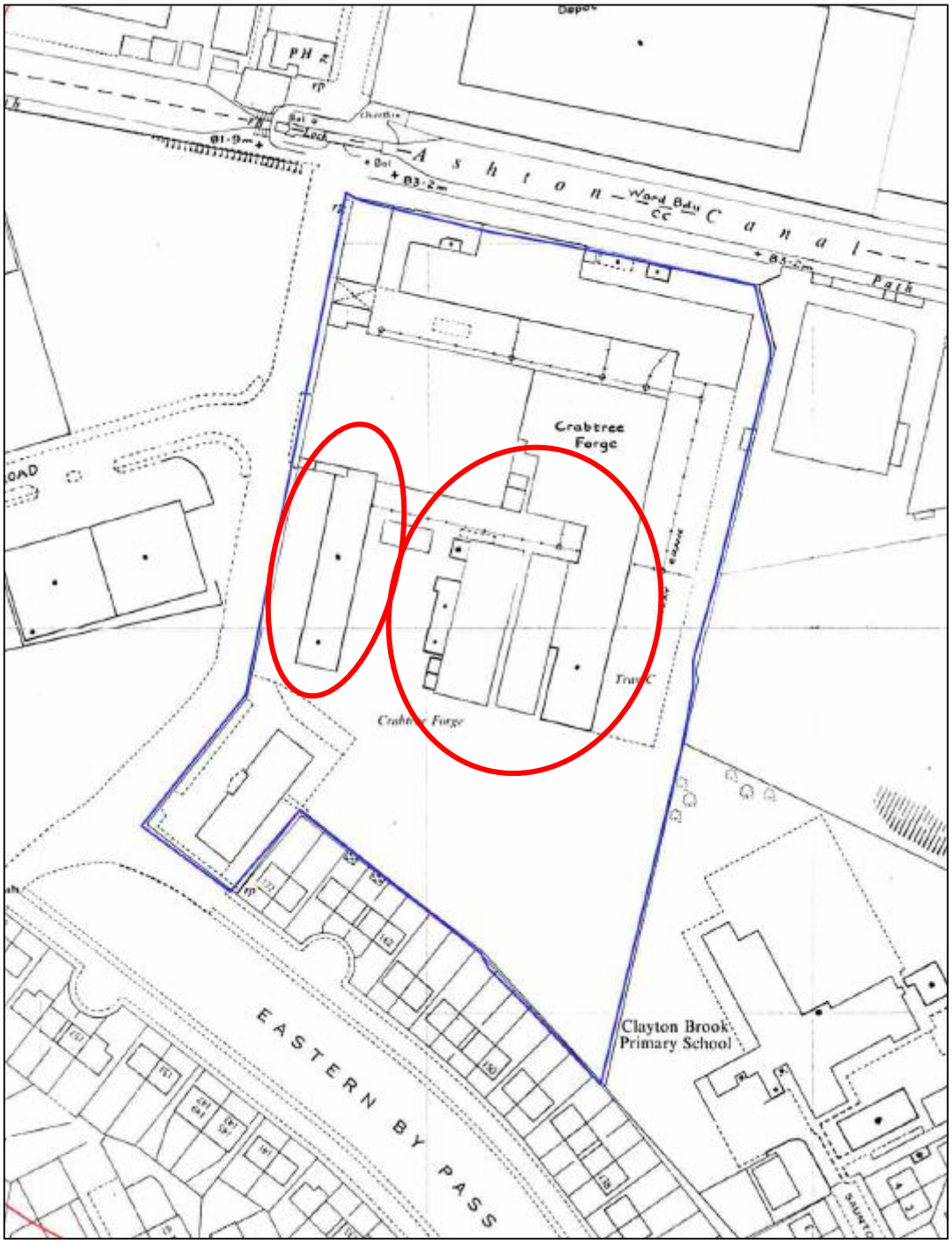




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The 1983-1986 1:1,250 map shows significant changes across the site, with the extension of existing buildings and construction of new ones. Clayton Brook no longer shown. An extract of this map is shown below;

**1983-1986 1:1,250 Map**

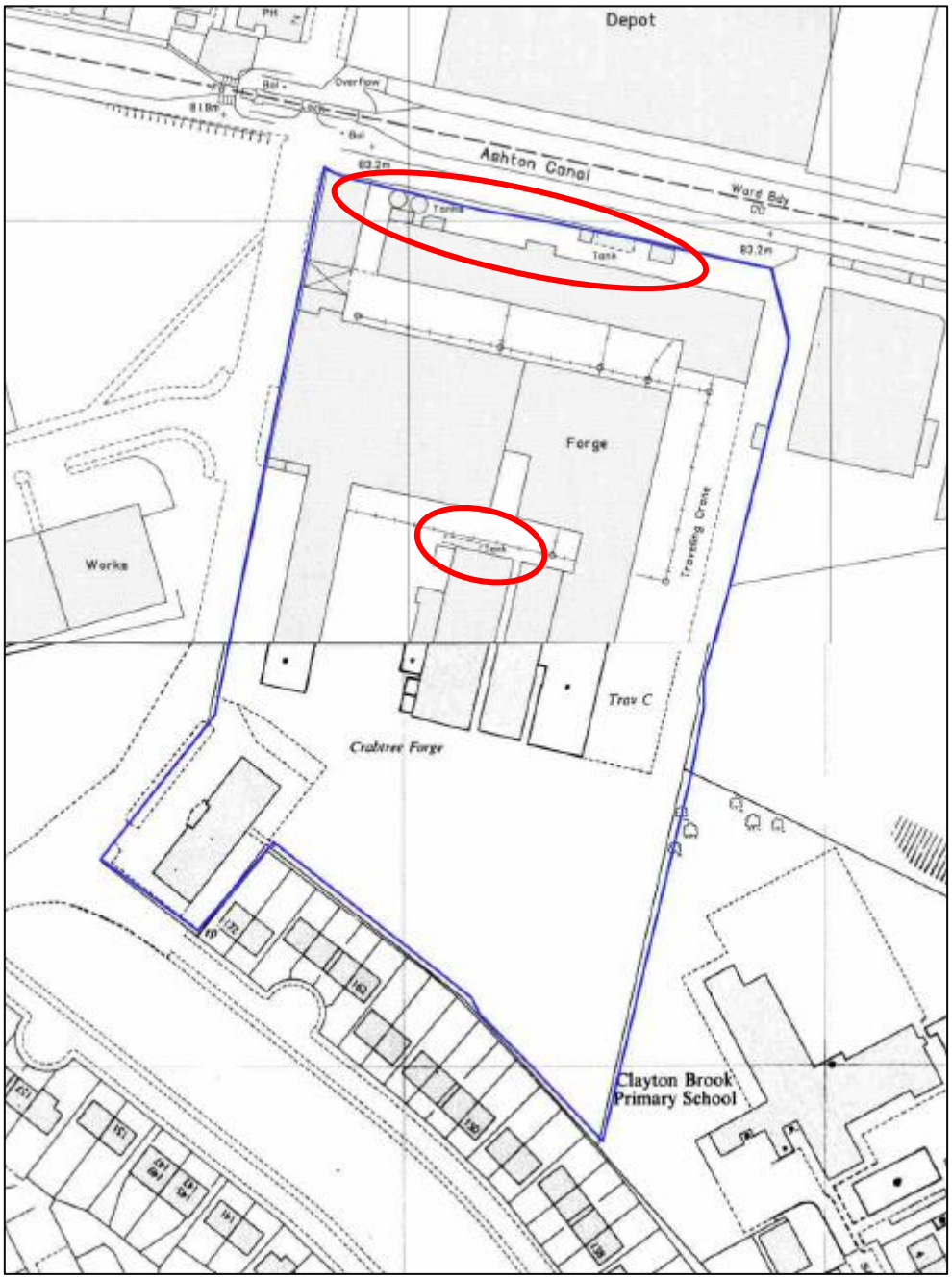




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The 1988-1991 1:1,250 map shows additional tanks in the north and the centre of the site. An extract of this map is shown below;

**1983-1986 1:1,250 Map**

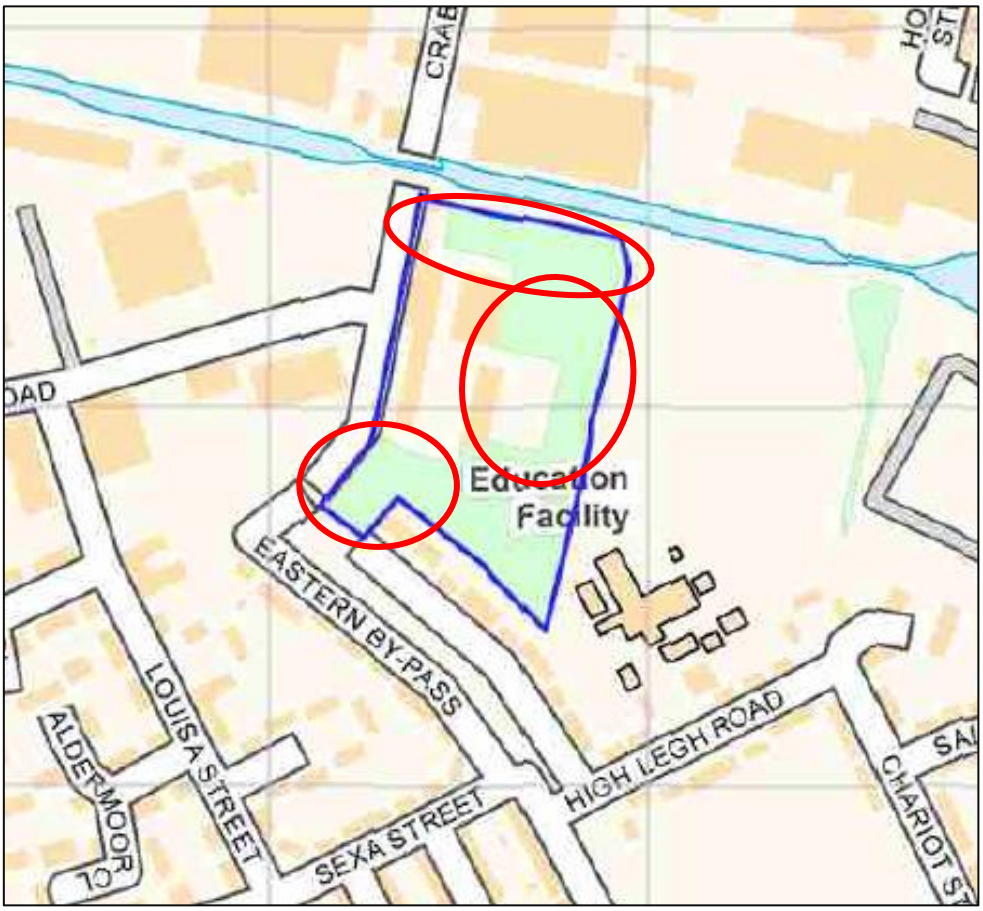




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There were no significant changes until the 2021 1:10,000 map which shows the site in its current state following demolition of several buildings. An extract of this map is shown below;

**2021 1:10,000 Map**





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### 3.1.2 Surrounding Area

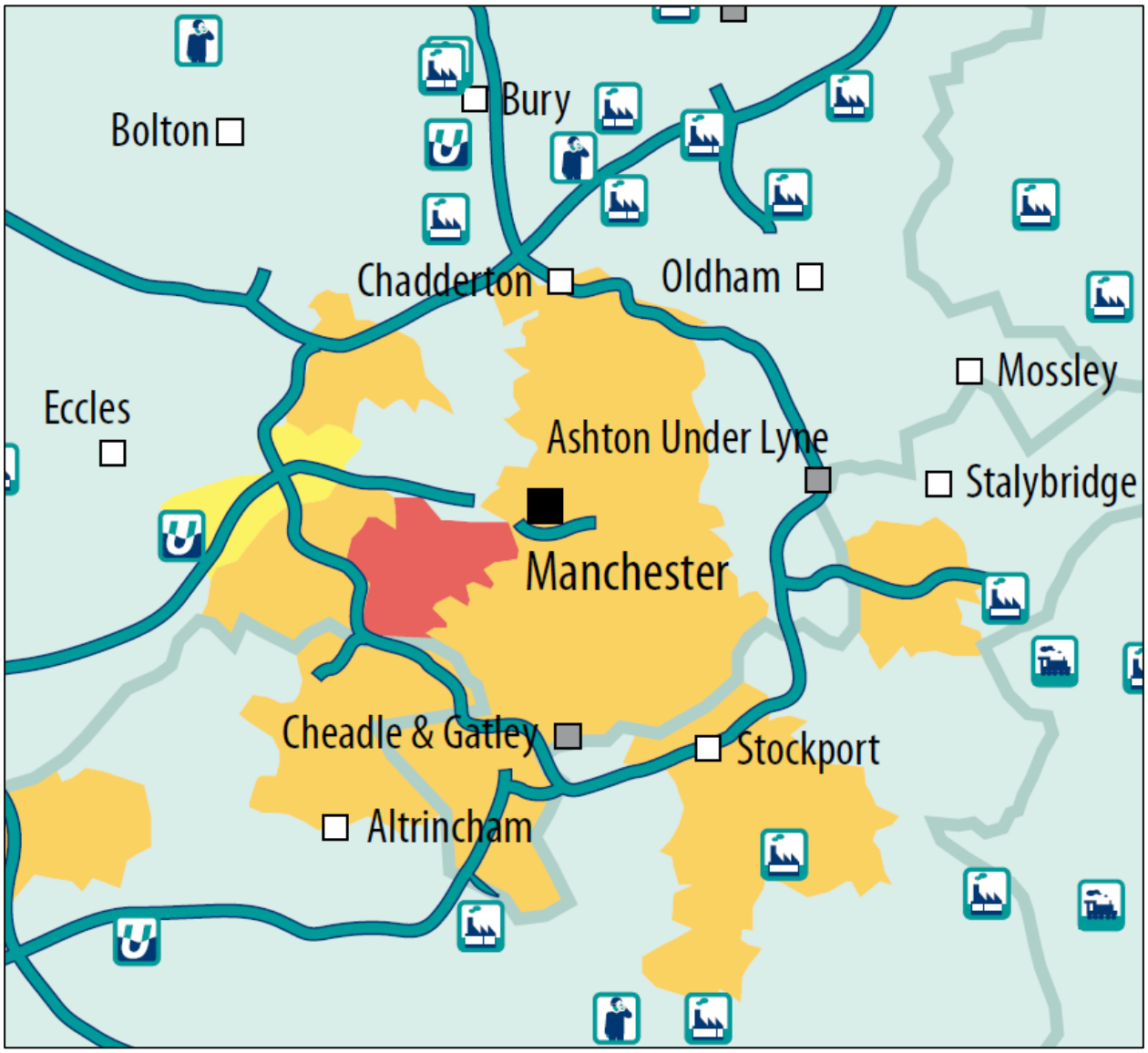
The following table summarises the significant changes in historical use within 500m the site:

| Date First Shown | Land Uses |
|---|---|
| **1848** | Canal – adjacent to northern boundary.<br>Brick kilns – 50m north on opposite bank of canal.<br>Ponds / reservoirs - 250m north, 125m northeast, 250m-500m east and 400m west.<br>Cotton Mill – 400m east<br>Cotton Mill – 400m south<br>Sand pit – 400m north |
| **1890-1892** | Significant development around the site.<br>A number of works have been built north of the canal and an iron foundry built 200m east of site.<br>Refuse tip - 300m south<br>Brick works – 450m southwest<br>Magazine and steep banks/cuts – 300m west |
| **1905-1908** | Various works with tanks (chemical, soap) – opposite bank of canal<br>Residential development – north of site 250-500m<br>Mill – 400m east<br>Brick field/sand pits and excavation – adjacent to 350m south, large and varies in size across maps<br>Works, mill and foundry – 300m-400m south and southwest.<br>Magazine – 200m west |
| **1922-1923** | Works (various) – adjacent to eastern boundary<br>Rifle range – 250m southwest<br>Chemical works with tanks – adjacent to western boundary |
| **1932-1938** | Allotments – 100m east<br>Residential development - All directions from adjacent to boundary |
| **1949-1951** | Ruins – Opposite side of canal<br>Refuse heap – 80m north and crossing site boundary in south east.<br>Electric Motor Works (north street works) – extended and now within 150m southwest of site.<br>Continued residential development |
| **1954-1956** | Residential development – from southern boundary to southeast<br>Redevelopment of former factory/works areas for residential end use. |
| **1981-1986** | Warehouses – west and southwest of boundary |
| **1986 – Present** | Alteration and redevelopment of existing industrial and residential areas. |


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# 4 UNEXPLODED ORDNANCE (UXO)

Zetica's indicative UXO risk mapping places Manchester, and the site, within a 'moderate bomb risk' area. As shown below;




A review of historical mapping has shown that the area around the site is rich in primary, secondary and tertiary level targets for Luftwaffe bombing. These targets include the forge/iron works located on site and a signficant number of various works and railways / railway sidings and located in close proximity.

A brief internet search of open source records and historical mapping provided by GroundSure has shown there were a number of bomb strikes on and around the site, with at least one recorded strike on the north of the site (firebombs), as shown on the extracts listed below. This mapping ONLY covers the Blitz period 1940-1941, and is therefore not exhaustive;


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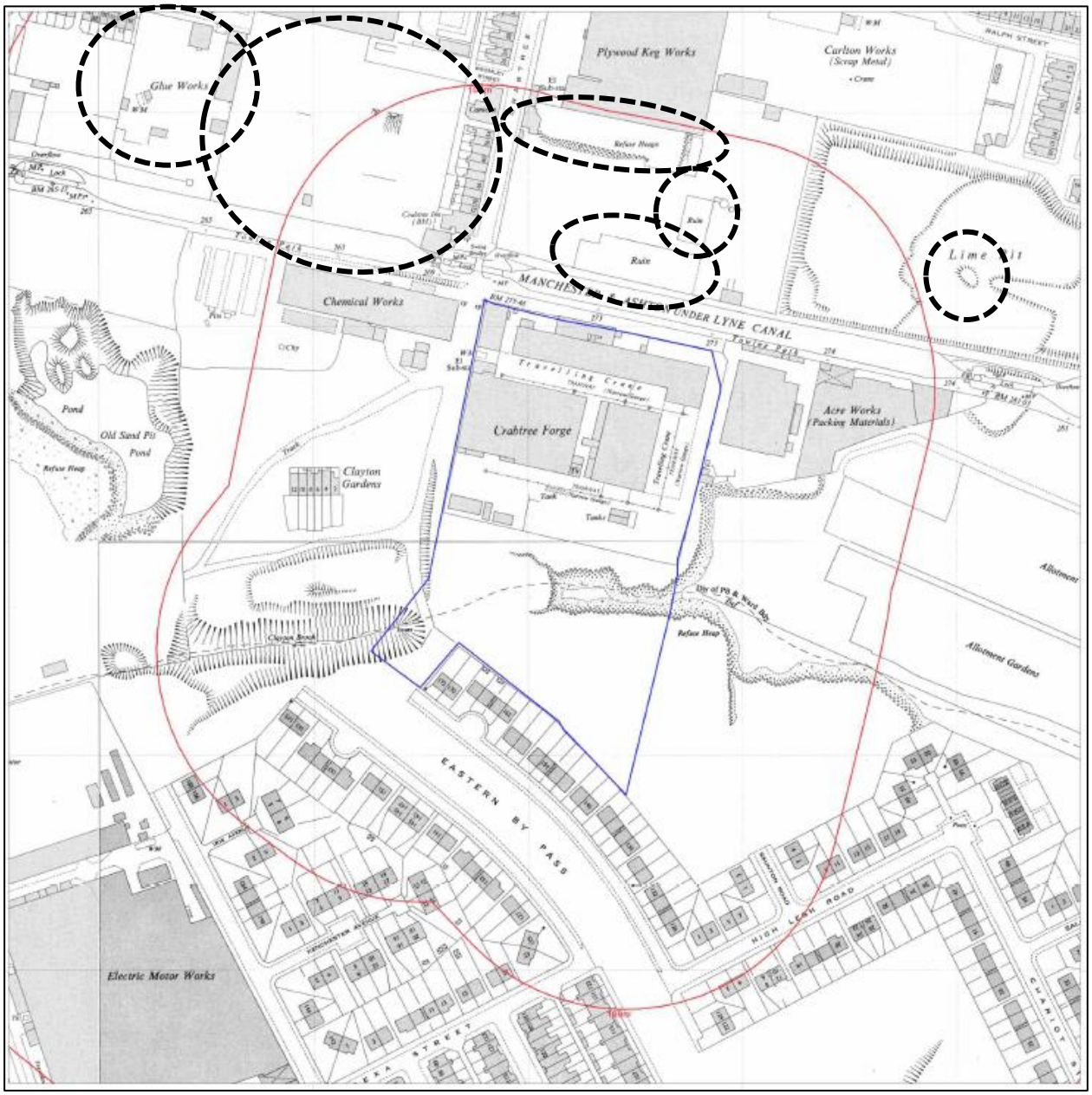



Description:

Original map of Manchester: Ordnance Survey Revisions of 1932-1935. Scale: 25" to 1 mile. Annotated with: red circles for fire bombs; blue circles for high explosives; pink shading for damaged buildings; red shading for demolished buildings; green marks: line mines, indicating bomb damage by the Luftwaffe during the Blitz. Detailing Openshaw and Gorton.


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Mapping from 1949-1950 shows a number of ruins located around the site, as well as the disappearance of buildings not listed as a ruin, but have gone during WWII period. Bomb strikes outside of developed areas are unlikely to be recorded. These are shown on plan below;




As the site has been developed prior to, during and after WWII, the likelihood of UXO remaining on site from a direct strike is considered **unlikely**. However, dropped ordnance can hit the ground outisde of the site boundary and migrate under the boundary in a typical 'J' shape. Due to the number of strikes around the site, and the strikes recorded on the north of the site, discussion with a suitably qualified and experienced UXO consutlant is considered prudent.

A summary of the Zetica Pre-Desk study is shown below;


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zeticaUXO

## Pre-Desk Study Assessment

| | |
|---|---|
| **Site:** | Crabtree Lane, Manchester |
| **Client:** | Betts Geo |
| **Contact:** | Kris Rodway |
| **Date:** | 6th September 2021 |
| | |
| Pre-WWI Military Activity on or Affecting the Site | None identified. |
| WWI Military Activity on or Affecting the Site | None identified. |
| WWI Strategic Targets (within 5km of Site) | The following strategic targets were located in the vicinity of the Site:<br>■ Transport infrastructure and public utilities.<br>■ Industries important to the war effort, including munitions factories and engineering works.<br>■ Royal Flying Corps (RFC) Alexandra Park.<br>■ Anti-Aircraft (AA) guns. |
| WWI Bombing | None identified on the Site. |
| Interwar Military Activity on or Affecting the Site | None identified. |
| WWII Military Activity on or Affecting the Site | None identified. |
| WWII Strategic Targets (within 5km of Site) | The following strategic targets were located in the vicinity of the Site:<br>■ Transport infrastructure and public utilities.<br>■ Industries important to the war effort, including engineering works.<br>■ Military camps and training areas.<br>■ AA and anti-invasion defences. |
| WWII Bombing Decoys (within 5km of Site) | 1No. located approximately 4.8km southeast of the Site. |
| WWII Bombing | During WWII the Site was located in the County Borough (CB) of Manchester, which officially recorded 737No. High Explosive (HE) bombs with a bombing density of 27 bombs per 405 hectares (ha).<br>The Manchester area was heavily bombed between the 22nd and 24th December 1940 (the 'Manchester Blitz'). Over 400No. HE bombs and more than 30,000 Incendiary Bombs (IBs) fell across the region. Bombing was concentrated on the city centre, approximately 4.7km from the Site.<br>No readily available records have been found to indicate that the Site was bombed. |
| Post-WWII Military Activity on or Affecting the Site | None identified. |
| Recommendation | A detailed desk study, whilst always prudent, is not considered essential in this instance. |


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# 5 GEOLOGY

The following section details the published and available geological data available for the site and the surrounding area. This summary is taken from the reports referenced in Section 3.1 above. For full details, please refer to these reports.

## 5.1 Published Geology

The documented geology of the site is summarised on British Geological Survey map principally:

| Geology | Artificial Ground and Land Slip | Drift | Solid |
|---|---|---|---|
| 1:50,000 | Infilled ground | Glacial Till **- Diamicton** | Manchester Marls Formation – **Mudstone** |

## 5.2 Fault Lines

There are no faults located within 500m of the site.

## 5.3 Coal Mining

The site is located within a coal mining area, as defined by the Coal Authority, therefore a coal mining report has been obtained. The pertinent points of the report are shown below;

### Past underground mining

| Colliery | Seam | Mineral | Coal Authority reference | Depth (m) | Direction to working | Dipping rate of seam worked (degrees) | Dipped direction of seam worked | Extraction thickness (cm) | Year last mined |
|---|---|---|---|---|---|---|---|---|---|
| unnamed | BRADFORD FOUR FEET | Coal | 35CV | 705 | North-West | 26.7 | South-West | 120 | 1961 |

### Withdrawal of support notices

The property is in an area where a notice to withdraw support was given in 1957.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

### 5.3.1 Radon

According to the GroundSure report, the site is not in a radon affected area as less than 1% of homes are above the action level. The current UKRadon mapping confirms less than 1% of homes are above action level.


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## 5.4 Geological Features

The table below summarises the presence/absence of recorded mining, extraction and natural cavities records within 500m of the site. If entries are present within 250m, further details are provided in the relevant section below.

| Data Type | On-Site | 0m – 50m | 50m – 250m | 250 – 500m |
|---|---|---|---|---|
| **Geological** | | | | |
| Natural Cavities | - | - | - | - |
| BritPits | - | - | 3 | - |
| Surface Ground Workings | 9 | 16 | 48 | - |
| Underground Workings | - | - | - | - |
| Historical Mineral Planning Areas | - | - | - | - |
| Non-Coal Mining | - | - | - | - |
| Mining Cavities | - | - | - | - |
| JPB Mining Areas | - | - | - | - |
| Coal Mining | - | - | - | - |
| Brine Areas | - | - | - | - |
| Gyspum Areas | - | - | - | - |
| Tin Mining | - | - | - | - |
| Clay Mining | - | - | - | - |

### 5.4.1 BritPits

| ID | Location | Details | Description |
|---|---|---|---|
| 4 | 79m N | Name: East End Brick Field<br>Address: Clayton, MANCHESTER, Lancashire<br>Commodity: Clay & Shale<br>Status: Ceased | Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site<br>Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority |
| I | 167m NW | Name: Clayton Gardens Sand Pit<br>Address: Clayton, MANCHESTER, Lancashire<br>Commodity: Sand & Gravel<br>Status: Ceased | Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site<br>Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority |
| H | 216m SE | Name: Wayne Street Brick Field<br>Address: Openshaw, MANCHESTER, Lancashire<br>Commodity: Clay & Shale<br>Status: Ceased | Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site<br>Status description: Site which, at date of entry, has ceased to extract minerals. May be considered as Closed by operator. May be considered to have Active, Dormant or Expired planning permissions by Mineral Planning Authority |


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### 5.4.2 Surface Ground Workings

| ID | Location | Land Use | Year of mapping | Mapping scale |
|---|---|---|---|---|
| **A** | **On site** | **Refuse Heap** | **1956** | **1:10560** |
| **B** | **On site** | **Unspecified Pit** | **1938** | **1:10560** |
| **B** | **On site** | **Unspecified Pit** | **1934** | **1:10560** |
| **B** | **On site** | **Unspecified Heap** | **1905** | **1:10560** |
| **B** | **On site** | **Cuttings** | **1956** | **1:10560** |
| **C** | **On site** | **Unspecified Heap** | **1938** | **1:10560** |
| **C** | **On site** | **Unspecified Heap** | **1934** | **1:10560** |
| **D** | **On site** | **Canal** | **1923** | **1:10560** |
| **E** | **On site** | **Unspecified Ground Workings** | **1923** | **1:10560** |
| 1 | 1m SW | Unspecified Ground Workings | 1923 | 1:10560 |
| D | 6m N | Canal | 1938 | 1:10560 |
| D | 6m N | Canal | 1934 | 1:10560 |
| D | 6m N | Canal | 1915 | 1:10560 |
| D | 6m N | Canal | 1905 | 1:10560 |
| D | 6m N | Canal | 1890 | 1:10560 |
| B | 10m N | Canal | 1968 | 1:10560 |
| B | 10m N | Canal | 1956 | 1:10560 |
| 2 | 10m SE | Unspecified Ground Workings | 1905 | 1:10560 |
| A | 11m E | Refuse Heap | 1968 | 1:10560 |
| F | 11m N | Canal | 1991 | 1:10000 |
| F | 14m N | Canal | 1985 | 1:10000 |
| F | 14m N | Canal | 1978 | 1:10000 |
| 3 | 17m N | Brick Kilns | 1851 | 1:10560 |
| G | 48m NE | Unspecified Ground Workings | 1938 | 1:10560 |
| G | 48m NE | Unspecified Ground Workings | 1934 | 1:10560 |
| H | 71m SE | Brick Field | 1923 | 1:10560 |
| H | 72m SE | Unspecified Pit | 1923 | 1:10560 |
| H | 76m SE | Disused Brick Field | 1915 | 1:10560 |
| I | 77m NW | Pond | 1905 | 1:10560 |
| H | 90m S | Pond | 1934 | 1:10560 |


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| ID | Location | Land Use | Year of mapping | Mapping scale |
|---|---|---|---|---|
| I | 99m NW | Old Sand Pit | 1938 | 1:10560 |
| I | 99m NW | Old Sand Pit | 1934 | 1:10560 |
| I | 108m NW | Sand Pit | 1915 | 1:10560 |
| E | 110m W | Unspecified Pit | 1938 | 1:10560 |
| E | 110m W | Unspecified Pit | 1934 | 1:10560 |
| H | 110m SE | Pond | 1934 | 1:10560 |
| I | 110m NW | Sand Pit | 1923 | 1:10560 |
| I | 111m NW | Pond | 1956 | 1:10560 |
| I | 113m NW | Refuse Heap | 1956 | 1:10560 |
| I | 134m W | Unspecified Ground Workings | 1956 | 1:10560 |
| J | 134m SW | Unspecified Pit | 1890 | 1:10560 |
| H | 143m SE | Brick Field | 1905 | 1:10560 |
| G | 146m E | Unspecified Pit | 1968 | 1:10560 |
| J | 156m SW | Unspecified Pit | 1923 | 1:10560 |
| J | 156m SW | Unspecified Pit | 1905 | 1:10560 |
| 5 | 171m N | Pond | 1851 | 1:10560 |
| K | 175m W | Unspecified Ground Workings | 1915 | 1:10560 |
| H | 182m SE | Unspecified Ground Workings | 1934 | 1:10560 |
| H | 182m SE | Unspecified Heap | 1956 | 1:10560 |
| K | 183m W | Unspecified Pit | 1923 | 1:10560 |
| K | 183m W | Unspecified Pit | 1905 | 1:10560 |
| K | 183m W | Unspecified Pit | 1890 | 1:10560 |
| K | 184m W | Sand Pit | 1851 | 1:10560 |
| 6 | 188m S | Refuse Pit | 1890 | 1:10560 |
| L | 191m E | Unspecified Wharf | 1923 | 1:10560 |
| L | 201m E | Unspecified Wharf | 1938 | 1:10560 |
| L | 201m E | Unspecified Wharf | 1934 | 1:10560 |
| L | 201m E | Unspecified Wharf | 1915 | 1:10560 |


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| ID | Location | Land Use | Year of mapping | Mapping scale |
|---|---|---|---|---|
| K | 209m W | Refuse Heap | 1968 | 1:10560 |
| K | 209m W | Refuse Heap | 1956 | 1:10560 |
| K | 215m W | Pond | 1938 | 1:10560 |
| K | 215m W | Pond | 1934 | 1:10560 |
| M | 225m W | Canal | 1938 | 1:10560 |
| M | 225m W | Canal | 1934 | 1:10560 |
| M | 225m W | Canal | 1915 | 1:10560 |
| M | 225m W | Canal | 1905 | 1:10560 |
| M | 225m W | Canal | 1890 | 1:10560 |
| N | 227m NW | Unspecified Heap | 1938 | 1:10560 |
| N | 227m NW | Unspecified Heap | 1934 | 1:10560 |
| 7 | 231m E | Pond | 1851 | 1:10560 |
| N | 231m NW | Unspecified Heap | 1923 | 1:10560 |
| 8 | 231m NW | Unspecified Pit | 1891 | 1:10560 |
| O | 248m NE | Ponds | 1891 | 1:10560 |

## 5.5 Hydrogeological and Hydrological Features

The table below summarises the presence/absence of any hydrological licences and incidents within 500m of the proposed site. If entries are present within 250m, further details are provided in the relevant subsection below;

| Data Type | On-Site | 0m – 50m | 50m – 250m | 250 – 500m |
|---|---|---|---|---|
| **Hydrogeology & Hydrology** | | | | |
| Licenced Discharge Consents | - | - | - | 1 |
| Red List Discharge Consents | - | - | - | - |
| Ground Water Abstraction Licences | - | - | - | - |
| Surface Water Abstraction Licences | - | - | - | - |
| Potable Water Abstraction Licences | - | - | - | - |
| Source Protection Zones | - | - | - | - |
| Water Network | - | 3 | 8 | - |


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### 5.5.1 Water Network

| ID | Location | Type of water feature | Ground level | Permanence | Name |
|---|---|---|---|---|---|
| 5 | 13m N | Lock or flight of locks. An enclosure in a canal or navigable river with gates and sluices at either end. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| 6 | 14m N | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| 7 | 23m NW | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| A | 188m W | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| A | 188m W | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| A | 193m W | Manmade watercourse for water transfer. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| A | 198m W | Lock or flight of locks. An enclosure in a canal or navigable river with gates and sluices at either end. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| B | 216m E | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| B | 216m E | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| A | 223m W | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |
| A | 246m W | Canal. A manmade watercourse for inland navigation. | On ground surface | Watercourse contains water year round (in normal circumstances) | Ashton Canal |

## 5.6 Hydrogeology

- The superficial deposits of the Glacial Till are classed as Secondary Undifferentiated (low permeability) and Secondary A Aquifer (moderate permeability).
- The bedrock deposits of the Manchester Marls Formation are classed as a Secondary B Aquifer (low permeability).
- The site does not lie within a Groundwater Source Protection Zone as defined by the Environment Agency.
- The closest listed watercourse is the canal adjacent to the northern boundary. However it is not clear from historical mapping whether Clayton Brook is rerouted away from the site, as historical mapping does show it being culverted across the south of the site.


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# 6 ENVIRONMENTAL DATA

The following section highlights environmental data available for the site and the surrounding area. Full details can be found in the Desk Study Report.

The table below summarises the presence/absence of any waste, hazardous substance sites of industrial land uses within 500m of the proposed site.

| Data Type | On Site | 0-50m | 50 – 250m | 250 – 500m |
|---|---|---|---|---|
| **Current Industrial Land Use** | | | | |
| Historic Integrated Pollution Control Authorisations | - | - | - | - |
| Part A (2) & Part B Activities and Enforcements | - | - | - | - |
| Licensed Pollutant Release (Part A (2)/B)) | - | - | 1 | 1 |
| Radioactive Substances Authorisations | - | - | - | - |
| Hazardous Substance Storage / Usage | - | - | - | - |
| EA/NRW Pollution Incidents | - | - | - | 1 |
| Control of Major Accident Hazards (COMAH) | - | - | - | 1 |
| Electricity Cables | - | - | - | - |
| Gas Pipelines | - | - | - | - |
| Recent Industrial Land Uses | 5 | 3 | 18 | - |
| Current or recent petrol stations | - | - | 1 | - |
| **Waste and Landfill** | | | | |
| Active or recent landfill (EA/NRW) | - | - | - | - |
| Historic Landfill (LA) | - | 1 | - | - |
| Historic Landfill (BGS) | - | - | - | - |
| Historic Landfill (EA/ NRW) | - | 2 | 1 | - |
| Historical Waste Sites (LA / OS records) | - | 1 | 4 | - |
| Waste Exemptions | - | 2 | 2 | 17 |
| Licenced Waste Sites (EA / NRW) | - | - | - | 2 |
| **Past Land Use** | | | | |
| Historical Industrial Land Uses | 20 | 31 | 73 | 103 |
| Historical Tanks | 15 | - | 22 | 64 |
| Historical Energy Features | 2 | - | 22 | 46 |
| Historical Petrol Stations | - | - | - | - |
| Historical Garages | - | - | 8 | 5 |
| Historical Military Land | - | - | - | - |
| **Environmental Designations** | | | | |
| Sites of Special Scientific Interest (SSSI) | - | - | - | - |
| National Nature Reserves (NNR) | - | - | - | - |
| Special Areas of Conservation (SAC) | - | - | - | - |
| Special Protection Areas (SPA) | - | - | - | - |
| Areas of Outstanding Natural Beauty (AONB) | - | - | - | - |
| National Parks | - | - | - | - |
| Green Belt Land | - | - | - | - |
| Nitrate Vulnerable Zones | - | - | - | - |


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## 6.1 Current Industrial Land Use

### 6.1.1 Licensed Pollutant Release (Part A (2)/B))

| ID | Location | Address | Details | |
|---|---|---|---|---|
| D | 111m N | A Mayne & Sons Ltd, Ashton New Rd, M11 4PD | Process: Petrol Vapour Recovery<br>Status: Historical Permit<br>Permit Type: Part B | Enforcement: No Enforcement Notified<br>Date of enforcement: No Enforcement Notified<br>Comment: No Enforcement Notified |

### 6.1.2 Recent Industrial Land Uses

| ID | Location | Company | Address | Activity | Category |
|---|---|---|---|---|---|
| A | On site | Tank | Greater Manchester, M11 | Tanks (Generic) | Industrial Features |
| A | On site | Tank | Greater Manchester, M11 | Tanks (Generic) | Industrial Features |
| A | On site | Tanks | Greater Manchester, M11 | Tanks (Generic) | Industrial Features |


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| ID | Location | Company | Address | Activity | Category |
|---|---|---|---|---|---|
| **B** | **On site** | **Travelling Crane** | **Greater Manchester, M11** | **Travelling Cranes and Gantries** | **Industrial Features** |
| **B** | **On site** | **Travelling Crane** | **Greater Manchester, M11** | **Travelling Cranes and Gantries** | **Industrial Features** |
| 2 | 30m W | Mast | Greater Manchester, M11 | Telecommunications Features | Infrastructure and Facilities |
| C | 35m W | Compass Mechanical Services Ltd | Unit 11 Clayton Industrial Estate, Crabtree Lane, Manchester, Greater Manchester, M11 1BR | Mechanical Engineers | Engineering Services |
| C | 37m W | Works | Greater Manchester, M11 | Unspecified Works Or Factories | Industrial Features |
| D | 79m N | S G B | Clayton Industrial Estate, Crabtree Lane, Manchester, Greater Manchester, M11 1BR | Construction and Tool Hire | Hire Services |
| D | 107m N | Electricity Sub Station | Greater Manchester, M11 | Electrical Features | Infrastructure and Facilities |
| E | 115m W | W & W Wholesale Ltd | Unit 14 Clayton Industrial Estate, Crabtree Lane, Manchester, Greater Manchester, M11 1BR | Catering and Non Specific Food Products | Foodstuffs |
| D | 116m N | Walkers Instore | Crabtree Lane, Manchester, Greater Manchester, M11 4GU | Published Goods | Industrial Products |
| D | 120m N | Works | Greater Manchester, M11 | Unspecified Works Or Factories | Industrial Features |
| E | 143m NW | Electricity Sub Station | Greater Manchester, M11 | Electrical Features | Infrastructure and Facilities |
| D | 156m N | Tank | Greater Manchester, M11 | Tanks (Generic) | Industrial Features |
| F | 161m W | Carriages Auto Services Ltd | Invicta House 1, Claytonbrook Road, Openshaw, Manchester, Greater Manchester, M11 1AL | Vehicle Parts and Accessories | Motoring |
| F | 161m W | Garriages Auto Services | Invicta House 1, Claytonbrook Road, Openshaw, Manchester, Greater Manchester, M11 1AL | Vehicle Repair, Testing and Servicing | Repair and Servicing |
| F | 161m W | Knightsbridge Contract & Domestic Furniture | Invicta House 1, Claytonbrook Road, Openshaw, Manchester, Greater Manchester, M11 1AL | Furniture | Consumer Products |
| 7 | 168m NE | Electricity Sub Station | Greater Manchester, M11 | Electrical Features | Infrastructure and Facilities |

### 6.1.3 Current or recent petrol stations

| ID | Location | Company | Address | LPG | Status |
|---|---|---|---|---|---|
| 5 | 90m E | OBSOLETE | 974-998, Ashton New Road, Openshaw, Manchester, Greater Manchester, M11 4PD | Not Applicable | Obsolete |

*This data is sourced from Experian.*


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## 6.2 Waste and Landfill

### 6.2.1 Historic Landfill (LA)

| ID | Location | Site address | Source | Data type |
|---|---|---|---|---|
| A | 12m W | Refuse Tip | 1963 mapping | Polygon |

### 6.2.2 Historic Landfill (EA/ NRW)

| ID | Location | Details | | |
|---|---|---|---|---|
| **1** | **On site** | **Site Address: Crabtree Forge, Crabtree Lane, Forge Lane, Clayton, Manchester**<br>**Licence Holder Address: -** | **Waste Licence: Yes**<br>**Site Reference: RD/LIC/216/81, GDO F049**<br>**Waste Type: Inert, Industrial**<br>**Environmental Permitting Regulations (Waste) Reference: -**<br>**Licence Issue: 28/04/1982**<br>**Licence Surrender: -** | **Operator: -**<br>**Licence Holder: Eva Brothers**<br>**First Recorded 31/12/1942**<br>**Last Recorded: 31/12/1992** |
| 2 | 11m W | Site Address: Clayton Industrial Estate, Greater Manchester<br>Licence Holder Address: - | Waste Licence: -<br>Site Reference: F048<br>Waste Type: -<br>Environmental Permitting Regulations (Waste) Reference: -<br>Licence Issue: -<br>Licence Surrender: - | Operator: -<br>Licence Holder: -<br>First Recorded -<br>Last Recorded: - |
| 5 | 205m W | Site Address: Stockport Branch Canal, Greater Manchester<br>Licence Holder Address: - | Waste Licence: -<br>Site Reference: F056<br>Waste Type: Inert, Liquid sludge<br>Environmental Permitting Regulations (Waste) Reference: -<br>Licence Issue: -<br>Licence Surrender: - | Operator: -<br>Licence Holder: -<br>First Recorded -<br>Last Recorded: - |


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### 6.2.3 Historic Waste Sites (LA / OS Records)

| ID | Location | Address | Further Details | Date |
|---|---|---|---|---|
| 3 | 20m N | Site Address: Acre Works, Crabtree Lane, Clayton, MANCHESTER, Greater Manchester, M11 1BR | Type of Site: Waste Transfer Depot<br>Planning application reference: 49492<br>Description: Change of use of industrial into a waste transfer depot. 20 car parking spaces. An application (ref: 49492) for Detailed Planning permission was submitted to Manchester C.C. on 8th March 1996.<br>Data source: Historic Planning Application<br>Data Type: Point | - |
| B | 117m N | Site Address: N/A | Type of Site: Scrap Metal Works<br>Planning application reference: N/A<br>Description: N/A<br>Data source: Historic Mapping<br>Data Type: Polygon | 1950 |
| B | 117m N | Site Address: N/A | Type of Site: Scrap Yard<br>Planning application reference: N/A<br>Description: N/A<br>Data source: Historic Mapping<br>Data Type: Polygon | 1988 |
| B | 117m N | Site Address: N/A | Type of Site: Scrap Metal Works<br>Planning application reference: N/A<br>Description: N/A<br>Data source: Historic Mapping<br>Data Type: Polygon | 1950 |
| 4 | 191m W | Site Address: N/A | Type of Site: Incinerator<br>Planning application reference: N/A<br>Description: N/A<br>Data source: Historic Mapping<br>Data Type: Polygon | 1949 |

### 6.2.4 Waste Exemptions

| ID | Location | Site | Reference | Category | Sub-Category | Description |
|---|---|---|---|---|---|---|
| A | 32m W | Yard 1, Crabtree lane, Manchester, M11 1BR | WEX158614 | Using waste exemption | Not on a Farm | Use of waste in construction |
| A | 32m W | Yard 1, Crabtree lane, Manchester, M11 1BR | WEX158614 | Storing waste exemption | Not on a Farm | Storage of waste in a secure place |
| C | 233m SW | 67 Louisa Street Higher Openshaw Manchester M11 1AD | EPR/JF0101MG/A001 | Storing waste exemption | Non-Agricultural Waste Only | Storage of waste in a secure place |
| C | 233m SW | 69 Louisa Street MANCHESTER M11 1AD | EPR/JF0801MY/A001 | Storing waste exemption | Non-Agricultural Waste Only | Storage of waste in a secure place |


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## 6.3 Past Land Use

### 6.3.1 Historic Industrial Land Use

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| 1 | On site | Unspecified Heap | 1905 | 976853 |
| 2 | On site | Corporation Yard | 1915 | 833876 |
| A | On site | Unspecified Pit | 1938 | 891092 |
| A | On site | Cuttings | 1956 | 795828 |
| B | On site | Forge | 1938 | 927324 |
| B | On site | Railway Sidings | 1938 | 953757 |
| B | On site | Railway Sidings | 1934 | 953757 |
| B | On site | Forge | 1934 | 927324 |
| B | On site | Forge | 1915 | 883950 |
| B | On site | Unspecified Works | 1985 | 968646 |
| B | On site | Unspecified Works | 1991 | 968646 |
| B | On site | Railway Sidings | 1991 | 944933 |
| B | On site | Unspecified Works | 1968 | 969086 |
| B | On site | Forge | 1923 | 974769 |
| C | On site | Unspecified Heap | 1938 | 851266 |
| C | On site | Unspecified Heap | 1934 | 851266 |
| D | On site | Refuse Heap | 1956 | 875678 |
| E | On site | Unspecified Commercial/Industrial | 1923 | 796798 |
| F | On site | Unspecified Ground Workings | 1923 | 880372 |
| 3 | 1m SW | Unspecified Ground Workings | 1923 | 800748 |
| E | 2m E | Unspecified Works | 1978 | 962653 |
| E | 2m E | Unspecified Works | 1968 | 962653 |
| E | 3m E | Unspecified Works | 1938 | 926650 |
| E | 3m E | Unspecified Works | 1934 | 926650 |
| E | 3m E | Unspecified Works | 1915 | 859228 |
| 4 | 10m SE | Unspecified Ground Workings | 1905 | 901924 |
| 5 | 11m W | Unspecified Works | 1968 | 830505 |
| D | 11m E | Refuse Heap | 1968 | 875678 |
| G | 11m W | Chemical Works | 1938 | 915443 |
| G | 11m W | Chemical Works | 1934 | 915443 |


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| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| G | 11m W | Chemical Works | 1915 | 985767 |
| H | 14m N | Chemical Works | 1923 | 898608 |
| H | 16m N | Chemical Works | 1890 | 923576 |
| H | 17m N | Brick Kilns | 1851 | 827902 |
| G | 19m W | Chemical Works | 1923 | 850414 |
| H | 19m N | Chemical Works | 1905 | 901354 |
| H | 21m N | Chemical Works | 1915 | 898608 |
| I | 23m NW | Chemical Works | 1915 | 848810 |
| E | 27m E | Iron Foundry | 1890 | 835199 |
| I | 29m NW | Unspecified Works | 1985 | 972239 |
| I | 29m NW | Unspecified Works | 1991 | 972239 |
| I | 31m W | Chemical Works | 1923 | 848810 |
| H | 33m N | Unspecified Works | 1978 | 968175 |
| J | 33m NE | Chemical Works | 1938 | 865007 |
| J | 33m NE | Chemical Works | 1934 | 865007 |
| H | 34m N | Unspecified Depot | 1985 | 903448 |
| H | 34m N | Unspecified Depot | 1991 | 903448 |
| J | 48m NE | Unspecified Ground Workings | 1938 | 887584 |
| J | 48m NE | Unspecified Ground Workings | 1934 | 887584 |
| I | 49m NW | Unspecified Works | 1968 | 910923 |
| G | 55m W | Unspecified Commercial/Industrial | 1985 | 965355 |
| G | 55m W | Unspecified Commercial/Industrial | 1991 | 965355 |
| I | 67m NW | Unspecified Works | 1978 | 910923 |
| K | 71m SE | Brick Field | 1923 | 933262 |
| K | 72m SE | Unspecified Pit | 1923 | 840714 |
| H | 73m N | Unspecified Works | 1991 | 940609 |
| H | 75m N | Unspecified Works | 1968 | 965096 |
| K | 76m SE | Disused Brick Field | 1915 | 834328 |


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| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| H | 86m N | Unspecified Works | 1985 | 940609 |
| H | 87m N | Unspecified Works | 1978 | 870097 |
| L | 99m NW | Old Sand Pit | 1938 | 913850 |
| L | 99m NW | Old Sand Pit | 1934 | 913850 |
| L | 108m NW | Sand Pit | 1915 | 929098 |
| F | 110m W | Unspecified Pit | 1938 | 982746 |
| F | 110m W | Unspecified Pit | 1934 | 982746 |
| L | 110m NW | Sand Pit | 1923 | 929098 |
| L | 113m NW | Refuse Heap | 1956 | 829161 |
| M | 118m SW | Electric Motor Works | 1934 | 896972 |
| M | 121m SW | Unspecified Commercial/Industrial | 1978 | 886658 |
| M | 121m SW | Unspecified Works | 1968 | 830499 |
| M | 123m SW | Unspecified Commercial/Industrial | 1956 | 845443 |
| N | 133m W | Soap Works | 1915 | 875760 |
| 6 | 134m W | Unspecified Ground Workings | 1956 | 800750 |
| M | 134m SW | Unspecified Pit | 1890 | 950240 |
| N | 136m W | Soap Works | 1890 | 991004 |
| N | 137m W | Soap Works | 1905 | 933371 |
| N | 137m W | Soap Works | 1923 | 975047 |
| K | 143m SE | Brick Field | 1905 | 924404 |
| N | 144m W | Chemical Works | 1915 | 967087 |
| J | 146m E | Unspecified Pit | 1968 | 840715 |
| J | 155m E | Unspecified Works | 1991 | 830504 |
| M | 156m SW | Unspecified Pit | 1905 | 898168 |
| M | 156m SW | Unspecified Pit | 1923 | 868357 |
| M | 164m SW | Electric Motor Works | 1915 | 926827 |
| M | 171m SW | Electric Motor Works | 1923 | 926827 |
| M | 171m SW | Electricity Motor Works | 1905 | 811645 |


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| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| P | 174m NW | Unspecified Warehouse | 1985 | 969361 |
| P | 174m NW | Unspecified Warehouse | 1978 | 931301 |
| P | 174m NW | Unspecified Warehouse | 1991 | 969361 |
| P | 175m W | Unspecified Ground Workings | 1915 | 800749 |
| K | 182m SE | Unspecified Ground Workings | 1934 | 800747 |
| K | 182m SE | Unspecified Heap | 1956 | 804176 |
| P | 183m W | Unspecified Pit | 1905 | 934039 |
| P | 183m W | Unspecified Pit | 1890 | 934039 |
| P | 183m W | Unspecified Pit | 1923 | 975009 |
| P | 184m W | Sand Pit | 1851 | 797602 |
| 7 | 188m S | Refuse Pit | 1890 | 834314 |
| Q | 191m E | Unspecified Wharf | 1923 | 886240 |
| Q | 192m E | Chemical Works | 1923 | 979717 |
| N | 194m NW | Chemical Works | 1905 | 946148 |
| N | 194m NW | Chemical Works | 1923 | 855125 |
| Q | 201m E | Unspecified Wharf | 1938 | 866923 |
| Q | 201m E | Unspecified Wharf | 1934 | 866923 |
| Q | 201m E | Unspecified Wharf | 1915 | 895650 |
| Q | 201m E | Chemical Works | 1915 | 979717 |
| P | 209m W | Refuse Heap | 1956 | 948721 |
| P | 209m W | Refuse Heap | 1968 | 948721 |
| Q | 213m E | Unspecified Works | 1968 | 830503 |
| R | 214m SW | Unspecified Commercial/Industrial | 1985 | 979765 |
| R | 214m SW | Unspecified Commercial/Industrial | 1991 | 979765 |
| P | 227m NW | Unspecified Heap | 1938 | 906104 |
| P | 227m NW | Unspecified Heap | 1934 | 906104 |
| P | 231m NW | Unspecified Heap | 1923 | 906104 |
| 8 | 231m NW | Unspecified Pit | 1891 | 840566 |


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| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| S | 234m SW | Unspecified Commercial/Industrial | 1978 | 796803 |
| T | 236m SW | Corporation Yard | 1934 | 883427 |
| U | 241m W | Steel Works | 1956 | 810023 |
| U | 241m W | Railway Sidings | 1956 | 877918 |
| R | 243m SW | Iron Foundry | 1968 | 904598 |
| U | 244m W | Railway Sidings | 1934 | 882010 |
| U | 244m W | Engineering Works | 1934 | 912693 |
| U | 244m W | Railway Sidings | 1915 | 870808 |
| T | 250m SW | Corporation Yard | 1923 | 883427 |

### 6.3.2 Historic Tanks

| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| **C** | **On site** | **Tanks** | **1988 - 1994** | **132381** |
| **C** | **On site** | **Unspecified Tank** | **1950** | **124985** |
| **C** | **On site** | **Tanks** | **1950** | **127740** |
| **C** | **On site** | **Unspecified Tank** | **1950 - 1988** | **138112** |
| **C** | **On site** | **Tanks** | **1994** | **140257** |
| **C** | **On site** | **Unspecified Tank** | **1988** | **143474** |
| **C** | **On site** | **Unspecified Tank** | **1994** | **148786** |
| F | 94m N | Unspecified Tank | 1893 | 116254 |
| F | 96m N | Unspecified Tank | 1933 | 116256 |
| E | 103m W | Tanks | 1922 | 107022 |
| F | 156m N | Unspecified Tank | 1988 - 1994 | 127243 |
| F | 157m N | Unspecified Tank | 1985 | 128826 |
| K | 214m SW | Tanks | 1968 - 1979 | 126978 |


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| ID | Location | Land use | Dates present | Group ID |
|---|---|---|---|---|
| L | 217m W | Unspecified Tank | 1922 | 116253 |
| K | 223m SW | Unspecified Tank | 1949 | 116166 |
| K | 225m SW | Tanks | 1949 - 1968 | 133526 |
| K | 234m SW | Unspecified Tank | 1949 | 116168 |
| N | 235m E | Unspecified Tank | 1985 - 1991 | 131003 |
| N | 235m E | Unspecified Tank | 1972 | 131457 |
| N | 236m E | Unspecified Tank | 1950 | 123381 |
| N | 236m E | Unspecified Tank | 1950 | 140830 |
| N | 242m E | Unspecified Tank | 1950 - 1972 | 147122 |


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### 6.3.3 Historic Energy Features

| ID | Location | Land Use | Date | Group ID |
|---|---|---|---|---|
| **B** | **On site** | **Electricity Substation** | **1950** | **73249** |
| **B** | **On site** | **Electricity Substation** | **1950** | **73249** |
| H | 92m N | Electricity Substation | 1994 | 77163 |
| H | 92m N | Electricity Substation | 1994 | 77163 |
| H | 93m N | Electricity Substation | 1950 | 77163 |
| H | 93m N | Electricity Substation | 1985 | 77163 |
| H | 93m N | Electricity Substation | 1950 | 84691 |
| H | 93m N | Electricity Substation | 1988 | 77163 |
| L | 143m NW | Electricity Substation | 1980 | 75348 |
| L | 143m NW | Electricity Substation | 1985 | 75348 |
| L | 143m NW | Electricity Substation | 1994 | 82356 |
| L | 143m NW | Electricity Substation | 1994 | 82356 |
| L | 144m NW | Electricity Substation | 1988 | 68694 |
| M | 161m SW | Electricity Substation | 1991 | 62222 |
| M | 170m SW | Electricity Substation | 1996 | 76489 |
| M | 170m SW | Electricity Substation | 1999 | 76489 |
| O | 173m NE | Electricity Substation | 1994 | 84429 |
| O | 173m NE | Electricity Substation | 1994 | 84429 |
| P | 211m W | Electricity Substation | 1972 | 73239 |
| P | 211m W | Electricity Substation | 1983 | 73239 |
| P | 211m W | Electricity Substation | 1979 | 66068 |
| P | 211m W | Electricity Substation | 1983 | 66068 |
| P | 211m W | Electricity Substation | 1996 | 66068 |
| P | 211m W | Electricity Substation | 1995 | 66068 |


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# 7 PREVIOUS NORWEST HOLST SOIL ENGINEERING (NHSEL) INVESTIGATION (APRIL 2005)

## 7.1 General

The NHSEL investigation was undertaken at the request of Manchester City Council (MCC).

The fieldwork was carried out between 18th and 24th January 2005, and comprised;

- Eleven (11no.) window sample boreholes to depths of between 3.30mbgl and 8.55mbgl
  - Where appropriate, U100s or CPTs were used
- Monitoring pipes were installed in BH01, BH07 and BH11
- Collection of twelve (12no.) environmental samples
- Geotechnical analysis for moisture content, atterberg limit, 1D consolidation and multistage undrained triaxial compression.

A summary of the report is given below.

## 7.2 Summary

### 7.2.1 Made Ground

MADE GROUND was observed between 1.80mbgl and 8.10mbgl in all locations.

This material was commonly observed as ash, brick, clinker, concrete, limestone, coal, clay and road planings. The thickest MADE GROUND was observed in the centre of the site in an east/west trend.

### 7.2.2 Superficial Deposits

Underlying the MADE GROUND, in the majority of locations, was a firm to stiff boulder CLAY which was recorded to depths of between 2.85mbgl and 7.05mbgl. The CLAY had a maximum proven thickness of 3.20m in BH02.

In BH01, BH03 and BH11 the CLAY was underlain by medium dense and dense brown silty gravelly SAND from depths of between 2.85mbgl and 4.00mbgl. These three boreholes were all completed in SAND.

BH09 and BH10 showed thickly laminated grey organic SILT below MADE GROUND. BH09 the SILT was found at 8.10mbgl and was proved to base of borehole at 8.55mbgl. In BH10 the SILT was noted from 4.55mbgl to 4.95mbgl and was underlain by boulder CLAY.

### 7.2.3 Groundwater

Groundwater was not observed during the investigation.


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### 7.2.4 Foundations

Consideration to use of vibro-compaction to form deep stone columns after discussion with a suitable contactor. Alternatively, a piled solution may be applicable, however, the investigation did not acquire suitable information to allow for design.

Ground floor slabs could be constructed on vibro-improved ground. A suspended slab would be required if a piled solution was implemented.

### 7.2.5 Concrete Design

pH levels were recorded between 5.4 and 9.8 and sulphate levels were recorded up to 1.61g/l. These levels indicate a Design Sulphate Class of DS-2.

### 7.2.6 Contamination Testing Results

| Determinant | Reference Value | Highest Value | True Mean ($US_{95}$) |
|---|---|---|---|
| Arsenic | 20 | 48.8 | 23.31 |
| Cadmium | 2 | 0.75 | 1.86 |
| Chromium | 130 | 47.54 | 68.1 |
| Copper | 190 | 607.2 | 216.26 |
| Lead | 450 | 322 | 162.31 |
| TPH | 1000 | 1074.3 | 520.68 |
| PAH | 20 | 254.4 | 96.54 |

The table indicates that there elevated concentrations of Metals, TPHs and PAHs.

Statistical analysis of the Cadmium and chromium indicate that they are associate with local hotspots, whilst the remaining metal exceedances are representative of the wider sampled population.

Similarly, TPHs are shown to be localised hotspots, PAHs are representative of the wider site soils.

Betts Geo note that some of these thresholds have now been adjusted, this will be taken into account during the Betts Geo Assessment.

### 7.2.7 Soil Contamination – Recommendations

Data suggests that the contamination is found within the MADE GROUND strata. Due to the large volumes of MADE GROUND, removal is unlikely to be considered appropriate. Table 4 of the NHSEL report indicates that the contamination is not mobile, and the site was found to be dry, and therefore the site poses little risk to groundwater.

Installation of clean and inert capping to gardens and landscaped areas will be sufficient to remove risk to human health.


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### 7.2.8 Gas Contamination

No elevated methane was recorded; however, carbon dioxide was noted in WS11 at a concentration of 8%. The use of gas protection measures will be required for the site.

Betts Geo note that gas flow was not checked during the gas monitoring, an no visits were undertaken below 1000mb atmospheric pressure.


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# 8 SUMMARY OF ENVIRONMENTAL SENSITIVITY

The following section is a review of the environmental sensitivity of the site as discussed in Sections 2-6. Significant potential risks are discussed in the following subsections and will then be evaluated as part of the Site Conceptual Model in Section 8.

Sources are defined as where pollution comes from, pathways are a route in which the pollution travels and receptors are anything affected by a pollutant. Further details on Source-Pathway-Receptor methodology can be found in Appendix F.

The table below focuses on significant site-specific sources, pathways and receptors. More 'generic' pathways and receptors (such as site end users) will be covered as part of the full Site Conceptual Model in Section 14.

## 8.1 Sources

| Source | Distance/ Direction | Details | Significant Risk |
|---|---|---|---|
| **Current Land Use** | On Site | The site is currently largely unused but the historical development has only been partially demolished. Ground investigation required to determine historical site impact. Potential risk of heavy metals, VOC/SVOC, TPH's, PAH's, asbestos, where made ground remains onsite. | **Likely** |
| **Historic Land Use** | On Site | Significant industrial usage. Risk of heavy metals, TPH's, PAH's, VOC/SVOC, asbestos. | **Likely** |
| **Surrounding Land use** | Adjacent to site boundary | The land surrounding the site has been mixed residential and industrial/commercial. Significant industry has been limited. Ground investigation to determine contamination impact. Potential risk of heavy metals, TPH's, PAH's, asbestos from these sources, however anticipated cohesive superficial geology surrounds the site limiting any migration onto site. | **Possible (Localised)** |

## 8.2 Pathways / Receptors

| Pathways and Receptors | Distance/ Direction | Details | Significant Risk |
|---|---|---|---|
| **Aquifers** | Below Site | For the majority of the site, bedrock deposits are classed as low to moderate permeability aquifer, however they are overlain by cohesive deposits of glacial till. Further ground investigation to confirm risk. The site is not within a Groundwater Protection Zone. | **Unlikely** |


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# 9 INITIAL CONCEPTUAL SITE MODEL

For details on how the conceptual model is evaluated please refer to Appendix F

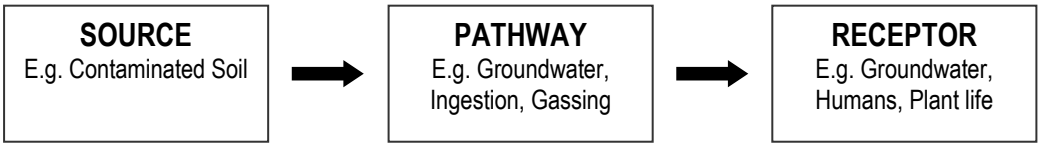
This section of the report aims to identify land which could potentially be affected by contamination, such that it could affect the value or re-use of the land, or such that mitigation would be required for certain proposed end uses of the land.

Potential contamination sources and environmentally sensitive receptors have been discussed in Section 7. Potentially significant risks are evaluated as part of the subsequent sub-sections.

## 9.1 Source-Pathway-Receptor Linkages

The risk assessment uses a 'Source-Pathway-Receptor' methodology for assessing whether a source of contamination could potentially lead to harmful consequences. This means that there needs to be a pollutant linkage from source to receptor for harm to be caused, this linkage consisting of: a source of pollution; a pathway for the pollutant to move along; a receptor that is affected by the pollutant.

The current potential risks to site arising from various source-pathway-receptor linkages are assessed below. A risk may be considered significant if all three of the stages are present and therefore providing a pollution linkage. The various sources, pathways and receptors are considered separately. The assessment is based on the future use, which is understood to be residential with garden area.





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| Type of Contamination | Potential Sources | Potential Pathway | Potential Receptors | Pollution Linkage | Comment | Estimated Level of Risk |
|---|---|---|---|---|---|---|
| **Ground Gas** | Current Land Use- onsite<br>Historic Land use<br>Made Ground<br>Surrounding Land Use | Inhalation of Vapours | Construction/ Maintenance Workers | **Potentially Active** | Made Ground anticipated due to former development which is a potential source for ground gas. Ground investigation and ground gas monitoring to confirm. | **Low / Moderate** |
| | | Vapours Penetrating Unprotected Buildings | Future Site Users | **Potentially Active** | Made Ground anticipated due to former development which is a potential source for ground gas. Ground investigation and ground gas monitoring to confirm. | **Low / Moderate** |
| **Surface and Near Surface Contaminants Within Soils** | Current Land Use- onsite<br>Historic Land use<br>Made Ground<br>Surrounding Land Use | Ingestion, Inhalation, Dermal Contact | Current Site Users | **Potentially Active** | Made Ground anticipated due to historical development. Possible contaminants include heavy metals, TPH's, VOC/SVOC, PAH's and asbestos. Ground investigation and ground gas monitoring to confirm. | **Moderate** |
| | | | Construction Workers | **Potentially Active** | Made Ground anticipated due to historical development. Possible contaminants include heavy metals, TPH's, VOC/SVOC, PAH's and asbestos. Ground investigation and ground gas monitoring to confirm. | **Moderate** |
| | | | Future Site Users | **Potentially Active** | Made Ground anticipated due to historical development. Possible contaminants include heavy metals, TPH's, VOC/SVOC, PAH's and asbestos. Ground investigation and ground gas monitoring to confirm. | **Moderate** |
| | | | Adjacent Land Users | **Potentially Active** | Made Ground anticipated due to historical development. Possible contaminants include heavy metals, TPH's, VOC/SVOC, PAH's and asbestos. Ground investigation and ground gas monitoring to confirm. | **Low** |
| | | Direct Contact | Structures | **Potentially Active** | Made Ground anticipated due to historical development. Possible contaminants include heavy metals, TPH's, VOC/SVOC, PAH's and asbestos. Ground investigation and ground gas monitoring to confirm. | **Low / Moderate** |
| | | Absorption in Root Zone | Plants | **Potentially Active** | Possible TPH, PAH, VOC/SVOC, heavy metals and sulphates within Made Ground. Ground investigation to confirm. | **Low** |
| **Mobile Contaminants, Leachables e.g. from Pollution Sources Adjacent to Site/On Site** | Current Land Use- onsite<br>Historic Land use<br>Made Ground<br>Surrounding Land Use | Leaching into Groundwater | Groundwater | **Potentially Active** | Cohesive superficial deposits are recorded as secondary A and undifferentiated Aquifers. Cohesive strata will limit migration. Solid geology recorded as Secondary B Aquifer. | **Low / Moderate** |
| | | Off-site Migration in Groundwater | Abstractions | **Potentially Active** | There are no potable groundwater abstractions within 500m of site. | **Low** |
| | | | Controlled Waters | **Potentially Active** | Nearest surface water features are located onsite and adjacent to the site boundary. Superficial deposits are recorded as secondary undifferentiated and are cohesive. | **Low** |
| **Organic and Inorganic Contaminants Within Soils / Groundwater** | Current Land Use- onsite<br>Historic Land use<br>Made Ground<br>Surrounding Land Use | Potable Water Supply Pipes | Utilities Workers | **Potentially Active** | Possible TPH, PAH and VOC contamination from Made Ground on site. Ground investigation to confirm, then liaise with local water authority supplier. | **Low / Moderate** |


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## 9.2 Summary

In this qualitative risk assessment, a **Low to Moderate** risk for contamination and ground gas exists across the site. Remedial action is likely to be necessary at the site, the likes of which cannot be confirmed until the geotechnical and contamination ground investigation has been completed.

It is anticipated that elevated risks are generally linked to extensive industrial site history and likelihood of Deep made ground.

## 9.3 Geotechnical Risk

- Depth of Made Ground from former foundations, demolition material and infilled land
- Possible heave / shrink in cohesive strata due to trees (predominantly in the west of the site)
- Buried foundations and other underground structures
- Possible culverted stream below south of site


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# 10 FIELDWORK

## 10.1 Fieldwork Objectives

The objectives of the intrusive ground investigation will be to:

- Clarify the shallow ground conditions encountered within the Third-Party Reports provided by the client.
- Clarify deeper ground conditions for piled foundation design.
- Clarify the 'Initial Contamination Conceptual Model'.
- Clarify the Initial Risk Assessment.
- Benchmark the contamination status of the site.
- Provide data for the design of any remedial works that may be required.
- Provide a geotechnical appraisal for the site area.

## 10.2 Fieldwork Scope

The initial fieldwork was carried out between 9th-10th August 2021 and comprised the following;

- Seven (7no) machine excavated trial holes to depths between 0.60mbgl (TP4) and 1.95mbgl (TP7).
- Four (4no) window sample boreholes to depths of up to 4.00mbgl.
- Chemical analysis (Metals, PAH's, TPH's) of ten (10no.) samples.
- Analysis of ten (10no.) samples for asbestos analysis.
- Two (2no) samples for geotechnical analysis, including pH, water soluble sulphate and Atterburg limits.

The exploratory hole positions were selected and set out by Betts Geo as shown on the Exploratory Hole Location Plan in Appendix B.

Prior to any intrusive works, each location was checked for services using a cable avoidance tool (CAT) and review of statutory service plans.

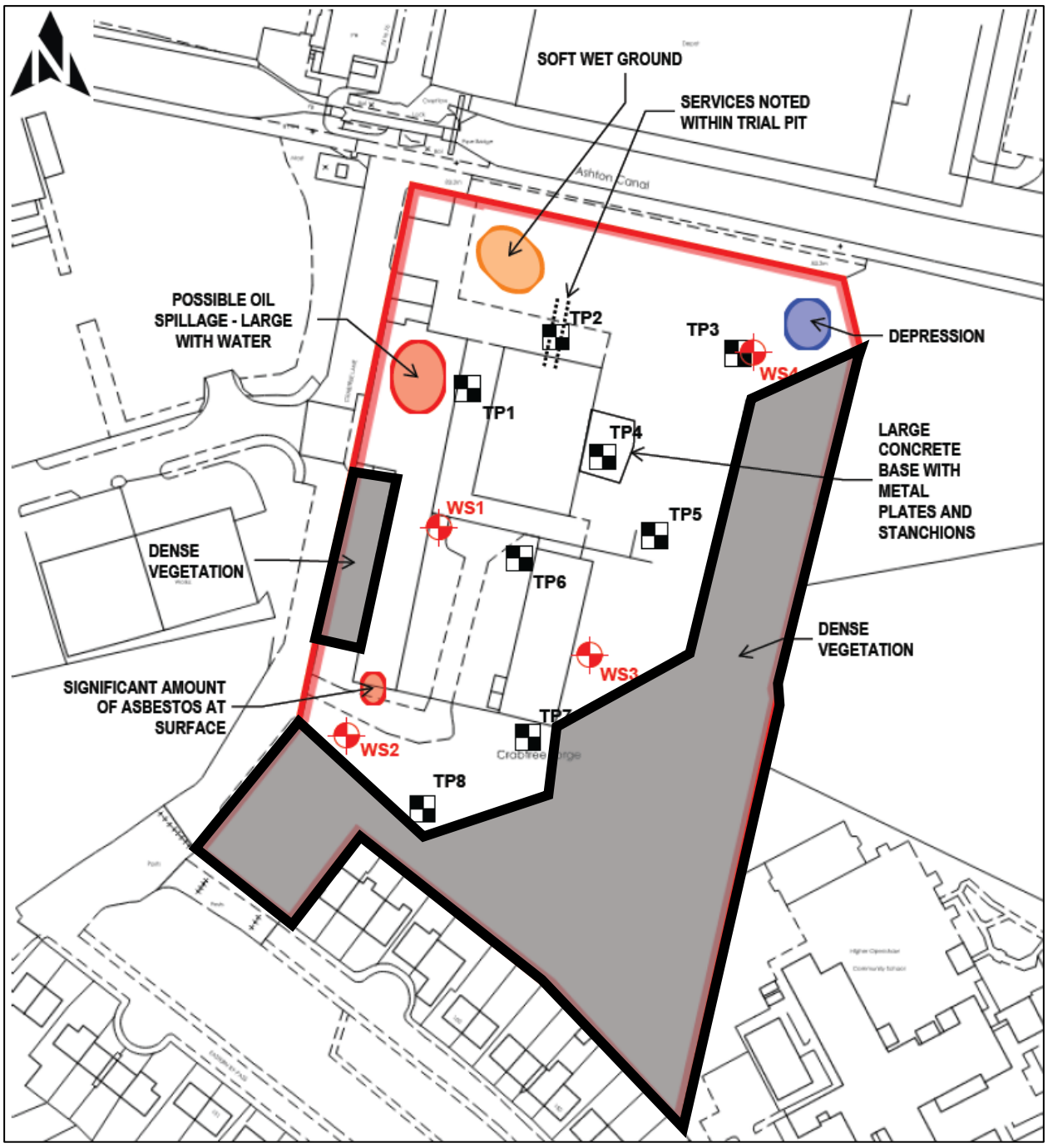
## 10.3 Targeted Investigation

The holes were generally positioned to achieve a general spread across the various site areas, however, TO was positioned near to a former tank.


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## 10.4 Areas Not Accessed

As shown on the sketch below, some areas were not accessible due to dense vegetation.





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# 11 GROUND CONDITIONS

## 11.1 General

The exploratory holes were logged by an Engineer in general accordance with the recommendations of BS5930:1999+A2:2010 Detailed descriptions, together with relevant comments, are given in the exploratory hole logs included in Appendix C.

## 11.2 Ground Conditions Summary

The prevailing ground conditions at the site can generally be summarised as MADE GROUND of various granular deposits to depths of greater than 2.95mbgl.

MADE GROUND was noted overlying NATURAL strata of CLAY in WS101, and TP1 from 1.20mbgl.

## 11.3 MADE GROUND

MADE GROUND was observed in all locations and was commonly described as 'Medium dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick'. This is in line with the findings of 'infilled land' in the desk study section of this report and the previous investigation. This stratum was noted to a maximum observed depth of 4.00mbgl.

Minor amounts of differing MADE GROUND were observed in various locations across the site and comprised of both granular and cohesive deposits with anthropogenic components such as limestone gravel (possible MOT Type 1) and crushed brick.

A 'pulpy' type material was observed in WS102 from 3.80-4.00mbgl (base not proven). The material was described as 'Soft to firm black and yellow clayey PULP like material'. This material is of unknown origin and depth.

MADE GROUND was observed to a maximum depth of 4.00mbgl in WS102 and WS103, the base was not proven.

## 11.4 COHESIVE – Natural

Natural cohesive strata were recorded in TP1 and WS101. The CLAY was generally described 'Firm to stiff light brown and grey sandy silty CLAY. Becoming dark and stiff to very stiff with depth' or 'Firm yellowish brown slightly sandy CLAY' and were recorded to depths of between 1.20mbgl and 2.35mbgl (TP1) and 3.50mbgl and 4.00mbgl (WS101), the base was not proven.


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## 11.5 Obstructions

Obstructions were noted in the locations detailed below:

| Location | Depth (mbgl) | Description |
|---|---|---|
| TP2 | 0.95 | Two services (pipework) spanning pit – likely live |
| TP4 | 0.60 | Very dense concrete slab edged by metal boards/strips with stanchions. Probable machine base or similar. Slab at least 3m x 3m |
| WS104/TP3 | 0.90 | Concrete base – very dense |

## 11.6 Possible Void

A possible void was noted WS101, based on the SPT results, as shown below;

**WS101**

| Depth (mbgl) | | | | | | |
|---|---|---|---|---|---|---|
| **1.20-1.65** | 1 | 2 | 1 | 1 | 1 | 2 |
| **2.00-2.45** | **1** | **0** | **0** | **0** | **0** | **0** |
| **3.00-3.45** | 3 | 2 | 1 | 2 | 2 | 2 |
| **4.00-4.45** | 2 | 2 | 2 | 2 | 2 | 3 |

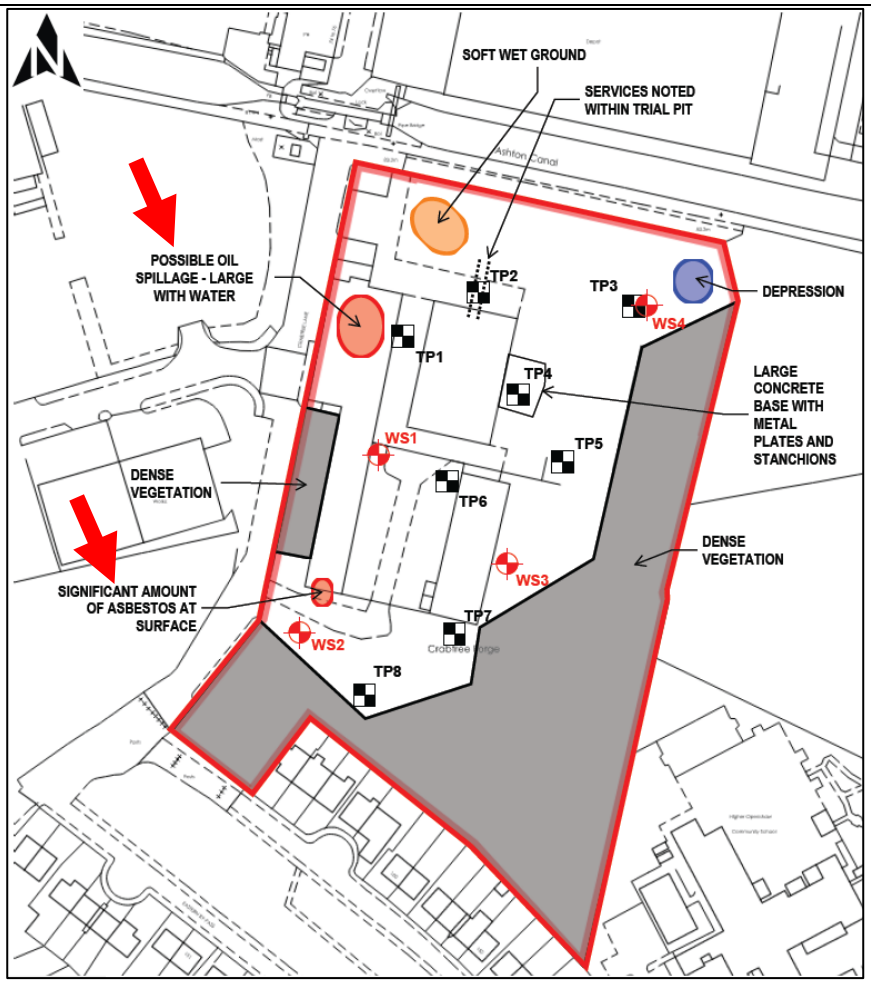
## 11.7 Visual and Olfactory Contamination

Other than the MADE GROUND, visual / olfactory information was noted in the following locations;

| Location | Depth (mbgl) | Description |
|---|---|---|
| TP2 | 0.95 | Creosote odour |
| TP8 | 0.45-1.90 | Multiple pieces of asbestos – possible chrysotile sheeting |

Surface contamination was noted in the locations below;


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## 11.8 Groundwater – Fieldwork

No groundwater was observed during the investigation.

## 11.9 Groundwater – Post Fieldwork Monitoring

Monitoring is underway and will be updated once the first visits have been carried out.


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# 12 LABORATORY TESTING GENERAL

An assessment of potential determinants associated with the current / former site uses has been undertaken. Determinants originating from the current/former site uses may include metals, polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPHs) and asbestos. A general suite of testing should detect most potential contaminants.

## 12.1 Scheduled Chemical Testing: Soils

Soil was sent to a UKAS accredited laboratory and were generally analysed in accordance with ISO 17025 and/or MCERTS accreditation. The results are summarised in tabular and/or graphical form in Appendix D.

| Chemical Test | No. of Samples | Comment/Method |
|---|---|---|
| pH Values | 12 | Determination of pH (using Cyberscan pH meter). |
| Sulphate - Soluble 2:1 Extract | 12 | Dionex. |
| Arsenic, Cadmium, Chromium VI, Chromium III, Total Chromium, Lead, Mercury, Selenium, Copper, Nickel, Complex and Free Cyanide and Zinc. | 10 | Soil samples were analysed in accordance with UKAS/MCERTS standards<br>Inductively coupled plasma atomic emission spectroscopy (ICP-OES) |
| Speciated Polycyclic Aromatic Hydrocarbons (PAH), | 10 | Determination of Polycyclic Aromatic Hydrocarbons by GC-MS. End/end extraction using DCM on as received sample. In house method modified USEPA 8270. Include coronene if required. |
| TPH CWG | 10 | TPH CWG (Aliphatics C5-6,>6-8,>8-10,>10-12,>12-16,>16-21,>2-35) (aromatics >C5-7,>7-8,>8-10,>10-12,>12-16,>16-21,>21-35)<br>C5-8 fractions by Headspace GC-MS (003S). C8-35 fractions on as received sample extracted with hexane/acetone, aliphatic/aromatic splits run by GC-FID (005S), banded as listed above. |
| GRO/BTEX/MTBE by GC-FID (C5-10; C10-C12) | 10 | Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12). |
| Organic Matter | 10 | Determination of Organic Matter by combustion. |
| Asbestos Screen | 10 (3) | Visual Screening for Fibres (No. of Quantified samples). |
| Atterburg Limits | 10 | BS1377 Part 2. 1990, 4.3,5.3,5.4 |
| Moisture Content | 2 | BS1377 Part 2. 1990, 3.2 |
| VOC / SVOC | 5 | GC-MS |


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# 13 CONTAMINATION ASSESSMENT

## 13.1 General

Contaminants of concern recorded at concentrations above relevant screening values are summarised below. For ease of description, the identification of contaminant sources and possible re-use of material, Topsoil, Made Ground, Natural Strata and Groundwater will be dealt with in separate sub-headings in this section of the report where required.

Our assessment is based on the following assumptions:

- The proposed site end use in of a high-risk rating (residential housing with gardens). For analysis purposes, 'residential with home grown produce' is deemed most appropriate end use.
- The Manchester Marl beneath site is classed as a Secondary B Aquifer (Low Permeability).
- Glacial Till deposits are likely to be generally low permeability, but also may be variable due to the nature of the deposits.
- It is deemed that some statistical analysis is appropriate. Where sample data numbers are low and/or targeted, each determinant result is however reviewed further as an individual result as opposed to an average across the site.
- Site history has indicated a **High** risk of contamination.
- Statistical analysis of the chemical test results has been undertaken in general accordance with Environment Agency 2009 SGV Guidance and AtRisk 2015 using the combined assessment criterion given by CLEA (Note: all SSVs for EA derivation are for a SOM of 6%, in line with Environment Agency Report SC050021/SR4 – this figure is deemed representative as an average value for a sandy loam soil). AtRisk 2015 are used to the nearest SOM percentage deemed appropriate. Where appropriate C4SL's could be utilised, when the site is not grossly contaminated.
- Other than sheens, no free product was noted within the exploratory holes.
- Following the withdrawal of CLR 7-10 Guidance documents by the Environment Agency, statistical analysis has been undertaken in accordance with the CIEH/CL:AIRE 'Guidance on Comparing Soil Contamination Data with a Critical Concentration' (May 2008). As such, the use of the mean value test alone is not considered.

A full risk assessment is detailed within Section 12 of this report.


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## 13.2 Soils Contamination Summary

### 13.2.1 Made Ground

All determinants for Metals, TPHs and PAHs fell below the residential home grown produce guidance levels within Made Ground strata, with the exception of the following;

| **Betts Geo Investigation** | | | | | |
|---|---|---|---|---|---|
| **Location** | **Depth (mbgl)** | **Determinand** | **Observed Concentration (mg/kg)** | **AtRisk 2017 (mg/kg)** | **DEFRA C4SL 2017 6%SOM (mg/kg)** |
| WS102 | 3.80 | Arsenic<br>Copper<br>Chrysotile & Amosite | 52<br>6570<br>3.822% | 32<br>4790<br><0.001% | 37<br>-<br><0.001% |
| WS103 | 2.00 | Chrysotile | 0.025% | <0.001% | <0.001% |
| TP6 | 1.00 | Chrysotile | <0.001% | <0.001% | <0.001% |
| TP8 | 1.00 | Benzo(a)pyrene | 1.84 | 1.51 | 4.95 |
| **NHSE Investigation - 2005** | | | | | |
| **Location** | **Depth (mbgl)** | **Determinand** | **Observed Concentration (mg/kg)** | **AtRisk 2017 (mg/kg)** | **DEFRA C4SL 2017 6%SOM (mg/kg)** |
| BH04 | 0.00 | Benzo(a)pyrene<br>Naphthalene | 2<br>3.1 | 1.51<br>0.829 | 4.95<br>- |
| BH07 | 4.85 | Arsenic<br>Lead<br>Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Dibenzo(ah)anthracene<br>Naphthalene | 48.8<br>322<br>9<br>11.6<br>13.1<br>1.6<br>2.1 | 32<br>-<br>4.52<br>1.51<br>7.72<br>0.838<br>0.829 | 37<br>200<br>-<br>4.95<br>-<br>-<br>- |
| BH08 | 4.85 | Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Dibenzo(ah)anthracene | 10.9<br>14.4<br>14.6<br>1.7 | 4.52<br>1.51<br>7.72<br>0.838 | -<br>4.95<br>-<br>- |
| BH10 | 2.75 | Benzo(a)anthracene<br>Benzo(a)pyrene<br>Benzo(b)fluoranthene<br>Dibenzo(ah)anthracene<br>Naphthalene | 17.5<br>21<br>17.9<br>4.1<br>1.5 | 4.52<br>1.51<br>7.72<br>0.838<br>0.829 | -<br>4.95<br>-<br>-<br>- |
| BH11 | 4.85 | Lead | 261 | - | 200 |

### 13.2.2 VOC / SVOC Testing

The vast majority of the VOC / SVOC do not have regulatory guidance levels, therefore where levels have returned above the laboratories limit of detection, they have been included in the tables below.

It is important to note that guidance values given are in mg/kg while the concentrations found on site are given in ug/kg, therefore care must be taken when converting these values.


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All areas where VOCs/SVOCs have been detected have been shown below, although no thresholds were available for the determinants detected.

| Location | Depth (mbgl) | Determinand | Observed Concentration (µg/kg) | AtRisk 2017 (mg/kg) |
|---|---|---|---|---|
| WS101 | 0.50 | Dibenzofuran<br>Carbazole<br>2-Methylnaphthalene<br>Perylene | 384<br>465<br>317<br>523 | -<br>-<br>-<br>- |
| WS102 | 3.80 | 2-Methylnaphthalene | 322 | - |
| TP2 | 0.85 | Carbazole<br>2-Methylnaphthalene<br>Perylene | 140<br>269<br>537 | -<br>-<br>- |
| TP6 | 1.00 | Perylene | 187 | - |

### 13.2.3 Natural Strata

All determinants for Metals, TPHs and PAHs fell below the residential home grown produce guidance levels within natural strata.


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# 14 ENVIRONMENTAL RISK ASSESSMENT

## 14.1 General

This section assesses likely risks to the identified receptors, arising from potential contamination sources. It provides a final qualitative assessment of the risks involved, indicating whether (where appropriate) any immediate action is required to mitigate certain risks.

In assessing the risk qualitatively, it is appropriate to use the methods outlined in the CIRIA document C552, "Contaminated Land Risk Assessment a Guide to Good Practice". It uses a classification of risk based on the magnitude of the potential consequence or severity of risk occurring, compared with the magnitude of the probability or likelihood of the risk occurring. These are indicated on the attached tables in Appendix H.

The superficial deposits are classed as being of variable permeability and the bedrock is classed a Secondary B Aquifer and is negligible-low permeability. Therefore, the site's environmental setting is considered to be a low to moderate environmental sensitivity. With respect to human health, the proposed end use (residential use with home-grown produce) is of high sensitivity. Transient risks to construction workers can be addressed by the adoption of appropriate health and safety measures (see Section 14.2).

## 14.2 Assessment of Soil Contamination Results

Elevated concentrations of various metals, asbestos, PAHs and SVOCs have been observed chemical samples in a number of locations across the site, in addition to the surficial, visual and olfactory contamination observed during the site works.

The presence of asbestos within the Made Ground is likely due to poorly managed historical demolition. This is evident from the deposits noted at surface.

ICRCL Guidance Note 64/85 "Asbestos on Contaminated Sites" (1990) is still the most current guidance for asbestos in soil and suggest asbestos fibres should be <0.001% w/w within soil. Dutch and Australian Guidance also suggest the use of a threshold of 0.001% as a threshold for asbestos in soil. The Dutch Guidelines consider the risk from Chrysotile to be ten times less than Amphibole (includes Amosite) asbestos but the HSE, WHO, the Australian DoH and the USEPA have chosen not to distinguish between different asbestos fibre types.

The concentrations of asbestos within made ground potentially poses a risk to end users and construction workers, if the material is exposed and soil and asbestos fibres allowed to become airborne in particular, the chrysotile and amosite in WS102 (3.822%) Groundworks should follow CAR-SOILTM Guidance. Given that the material used to back fill comprises some demolition waste, the presence of further asbestos is possible.

Due to the presence of Naphthalene at depth in a number, the use of VOC vapour resistant membranes may be required. This may be reassessed during further investigation or demolition works.


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Other VOCs / SVOCs detected do not have regulatory guidance levels and were detected at relatively low concentrations. They may however still pose a risk to human health, further investigation may be required to adequately address that potential risk.

Due to the widespread nature of contamination, remedial measures will be required across the site. These measures are addressed in Section 17.

### 14.2.1 Groundwater and Aquifer Risk

The underlying aquifer and groundwater are largely protected by cohesive clay strata. No significant mobile contamination has been observed, neither has any perched water.

### 14.2.2 Risk To Canal

The risk of contamination to the adjacent canal to the north of the site is deemed low due to the anticipated cohesive superficial geology surrounding the clay preventing any significant contamination migration. A road/access track is also present between the canal and the site, increasing its distance from site.

Protection measures may be required during the construction works to prevent any water ingress during the earthworks and sediment runoff will need to be controlled.

If any unofficial connections are discovered to the canal during the construction works, they will be blocked up to prevent any water from the site draining to the canal.


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# 15 GROUND GAS ASSESSMENT - PRELIMINARY

## 15.1 Ground Gas Requirements – Radon

BRE211 (2007) Radon: guidance on protective measures for new buildings shows it is in a lower probability area, as less than 1% of homes are above the action level. Therefore, no Radon protective measures are necessary in the construction of new dwellings or extensions.

### 15.1.1 Guidance

Three recent publications are used for ground gas risk assessment:

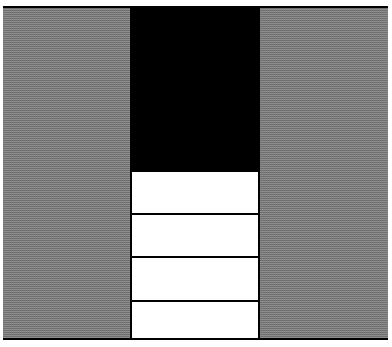
- 'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present', Report Edition No.04 March 2007 NHBC – designed for use with low rise residential properties
- CIRIA C665 'Assessing risks posed by hazardous ground gases for buildings' 2007 - for high rise residential / flats
- BS8485:2015 'Code of practice for the characterization and remediation from ground gas in affected developments'

Further details / accompanying notes for the following gas risk assessment are enclosed in Appendix I. The proposed development at the site is private residential two-storey houses, therefore assessments using the NHBC Guidance are deemed most appropriate.

## 15.2 Ground Gas Assessment

### 15.2.1 Ground Gas Boreholes Installations

Three (3 No.) window sample boreholes were all installed to depths between 3.00mbgl and 4.00mbgl into both Made Ground. An example installation is shown below;




### 15.2.2 Summary of Results

Ground gas monitoring is complete (6/6 visits have been undertaken). WS4 had been destroyed on the first visit, therefore no readings were possible from this well.


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Slightly elevated carbon dioxide (greater than 5%) was noted in WS01 on four out of the six visits. Slightly depleted oxygen was also noted in WS01 and WS03 on four of the six visits. Flow rates remained low across all of the visits (max 0.1l/hr).

The previous third party investigation also identified elevated carbon dioxide in WS11 at a concentration of 8%.

Due to the history of the site and the MADE GROUND encountered during the initial ground investigation, it is proposed Amber 1/CS2 ground gas protection is utilized across site. Additional ground gas monitoring is required in the areas that could not be accessed due to dense vegetation/existing buildings (post demo) during the initial investigation.

### 15.2.3 Gas Recommendations

The Betts Geo ground gas assessment is shown below;

| Site Area | Site Classification | Recommended Ground Gas Protection Measures |
|---|---|---|
| Whole Site | Amber 1 / CS2 | Low-level ground gas protection measures are required, using a membrane and ventilated sub-floor void that creates a permeability contrast to limit the ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. Ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours. |


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# 16 REVISED CONCEPTUAL SITE MODEL

## 16.1 General

The Initial Conceptual Site Model has been amended in light of data obtained during the ground investigation, most notably the absence of any contaminated soil in relation to the screening criteria for the proposed end use.

## 16.2 Final Conceptual Site Model

This section reassesses likely risks to the identified receptors, arising from potential contamination sources. It provides a final qualitative assessment of the risks involved, indicating whether (where appropriate) any immediate action is required to mitigate certain risks. It also discusses (where appropriate) what longer term measures or remedial works may be required in the future if the site were to be developed. It is considered that the site has not been assessed by the Local Authority as a contaminated site under the terms of the Environmental Protection Act 1990 Part IIa.

| Target (Receptor) | Potential Source-Pathway Linkage | Remedial Action Required (where appropriate) | Est. Degree of Risk to Target Following Remedial Action Where Necessary |
|---|---|---|---|
| Site End Users | Inhalation of soil gases, odours or dust. | Amber 1/CS2 ground gas protection is recommended across site. Additional ground gas monitoring is required in the areas that could not be accessed due to dense vegetation/existing buildings (post demo) during the initial investigation. | Low |
| Site End Users | Ingestion of, and skin contact with, contaminated soil. | Whole site requires 600mm/1000mm minimum clean and inert capping with geotextile break layer as per NHBC guidance. | Low* |
| Site End Users | Ingestion of contaminants in vegetables etc. or in soils adhering to vegetables, etc | Whole site requires 600mm/1000mm minimum clean and inert capping with geotextile break layer as per NHBC guidance | Low * |
| Construction/ Maintenance Workers. | Inhalation of soil gases, odours or dust. | PPE | Low ** |
| Construction/ Maintenance Workers. | Ingestion of, and skin contact with, contaminated soil | PPE | Low ** |
| Plants | Adverse effects on growth caused by presence of contaminants in soil | Whole site requires 600mm/1000mm minimum clean and inert capping with geotextile break layer as per NHBC guidance | Low* |
| Buildings and Structures | Flow of ground gas into buildings. Asphyxiation, toxicity, explosion and fire hazards | Amber 1/CS2 ground gas protection is recommended across site. Additional ground gas monitoring is required in the areas that could not be accessed due to dense vegetation/existing buildings (post demo) during the initial investigation. | Low |
| Foundations | Sulphate attack of foundations | Foundations to be designed as per section 16.9 | Low |


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| | | | |
|---|---|---|---|
| Water Supplies | Hydrocarbons penetrating plastic water supply pipes. | United Utilities pipeline risk assessment required. Protect-a-Line due to elevated TPH/VOC/SVOC pipes anticipated. | Low |
| Groundwater | Migration of soluble contaminants into groundwater on or off site | No remedial action required. Significant thickness of cohesive strata will limit vertical migration. | Low |
| Surface Water | Migration of soluble contaminants and/or direct run-off of contaminants | No highly mobile, with regards to water, contamination observed at site. No significant risk anticipated to the nearby canal however protection measures may be required during the construction works to prevent any water ingress during the earthworks and sediment runoff will need to be controlled. | Low |

** assumes basic PPE is used

* Site levels within garden areas may need lowering to allow for the 600mm cover system.


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# 17 OUTLINE STRATEGY FOR RISK REDUCTION/REMEDIATION STRATEGY

## 17.1 General

The following section details any recommendations and to reduce risk on site and recommended remedial actions (as per the previous sections of this report). For clarity, the section is split into sub-sections as per the conceptual site model (Section 14).

## 17.2 Construction/Maintenance Workers

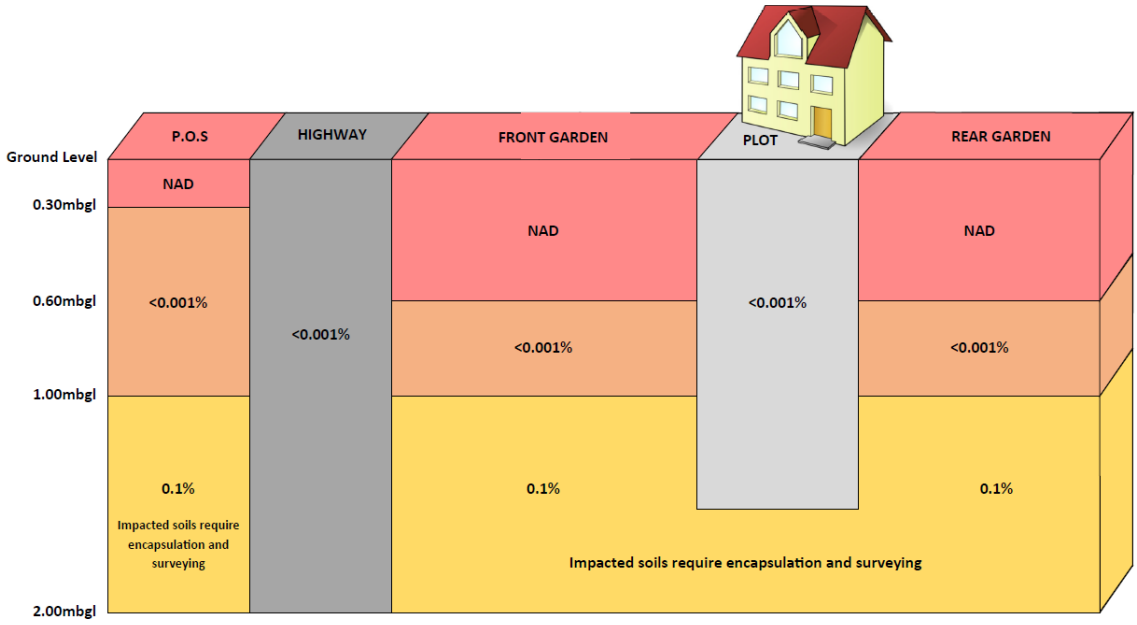
The following recommendations should be adhered to during site works:

- Toolbox talk on asbestos.
- Consideration to dampening down during work within made ground.
- Site workers should wear gloves, boots and overalls and wash their hands before eating, drinking and smoking. Excessive dust generation should be avoided.
- It is recommended that during all excavations adequate ventilation should be maintained. If man entry is required, gas monitoring should be carried out as a precaution.
- If areas of suspected contamination are found then a suitably qualified person should undertake appropriate sampling, testing and further risk assessment.

## 17.3 Site-End Users

Below is a sketch showing levels of asbestos concentrations and locations where they are commonly accepted / unacceptable. This should be confirmed with the Local Authority prior to implementation, and should therefore only be used as a guide;


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**Notes:**

**P.O.S -** Public Open Space

**NAD -** No Asbestos Detected

**0.001% -** Soils may contain ≤0.001% using composite testing to ensure there is no potential risk to human health. Value is present where there may be short-term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (e.g. dust suppression).

**0.1% -** Soils at depth of >1.00mbgl may contain <0.1% asbestos using composite testing where they will be not likely not be disturbed in the future and will therefore be in an area of Low Sensitivity. Risk assessment completed in accordance with the Asbestos JIWG Risk Assessment Tools.

**Undefined -** Dependant upon soils encountered during earthworks, which may be placed at depths to ensure no potential risk to human health.

Burial and encapsulation of asbestos should be agreed with regulators and consultant prior to the works being undertaken. Consideration should also be made to CAR-SOIL ™.

This methodology of reusing asbestos impacted soils will require carefully managed soil movements, in conjunction with an MMP (Materials Management Plan) and Local Authority agreement and signoff.

Discussion with a suitably qualified asbestos consultant is advised.

If the soils are to be excavated and removed, then delineation of these locations will be required, dampening down techniques will also be required to ensure fibres cannot migrate.

Due to the concentrations of the asbestos in WS102 (3.822%), it must be placed at a depth greater than 2.00m and must be surveyed and encapsulated with proper demarcation and must not be below a road. It must also be positioned where it is unlikely to be disturbed in the future.

The materials within WS103 (0.025%) should be place below a depth of 1.00m, and must not be below a road, they must be surveyed and encapsulated with proper demarcation. It must also be positioned where it is unlikely to be disturbed in the future.

The material within TP6 (<0.001%), could be placed within private gardens areas with a clean and inert cover of 600mm with geotextile breaklayer. They could also be placed in public open space below 300mm capping and geotextile breaklayer. They could also be used within roadboxes and below plot footprints.

Agreement and signoff by MCC will be required and should be agreed before undertaking the works.


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Removal of materials may be required within roadbox and plot footprints, depending on the concentrations listed. Locations and concentrations of asbestos shown in table below;

| Location | Depth (mbgl) | Determinand | Observed Concentration (mg/kg) | AtRisk 2017 (mg/kg) | DEFRA C4SL 2017 6%SOM (mg/kg) |
|---|---|---|---|---|---|
| WS102 | 3.80 | Chrysotile & Amosite | **3.822%** | <0.001% | <0.001% |
| WS103 | 2.00 | Chrysotile | **0.025%** | <0.001% | <0.001% |
| TP6 | 1.00 | Chrysotile | <0.001% | <0.001% | <0.001% |

Slightly elevated carbon dioxide (greater than 5%) was noted in WS01 on four out of the six visits. Slightly depleted oxygen was also noted in WS01 and WS03 on four of the six visits. Flow rates remained low across all of the visits (max 0.1l/hr). Due to the history of the site and the MADE GROUND encountered during the initial ground investigation, it is proposed Amber 1/CS2 ground gas protection is utilized across site. Additional ground gas monitoring is required in the areas that could not be accessed due to dense vegetation/existing buildings (post demo) during the initial investigation.

The Betts Geo ground gas assessment is shown below;

| Site Area | Site Classification | Recommended Ground Gas Protection Measures |
|---|---|---|
| Whole Site | Amber 1 / CS2 | Low-level ground gas protection measures are required, using a membrane and ventilated sub-floor void that creates a permeability contrast to limit the ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. Ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours. |

## 17.6 Controlled Waters

No significant mobile contamination has been observed, neither has any perched water.

The underlying aquifer and groundwater are largely protected by cohesive clay strata, which will limit migration. The underlying solid geology is the Manchester Marls, which has been classified as a Secondary B Aquifer and is of low permeability which will inhibit vertical and horizontal migration.

There are no potable abstractions within 500m of the site.

The possible culvert that may or may not be present on the site is likely to be a solid construction and encapsulated by clay. Risk to be aquifers and surface waters, including the culvert is deemed to be low.

The risk of contamination to the adjacent canal to the north of the site is deemed low due to the anticipated cohesive superficial geology surrounding the clay preventing any significant contamination migration. A road/access track is also present between the canal and the site, increasing its distance from site.

Protection measures may be required during the construction works to prevent any water ingress during the earthworks and sediment runoff will need to be controlled.


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If any unofficial connections are discovered to the canal during the construction works, they will be blocked up to prevent any water from the site draining to the canal.

### 17.7 Piped Drinking Water Supplies

The use of Protect-A-Line is anticipated; a UU risk assessment should be completed to confirm.

### 17.8 Off-Site Disposal of Surplus Soil

It is recommended that the results of the contamination testing (including the history of the site) be presented to any proposed landfills, to obtain their acceptance of the information to date and to determine the actual WAC limits used by them, (see Appendix J for further guidance). Segregation of made ground/topsoil and natural should be possible given the chemical analysis and very different visual identification.

Site waste management plans will be required due to the size and cost of the proposed scheme.


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# 18 GEOTECHNICAL ASSESSMENT

## 18.1 Introduction

It is understood that the proposed development will consist of construction of residential properties with associated rear gardens, associated infrastructure and public open space. The properties are expected to be multiple storey.

## 18.2 Site Preparation and Excavation

All excavations should be planned, and due consideration should be given to providing temporary support or suitable battering. Excavations should be regularly inspected by a competent person to ensure continued safety. Further advice on the safety of excavations is given *in Health and Safety in Construction.* Shallow (<1.20mbgl) excavations for service trenches could be complicated by collapsing ground, and care should be taken.

Stability of the ash is questionable and should be considered during construction.

## 18.3 Control of Groundwater

Shallow perched groundwater has been observed. The provision of pumping/shuttering will be necessary during excavation of foundation trenches, especially during wet weather, close to surface water features and to deeper excavations for sewers etc. It is good practice to have such equipment on standby in case of seasonal / abnormal weather conditions.

## 18.4 Foundations

Due to the variability of the ground, a detailed foundation zoning plan should be undertaken once final layouts / levels are known taking in to account the varying ground conditions.

For low-rise properties, strip / trench foundations may be suitable where competent ground is found <2.00mbgl., based on the below;

- Firm CLAY strata with an allowable bearing pressure (ABP) of 100kN/m$^2$
- Stiff CLAY strata with an allowable bearing pressure of 125kN/m$^2$

However, due to the prevalence and depth of made ground, previous infrastructure and contamination (arisings), it would be prudent to allow for a piled foundation solution across the site until further site investigation can be undertaken post demolition. Made ground has been recorded to a depth of around 8.00mbgl. Deeper Boreholes are advised for piled foundation design.

Where groundwater is present with granular strata, half the stated ABP value may be expected in granular soils.

Due to variable ground conditions, a detailed foundation zoning plan is advised.


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Localised deepening of foundations and / or piled foundations are likely to be required in areas of reduced ground strength.

Possibility of culverts and air ducts from the former use cannot be discounted.

Allowance for pre-digging pile locations should be made due to possibility of unknown obstructions.

Foundations should be excavated wholly on one stratum. Should proposed foundations span different strata, trenching and stepping of foundations and/or nominal reinforcement will be required.

Calculations on the allowable bearing capacity indicate settlements of less than 25mm for a square pad using the above allowable bearing capacity.

For any multi-storey structures, a piled foundation solution will be required based on greater expected loadings. A specialised piling foundation contractor should be consulted with regards to pile design.

### 18.5 Ground Floor Construction

Suspended floor construction e.g. either in-situ RC slabs or block and beam flooring is recommended as per NHBC guidance.

### 18.6 Soakaways

Soakaway tests were not undertaken during the fieldwork due to the anticipated made ground and underlying cohesive strata.

### 18.7 Heave / Shrinkage Potential

A summary of Atterburg limit tests is shown below. Full results are located in Appendix D.

| Exploratory Position ID | Depth (m) | Plasticity Index % | % <425um | Modified Plasticity Index % | NHBC Volume Change Level |
|---|---|---|---|---|---|
| TP1 | 1.20 | 20 | 95 | 19 | Low |
| WS101 | 3.70 | 20 | 97 | 19 | Low |

**Low** plasticity is evident across the materials tested. Foundation design for tree heave protection could be designed accordingly following discussion with the NHBC.

### 18.8 Highway

According to the criteria of Highways Agency HD 25/95 Volume 7 Section 2 Part 2 HD 25/94, a CBR value of 3-5% on the Made Ground anticipated, however confirming in-situ CBR's should be undertaken. Placement of geotextiles within the areas of roads / parking could also be designed to minimise the subgrade thickness.


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## 18.9 Protection of Buried Concrete

It is considered for concrete design purposes that brownfield site and mobile groundwater conditions are applicable, the results are summarised in the tables below:

**Area Around WS101**

| Concrete Classification | |
|---|---|
| **Design Sulphate Class** | DS-1s |
| **ACEC Class** | AC-2 |
| **Design Chemical Class** | DC-2 |

**Rest of Site**

| Concrete Classification | |
|---|---|
| **Design Sulphate Class** | DS-1s |
| **ACEC Class** | AC-1 |
| **Design Chemical Class** | DC-1 |

## 18.10 Additional Works – Post-demolition

Further works will be required, as listed below;

- Trial pitting to delineate CLAY / MADE GROUND interface and inaccessible areas, with geotechnical and environmental sample collection
- Cable percussive boreholes, with gas monitoring installs


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# 19 REFERENCES

**19.1** *BS 5930:1999+A2 Code of Practice for Site Investigation.*

**19.2** *BS1377: 1990 Methods of Test for Soils for Civil Engineering Purposes.*

**19.3** Assessment of risks to human health from land contamination: an overview of the development of guideline values and related research. EA, 2002

**19.4** *Contaminated Land Risk Assessment; A Guide to Good Practice; CIRIA C552: 2001.*

**19.5** *Health and Safety in Construction, HSG150, HSE, 1996.*

**19.6** *Hazardous Waste: Interpretation of the Definition and Classification of Hazardous Waste, Environment Agency, WM2 Version 1.0, June 2003.*

**19.7** *DoE (1991), The Building Regulations Approved Document C, Site Preparation and Resistance to Moisture, HMSO*

**19.8** *Baker W (1987), Investigation Strategy - lecture at City of Birmingham Development Department Symposium on Methane Generating Sites, 9 December 1987, Industrial Research Laboratories, Birmingham*

**19.9** *NHBC Standards, Chapter 4.2, 2017 Building Near Trees*

**19.10** *Highways Agency HD 25/95 volume 7 section 2 Part 2 HD 25/94*

**19.11** *Water Regulations Advisory Scheme (2002) The selection of materials for water supply pipes to be laid in contaminated land*

**19.12** *Anon (1997) Dutch in Policy Retreat on Contaminated Land ENDS (Environmental Data Services), 269, 46*

**19.13** *Water Regulations Advisory Scheme (2002) The selection of materials for water supply pipes to be laid in contaminated land*

**19.14** *Piling In Layered Ground: Risks to Groundwater and Archaeology Science Report SC020074/SR Environment Agency October 2006*

**19.15** *Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention National Groundwater & Contaminated Land Centre report NC/99/73 F J Westcott, C M B Lean & M L Cunningham May 2001*

**19.16** *'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present', Report Edition No.04 March 2007 NHBC – designed for use with low rise residential properties*

**19.17** *CIRIA C665 'Assessing risks posed by hazardous ground gases for buildings' 2007 - for high rise residential / flats*

**19.18** *BS8485:2007 'Code of practice for the characterization and remediation from ground gas in affected developments'*

**19.19** *BRE 414 'Protective measures for housing on gas-contaminated land' Roger Johnson, Parkman Environment 2001*


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**19.20** *BS 8500- 1:2006 'Concrete – Complementary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance for the specifier' November 2006*

**19.21** *'Planning Policy 23: Planning and Pollution Control' Office of the Deputy Prime Minister 2004*

**19.22** *CLR11 'Model Procedures for the Management of Land Contamination' DEFRA 2004*

**19.23** *BRE 465 'Cover Systems for Land Regeneration' 2004*

**19.24** *'The UK Approach for Evaluating the Human Health Risks from Petroleum Hydrocarbons in Soils, Environment Agency Science Report P5-080/TR3', Environment Agency (May 2005)*

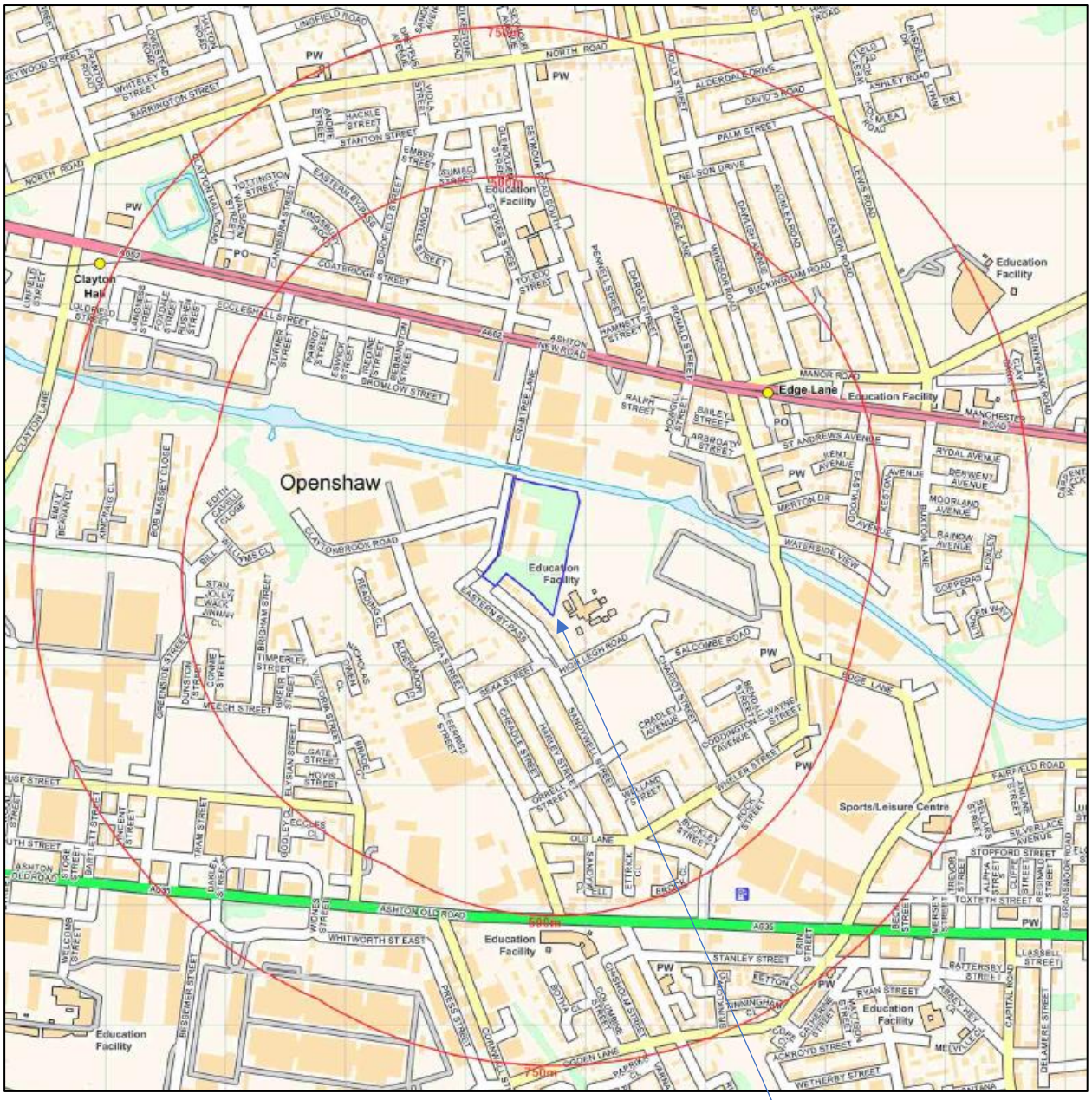
**19.25** *TOX12- Contaminants in Soil: Collation of Toxicological Data and Intake Values for Humans. Dioxins, Furans and Dioxin-like PCBs' Environment Agency 2003*

**19.26** *The LQM/CIEH GAC for Human Health Risk Assessment 2009 second edition*


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## APPENDIX A

(i) Site Location Plan




**Site Location Plan**

The site is located between Openshaw and Clayton and is between Ashton New Road and Ashton Old Road.

The site has an approximate address of B&S Massey, Crabtree Ln, Manchester M11 1BR.


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## APPENDIX B

(i) Drawings and Plans


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SOFT WET GROUND

SERVICES NOTED WITHIN TRIAL PIT

POSSIBLE OIL SPILLAGE - LARGE WITH WATER

DEPRESSION

LARGE CONCRETE BASE WITH METAL PLATES AND STANCHIONS

DENSE VEGETATION

SIGNIFICANT AMOUNT OF ASBESTOS AT SURFACE

DENSE VEGETATION

TP1
TP2
TP3
TP4
TP5
TP6
TP7
TP8

WS1
WS2
WS3
WS4

Ashton Canal

Crabtree Forge

NOTES

DO NOT SCALE

WINDOW SAMPLE BOREHOLE LOCATION

TRIAL PIT LOCATION

| REV | DATE | BY | DESCRIPTION | CHK |
|---|---|---|---|---|

DRAWING STATUS: DRAFT

BETTS GEO CONSULTING ENGINEERS
Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 Fax: 01244 288179 enquiries@betts-associates.co.uk

MCI

PROJECT: CRABTREE LANE, OPENSHAW

TITLE: EXPLORATORY HOLE LOCATION PLAN

| DATE: | SCALE @ SIZE: | DRAWN: | CHECKED: |
|---|---|---|---|
| AUG 21 | NTS | KR | BL |

| PROJECT No: | DRAWING No: | REV: |
|---|---|---|
| 21CHE276 | EXP001 | / |

# APPENDIX C

(i) Betts Exploratory Hole Logs


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# TRIAL PIT LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | TP1 |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 10-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.10 | MADE GROUND: Concrete (red). | | |
| | | | | | | 0.40 | MADE GROUND: Concrete with single layer of rebar | | |
| | | | | | | 0.50 | MADE GROUND: Loose to medium dense red SAND & GRAVEL. Gravel is fine to medium angular to subangular of brick. crushed brick. | | |
| 0.65 | ES | | | | | 0.65 | | | |
| | | | | | | (0.55) | MADE GROUND: Medium dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| 1.20 | D | | | | | 1.20 | | | |
| | | | | | | | MADE GROUND: Firm brown gravelly sandy silty CLAY. Gravel is fine to medium angular to subangular of brick. | | |
| | | | | | | (1.15) | Firm to stiff light brown and grey sandy silty CLAY. Becoming dark and stiff to very stiff with depth. Hole aborted on very stiff CLAY. | | |
| | | | | | | 2.35 | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | |
| | | | | | | | | | | | Dry |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used 6t Tracked Excavator | Logged By<br>KR |
|---|---|---|---|

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# TRIAL PIT LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | TP2 |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 10-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.10 | MADE GROUND: Sandstone Setts | | |
| | | | | | | 0.40 | MADE GROUND: Medium dense black fine to very clayey coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| | | | | | | (0.45) | | | |
| | | | | | | 0.85 | MADE GROUND: Firm to stiff yellowish brown sandy CLAY. Service at 0.85mbgl, pit extended west. | | |
| 0.85 | ES | | | | | 0.95 | MADE GROUND: Soft to firm black CLAY. Slight creosote odour. Aborted on second service pipe. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To |
| | | | | | | | | | | |

**GENERAL REMARKS**

Possible live (on CAT) service pipes at 0.85 and 0.95mbgl. Both left intact.

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used 6t Tracked Excavator | Logged By<br>KR |
|---|---|---|---|

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# TRIAL PIT LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | TP4 |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 10-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | (0.50)<br>0.50 | Brick Floor - Intact with ash blinding | | |
| | | | | | | 0.60 | Strong concrete slab edged by metal boards/strips with stanchions. Probable machine base or similar. Slab at least 3m x 3m | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | |
| | | | | | | | | | | | Dry |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used 6t Tracked Excavator | Logged By<br>KR |
|---|---|---|---|

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# TRIAL PIT LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | TP5 |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 10-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | (0.45)<br>0.45 | MADE GROUND: Brick floor over fien to coarse SAND & GRAVEL. Gravel is fien to medium of crushed brick. | | |
| 1.50 | ES | | | | | (1.85)<br>2.30 | MADE GROUND: Loose becoming medium dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| | | | | | | (0.40)<br>2.70 | MADE GROUND: Medium dense becoming very dense / concrete base red fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of brick. Crushed brick. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | Concrete base or very dense strata at base. |
| | | | | | | | | | | | |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used 6t Tracked Excavator | Logged By<br>KR |
|---|---|---|---|

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# TRIAL PIT LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | TP6 |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 10-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.05 | MADE GROUND: Brown fine to coarse SAND. | | |
| | | | | | | 0.35 | MADE GROUND: Medium dense greyish yellow very sandy GRAVEL. Gravel is fine to coarse angular to subangular of limestone. Possible Type 1 MOT. | | |
| 1.00 | ES | | | | | (2.15) | MADE GROUND: Loose becoming medium dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| | | | | | | 2.50 | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | |
| | | | | | | | | | | | Dry |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used 6t Tracked Excavator | Logged By<br>KR |
|---|---|---|---|

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# TRIAL PIT LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | TP7 |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 10-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.05 | MADE GROUND: Grass over brown and black gravelly cobbley fine to coarse SAND. Gravel and cobbles are fine to coarse angular to subrounded of concrete, bricks, roots and ash. | | |
| | | | | | | (0.55) | | | |
| | | | | | | 0.60 | MADE GROUND: Dense yellow fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subangular of sandstone and brick. | | |
| 1.00 | ES | | | | | (2.35) | MADE GROUND: Medium dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. Occasional boulders of sandstone flags noted. | | |
| | | | | | | 2.95 | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | Dry |
| | | | | | | | | | | | |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used 6t Tracked Excavator | Logged By<br>KR |
|---|---|---|---|

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# TRIAL PIT LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | TP8 |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 10-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.20 | MADE GROUND: Grass over brown and black gravelly cobbley fine to coarse SAND. Gravel and cobbles are fine to coarse angular to subrounded of concrete, bricks, roots and ash. | | |
| | | | | | | 0.45 | MADE GROUND: Dense yellow fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subangular of sandstone and brick. | | |
| 1.00 | | | | | | (1.45) | MADE GROUND: Loose becoming medium dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| | | | | | | 1.90 | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | Hole aborted due to lots of pieces of possible asbestos sheet |
| | | | | | | | | | | | |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used 6t Tracked Excavator | Logged By<br>KR |
|---|---|---|---|

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# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | **WS101** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 09-08-21<br>09-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.20 | MADE GROUND: Concrete with single layer of rebar | | |
| | | | | | | 0.40 | MADE GROUND: Medium dense greyish yellow very sandy GRAVEL. Gravel is fine to coarse angular to subangular of limestone. Possible Type 1 MOT. | | |
| 0.50 | ES | | | | | | MADE GROUND: Very loose to loose dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| 1.20 | | N5 | | | | | | | |
| | | | | | | (3.00) | | | |
| 2.00 | | N0 | | | | | | | |
| 3.00 | | N7 | | | | | | | |
| | | | | | | 3.40 | | | |
| 3.40 | ES | | | | | 3.50 | MADE GROUND: Soft black and brown sandy CLAY. | | |
| | | | | | | 3.70 | Firm yellowish brown slightly sandy CLAY. | | |
| | | | | | | 4.00 | Firm to stiff brown and mottled grey slightly sandy CLAY. | | |
| 4.00 | | N9 | | | | | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | |
| | | | | | | | | | | | Dry.<br>Possible void at 2.00mbgl. |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used Competitor Rig | Logged By<br>KR |
|---|---|---|---|

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# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | **WS102** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 09-08-21<br>09-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | (0.50)<br>0.50 | MADE GROUND: Brown fine to coarse SAND with occasional limestone gravel. | | |
| 1.20 | | N6 | | | | (3.00) | MADE GROUND: Very loose to loose dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| 2.00 | | N4 | | | | | | | |
| 3.00 | | N2 | | | | 3.50 | | | |
| | | | | | | 3.80 | MADE GROUND: Medium dense black fine to very clayey coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| 3.80 | ES | | | | | 4.00 | | | |
| 4.00 | | N4 | | | | | MADE GROUND: Soft to firm black and yellow clayey PULP like material. | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | |
| | | | | | | | | | | | Dry |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used Competitor Rig | Logged By<br>KR |
|---|---|---|---|

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# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | **WS103** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 09-08-21<br>09-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | 0.20 | MADE GROUND: Concrete with single layer of rebar | | |
| | | | | | | 0.45 | MADE GROUND: Medium dense greyish yellow very sandy GRAVEL. Gravel is fine to coarse angular to subangular of limestone. Possible Type 1 MOT. | | |
| | | | | | | | MADE GROUND: Very loose to medium dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick. | | |
| 1.20 | | N6 | | | | | | | |
| 2.00 | ES | | | | | | | | |
| 2.00 | | N10 | | | | (3.55) | | | |
| 3.00 | | N5 | | | | | | | |
| | | | | | | 4.00 | | | |
| 4.00 | | N4 | | | | | | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | | GENERAL REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To | |
| | | | | | | | | | | | Dry |

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/<br>Plant Used Competitor Rig | Logged By<br>KR |
|---|---|---|---|

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# BOREHOLE LOG

| Project | | | | BOREHOLE No |
|---|---|---|---|---|
| Crabtree Lane, Openshaw | | | | **WS104/TP3** |
| Job No | Date | Ground Level (m) | Co-Ordinates () | |
| 21MCI001 | 09-08-21<br>10-08-21 | | | |
| Contractor | | | | Sheet |
| BETTS GEO Ltd | | | | 1 of 1 |

| SAMPLES & TESTS | | | Water | STRATA | | | | Geology | Instrument/ Backfill |
|---|---|---|---|---|---|---|---|---|---|
| Depth | Type No | Test Result | | Reduced Level | Legend | Depth (Thick-ness) | DESCRIPTION | | |
| | | | | | | (0.90)<br>0.90 | MADE GROUND: Concrete | | |

| Boring Progress and Water Observations | | | | | | Chiselling | | | Water Added | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Time | Depth | Casing Depth | Casing Dia. mm | Water Dpt | From | To | Hours | From | To |
| | | | | | | | | | | |

**GENERAL REMARKS**

WS location followed by TP attempt large hard concrete block / base.

| All dimensions in metres<br>Scale 1:50 | Client MCI Developments | Method/ Plant Used Competitor Rig | Logged By KR |
|---|---|---|---|

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## APPENDIX D

(i) Contamination Test Results

(ii) Geotechnical Test Results


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BETTS GEO
CONSULTING ENGINEERS

## SUMMARY OF CONTAMINATION ANALYSIS: METALS

**Project Name** Crabtree Lane, Openshaw
**Project No** 21CHE276
**Date** 01/03/2005

| SOIL TYPE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE LOCATION | BH01 | BH02 | BH03 | BH04 | BH05 | BH07 | BH08 | BH09 | BH10 | BH10 | BH11 | BH11 |
| DEPTH (m) | 3.8 | 1.7 | 2.75 | 0.00 | 6.95 | 4.85 | 4.85 | 6.95 | 2.75 | 4.85 | 0.00 | 4.85 |
| pH | | | | | | 7.2 | 7.6 | 6.2 | 6.4 | 6.1 | 7.4 | 7.6 |
| Sulphate (water sol 2:1) | | | | | | 0.481 | 0.175 | 0.749 | 0.414 | 0.075 | 0.062 | 0.025 |
| Organic matter | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arsenic | | | | | | 48.8 | 17.7 | 22.8 | 18.8 | 3.3 | 30 | 2.6 |
| Cadmium | | | | | | 0.6 | 6.1 | 0.5 | 0.2 | 0.3 | 0.5 | <0.2 |
| Copper | | | | | | 251.2 | 607.2 | 92.2 | 131.9 | 46.4 | 86.4 | 17.5 |
| Chromium (hexavalent) | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | | | | | | 2.6 | <0.1 |
| Lead | | | | | | 322 | 181.2 | 110.2 | 125 | 50.1 | 261 | 8.1 |
| Mercury | | | | | | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 1 | 0.1 |
| Nickel | | | | | | 276.5 | 61 | 120.1 | 32.1 | 16.3 | 27.8 | 9.6 |
| Selenium | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Zinc | | | | | | 239.7 | 352.3 | 144.7 | 100.3 | 213 | 128.5 | 31.9 |
| Asbestos in Soil | | | | | | NAD | NAD | NAD | NAD | NAD | NAD | NAD |
| Asbestos Matrix | | | | | | NAD | NAD | NAD | NAD | NAD | NAD | NAD |
| Quantification | | | | | | NAD | NAD | NAD | NAD | NAD | NAD | NAD |
| Organic matter | | | | | | | | | | | | |

| Metals | Mean Value Test * | Range | | AtRisk 2017 (mg/kg) | AtRisk 2017 (mg/kg) | DEFRA C4SL 2017 |
|---|---|---|---|---|---|---|
| | $US_{95}$ | Largest Value (mg/kg) | Smallest Value (mg/kg) | With Homegrown Produce (1% SOM) | With Homegrown Produce (6% SOM) | |
| pH | 7.42 | 7.60 | 6.10 | | | - |
| Sulphate (water sol 2:1) | 0.48 | 0.75 | 0.03 | | | - |
| Organic matter | | 0.00 | 0.00 | | | |
| Arsenic | 32.27 | 48.80 | 2.60 | **32** | **32** | **37** |
| Cadmium | 2.79 | 6.10 | 0.20 | **10** | **10** | **22.1** |
| Copper | 326.18 | 607.20 | 17.50 | **4730** | **4790** | - |
| Chromium (hexavalent) | 1.15 | 2.60 | 2.60 | **3.62** | **3.63** | **20.5** |
| Lead | 233.31 | 322.00 | 8.10 | | | **200** |
| Mercury | 0.52 | 1.00 | 0.10 | **8.81** | **15.8** | - |
| Nickel | 147.67 | 276.50 | 9.60 | **EA/ATRisk withdrawn Aug 2015** | | |
| Selenium | | 0.00 | 0.00 | **375** | **375** | - |
| Zinc | 250.05 | 352.30 | 31.90 | **20000** | **20300** | - |

**NOTE:**
Any individual results and mean value tests above SGVs are shown RED highlighted.
Any outlier values which exceed relevant SGVs are shown in red

* - The calculations for the mean value test include outliers

**- Results for this determinand are assessed with no background levels taken into account

Results are expressed as mg/kg unless otherwise stated

ALL RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4ASSUMING **NO** FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

SGVs are derived from the EA 2009 SGV's which are taken from AtRisk 2015. Category 4 screening levels have been adopted by the EA and have been included as new guidance.
Note: The SGV for elemental mercury has been used to assess total mercury concentrations at the site. The Environment Agency's Science Report SC050021 /Mercury SGV states that 'for general surface contamination and to simplify the assessment the SGV's for inorganic mercury can normally be compared with chemical analysis for total mercury content….'. Based on the latter, SGV for elemental mercury (170mg/kg) in the soil assessment is used
NAD - NO ASBESTOS DETECTED

TS - Topsoil, MG - Made Ground and N - Natural Ground

BETTS GEO
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## SUMMARY OF CONTAMINATION ANALYSIS: TPH

**Project Name** Crabtree Lane, Openshaw
**Project No** 21CHE276
**Date** 01/03/2005

| SOIL TYPE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE LOCATION | BH01 | BH02 | BH03 | BH04 | BH05 | BH07 | BH08 | BH09 | BH10 | BH10 | BH11 | BH11 |
| DEPTH (m) | 3.8 | 1.7 | 2.75 | 0.00 | 6.95 | 4.85 | 4.85 | 6.95 | 2.75 | 4.85 | 0.00 | 4.85 |
| Ali >C5-C6 | | | | | | | | | | | | |
| Ali >C6-C8 | | | | | | | | | | | | |
| Ali >C8-C10 | | | | | | | | | | | | |
| Ali >C10-C12 | | | | | | | | | | | | |
| Ali >C12-C16 | | | | | | | | | | | | |
| Ali >C16-C21 | | | | | | | | | | | | |
| Ali >C21-C35 | | | | | | | | | | | | |
| Total Aliphatics | | | | | | | | | | | | |
| Aro >C5-C7 | | | | | | | | | | | | |
| Aro >C7-C8 | | | | | | | | | | | | |
| Aro >C8-C10 | | | | | | | | | | | | |
| Aro >C10-C12 | | | | | | | | | | | | |
| Aro >C12-C16 | | | | | | | | | | | | |
| Aro >C16-C21 | | | | | | | | | | | | |
| Aro >C21-C35 | | | | | | | | | | | | |
| Total Aromatics | | | | | | | | | | | | |
| TPH (Ali & Aro) | | | | | | 661.6 | 1074.3 | 230.3 | 996.2 | 147.2 | 156.1 | <0.1 |
| BTEX - Benzene | | | | | | | | | | | | |
| BTEX - Toluene | | | | | | | | | | | | |
| BTEX - Ethyl Benzene | | | | | | | | | | | | |
| BTEX - m & p Xylene | | | | | | | | | | | | |
| BTEX - o Xylene | | | | | | | | | | | | |
| MTBE | | | | | | | | | | | | |
| Organic Matter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| TPH | Mean Value Test * | Range | | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | DEFRA C4SL 2017 |
|---|---|---|---|---|---|---|
| | $US_{95}$ | Largest Value (mg/kg) | Smallest Value (mg/kg) | 1% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** |
| Ali >C5-C6 | | 0.00 | 0.00 | 42.7 | 369 | - |
| Ali >C6-C8 | | 0.00 | 0.00 | 99.3 | 1240 | - |
| Ali >C8-C10 | | 0.00 | 0.00 | 13.9 | 204 | - |
| Ali >C10-C12 | | 0.00 | 0.00 | 81.7 | 1180 | - |
| Ali >C12-C16 | | 0.00 | 0.00 | 385 | 4130 | - |
| Ali >C16-C21 | | 0.00 | 0.00 | 210000 | 210100 | - |
| Ali >C21-C35 | | 0.00 | 0.00 | | | |
| Total Aliphatics | | 0.00 | 0.00 | | | |
| Aro >C5-C7 | | 0.00 | 0.00 | 0.137 | 0.871 | - |
| Aro >C7-C8 | | 0.00 | 0.00 | 113 | 780 | - |
| Aro >C8-C10 | | 0.00 | 0.00 | 20.5 | 232 | - |
| Aro >C10-C12 | | 0.00 | 0.00 | 70 | 468 | - |
| Aro >C12-C16 | | 0.00 | 0.00 | 165 | 830 | - |
| Aro >C16-C21 | | 0.00 | 0.00 | 319 | 1040 | - |
| Aro >C21-C35 | | 0.00 | 0.00 | 1120 | 1710 | - |
| Total Aromatics | | 0.00 | 0.00 | | | |
| TPH (Ali & Aro) | 789.44 | 1074.30 | 147.20 | | | |
| BTEX - Benzene | | 0.00 | 0.00 | 0.0493 | 0.33 | 0.871 |
| BTEX - Toluene | | 0.00 | 0.00 | 113 | 780 | - |
| BTEX - Ethyl Benzene | | 0.00 | 0.00 | 50.7 | 453 | - |
| BTEX - m & p Xylene | | 0.00 | 0.00 | 24 | 312 | - |
| BTEX - o Xylene | | 0.00 | 0.00 | 26.4 | 336 | - |
| MTBE | | 0.00 | 0.00 | 27.6 | 220 | |

| | UU Drinking Water Guidelines |
|---|---|
| | PE Threshold |
| Total BTEX & MTBE | 0.1 |
| EC5-EC10 Ali-Aro | 2 |
| EC10-EC16 Ali-Aro | 10 |
| EC16-EC40 Ali-Aro | 500 |

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4ASSUMING **NO** FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

**NOTES:**

For the Purpose of this investigation- results will be assessed agains **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**

## SUMMARY OF CONTAMINATION ANALYSIS: PAH

**Project Name** Crabtree Lane, Openshaw
**Project No** 21CHE276
**Date** 01/03/05

| SOIL TYPE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE LOCATION | BH01 | BH02 | BH03 | BH04 | BH05 | BH07 | BH08 | BH09 | BH10 | BH10 | BH11 | BH11 |
| DEPTH (m) | 3.8 | 1.7 | 2.75 | 0.00 | 6.95 | 4.85 | 4.85 | 6.95 | 2.75 | 4.85 | 0.00 | 4.85 |
| Acenaphthene | <0.1 | <0.1 | <0.1 | - | <0.1 | 2.3 | 1.1 | 0.6 | 7 | 0.1 | 0.1 | <0.1 |
| Acenaphthylene | <0.1 | <0.1 | <0.1 | - | <0.1 | 0.2 | 1.2 | <0.1 | 0.4 | <0.1 | <0.1 | <0.1 |
| Anthracene | <0.1 | <0.1 | <0.1 | - | <0.1 | 3.6 | 3.7 | 0.6 | 8.8 | 0.1 | 0.2 | <0.1 |
| Benzo(a)anthracene | <0.1 | <0.1 | <0.1 | 1.5 | <0.1 | 9 | 10.9 | 1 | 17.5 | 0.2 | 0.6 | <0.1 |
| Benzo(a)pyrene | <0.1 | <0.1 | <0.1 | 2 | <0.1 | 11.6 | 14.4 | 1 | 21 | 0.2 | 0.9 | <0.1 |
| Benzo(b)fluoranthene | <0.1 | <0.1 | <0.1 | 1.6 | <0.1 | 13.1 | 14.6 | 1.1 | 17.9 | 0.2 | 0.3 | <0.1 |
| Benzo(ghi)perylene | <0.1 | <0.1 | <0.1 | 0.9 | <0.1 | 4.2 | 3.1 | 0.7 | 6.6 | <0.1 | 0.9 | <0.1 |
| Benzo(k)fluoranthene | <0.1 | <0.1 | <0.1 | 1 | <0.1 | 5.8 | 7.4 | 0.5 | 9.3 | 0.1 | 0.3 | <0.1 |
| Chrysene | <0.1 | <0.1 | <0.1 | 2.7 | <0.1 | 12.2 | 13.6 | 1.3 | 19.7 | 0.3 | 0.8 | <0.1 |
| Dibenzo(ah)anthracene | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | 1.6 | 1.7 | <0.1 | 4.1 | <0.1 | <0.1 | <0.1 |
| Fluoranthene | <0.1 | <0.1 | <0.1 | 6.1 | 0 | 23.1 | 27 | 3.4 | 45.8 | 0.7 | 1.7 | <0.1 |
| Fluorene | <0.1 | <0.1 | <0.1 | 0.8 | <0.1 | 1.4 | 1.2 | 0.5 | 5 | 0.1 | 0.1 | <0.1 |
| Indeno(123-cd)pyrene | <0.1 | <0.1 | <0.1 | 0.8 | <0.1 | 3.2 | 4 | 0.7 | 5.6 | <0.1 | 0.3 | <0.1 |
| Naphthalene | <0.1 | <0.1 | <0.1 | 3.1 | <0.1 | 2.1 | 0.7 | 0.6 | 1.5 | 0.1 | 0.8 | <0.1 |
| Phenanthrene | <0.1 | <0.1 | <0.1 | 6.1 | <0.1 | 15.2 | 11.7 | 2.8 | 41.5 | 0.7 | 1.2 | <0.1 |
| Pyrene | <0.1 | <0.1 | <0.1 | 5.1 | <0.1 | 20.8 | 21.9 | 2.6 | 43.1 | 0.6 | 1.5 | <0.1 |
| Organic Matter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| PAH | Mean Value Test * | Range | | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | DEFRA's C4SL 2017 |
|---|---|---|---|---|---|---|
| | $US_{95}$ | Largest Value (mg/kg) | Smallest Value (mg/kg) | 1% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** |
| Acenaphthene | | 7.00 | 0.10 | 608 | 2760 | - |
| Acenaphthylene | | 1.20 | 0.20 | | | - |
| Anthracene | | 8.80 | 0.10 | 10200 | 26200 | - |
| Benzo(a)anthracene | 6.43 | 17.50 | 0.20 | 4.52 | 8.54 | - |
| Benzo(a)pyrene | 8.02 | 21.00 | 0.20 | 1.51 | 2.05 | 4.95 |
| Benzo(b)fluoranthene | 7.63 | 17.90 | 0.20 | 7.72 | 9.86 | - |
| Benzo(ghi)perylene | 2.51 | 6.60 | 0.70 | 96.2 | 103 | - |
| Benzo(k)fluoranthene | 3.82 | 9.30 | 0.10 | 84.4 | 100 | - |
| Chrysene | 7.80 | 19.70 | 0.30 | 585 | 927 | - |
| Dibenzo(ah)anthracene | 1.33 | 4.10 | 1.60 | 0.838 | 1 | - |
| Fluoranthene | 18.21 | 45.80 | 0.00 | 983 | 2980 | - |
| Fluorene | 1.53 | 5.00 | 0.10 | 735 | 2610 | - |
| Indeno(123-cd)pyrene | 2.25 | 5.60 | 0.30 | 7.31 | 9.75 | - |
| Naphthalene | 1.29 | 3.10 | 0.10 | 0.829 | 12.2 | - |
| Phenanthrene | 12.91 | 41.50 | 0.70 | | | - |
| Pyrene | 15.06 | 43.10 | 0.60 | 668 | 2120 | - |

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

**NOTES:**

For the Purpose of this investigation- results will be assessed agains **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**

BETTS GEO CONSULTING ENGINEERS

## SUMMARY OF CONTAMINATION ANALYSIS: METALS

**Project Name** Crabtree Lane, Openshaw
**Project No** 21MCI001
**Date** 09/08/2021

| SOIL TYPE | MG | MG | MG | MG | MG | MG | MG | MG | MG | MG |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE LOCATION | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | TP1 | TP2 | TP5 | TP7 |
| DEPTH (m) | 0.50 | 3.40 | 3.80 | 2.00 | 1.00 | 1 | 0.65 | 0.85 | 1.5 | 1 |
| pH | 5.89 | 7.13 | 7.69 | 8.25 | 8.54 | 7.98 | 6.09 | 6.52 | 6.19 | 7.91 |
| Sulphate (water sol 2:1) | 0.42 | 0.16 | 0.08 | 0.18 | <0.01 | <0.01 | 0.13 | 0.04 | <0.01 | 0.03 |
| Organic matter | 28.6 | 3.5 | 31.5 | 6.8 | 5.5 | 35.4 | 2 | 11.8 | 42.8 | 28.4 |
| Arsenic | 18 | 10 | 52 | 17 | 14 | 26 | <1 | 23 | 30 | 20 |
| Cadmium | 1.8 | 1.1 | 0.8 | 1.3 | 1 | 1.9 | 0.9 | 2.1 | 1.6 | 0.9 |
| Copper | 177 | 53 | 6570 | 120 | 73 | 131 | 28 | 125 | 103 | 122 |
| Chromium (hexavalent) | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Lead | 48 | 113 | 161 | 43 | 85 | 62 | 37 | 186 | 101 | 52 |
| Mercury | <0.17 | <0.17 | <0.17 | 0.63 | 2.22 | <0.17 | <0.17 | <0.17 | <0.17 | <0.17 |
| Nickel | 91 | 50 | 68 | 107 | 43 | 289 | 26 | 165 | 76 | 36 |
| Selenium | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Zinc | 48 | 754 | 345 | 93 | 112 | 98 | 218 | 144 | 43 | 98 |
| Asbestos in Soil | NAD | NAD | Chrysotile & Amosite | Chrysotile | NAD | Chrysotile | NAD | NAD | NAD | NAD |
| Asbestos Matrix | - | - | loose insulation | Loose fibres | - | Loose fibres | - | - | - | - |
| Quantification | - | - | 3.822 | 0.025 | - | <0.001 | - | - | - | - |
| Organic matter | 28.6 | 3.5 | 31.5 | 6.8 | 5.5 | 35.4 | 2 | 11.8 | 42.8 | 28.4 |

| Metals | Mean Value Test * | Range | | AtRisk 2017 (mg/kg) | AtRisk 2017 (mg/kg) | DEFRA C4SL 2017 |
|---|---|---|---|---|---|---|
| | $US_{95}$ | Largest Value (mg/kg) | Smallest Value (mg/kg) | With Homegrown Produce (1% SOM) | With Homegrown Produce (6% SOM) | |
| pH | 7.79 | 8.54 | 5.89 | | | - |
| Sulphate (water sol 2:1) | 0.18 | 0.42 | 0.03 | | | - |
| Organic matter | 28.44 | 42.80 | 2.00 | | | |
| Arsenic | 28.99 | 52.00 | 10.00 | 32 | 32 | 37 |
| Cadmium | 1.61 | 2.10 | 0.80 | 10 | 10 | 22.1 |
| Copper | 1935.83 | 6570.00 | 28.00 | 4730 | 4790 | - |
| Chromium (hexavalent) | 1.00 | 0.00 | 0.00 | 3.62 | 3.63 | 20.5 |
| Lead | 118.69 | 186.00 | 37.00 | | | 200 |
| Mercury | 0.80 | 2.22 | 0.63 | 8.81 | 15.8 | - |
| Nickel | 141.13 | 289.00 | 26.00 | EA/ATRisk withdrawn Aug 2015 | | |
| Selenium | 1.00 | 0.00 | 0.00 | 375 | 375 | - |
| Zinc | 320.37 | 754.00 | 43.00 | 20000 | 20300 | - |

**NOTE:**
Any individual results and mean value tests above SGVs are shown RED highlighted.
Any outlier values which exceed relevant SGVs are shown in red

* - The calculations for the mean value test include outliers

**- Results for this determinand are assessed with no background levels taken into account

Results are expressed as mg/kg unless otherwise stated

ALL RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING **NO** FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

SGVs are derived from the EA 2009 SGV's which are taken from AtRisk 2015. Category 4 screening levels have been adopted by the EA and have been included as new guidance.
Note: The SGV for elemental mercury has been used to assess total mercury concentrations at the site. The Environment Agency's Science Report SC050021 /Mercury SGV states that 'for general surface contamination and to simplify the assessment the SGV's for inorganic mercury can normally be compared with chemical analysis for total mercury content….'. Based on the latter, SGV for elemental mercury (170mg/kg) in the soil assessment is used
NAD - NO ASBESTOS DETECTED

TS - Topsoil, MG - Made Ground and N - Natural Ground

BETTS GEO
CONSULTING ENGINEERS

## SUMMARY OF CONTAMINATION ANALYSIS: TPH

**Project Name** Crabtree Lane, Openshaw
**Project No** 21MCI001
**Date** 09/08/2021

| SOIL TYPE | MG | MG | MG | MG | MG | MG | MG | MG | MG | MG |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE LOCATION | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | TP1 | TP2 | TP5 | TP7 |
| DEPTH (m) | 0.50 | 3.40 | 3.80 | 2.00 | 1.00 | 1 | 0.65 | 0.85 | 1.5 | 1 |
| Ali >C5-C6 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Ali >C6-C8 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Ali >C8-C10 | <1 | <1 | 30 | 2 | <1 | 1 | <1 | 12 | <1 | 6 |
| Ali >C10-C12 | <1 | <1 | 34 | 1 | <1 | <1 | <1 | 48 | <1 | 3 |
| Ali >C12-C16 | <1 | <1 | 5 | 2 | 2 | 2 | <1 | 128 | <1 | 4 |
| Ali >C16-C21 | <1 | 1 | 10 | 3 | 4 | 8 | <1 | 146 | 1 | 10 |
| Ali >C21-C35 | 5 | 6 | 69 | 23 | 9 | 56 | 1 | 75 | 3 | 42 |
| Total Aliphatics | 5 | 7 | 149 | 32 | 16 | 68 | 1 | 409 | 4 | 64 |
| Aro >C5-C7 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Aro >C7-C8 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Aro >C8-C10 | <1 | <1 | 7 | 1 | <1 | <1 | <1 | 6 | <1 | 4 |
| Aro >C10-C12 | <1 | 1 | 16 | 2 | <1 | 1 | <1 | 27 | <1 | 4 |
| Aro >C12-C16 | 5 | 11 | 18 | 6 | 7 | 6 | <1 | 100 | 3 | 16 |
| Aro >C16-C21 | 17 | 50 | 18 | 14 | 23 | 17 | <1 | 151 | 3 | 30 |
| Aro >C21-C35 | 37 | 87 | 42 | 35 | 59 | 63 | 4 | 159 | 8 | 42 |
| Total Aromatics | 59 | 149 | 101 | 58 | 91 | 87 | 4 | 443 | 14 | 95 |
| TPH (Ali & Aro) | 64 | 157 | 250 | 90 | 106 | 156 | 5 | 852 | 19 | 159 |
| BTEX - Benzene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| BTEX - Toluene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| BTEX - Ethyl Benzene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| BTEX - m & p Xylene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| BTEX - o Xylene | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| MTBE | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Organic Matter | 28.6 | 3.5 | 31.5 | 6.8 | 5.5 | 35.4 | 2 | 11.8 | 42.8 | 28.4 |

| TPH | Mean Value Test * | Range | | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | DEFRA C4SL 2017 |
|---|---|---|---|---|---|---|
| | $US_{95}$ | Largest Value (mg/kg) | Smallest Value (mg/kg) | 1% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** |
| Ali >C5-C6 | 0.01 | 0.00 | 0.00 | 42.7 | 369 | - |
| Ali >C6-C8 | 0.01 | 0.00 | 0.00 | 99.3 | 1240 | - |
| Ali >C8-C10 | 10.98 | 30.00 | 1.00 | 13.9 | 204 | - |
| Ali >C10-C12 | 19.11 | 48.00 | 1.00 | 81.7 | 1180 | - |
| Ali >C12-C16 | 37.79 | 128.00 | 2.00 | 385 | 4130 | - |
| Ali >C16-C21 | 44.56 | 146.00 | 1.00 | 210000 | 210100 | - |
| Ali >C21-C35 | 45.76 | 75.00 | 1.00 | | | |
| Total Aliphatics | 148.46 | 409.00 | 1.00 | | | |
| Aro >C5-C7 | 0.01 | 0.00 | 0.00 | 0.137 | 0.871 | - |
| Aro >C7-C8 | 0.01 | 0.00 | 0.00 | 113 | 780 | - |
| Aro >C8-C10 | 3.77 | 7.00 | 1.00 | 20.5 | 232 | - |
| Aro >C10-C12 | 10.64 | 27.00 | 1.00 | 70 | 468 | - |
| Aro >C12-C16 | 34.44 | 100.00 | 3.00 | 165 | 830 | - |
| Aro >C16-C21 | 57.84 | 151.00 | 3.00 | 319 | 1040 | - |
| Aro >C21-C35 | 79.36 | 159.00 | 4.00 | 1120 | 1710 | - |
| Total Aromatics | 182.23 | 443.00 | 4.00 | | | |
| TPH (Ali & Aro) | 327.96 | 852.00 | 5.00 | | | |
| BTEX - Benzene | 0.01 | 0.00 | 0.00 | 0.0493 | 0.33 | 0.871 |
| BTEX - Toluene | 0.01 | 0.00 | 0.00 | 113 | 780 | - |
| BTEX - Ethyl Benzene | 0.01 | 0.00 | 0.00 | 50.7 | 453 | - |
| BTEX - m & p Xylene | 0.01 | 0.00 | 0.00 | 24 | 312 | - |
| BTEX - o Xylene | 0.01 | 0.00 | 0.00 | 26.4 | 336 | - |
| MTBE | 0.01 | 0.00 | 0.00 | 27.6 | 220 | |

| | UU Drinking Water Guidelines |
|---|---|
| | PE Threshold |
| Total BTEX & MTBE | 0.1 |
| EC5-EC10 Ali-Aro | 2 |
| EC10-EC16 Ali-Aro | 10 |
| EC16-EC40 Ali-Aro | 500 |

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4ASSUMING **NO** FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

**NOTES:**

For the Purpose of this investigation- results will be assessed agains **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**

## SUMMARY OF CONTAMINATION ANALYSIS: PAH

**Project Name** Crabtree Lane, Openshaw
**Project No** 21MCI001
**Date** 09/08/21

| SOIL TYPE | MG | MG | MG | MG | MG | MG | MG | MG | MG | MG |
|---|---|---|---|---|---|---|---|---|---|---|
| SAMPLE LOCATION | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | TP1 | TP2 | TP5 | TP7 |
| DEPTH (m) | 0.50 | 3.40 | 3.80 | 2.00 | 1.00 | 1 | 0.65 | 0.85 | 1.5 | 1 |
| Acenaphthene | 0.31 | 0.2 | 0.01 | 0.05 | 0.3 | 0.5 | <0.01 | 0.13 | <0.01 | 0.11 |
| Acenaphthylene | 0.06 | 0.01 | <0.01 | <0.01 | 0.03 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Anthracene | 0.44 | 0.25 | 0.03 | 0.11 | 0.45 | 0.55 | <0.02 | 0.27 | <0.02 | 0.17 |
| Benzo(a)anthracene | 1.16 | 0.59 | 0.13 | 0.51 | 1.86 | 1.4 | <0.04 | 1.77 | 0.16 | 0.46 |
| Benzo(a)pyrene | 1.2 | 0.5 | 0.1 | 0.49 | 1.84 | 1.32 | <0.04 | 2.66 | 0.2 | 0.43 |
| Benzo(b)fluoranthene | 1.17 | 0.47 | 0.12 | 0.56 | 1.98 | 1.4 | <0.05 | 2.76 | 0.22 | 0.45 |
| Benzo(ghi)perylene | 0.69 | 0.25 | <0.05 | 0.22 | 0.84 | 0.69 | <0.05 | 1.88 | 0.11 | 0.23 |
| Benzo(k)fluoranthene | 0.43 | 0.16 | <0.07 | 0.19 | 0.65 | 0.48 | <0.07 | 0.89 | 0.08 | 0.16 |
| Chrysene | 1.16 | 0.66 | 0.14 | 0.53 | 1.98 | 1.38 | <0.06 | 2.08 | 0.21 | 0.49 |
| Dibenzo(ah)anthracene | 0.17 | 0.06 | <0.04 | 0.05 | 0.22 | 0.17 | <0.04 | 0.37 | <0.04 | 0.05 |
| Fluoranthene | 2.41 | 1.31 | 0.25 | 0.91 | 3.75 | 2.72 | <0.08 | 3.29 | 0.27 | 1.02 |
| Fluorene | 0.21 | 0.17 | <0.01 | 0.02 | 0.2 | 0.35 | <0.01 | 0.15 | <0.01 | 0.07 |
| Indeno(123-cd)pyrene | 0.8 | 0.26 | 0.07 | 0.28 | 1 | 0.8 | <0.03 | 1.9 | 0.13 | 0.26 |
| Naphthalene | 0.22 | 0.09 | 0.09 | 0.05 | 0.31 | 0.74 | <0.03 | 0.11 | 0.06 | 0.09 |
| Phenanthrene | 2.15 | 1.59 | 0.18 | 0.55 | 2.18 | 2.79 | <0.03 | 1.4 | 0.12 | 0.86 |
| Pyrene | 2.15 | 1.28 | 0.22 | 0.75 | 3.41 | 2.4 | <0.07 | 3.86 | 0.23 | 0.89 |
| Organic Matter | 28.6 | 3.5 | 31.5 | 6.8 | 5.5 | 35.4 | 2 | 11.8 | 42.8 | 28.4 |

| PAH | Mean Value Test * | Range | | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | AtRisk 2017 (mg/kg) Residential with Home Grown Produce | DEFRA's C4SL 2017 |
|---|---|---|---|---|---|---|
| | $US_{95}$ | Largest Value (mg/kg) | Smallest Value (mg/kg) | 1% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** | 6% SOM WITHOUT Free Product*** |
| Acenaphthene | 0.26 | 0.50 | 0.01 | **608** | **2760** | - |
| Acenaphthylene | 0.03 | 0.06 | 0.01 | | | - |
| Anthracene | 0.34 | 0.55 | 0.03 | **10200** | **26200** | - |
| Benzo(a)anthracene | 1.21 | 1.86 | 0.13 | **4.52** | **8.54** | - |
| Benzo(a)pyrene | 1.38 | 2.66 | 0.10 | **1.51** | **2.05** | **4.95** |
| Benzo(b)fluoranthene | 1.44 | 2.76 | 0.12 | **7.72** | **9.86** | - |
| Benzo(ghi)perylene | 0.83 | 1.88 | 0.11 | **96.2** | **103** | - |
| Benzo(k)fluoranthene | 0.48 | 0.89 | 0.08 | **84.4** | **100** | - |
| Chrysene | 1.30 | 2.08 | 0.14 | **585** | **927** | - |
| Dibenzo(ah)anthracene | 0.19 | 0.37 | 0.05 | **0.838** | **1** | - |
| Fluoranthene | 2.38 | 3.75 | 0.25 | **983** | **2980** | - |
| Fluorene | 0.19 | 0.35 | 0.02 | **735** | **2610** | - |
| Indeno(123-cd)pyrene | 0.89 | 1.90 | 0.07 | **7.31** | **9.75** | - |
| Naphthalene | 0.30 | 0.74 | 0.05 | **0.829** | **12.2** | - |
| Phenanthrene | 1.75 | 2.79 | 0.12 | | | - |
| Pyrene | 2.32 | 3.86 | 0.22 | **668** | **2120** | - |

Results expressed as mg/kg air dried unless otherwise stated.

* - The calculations for the mean value test include outliers

*** THESE RESULTS PRESENTED ARE ASSESSED UNDER THE COMBINED CLEA ASSESSMENT CRITERION AS OUTLINED WITHIN SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

**NOTES:**

For the Purpose of this investigation- results will be assessed agains **RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.**

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Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

# FINAL ANALYTICAL TEST REPORT

**Envirolab Job Number:** 21/08758
**Issue Number:** 1 **Date:** 08 September, 2021

**Client:**
Betts Geo Environmental
Old Marsh Farm Barns
Welsh Road
Sealand
Flintshire
UK
CH5 2LY

**Project Manager:** Betts Geolab
**Project Name:** Crabtree Lane, Openshaw
**Project Ref:** 21MCI001
**Order No:** TBC
**Date Samples Received:** 11/08/21
**Date Instructions Received:** 12/08/21
**Date Analysis Completed:** 08/09/21

**Prepared by:**

Melanie Marshall
Laboratory Coordinator

**Approved by:**



Richard Wong
Client Manager

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| % Stones >10mm$_A$ | 6.2 | <0.1 | 2.5 | <0.1 | <0.1 | 13.1 | <0.1 | % w/w | 0.1 | A-T-044 |
| pH$_D$$^{M\#}$ | 5.89 | 7.13 | 7.58 | 7.69 | 8.25 | 8.54 | 7.98 | pH | 0.01 | A-T-031s |
| Sulphate (water sol 2:1)$_D$$^{M\#}$ | 0.42 | 0.16 | 0.04 | 0.08 | 0.18 | <0.01 | <0.01 | g/l | 0.01 | A-T-026s |
| Organic matter$_D$$^{M\#}$ | 28.6 | 3.5 | - | 31.5 | 6.8 | 5.5 | 35.4 | % w/w | 0.1 | A-T-032 OM |
| Arsenic$_D$$^{M\#}$ | 18 | 10 | - | 52 | 17 | 14 | 26 | mg/kg | 1 | A-T-024s |
| Cadmium$_D$$^{M\#}$ | 1.8 | 1.1 | - | 0.8 | 1.3 | 1.0 | 1.9 | mg/kg | 0.5 | A-T-024s |
| Copper$_D$$^{M\#}$ | 177 | 53 | - | 6570 | 120 | 73 | 131 | mg/kg | 1 | A-T-024s |
| Chromium (hexavalent)$_D$ | <1 | <1 | - | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-040s |
| Lead$_D$$^{M\#}$ | 48 | 113 | - | 161 | 43 | 85 | 62 | mg/kg | 1 | A-T-024s |
| Mercury$_D$ | <0.17 | <0.17 | - | <0.17 | 0.63 | 2.22 | <0.17 | mg/kg | 0.17 | A-T-024s |
| Nickel$_D$$^{M\#}$ | 91 | 50 | - | 68 | 107 | 43 | 289 | mg/kg | 1 | A-T-024s |
| Selenium$_D$$^{M\#}$ | <1 | <1 | - | <1 | <1 | <1 | <1 | mg/kg | 1 | A-T-024s |
| Zinc$_D$$^{M\#}$ | 48 | 754 | - | 345 | 93 | 112 | 98 | mg/kg | 5 | A-T-024s |
| VPH total (>C5-C10) | <1 | <1 | - | 37 | 3 | 2 | 1 | mg/kg | 1 | Calc-stone+mois |
| 1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4$_A$$^{\#}$ | - | - | Appended | - | - | - | - | % | 1 | Subcon SS |
| 1.01 % Moisture BS1377 1990 pt2 cl3.2$_A$$^{\#}$ | - | - | Appended | - | - | - | - | % | 0.1 | Subcon SS |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| **Asbestos in Soil (inc. matrix)** | | | | | | | | | | |
| Asbestos in soil$_{D}^{\#}$ | NAD | NAD | - | Chrysotile & Amosite | Chrysotile | NAD | Chrysotile | | | A-T-045 |
| Asbestos Matrix (visual)$_{D}$ | - | - | - | loose insulation | - | - | - | | | A-T-045 |
| Asbestos Matrix (microscope)$_{D}$ | - | - | - | loose fibres | loose fibres | - | loose fibres | | | A-T-045 |
| Asbestos ACM - Suitable for Water Absorption Test?$_{D}$ | N/A | N/A | - | N/A | N/A | N/A | N/A | | | A-T-045 |
| | | | | | | | | | | |
| **Asbestos in Soil Quantification % (Hand Picking & Weighing)** | | | | | | | | | | |
| Asbestos in soil % composition (hand picking and weighing)$_{D}$ | - | - | - | 3.822 | 0.025 | - | <0.001 | % w/w | 0.001 | A-T-054 |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| **PAH-16MS** | | | | | | | | | | |
| Acenaphthene$_A^{M\#}$ | 0.31 | 0.20 | - | 0.01 | 0.05 | 0.30 | 0.50 | mg/kg | 0.01 | A-T-019s |
| Acenaphthylene$_A^{M\#}$ | 0.06 | 0.01 | - | <0.01 | <0.01 | 0.03 | <0.01 | mg/kg | 0.01 | A-T-019s |
| Anthracene$_A^{M\#}$ | 0.44 | 0.25 | - | 0.03 | 0.11 | 0.45 | 0.55 | mg/kg | 0.02 | A-T-019s |
| Benzo(a)anthracene$_A^{M\#}$ | 1.16 | 0.59 | - | 0.13 | 0.51 | 1.86 | 1.40 | mg/kg | 0.04 | A-T-019s |
| Benzo(a)pyrene$_A^{M\#}$ | 1.20 | 0.50 | - | 0.10 | 0.49 | 1.84 | 1.32 | mg/kg | 0.04 | A-T-019s |
| Benzo(b)fluoranthene$_A^{M\#}$ | 1.17 | 0.47 | - | 0.12 | 0.56 | 1.98 | 1.40 | mg/kg | 0.05 | A-T-019s |
| Benzo(ghi)perylene$_A^{M\#}$ | 0.69 | 0.25 | - | <0.05 | 0.22 | 0.84 | 0.69 | mg/kg | 0.05 | A-T-019s |
| Benzo(k)fluoranthene$_A^{M\#}$ | 0.43 | 0.16 | - | <0.07 | 0.19 | 0.65 | 0.48 | mg/kg | 0.07 | A-T-019s |
| Chrysene$_A^{M\#}$ | 1.16 | 0.66 | - | 0.14 | 0.53 | 1.98 | 1.38 | mg/kg | 0.06 | A-T-019s |
| Dibenzo(ah)anthracene$_A^{M\#}$ | 0.17 | 0.06 | - | <0.04 | 0.05 | 0.22 | 0.17 | mg/kg | 0.04 | A-T-019s |
| Fluoranthene$_A^{M\#}$ | 2.41 | 1.31 | - | 0.25 | 0.91 | 3.75 | 2.72 | mg/kg | 0.08 | A-T-019s |
| Fluorene$_A^{M\#}$ | 0.21 | 0.17 | - | <0.01 | 0.02 | 0.20 | 0.35 | mg/kg | 0.01 | A-T-019s |
| Indeno(123-cd)pyrene$_A^{M\#}$ | 0.80 | 0.26 | - | 0.07 | 0.28 | 1.00 | 0.80 | mg/kg | 0.03 | A-T-019s |
| Naphthalene $_A^{M\#}$ | 0.22 | 0.09 | - | 0.09 | 0.05 | 0.31 | 0.74 | mg/kg | 0.03 | A-T-019s |
| Phenanthrene$_A^{M\#}$ | 2.15 | 1.59 | - | 0.18 | 0.55 | 2.18 | 2.79 | mg/kg | 0.03 | A-T-019s |
| Pyrene$_A^{M\#}$ | 2.15 | 1.28 | - | 0.22 | 0.75 | 3.41 | 2.40 | mg/kg | 0.07 | A-T-019s |
| Total PAH-16MS$_A^{M\#}$ | 14.7 | 7.85 | - | 1.34 | 5.27 | 21 | 17.7 | mg/kg | 0.01 | A-T-019s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| **TPH CWG** | | | | | | | | | | |
| Ali >C5-C6$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ali >C6-C8$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Ali >C8-C10$_A$ | <1 | <1 | - | 30 | 2 | <1 | 1 | mg/kg | 1 | A-T-055s |
| Ali >C10-C12$_A^{M\#}$ | <1 | <1 | - | 34 | 1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Ali >C12-C16$_A^{M\#}$ | <1 | <1 | - | 5 | 2 | 2 | 2 | mg/kg | 1 | A-T-055s |
| Ali >C16-C21$_A^{M\#}$ | <1 | 1 | - | 10 | 3 | 4 | 8 | mg/kg | 1 | A-T-055s |
| Ali >C21-C35$_A^{M\#}$ | 5 | 6 | - | 69 | 23 | 9 | 56 | mg/kg | 1 | A-T-055s |
| Total Aliphatics$_A$ | 5 | 7 | - | 149 | 32 | 16 | 68 | mg/kg | 1 | A-T-055s |
| Aro >C5-C7$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Aro >C7-C8$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| Aro >C8-C10$_A$ | <1 | <1 | - | 7 | 1 | <1 | <1 | mg/kg | 1 | A-T-055s |
| Aro >C10-C12$_A$ | <1 | 1 | - | 16 | 2 | <1 | 1 | mg/kg | 1 | A-T-055s |
| Aro >C12-C16$_A$ | 5 | 11 | - | 18 | 6 | 7 | 6 | mg/kg | 1 | A-T-055s |
| Aro >C16-C21$_A^{M\#}$ | 17 | 50 | - | 18 | 14 | 23 | 17 | mg/kg | 1 | A-T-055s |
| Aro >C21-C35$_A^{M\#}$ | 37 | 87 | - | 42 | 35 | 59 | 63 | mg/kg | 1 | A-T-055s |
| Total Aromatics$_A$ | 59 | 149 | - | 101 | 58 | 91 | 87 | mg/kg | 1 | A-T-055s |
| TPH (Ali & Aro >C5-C35)$_A$ | 64 | 157 | - | 250 | 90 | 106 | 156 | mg/kg | 1 | A-T-055s |
| BTEX - Benzene$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - Toluene$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - Ethyl Benzene$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - m & p Xylene$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| BTEX - o Xylene$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |
| MTBE$_A^{\#}$ | <0.01 | <0.01 | - | <0.01 | <0.01 | <0.01 | <0.01 | mg/kg | 0.01 | A-T-022s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| **SVOC** | | | | | | | | | | |
| 4-Bromophenyl phenyl ether$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Hexachlorobenzene$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Diethyl phthalate$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Dimethyl phthalate$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Dibenzofuran$_A$ | 384 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Carbazole$_A$ | 465 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Butylbenzyl phthalate$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Bis(2-ethylhexyl)phthalate$_A$ | <2000 | - | - | <2000 | - | - | <2000 | µg/kg | 500 | A-T-052s |
| Bis(2-chloroethoxy)methane$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Bis(2-chloroethyl)ether$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 4-Nitrophenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 3+4-Methylphenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 4-Chloro-3-methylphenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2-Nitrophenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2-Methylphenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2-Chlorophenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2,6-Dinitrotoluene$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2,4-Dinitrotoluene$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2,4-Dimethylphenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2,4-Dichlorophenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2,4,6-Trichlorophenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2,4,5-Trichlorophenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2-Chloronaphthalene$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| 2-Methylnaphthalene$_A$ | 317 | - | - | 322 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Bis(2-chloroisopropyl)ether$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Phenol$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Pentachlorophenol (SVOC)$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| n-Nitroso-n-dipropylamine$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| n-Dioctylphthalate$_A$ | <500 | - | - | <500 | - | - | <500 | µg/kg | 500 | A-T-052s |
| n-Dibutylphthalate$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Nitrobenzene$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Isophorone$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| Hexachloroethane$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Hexachlorocyclopentadiene$_A$ | <100 | - | - | <100 | - | - | <100 | µg/kg | 100 | A-T-052s |
| Perylene$_A$ | 523 | - | - | <100 | - | - | 187 | µg/kg | 100 | A-T-052s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| **VOC** | | | | | | | | | | |
| Dichlorodifluoromethane$_{A}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Chloromethane$_{A}$ | <10 | - | - | <10 | - | - | <10 | µg/kg | 10 | A-T-006s |
| Vinyl Chloride (Chloroethene)$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Bromomethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Chloroethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Trichlorofluoromethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethene$_{A}^{\#}$ | *<1* | - | - | *<1* | - | - | *<1* | µg/kg | 1 | A-T-006s |
| Carbon Disulphide$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Dichloromethane$_{A}$ | <5 | - | - | <5 | - | - | <5 | µg/kg | 5 | A-T-006s |
| trans 1,2-Dichloroethene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| cis 1,2-Dichloroethene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 2,2-Dichloropropane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Bromochloromethane$_{A}^{\#}$ | <5 | - | - | <5 | - | - | <5 | µg/kg | 5 | A-T-006s |
| Chloroform$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,1,1-Trichloroethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,1-Dichloropropene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Carbon Tetrachloride$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,2-Dichloroethane$_{A}^{\#}$ | <2 | - | - | <2 | - | - | <2 | µg/kg | 2 | A-T-006s |
| Benzene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Trichloroethene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,2-Dichloropropane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Dibromomethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Bromodichloromethane$_{A}^{\#}$ | <10 | - | - | <10 | - | - | <10 | µg/kg | 10 | A-T-006s |
| cis 1,3-Dichloropropene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Toluene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| trans 1,3-Dichloropropene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,1,2-Trichloroethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,3-Dichloropropane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Tetrachloroethene$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Dibromochloromethane$_{A}^{\#}$ | <3 | - | - | <3 | - | - | <3 | µg/kg | 3 | A-T-006s |
| 1,2-Dibromoethane$_{A}^{\#}$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | WS101 | WS101 | WS101 | WS102 | WS103 | TP8 | TP6 | | | |
| Depth to Top | 0.50 | 3.40 | 3.70 | 3.80 | 2.00 | 1.00 | 1 | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 09-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | |
| Sample Type | Soil - ES | Soil - ES | Soil - D | Soil - ES | Solid | Soil - ES | Soil - ES | | | |
| Sample Matrix Code | 4A | 5AE | 5A | 5A | 7 | 4A | 4A | | | |
| Chlorobenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,1,1,2-Tetrachloroethane$_A$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Ethylbenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| m & p Xylene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| o-Xylene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Styrene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Bromoform$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Isopropylbenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,1,2,2-Tetrachloroethane$_A$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichloropropane$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| Bromobenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| n-Propylbenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 2-Chlorotoluene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,3,5-Trimethylbenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 4-Chlorotoluene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| tert-Butylbenzene$_A^\#$ | <2 | - | - | <2 | - | - | <2 | µg/kg | 2 | A-T-006s |
| 1,2,4-Trimethylbenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| sec-Butylbenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 4-Isopropyltoluene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,3-Dichlorobenzene$_A$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,4-Dichlorobenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| n-Butylbenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,2-Dichlorobenzene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,2-Dibromo-3-chloropropane (DCBP)$_A$ | <2 | - | - | <2 | - | - | <2 | µg/kg | 2 | A-T-006s |
| 1,2,4-Trichlorobenzene$_A$ | <3 | - | - | <3 | - | - | <3 | µg/kg | 3 | A-T-006s |
| Hexachlorobutadiene$_A^\#$ | <1 | - | - | <1 | - | - | <1 | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichlorobenzene$_A$ | <3 | - | - | <3 | - | - | <3 | µg/kg | 3 | A-T-006s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCl001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| % Stones >10mm$_A$ | <0.1 | <0.1 | 4.9 | 7.6 | 15.1 | | | % w/w | 0.1 | A-T-044 |
| pH$_D^{M\#}$ | 6.09 | 5.68 | 6.52 | 6.19 | 7.91 | | | pH | 0.01 | A-T-031s |
| Sulphate (water sol 2:1)$_D^{M\#}$ | 0.13 | 0.11 | 0.04 | <0.01 | 0.03 | | | g/l | 0.01 | A-T-026s |
| Organic matter$_D^{M\#}$ | 2.0 | - | 11.8 | 42.8 | 28.4 | | | % w/w | 0.1 | A-T-032 OM |
| Arsenic$_D^{M\#}$ | <1 | - | 23 | 30 | 20 | | | mg/kg | 1 | A-T-024s |
| Cadmium$_D^{M\#}$ | 0.9 | - | 2.1 | 1.6 | 0.9 | | | mg/kg | 0.5 | A-T-024s |
| Copper$_D^{M\#}$ | 28 | - | 125 | 103 | 122 | | | mg/kg | 1 | A-T-024s |
| Chromium (hexavalent)$_D$ | <1 | - | <1 | <1 | <1 | | | mg/kg | 1 | A-T-040s |
| Lead$_D^{M\#}$ | 37 | - | 186 | 101 | 52 | | | mg/kg | 1 | A-T-024s |
| Mercury$_D$ | <0.17 | - | <0.17 | <0.17 | <0.17 | | | mg/kg | 0.17 | A-T-024s |
| Nickel$_D^{M\#}$ | 26 | - | 165 | 76 | 36 | | | mg/kg | 1 | A-T-024s |
| Selenium$_D^{M\#}$ | <1 | - | <1 | <1 | <1 | | | mg/kg | 1 | A-T-024s |
| Zinc$_D^{M\#}$ | 218 | - | 144 | 43 | 98 | | | mg/kg | 5 | A-T-024s |
| VPH total (>C5-C10) | <1 | - | 18 | <1 | 9 | | | mg/kg | 1 | Calc-stone+mois |
| 1.02 Atterburg 4Pt BS1377 1990 pt2 cl4.4,5.3+5.4$_A^{\#}$ | - | Appended | - | - | - | | | % | 1 | Subcon SS |
| 1.01 % Moisture BS1377 1990 pt2 cl3.2$_A^{\#}$ | - | Appended | - | - | - | | | % | 0.1 | Subcon SS |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| **Asbestos in Soil (inc. matrix)** | | | | | | | | | | |
| Asbestos in soil$_D^{\#}$ | NAD | - | NAD | NAD | NAD | | | | | A-T-045 |
| Asbestos ACM - Suitable for Water Absorption Test?$_D$ | N/A | - | N/A | N/A | N/A | | | | | A-T-045 |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| PAH-16MS | | | | | | | | | | |
| Acenaphthene$_{A}^{M\#}$ | <0.01 | - | 0.13 | <0.01 | 0.11 | | | mg/kg | 0.01 | A-T-019s |
| Acenaphthylene$_{A}^{M\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-019s |
| Anthracene$_{A}^{M\#}$ | <0.02 | - | 0.27 | <0.02 | 0.17 | | | mg/kg | 0.02 | A-T-019s |
| Benzo(a)anthracene$_{A}^{M\#}$ | <0.04 | - | 1.77 | 0.16 | 0.46 | | | mg/kg | 0.04 | A-T-019s |
| Benzo(a)pyrene$_{A}^{M\#}$ | <0.04 | - | 2.66 | 0.20 | 0.43 | | | mg/kg | 0.04 | A-T-019s |
| Benzo(b)fluoranthene$_{A}^{M\#}$ | <0.05 | - | 2.76 | 0.22 | 0.45 | | | mg/kg | 0.05 | A-T-019s |
| Benzo(ghi)perylene$_{A}^{M\#}$ | <0.05 | - | 1.88 | 0.11 | 0.23 | | | mg/kg | 0.05 | A-T-019s |
| Benzo(k)fluoranthene$_{A}^{M\#}$ | <0.07 | - | 0.89 | 0.08 | 0.16 | | | mg/kg | 0.07 | A-T-019s |
| Chrysene$_{A}^{M\#}$ | <0.06 | - | 2.08 | 0.21 | 0.49 | | | mg/kg | 0.06 | A-T-019s |
| Dibenzo(ah)anthracene$_{A}^{M\#}$ | <0.04 | - | 0.37 | <0.04 | 0.05 | | | mg/kg | 0.04 | A-T-019s |
| Fluoranthene$_{A}^{M\#}$ | <0.08 | - | 3.29 | 0.27 | 1.02 | | | mg/kg | 0.08 | A-T-019s |
| Fluorene$_{A}^{M\#}$ | <0.01 | - | 0.15 | <0.01 | 0.07 | | | mg/kg | 0.01 | A-T-019s |
| Indeno(123-cd)pyrene$_{A}^{M\#}$ | <0.03 | - | 1.90 | 0.13 | 0.26 | | | mg/kg | 0.03 | A-T-019s |
| Naphthalene $_{A}^{M\#}$ | <0.03 | - | 0.11 | 0.06 | 0.09 | | | mg/kg | 0.03 | A-T-019s |
| Phenanthrene$_{A}^{M\#}$ | <0.03 | - | 1.40 | 0.12 | 0.86 | | | mg/kg | 0.03 | A-T-019s |
| Pyrene$_{A}^{M\#}$ | <0.07 | - | 3.86 | 0.23 | 0.89 | | | mg/kg | 0.07 | A-T-019s |
| Total PAH-16MS$_{A}^{M\#}$ | <0.08 | - | 23.5 | 1.79 | 5.74 | | | mg/kg | 0.01 | A-T-019s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| **TPH CWG** | | | | | | | | | | |
| Ali >C5-C6$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| Ali >C6-C8$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| Ali >C8-C10$_A$ | <1 | - | 12 | <1 | 6 | | | mg/kg | 1 | A-T-055s |
| Ali >C10-C12$_A^{M\#}$ | <1 | - | 48 | <1 | 3 | | | mg/kg | 1 | A-T-055s |
| Ali >C12-C16$_A^{M\#}$ | <1 | - | 128 | <1 | 4 | | | mg/kg | 1 | A-T-055s |
| Ali >C16-C21$_A^{M\#}$ | <1 | - | 146 | 1 | 10 | | | mg/kg | 1 | A-T-055s |
| Ali >C21-C35$_A^{M\#}$ | 1 | - | 75 | 3 | 42 | | | mg/kg | 1 | A-T-055s |
| Total Aliphatics$_A$ | 1 | - | 409 | 4 | 64 | | | mg/kg | 1 | A-T-055s |
| Aro >C5-C7$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| Aro >C7-C8$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| Aro >C8-C10$_A$ | <1 | - | 6 | <1 | 4 | | | mg/kg | 1 | A-T-055s |
| Aro >C10-C12$_A$ | <1 | - | 27 | <1 | 4 | | | mg/kg | 1 | A-T-055s |
| Aro >C12-C16$_A$ | <1 | - | 100 | 3 | 16 | | | mg/kg | 1 | A-T-055s |
| Aro >C16-C21$_A^{M\#}$ | <1 | - | 151 | 3 | 30 | | | mg/kg | 1 | A-T-055s |
| Aro >C21-C35$_A^{M\#}$ | 4 | - | 159 | 8 | 42 | | | mg/kg | 1 | A-T-055s |
| Total Aromatics$_A$ | 4 | - | 443 | 14 | 95 | | | mg/kg | 1 | A-T-055s |
| TPH (Ali & Aro >C5-C35)$_A$ | 5 | - | 852 | 19 | 159 | | | mg/kg | 1 | A-T-055s |
| BTEX - Benzene$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| BTEX - Toluene$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| BTEX - Ethyl Benzene$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| BTEX - m & p Xylene$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| BTEX - o Xylene$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |
| MTBE$_A^{\#}$ | <0.01 | - | <0.01 | <0.01 | <0.01 | | | mg/kg | 0.01 | A-T-022s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| **SVOC** | | | | | | | | | | |
| 4-Bromophenyl phenyl ether$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Hexachlorobenzene$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Diethyl phthalate$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Dimethyl phthalate$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Dibenzofuran$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Carbazole$_A$ | - | - | 140 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Butylbenzyl phthalate$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Bis(2-ethylhexyl)phthalate$_A$ | - | - | <2000 | <2000 | - | | | µg/kg | 500 | A-T-052s |
| Bis(2-chloroethoxy)methane$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Bis(2-chloroethyl)ether$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 4-Nitrophenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 3+4-Methylphenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 4-Chloro-3-methylphenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2-Nitrophenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2-Methylphenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2-Chlorophenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2,6-Dinitrotoluene$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2,4-Dinitrotoluene$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2,4-Dimethylphenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2,4-Dichlorophenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2,4,6-Trichlorophenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2,4,5-Trichlorophenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2-Chloronaphthalene$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| 2-Methylnaphthalene$_A$ | - | - | 269 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Bis(2-chloroisopropyl)ether$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Phenol$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Pentachlorophenol (SVOC)$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| n-Nitroso-n-dipropylamine$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| n-Dioctylphthalate$_A$ | - | - | <500 | <500 | - | | | µg/kg | 500 | A-T-052s |
| n-Dibutylphthalate$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Nitrobenzene$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Isophorone$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| Hexachloroethane$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Hexachlorocyclopentadiene$_A$ | - | - | <100 | <100 | - | | | µg/kg | 100 | A-T-052s |
| Perylene$_A$ | - | - | 537 | <100 | - | | | µg/kg | 100 | A-T-052s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| **VOC** | | | | | | | | | | |
| Dichlorodifluoromethane$_A$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Chloromethane$_A$ | - | - | <10 | <10 | - | | | µg/kg | 10 | A-T-006s |
| Vinyl Chloride (Chloroethene)$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Bromomethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Chloroethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Trichlorofluoromethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethene$_A^{\#}$ | - | - | *<1* | *<1* | - | | | µg/kg | 1 | A-T-006s |
| Carbon Disulphide$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Dichloromethane$_A$ | - | - | <5 | <5 | - | | | µg/kg | 5 | A-T-006s |
| trans 1,2-Dichloroethene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,1-Dichloroethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| cis 1,2-Dichloroethene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 2,2-Dichloropropane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Bromochloromethane$_A^{\#}$ | - | - | <5 | <5 | - | | | µg/kg | 5 | A-T-006s |
| Chloroform$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,1,1-Trichloroethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,1-Dichloropropene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Carbon Tetrachloride$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,2-Dichloroethane$_A^{\#}$ | - | - | <2 | <2 | - | | | µg/kg | 2 | A-T-006s |
| Benzene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Trichloroethene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,2-Dichloropropane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Dibromomethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Bromodichloromethane$_A^{\#}$ | - | - | <10 | <10 | - | | | µg/kg | 10 | A-T-006s |
| cis 1,3-Dichloropropene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Toluene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| trans 1,3-Dichloropropene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,1,2-Trichloroethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,3-Dichloropropane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Tetrachloroethene$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Dibromochloromethane$_A^{\#}$ | - | - | <3 | <3 | - | | | µg/kg | 3 | A-T-006s |
| 1,2-Dibromoethane$_A^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |

**Envirolab Job Number: 21/08758**

**Client Project Name: Crabtree Lane, Openshaw**

**Client Project Ref: 21MCI001**

| Lab Sample ID | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 | | | Units | Limit of Detection | Method ref |
|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | |
| Client Sample ID | TP1 | TP1 | TP2 | TP5 | TP7 | | | | | |
| Depth to Top | 0.65 | 1.2 | 0.85 | 1.5 | 1 | | | | | |
| Depth To Bottom | | | | | | | | | | |
| Date Sampled | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | 10-Aug-21 | | | | | |
| Sample Type | Soil - ES | Soil - D | Soil - ES | Soil - ES | Soil - ES | | | | | |
| Sample Matrix Code | 5A | 6A | 5A | 4A | 4AE | | | | | |
| Chlorobenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,1,1,2-Tetrachloroethane$_{A}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Ethylbenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| m & p Xylene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| o-Xylene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Styrene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Bromoform$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Isopropylbenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,1,2,2-Tetrachloroethane$_{A}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichloropropane$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| Bromobenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| n-Propylbenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 2-Chlorotoluene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,3,5-Trimethylbenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 4-Chlorotoluene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| tert-Butylbenzene$_{A}^{\#}$ | - | - | <2 | <2 | - | | | µg/kg | 2 | A-T-006s |
| 1,2,4-Trimethylbenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| sec-Butylbenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 4-Isopropyltoluene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,3-Dichlorobenzene$_{A}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,4-Dichlorobenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| n-Butylbenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,2-Dichlorobenzene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,2-Dibromo-3-chloropropane (DCBP)$_{A}$ | - | - | <2 | <2 | - | | | µg/kg | 2 | A-T-006s |
| 1,2,4-Trichlorobenzene$_{A}$ | - | - | <3 | <3 | - | | | µg/kg | 3 | A-T-006s |
| Hexachlorobutadiene$_{A}^{\#}$ | - | - | <1 | <1 | - | | | µg/kg | 1 | A-T-006s |
| 1,2,3-Trichlorobenzene$_{A}$ | - | - | <3 | <3 | - | | | µg/kg | 3 | A-T-006s |

## REPORT NOTES

**General**
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

**Soil chemical analysis:**
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

**TPH analysis of water by method A-T-007:**
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

**Electrical Conductivity of water by Method A-T-037:**
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

**Asbestos:**
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

**Predominant Matrix Codes:**
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
**Secondary Matrix Codes:**
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

**Key:**
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

v1

# Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

**Client:** Betts Geo Environmental, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, UK, CH5 2LY

**Project:** Crabtree Lane, Openshaw

**Clients Project No:** 21MCI001

**Project No:** 21/08758

**Date Received:** 12/08/2021 (am)

**Cool Box Temperatures (°C):** 20.1

NO DEVIATIONS IDENTIFIED with respect to sampling dates or containers received.

Note: If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3 (for water samples 5 ± 3°C), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

# Envirolab Analysis Dates

| Lab Sample ID | 21/08758/1 | 21/08758/2 | 21/08758/3 | 21/08758/4 | 21/08758/5 | 21/08758/6 | 21/08758/7 | 21/08758/8 | 21/08758/9 | 21/08758/10 | 21/08758/11 | 21/08758/12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Client Sample No | | | | | | | | | | | | |
| Client Sample ID/Depth | WS101 0.50m | WS101 3.40m | WS101 3.70m | WS102 3.80m | WS103 2.00m | TP8 1.00m | TP6 1m | TP1 0.65m | TP1 1.2m | TP2 0.85m | TP5 1.5m | TP7 1m |
| Date Sampled | 09/08/21 | 09/08/21 | 09/08/21 | 09/08/21 | 09/08/21 | 10/08/21 | 10/08/21 | 10/08/21 | 10/08/21 | 10/08/21 | 10/08/21 | 10/08/21 |
| A-T-006s | 17/08/2021 | | | 17/08/2021 | | | 17/08/2021 | | | 17/08/2021 | 17/08/2021 | |
| A-T-019s | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 |
| A-T-022s | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 |
| A-T-024s | 18/08/2021 | 18/08/2021 | | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | | 18/08/2021 | 18/08/2021 | 18/08/2021 |
| A-T-026s | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 |
| A-T-031s | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 |
| A-T-032 OM | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 |
| A-T-040s | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 |
| A-T-044 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 | 18/08/2021 |
| A-T-045 | 13/08/2021 | 13/08/2021 | | 13/08/2021 | 13/08/2021 | 13/08/2021 | 13/08/2021 | 13/08/2021 | | 13/08/2021 | 13/08/2021 | 13/08/2021 |
| A-T-052s | 18/08/2021 | | | 18/08/2021 | | | 18/08/2021 | | | 18/08/2021 | 18/08/2021 | |
| A-T-054 | | | | 16/08/2021 | 16/08/2021 | | 16/08/2021 | | | | | |
| A-T-055s | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 |
| Calc-stone+mois | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | 17/08/2021 | | 17/08/2021 | 17/08/2021 | 17/08/2021 |

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

**End of Report**

# STRUCTURAL SOILS LTD

## TEST REPORT

Report No. 750277R.01(00) 1774

| | | | |
|---|---|---|---|
| Date | 31-August-2021 | Contract | 21MCI001 |

Client Envirolab Ltd
Address Units 7 & 8
Sandpits Business Park
Mottram Road
Hyde
SK14 3AR
For the Attention of Holly Neary-King

| | | | |
|---|---|---|---|
| Samples submitted by client | 23-August-2021 | Client Reference | 21/08758 |
| Testing Started | 23-August-2021 | Client Order No. | P0747154 |
| Testing Completed | 31-August-2021 | Instruction Type | Written |

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests

Moisture Content (oven drying method) BS1377:Part 2:1990:clause 3.2 (superseded)*
Liquid Limit (definitive method ) & Plastic Limit BS1377:Part 2:1990,clause 4.3/5.3 (superseded)*

* This clause of BS1377 is no longer the most up to date method due to the publication of ISO17892

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of .
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

Structural Soils Ltd 1a Princess Street Bedminster Bristol BS3 4AG Tel.0117 9471000. e-mail dimitris.xirouchakis@soils.co.uk

# TESTING VERIFICATION CERTIFICATE

1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **31/08/2021 11:27:03**.

Testing reported after this date is not covered by this Verification Certificate.



Approved Signatory
**Alan Frost (Data Quality Manager)**

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

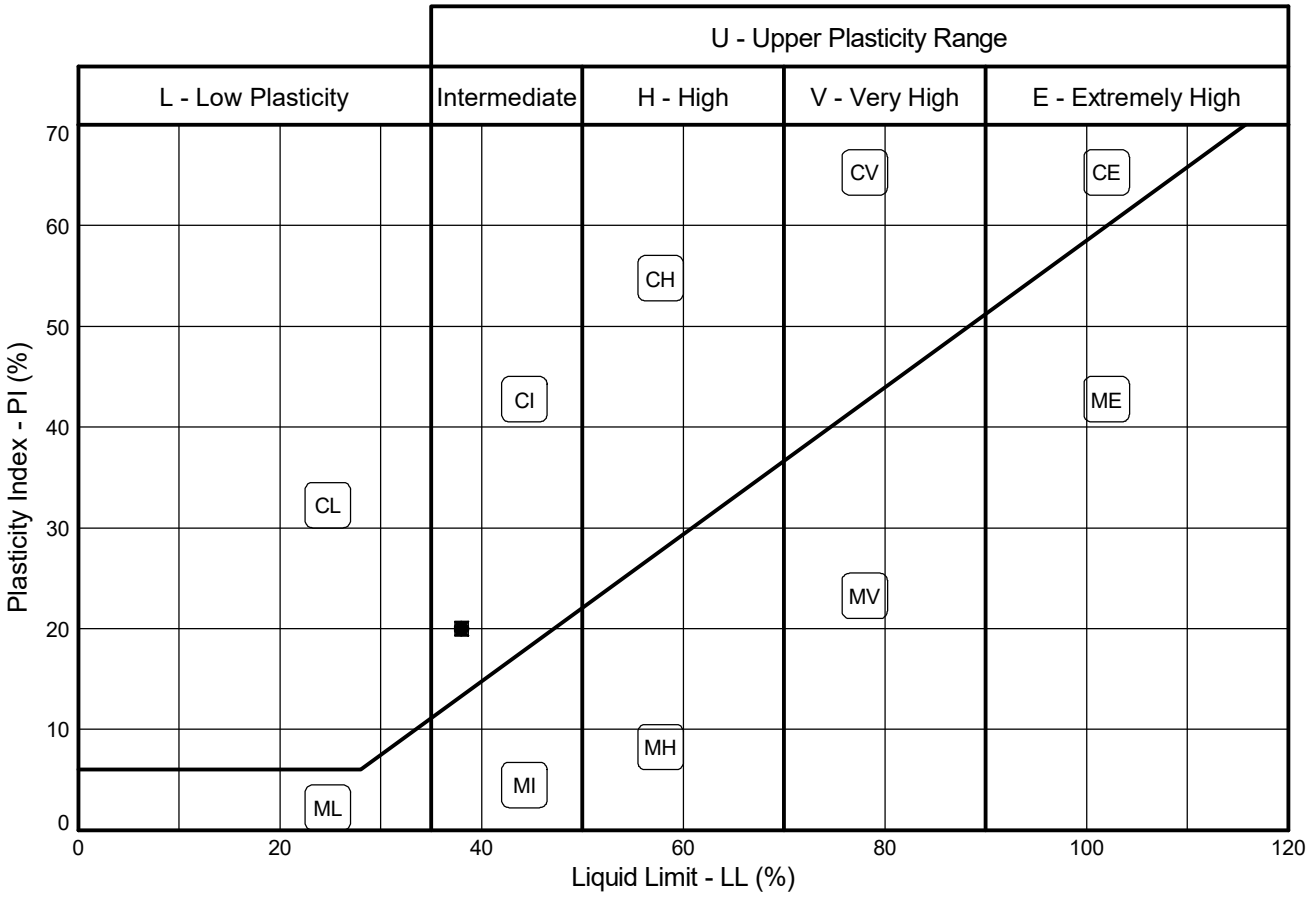
Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU

| | | |
|---|---|---|
| **STRUCTURAL SOILS LTD** | Contract: **21MCl001** | Job No: **750277** |

GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | GrfcText L - LAB VERIFICATION REPORT - V02 - A4P | 750277.GPJ - v10_01.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 31/08/21 - 11:27 | AF3 |

# PLASTICITY CHART - PI Vs LL

In accordance with BS5930:2015
Testing in accordance with BS1377-2:1990




| Sample Identification | | | | BS Test Method # | Preparation Method + | MC % | LL % | PL % | PI % | <425µm % | Lab location | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exploratory Position ID | | Sample | Depth (m) | | | | | | | | | |
| ● | TP1 | 21/08758/9 | 1.20 | 3.2/4.3/5.3/5.4 | 4.2.3 | 22 | 38 | 18 | 20 | 95 | B | |
| ⊠ | WS101 | 21/08758/3 | 3.70 | 3.2/4.3/5.3/5.4 | 4.2.3 | 22 | 38 | 18 | 20 | 97 | B | |

# Tested in accordance with the following clauses of BS1377-2:1990.

3.2 - Moisture Content
4.3 - Cone Penetrometer Method
4.4 - One Point Cone Penetrometer Method
4.6 - One Point Casagrande Method
5.3 - Plastic Limit Method
5.4 - Plasticity Index

+ Tested in accordance with the following clauses of BS1377-2:1990.

4.2.3 - Natural State
4.2.4 - Wet Sieved

Key: * = Non-standard test, NP = Non plastic.

Lab location: B = Bristol (BS3 4AG), C = Castleford (WF10 1NJ), H = Hemel Hempstead (HP3 9RT), T = Tonbridge (TN11 9HU)


STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG


| Compiled By | | Date |
|---|---|---|
| D. Richards | DAISY RICHARDS | 31/08/21 |

| Contract | Contract Ref: |
|---|---|
| 21MCI001 | 750277 |


GINT_LIBRARY_V10_01.GLB LibVersion: v8_07_001 PrjVersion: v8_07 | Graph L - ALINE STANDARD - A4P | 750277.GPJ - v10_01.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 31/08/21 - 11:22 | AF3 |

# SUMMARY OF SOIL CLASSIFICATION TESTS

In accordance with clauses 3.2,4.3,4.4,5.3,5.4,7.2,8.2,8.3 of BS1377:Part 2:1990

| Exploratory Position ID | Sample Ref | Sample Type | Depth (m) | Moisture Content % | Liquid Limit % | Plastic Limit % | Plasticity Index | % <425µm | Description of Sample |
|---|---|---|---|---|---|---|---|---|---|
| TP1 | 21/08758/9 | D | 1.20 | 22 | 38 | 18 | 20 | 95 | Greyish brown slightly gravelly slightly sandy CLAY |
| | | | | | | | | | |
| WS101 | 21/08758/3 | D | 3.70 | 22 | 38 | 18 | 20 | 97 | Greyish brown slightly gravelly slightly sandy CLAY |
| | | | | | | | | | |
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ECõS Environmental
Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100

**Client:** **Norwest Holst Soil Engineering Limited**
Parkside Lane
Dewsbury Road
LEEDS
West Yorkshire
LS11 5SX

**FAO:** Mr S Kirk

**Analytical Report Number: R05/0426**

| | |
|---|---|
| **Client Project Name:** | **Vintage Wings, Clayton** |
| **Client Project Number:** | **F13785** |
| **Your Order Number:** | **None Specified** |
| **Order Receipt Date:** | **15/02/05** |
| **Reporting Date:** | **Tuesday 1 March 2005** |

If you have any queries regarding this report please contact our Customer Services Manager

# ECõS Environmental

Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100


**Client Project Name: Vintage Wings, Clayton**

**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**

**Reporting Date: Tuesday 1 March 2005**

## Comments

All analyses are carried out using the laboratory's standard methods unless otherwise agreed.

The test results in this report refer only to the actual samples on which testing has been performed.

Any opinions and/or interpretations expressed herein are outside the scope of the testing laboratory's UKAS accreditation.

The test report shall not be reproduced, except in full, without the testing laboratory's written approval.

This testing laboratory cannot be held responsible for the condition or suitability of samples submitted for testing by a party or for the competency of personnel other than its own staff.

## Soil Samples

Results are expressed based on air dried mass @ 40°C unless otherwise stated.

See key in Notes section for explanation of numerical categories for asbestos results, if applicable.

Stones (for example inert flints and inorganic minerals) >10mm are removed prior to analysis. Unless otherwise stated, results have not been corrected for this loss.

Samples submitted for leachate determination were prepared using agreed procedures and analysed using UKAS accredited methodology where appropriate.

Results are expressed without correction for recovery factors.

## Key:

### Accreditation:

MCERTS = This test is accredited to the British Standard BS EN ISO/IEC 17025:2000 and the Environment Agency MCERTS for soil standard.

17025 = This test is accredited to the British Standard BS EN ISO/IEC 17025:2000.

None = This test is currently not on our scope of accreditation.

### Sample Pretreatment (Appended to Method of Detection)

D = Air Dried @ 40°C

R = As Received

### Sample Type

B = Bulk disturbed sample
C = Core Sample
D = Small disturbed sample
P = Piston sample
U = Undisturbed sample - open drive
W = Water Sample

### Sample Results

# Analysis not requested
**** Test not completed. Please see notes on last page

**Signed:** _____

**For and on behalf of ECõS Environmental**

Approved signatories:

| Name | Position |
|---|---|
| J R Brown | Customer Services Manager |
| R Beeker | Integration Manager |
| P Richardson | Quality Manager |
| J Stoddart | Technical Manager |

ECõS Environmental
Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100

**Client Project Name: Vintage Wings, Clayton**
**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**
**Reporting Date: Tuesday 1 March 2005**

## Soil Samples

## Method Statement

| Determinand | Method of Detection | Sample Pretreatment | Limit of Detection | Accredi-tation | Sub-Contracted | Result Date |
|---|---|---|---|---|---|---|
| Arsenic | ICP-OES | D | 1.0 mg/kg | 17025 | No | 28/02/05 |
| Boron (water soluble) | ICP-OES | D | 0.5 mg/kg | 17025 | No | 28/02/05 |
| Cadmium | ICP-OES | D | 0.2 mg/kg | 17025 | No | 28/02/05 |
| nium (total) | ICP-OES | D | 0.2 mg/kg | 17025 | No | 28/02/05 |
| Lead | ICP-OES | D | 0.5 mg/kg | 17025 | No | 28/02/05 |
| Mercury | ICP-OES | D | 0.1 mg/kg | 17025 | No | 28/02/05 |
| Selenium | ICP-OES | D | 0.1 mg/kg | 17025 | No | 28/02/05 |
| Copper | ICP-OES | D | 0.2 mg/kg | 17025 | No | 28/02/05 |
| Nickel | ICP-OES | D | 0.2 mg/kg | 17025 | No | 28/02/05 |
| Zinc | ICP-OES | D | 0.2 mg/kg | 17025 | No | 28/02/05 |
| Resorcinol | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Catechol | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Phenol | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Cresols | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Xylenols | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Napthol | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Trimethylphenol | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Phenols | HPLC-EC | R | 0.1 mg/kg | 17025 | No | 23/02/05 |
| Cyanide (free) | Colorimetry | R | 2.0 mg/kg | 17025 | No | 28/02/05 |
| Sulphate (water soluble) | HPLC-IC | D | 0.001 g/l SO4 | 17025 | No | 01/03/05 |
| Sulphide | Colorimetry | R | 2.0 mg/kg | 17025 | No | 24/02/05 |
| hur (total) | ICP-OES | D | 10 mg/kg | 17025 | No | 28/02/05 |
| pH | pH-meter | D | N/A | 17025 | No | 25/02/05 |
| PCB 28 | GC-ECD | D | 0.1 mg/kg | None | No | 01/03/05 |
| PCB 52 | GC-ECD | D | 0.1 mg/kg | None | No | 01/03/05 |
| PCB 101 | GC-ECD | D | 0.1 mg/kg | None | No | 01/03/05 |
| PCB 118 | GC-ECD | D | 0.1 mg/kg | None | No | 01/03/05 |
| PCB 138 | GC-ECD | D | 0.1 mg/kg | None | No | 01/03/05 |
| PCB 153 | GC-ECD | D | 0.1 mg/kg | None | No | 01/03/05 |
| PCB 180 | GC-ECD | D | 0.1 mg/kg | None | No | 01/03/05 |
| TPH | GC-FID | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| PAH (total) | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Acenaphthene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Acenaphthylene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Anthracene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Benz(a)anthracene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Benzo(b)fluoranthene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Benzo(k)fluoranthene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Benzo(g,h,i)perylene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Benzo(a)pyrene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Chrysene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Dibenz(a,h)anthracene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |

# ECõS Environmental

Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100


**Client Project Name: Vintage Wings, Clayton**

**Client: Norwest Holst Soil Engineering Limited**

**Project Number: F13785**

**Reporting Date: Tuesday 1 March 2005**

| Determinand | Method of Detection | Sample Pretreatment | Limit of Detection | Accredi-tation | Sub-Contracted | Result Date |
|---|---|---|---|---|---|---|
| Fluoranthene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Fluorene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Indeno(1,2,3-cd)pyrene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Naphthalene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Phenanthrene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Pyrene | GC-MS | D | 0.1 mg/kg | 17025 | No | 01/03/05 |
| Chrysotile (white) | Microscopy | D | 0.01 % by vol. | 17025 | No | 18/02/05 |
| Amosite (brown) | Microscopy | D | 0.01 % by vol. | 17025 | No | 18/02/05 |
| Crocidolite (blue) | Microscopy | D | 0.01 % by vol. | 17025 | No | 18/02/05 |
| Anthophyllite | Microscopy | D | 0.01 % by vol. | 17025 | No | 18/02/05 |
| Actinolite | Microscopy | D | 0.01 % by vol. | 17025 | No | 18/02/05 |
| Tremolite | Microscopy | D | 0.01 % by vol. | 17025 | No | 18/02/05 |
| Non-Asbestos fibres | Microscopy | D | 0.01 % by vol. | None | No | 18/02/05 |
| Chromium (hexavalent) | ICP-OES | D | 1.0 mg/kg | 17025 | No | 26/02/05 |
| TEM | Gravimetry | D | 100 mg/kg | None | No | 24/02/05 |
| Cyanide (complex) | Colorimetry | R | 2.0 mg/kg | 17025 | No | 28/02/05 |
| Thiocyanate | Colorimetry | R | 10 mg/kg | 17025 | No | 23/02/05 |
| Cyanide (total) | Colorimetry | R | 2.0 mg/kg | 17025 | No | 28/02/05 |

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**Client Project Name: Vintage Wings, Clayton**

**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**

**Reporting Date: Tuesday 1 March 2005**

| | BH/TP | BH01 | BH02 | BH03 | BH04 | BH05 |
|---|---|---|---|---|---|---|
| | Top Depth / m | 3.80 | 1.70 | 2.75 | 0.00 | 6.95 |
| | Bottom Depth / m | | | | | |
| | Customer ID | 006 | 002 | 004 | 005 | 012 |
| | Sample Type | | | | | |
| | Date Sampled | | | | | |
| | Receipt Date | 15/02/05 | 15/02/05 | 15/02/05 | 15/02/05 | 15/02/05 |
| | ECoS Sample ID | S0503657 | S0503659 | S0503660 | S0503661 | S0503662 |
| | Matrix Type | Soil | Soil | Soil | Soil | Soil |
| Determinand | Units | | | | | |
| Benz(a)anthracene | mg/kg | <0.1 | <0.1 | <0.1 | 1.5 | <0.1 |
| Benzo(b)fluoranthene | mg/kg | <0.1 | <0.1 | <0.1 | 1.6 | <0.1 |
| Benzo(k)fluoranthene | mg/kg | <0.1 | <0.1 | <0.1 | 1.0 | <0.1 |
| Benzo(g,h,i)perylene | mg/kg | <0.1 | <0.1 | <0.1 | 0.9 | <0.1 |
| Benzo(a)pyrene | mg/kg | <0.1 | <0.1 | <0.1 | 2.0 | <0.1 |
| Chrysene | mg/kg | <0.1 | <0.1 | <0.1 | 2.7 | <0.1 |
| Dibenz(a,h)anthracene | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Fluoranthene | mg/kg | <0.1 | <0.1 | <0.1 | 6.1 | 0.1 |
| Fluorene | mg/kg | <0.1 | <0.1 | <0.1 | 0.8 | <0.1 |
| Indeno(1,2,3-cd)pyrene | mg/kg | <0.1 | <0.1 | <0.1 | 0.8 | <0.1 |
| Naphthalene | mg/kg | <0.1 | <0.1 | <0.1 | 3.1 | <0.1 |
| Phenanthrene | mg/kg | <0.1 | <0.1 | <0.1 | 6.1 | <0.1 |
| Pyrene | mg/kg | <0.1 | <0.1 | <0.1 | 5.1 | 0.1 |
| Chrysotile (white) | Category | ND | ND | ND | ND | ND |
| Amosite (brown) | Category | ND | ND | ND | ND | ND |
| Crocidolite (blue) | Category | ND | ND | ND | ND | ND |
| Anthophyllite | Category | ND | ND | ND | ND | ND |
| Actinolite | Category | ND | ND | ND | ND | ND |
| Tremolite | Category | ND | ND | ND | ND | ND |
| Non-Asbestos fibres | Category | ND | ND | ND | ND | ND |
| Chromium (hexavalent) | mg/kg | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| TEM | mg/kg | <100 | <100 | 110 | 2510 | 300 |
| Cyanide (complex) | mg/kg | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Thiocyanate | mg/kg | <10 | <10 | <10 | <10 | <10 |
| Cyanide (total) | mg/kg | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |

# ECõS Environmental

Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100


**Client Project Name: Vintage Wings, Clayton**

**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**

**Reporting Date: Tuesday 1 March 2005**

| | | | | | | |
|---|---|---|---|---|---|---|
| | **BH/TP** | BH07 | BH08 | BH09 | BH10 | BH10 |
| | **Top Depth / m** | 4.85 | 4.85 | 6.95 | 2.75 | 4.85 |
| | **Bottom Depth / m** | | | | | |
| | **Customer ID** | 008 | 008 | 011 | 004 | 008 |
| | **Sample Type** | | | | | |
| | **Date Sampled** | | | | | |
| | **Receipt Date** | 15/02/05 | 15/02/05 | 15/02/05 | 15/02/05 | 15/02/05 |
| | **ECoS Sample ID** | S0503663 | S0503664 | S0503665 | S0503666 | S0503667 |
| | **Matrix Type** | Soil | Soil | Soil | Soil | Soil |
| **Determinand** | **Units** | | | | | |
| Arsenic | mg/kg | 48.8 | 17.7 | 22.8 | 18.8 | 3.3 |
| Boron (water soluble) | mg/kg | 0.7 | 0.5 | 0.7 | <0.5 | 1.3 |
| Cadmium | mg/kg | 0.6 | 6.1 | 0.5 | 0.2 | 0.3 |
| Chromium (total) | mg/kg | 59.0 | 42.9 | 43.8 | 37.5 | 35.9 |
| Lead | mg/kg | 322.0 | 181.2 | 110.2 | 125.0 | 50.1 |
| Mercury | mg/kg | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 |
| Selenium | mg/kg | 1.9 | 0.3 | 0.5 | 0.5 | 0.5 |
| Copper | mg/kg | 251.2 | 607.2 | 92.2 | 131.9 | 46.4 |
| Nickel | mg/kg | 276.5 | 61.0 | 120.1 | 32.1 | 16.3 |
| Zinc | mg/kg | 239.7 | 352.3 | 144.7 | 100.3 | 213.0 |
| Resorcinol | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Catechol | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Phenol | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Cresols | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| [illegible]enols | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Napthol | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Trimethylphenol | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Phenols | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Cyanide (free) | mg/kg | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Sulphate (water soluble) | g/l SO4 | 0.481 | 0.175 | 0.749 | 0.414 | 0.075 |
| Sulphide | mg/kg | 11.0 | 2.1 | 31.0 | <2.0 | 20.3 |
| Sulphur (total) | mg/kg | 2807 | 557 | 3902 | 877 | 1893 |
| pH | N/A | 7.2 | 7.6 | 6.2 | 6.4 | 6.1 |
| PCB 28 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| PCB 52 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| PCB 101 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| PCB 118 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| PCB 138 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| PCB 153 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| PCB 180 | mg/kg | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| TPH | mg/kg | 661.6 | 1074.3 | 230.3 | 996.2 | 147.2 |
| PAH (total) | mg/kg | 129.5 | 138.1 | 17.5 | 254.4 | 3.5 |
| Acenaphthene | mg/kg | 2.3 | 1.1 | 0.6 | 7.0 | 0.1 |
| Acenaphthylene | mg/kg | 0.2 | 1.2 | <0.1 | 0.4 | <0.1 |
| Anthracene | mg/kg | 3.6 | 3.7 | 0.6 | 8.8 | 0.1 |

# ECõS Environmental

Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100


**Client Project Name: Vintage Wings, Clayton**

**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**

**Reporting Date: Tuesday 1 March 2005**

| | | | | | | |
|---|---|---|---|---|---|---|
| | **BH/TP** | BH07 | BH08 | BH09 | BH10 | BH10 |
| | **Top Depth / m** | 4.85 | 4.85 | 6.95 | 2.75 | 4.85 |
| | **Bottom Depth / m** | | | | | |
| | **Customer ID** | 008 | 008 | 011 | 004 | 008 |
| | **Sample Type** | | | | | |
| | **Date Sampled** | | | | | |
| | **Receipt Date** | 15/02/05 | 15/02/05 | 15/02/05 | 15/02/05 | 15/02/05 |
| | **ECoS Sample ID** | S0503663 | S0503664 | S0503665 | S0503666 | S0503667 |
| | **Matrix Type** | Soil | Soil | Soil | Soil | Soil |
| **Determinand** | **Units** | | | | | |
| Benz(a)anthracene | mg/kg | 9.0 | 10.9 | 1.0 | 17.2 | 0.2 |
| Benzo(b)fluoranthene | mg/kg | 13.1 | 14.6 | 1.1 | 17.9 | 0.2 |
| Benzo(k)fluoranthene | mg/kg | 5.8 | 7.4 | 0.5 | 9.3 | 0.1 |
| Benzo(g,h,i)perylene | mg/kg | 4.2 | 3.1 | 0.7 | 6.6 | <0.1 |
| Benzo(a)pyrene | mg/kg | 11.6 | 14.4 | 1.0 | 21.0 | 0.2 |
| Chrysene | mg/kg | 12.2 | 13.6 | 1.3 | 19.7 | 0.3 |
| Dibenz(a,h)anthracene | mg/kg | 1.6 | 1.7 | <0.1 | 4.1 | <0.1 |
| Fluoranthene | mg/kg | 23.1 | 27.0 | 3.4 | 45.8 | 0.7 |
| Fluorene | mg/kg | 1.4 | 1.2 | 0.5 | 5.0 | 0.1 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 3.2 | 4.0 | 0.7 | 5.6 | <0.1 |
| Naphthalene | mg/kg | 2.1 | 0.7 | 0.6 | 1.5 | 0.1 |
| Phenanthrene | mg/kg | 15.2 | 11.7 | 2.8 | 41.5 | 0.7 |
| Pyrene | mg/kg | 20.8 | 21.9 | 2.6 | 43.1 | 0.6 |
| Chrysotile (white) | Category | ND | ND | ND | ND | ND |
| Amosite (brown) | Category | ND | ND | ND | ND | ND |
| idolite (blue) | Category | ND | ND | ND | ND | ND |
| Anthophyllite | Category | ND | ND | ND | ND | ND |
| Actinolite | Category | ND | ND | ND | ND | ND |
| Tremolite | Category | ND | ND | ND | ND | ND |
| Non-Asbestos fibres | Category | ND | ND | ND | ND | ND |
| Chromium (hexavalent) | mg/kg | <1.0 | <1.0 | 1.0 | <1.0 | <1.0 |
| TEM | mg/kg | 3020 | 2150 | 2520 | 2430 | 1570 |
| Cyanide (complex) | mg/kg | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |
| Thiocyanate | mg/kg | <10 | <10 | <10 | <10 | <10 |
| Cyanide (total) | mg/kg | <2.0 | <2.0 | <2.0 | <2.0 | <2.0 |

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**Client Project Name: Vintage Wings, Clayton**

**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**

**Reporting Date: Tuesday 1 March 2005**

| | BH/TP | BH11 | BH11 |
|---|---|---|---|
| | Top Depth / m | 0.00 | 4.85 |
| | Bottom Depth / m | | |
| | Customer ID | 009 | 008 |
| | Sample Type | | |
| | Date Sampled | | |
| | Receipt Date | 15/02/05 | 15/02/05 |
| | ECoS Sample ID | S0503668 | S0503669 |
| | Matrix Type | Soil | Soil |
| Determinand | Units | | |
| Arsenic | mg/kg | 30.0 | 2.6 |
| Boron (water soluble) | mg/kg | <0.5 | <0.5 |
| Cadmium | mg/kg | 0.5 | <0.2 |
| Chromium (total) | mg/kg | 69.0 | 10.0 |
| Lead | mg/kg | 261.0 | 8.1 |
| Mercury | mg/kg | 1.0 | 0.1 |
| Selenium | mg/kg | 0.5 | <0.1 |
| Copper | mg/kg | 86.4 | 17.5 |
| Nickel | mg/kg | 27.8 | 9.6 |
| Zinc | mg/kg | 128.5 | 31.9 |
| Resorcinol | mg/kg | <0.1 | <0.1 |
| Catechol | mg/kg | <0.1 | <0.1 |
| Phenol | mg/kg | <0.1 | <0.1 |
| Cresols | mg/kg | <0.1 | <0.1 |
| nols | mg/kg | <0.1 | <0.1 |
| Napthol | mg/kg | <0.1 | <0.1 |
| Trimethylphenol | mg/kg | <0.1 | <0.1 |
| Phenols | mg/kg | <0.1 | <0.1 |
| Cyanide (free) | mg/kg | <2.0 | <2.0 |
| Sulphate (water soluble) | g/l SO4 | 0.062 | 0.025 |
| Sulphide | mg/kg | <2.0 | <2.0 |
| Sulphur (total) | mg/kg | 494 | 36 |
| pH | N/A | 7.4 | 7.6 |
| PCB 28 | mg/kg | <0.1 | <0.1 |
| PCB 52 | mg/kg | <0.1 | <0.1 |
| PCB 101 | mg/kg | <0.1 | <0.1 |
| PCB 118 | mg/kg | <0.1 | <0.1 |
| PCB 138 | mg/kg | <0.1 | <0.1 |
| PCB 153 | mg/kg | <0.1 | <0.1 |
| PCB 180 | mg/kg | <0.1 | <0.1 |
| TPH | mg/kg | 156.1 | <0.1 |
| PAH (total) | mg/kg | 9.6 | <0.1 |
| Acenaphthene | mg/kg | 0.1 | <0.1 |
| Acenaphthylene | mg/kg | <0.1 | <0.1 |
| Anthracene | mg/kg | 0.2 | <0.1 |

# ECõS Environmental

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**Client Project Name: Vintage Wings, Clayton**

**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**

**Reporting Date: Tuesday 1 March 2005**

| Determinand | Units | BH11 | BH11 |
|---|---|---|---|
| BH/TP | | BH11 | BH11 |
| Top Depth / m | | 0.00 | 4.85 |
| Bottom Depth / m | | | |
| Customer ID | | 009 | 008 |
| Sample Type | | | |
| Date Sampled | | | |
| Receipt Date | | 15/02/05 | 15/02/05 |
| ECoS Sample ID | | S0503668 | S0503669 |
| Matrix Type | | Soil | Soil |
| Benz(a)anthracene | mg/kg | 0.6 | <0.1 |
| Benzo(b)fluoranthene | mg/kg | 0.6 | <0.1 |
| Benzo(k)fluoranthene | mg/kg | 0.3 | <0.1 |
| Benzo(g,h,i)perylene | mg/kg | 0.4 | <0.1 |
| Benzo(a)pyrene | mg/kg | 0.9 | <0.1 |
| Chrysene | mg/kg | 0.8 | <0.1 |
| Dibenz(a,h)anthracene | mg/kg | <0.1 | <0.1 |
| Fluoranthene | mg/kg | 1.7 | <0.1 |
| Fluorene | mg/kg | 0.1 | <0.1 |
| Indeno(1,2,3-cd)pyrene | mg/kg | 0.3 | <0.1 |
| Naphthalene | mg/kg | 0.8 | <0.1 |
| Phenanthrene | mg/kg | 1.2 | <0.1 |
| Pyrene | mg/kg | 1.5 | <0.1 |
| Chrysotile (white) | Category | ND | ND |
| Amosite (brown) | Category | ND | ND |
| Crocidolite (blue) | Category | ND | ND |
| Anthophyllite | Category | ND | ND |
| Actinolite | Category | ND | ND |
| Tremolite | Category | ND | ND |
| Non-Asbestos fibres | Category | P | P |
| Chromium (hexavalent) | mg/kg | 2.6 | <1.0 |
| TEM | mg/kg | 310 | 180 |
| Cyanide (complex) | mg/kg | <2.0 | <2.0 |
| Thiocyanate | mg/kg | <10 | <10 |
| Cyanide (total) | mg/kg | <2.0 | <2.0 |

**ECõS Environmental**
Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100

**Client Project Name: Vintage Wings, Clayton**

**Client: Norwest Holst Soil Engineering Limited**

**Project Number: F13785**

**Reporting Date: Tuesday 1 March 2005**

## Notes and Preservation Details

ASBESTOS BULK MATERIAL ANALYSIS

Samples analysed using polarised light optical microscopy with dispersion staining in accordance with a documented in-house procedure based on HSE Method MDHS 77 - Asbestos in Bulk Materials.

KEY TO ASBESTOS RESULTS

The standard analytical method used for asbestos identification cannot give an accurate quantitative value for percentage asbestos content. The following numerical categories however may be used to assess the approximate quantity of asbestos present in the sample as submitted to the laboratory:

| | | |
|---|---|---|
| ND | - | No fibres detected (based on a detection limit of 0.01% by volume) |
| 1 | - | Fibres detected - greater than 0.01% but less than 2% by volume |
| 2 | - | Fibres detected - greater than 2% but less than 50% by volume |
| 3 | - | Fibres detected - more than 50% by volume |
| P | - | Non - asbestos fibres present |

Quantitative estimates, to which the above numerical categories apply, are outside the scope of the laboratory's UKAS accreditation which covers asbestos identification only.

ECõS Environmental
Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100

**Client:** **Norwest Holst Soil Engineering Limited**
Parkside Lane
Dewsbury Road
LEEDS
West Yorkshire
LS11 5SX

**FAO:** Mr S Kirk

**Analytical Report Number: R05/0427**

| | |
|---|---|
| **Client Project Name:** | **Vintage Wings, Clayton** |
| **Client Project Number:** | **F13785** |
| **Your Order Number:** | **None Specified** |
| **Order Receipt Date:** | **15/02/05** |
| **Reporting Date:** | **Wednesday 2 March 2005** |

If you have any queries regarding this report please contact our Customer Services Manager

# ECõS Environmental

Low Moor Business Park,
Common Road, Bradford BD12 8ND
Tel: 01274 691122 Fax: 01274 608100


**Client Project Name: Vintage Wings, Clayton**

**Project Number: F13785**

**Client: Norwest Holst Soil Engineering Limited**

**Reporting Date: Wednesday 2 March 2005**

## Comments

All analyses are carried out using the laboratory's standard methods unless otherwise agreed.

The test results in this report refer only to the actual samples on which testing has been performed.

Any opinions and/or interpretations expressed herein are outside the scope of the testing laboratory's UKAS accreditation.

The test report shall not be reproduced, except in full, without the testing laboratory's written approval.

This testing laboratory cannot be held responsible for the condition or suitability of samples submitted for testing by a third party or for the competency of personnel other than its own staff.

## Soil Samples

Results are expressed based on air dried mass @ 40°C unless otherwise stated.

See key in Notes section for explanation of numerical categories for asbestos results, if applicable.

Stones (for example inert flints and inorganic minerals) >10mm are removed prior to analysis. Unless otherwise stated, results have not been corrected for this loss.

Samples submitted for leachate determination were prepared using agreed procedures and analysed using UKAS accredited methodology where appropriate.

Results are expressed without correction for recovery factors.

## Key:

### Accreditation:

MCERTS = This test is accredited to the British Standard BS EN ISO/IEC 17025:2000 and the Environment Agency MCERTS for soil standard.

17025 = This test is accredited to the British Standard BS EN ISO/IEC 17025:2000.

None = This test is currently not on our scope of accreditation.

### Sample Pretreatment (Appended to Method of Detection)

Air Dried @ 40°C

R = As Received

### Sample Type

B = Bulk disturbed sample
C = Core Sample
D = Small disturbed sample
P = Piston sample
U = Undisturbed sample - open drive
W = Water Sample

### Sample Results

# Analysis not requested
*** Test not completed. Please see notes on last page

Signe[redacted]

**For and on behalf of ECõS Environmental**

Approved signatories:

| Name | Position |
|---|---|
| J R Brown | Customer Services Manager |
| R Beeker | Integration Manager |
| P Richardson | Quality Manager |
| J Stoddart | Technical Manager |

# APPENDIX E

(i) Betts Geo Gas Monitoring


© Betts Geo Environmental Ltd 2021

**Site: Crabtree Lane, Openshawe**
**Job Number: 21MCI001**
**Date of Monitoring: 09/09/2021**

## Ground Gas Monitoring Round 1

BETTS GEO
CONSULTING ENGINEERS

| Borehole | Gas Flow (l/hr) | Atmospheric Pressure (mB) | Methane $CH_4$(%v/v) | | Carbon Dioxide $CO_2$ (% v/v) | | Oxygen (%v/v) | | Other Gases | | | Depth to Water | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Peak | Steady | Peak | Steady | Min | Steady | PID | $H_2S$ | CO | (mbgl) | BH depth |
| **WS01** | 0 | 988 | 0 | 0 | 0.3 | 0.3 | 20.6 | 20.6 | - | 1 | 1 | DRY | 2.50 |
| **WS02** | 0.0 | 988 | 0 | 0 | 0.3 | 0.3 | 20.8 | 20.8 | - | 1 | 1 | DRY | 2.75 |
| **WS03** | 0 | 988 | 0.1 | 0.1 | 0.1 | 0.1 | 20.2 | 20 | - | - | - | DRY | 2.70 |
| **WS04** | WELL DESTRYED | | | | | | | | | | | | |
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**Notes:**
Monitoring order is left to right across the table
Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

| Relevant Information at the Time of Monitoring | |
|---|---|
| **Monitored by:** | TOMMY |
| **Weather:** | WELL 4 NOT ABLE TO INSTALL. HAD TO PUT NEW STOPPERS ON WELL 2,3. WEATHER WAS HOT AND DRY |
| **Equipment Used:** | GA5000 |
| | Solinst Mini Interface Meter |
| | |
| **Visible signs of damage/stress:** | |
| **Other Comments/Observations:** | Pressure Steady |

**Site: Crabtree Lane openshawe**
**Job Number: 21MCI001**
**Date of Monitoring: 29/09/2021**

## Ground Gas Monitoring Round 2

BETTS GEO
CONSULTING ENGINEERS

| Borehole | Gas Flow (l/hr) | Atmospheric Pressure (mB) | Methane $CH_4$(%v/v) | | Carbon Dioxide $CO_2$ (% v/v) | | Oxygen (%v/v) | | Other Gases | | | Depth to Water | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Peak | Steady | Peak | Steady | Min | Steady | PID | $H_2S$ | CO | (mbgl) | BH depth |
| **WS01** | 0 | 1007 | 0.1 | 0.1 | 0.5 | 0.5 | 19.9 | 20.0 | - | - | - | DRY | 2.85 |
| **WS02** | 0 | 1007 | 0.1 | 0.1 | 3.1 | 3.1 | 17.8 | 17.9 | - | 1 | - | DRY | 2.30 |
| **WS03** | 0.1 | 1007 | 0 | 0 | 0.8 | 0.8 | 19.7 | 19.7 | - | 1 | - | DRY | 3.80 |
| **WS04** | WELL DESTOYED | | | | | | | | | | | | |
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**Notes:**
Monitoring order is left to right across the table
Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

| Relevant Information at the Time of Monitoring | |
|---|---|
| **Monitored by:** | TOMMY |
| **Weather:** | WELL HEAD DESTOYED ON WELL 3. REPLACED. DRY AND MILD |
| **Equipment Used:** | GA5000 |
| | Solinst Mini Interface Meter |
| | |
| **Visible signs of damage/stress:** | |
| **Other Comments/Observations:** | pressure steady |

**Site: Crab Tree Lane Openshawe**
**Job Number: 21MCI001**
**Date of Monitoring: 01/11/2021**

## Ground Gas Monitoring Round 3

BETTS GEO CONSULTING ENGINEERS

| Borehole | Gas Flow (l/hr) | Atmospheric Pressure (mB) | Methane $CH_4$(%v/v) | | Carbon Dioxide $CO_2$ (% v/v) | | Oxygen (%v/v) | | Other Gases | | | Depth to Water | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Peak | Steady | Peak | Steady | Min | Steady | PID | $H_2S$ | CO | (mbgl) | BH depth |
| **WS01** | 0 | 977 | 0 | 0 | 5.9 | 5.9 | 14.2 | 14.2 | - | - | 1 | dry | 2.80 |
| **WS02** | 0 | 977 | 0 | 0 | 0.1 | 0.1 | 21.5 | 21.5 | - | - | - | dry | 2.80 |
| **WS03** | 0 | 977 | 0 | 0 | 0.2 | 0.2 | 14.3 | 14.3 | - | - | - | dry | 3.80 |
| **WS04** | WELL Destroyed | | | | | | | | | | | | |
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**Notes:**
Monitoring order is left to right across the table
Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

| Relevant Information at the Time of Monitoring | |
|---|---|
| **Monitored by:** | TOMMY |
| **Weather:** | RAINING |
| **Equipment Used:** | GA5000 |
| | Solinst Mini Interface Meter |
| | |
| **Visible signs of damage/stress:** | |
| **Other Comments/Observations:** | PRESSUSRE STEADY |

**Site: Crab Tree Lane Openshawe**
**Job Number: 21MCI001**
**Date of Monitoring: 16/11/2021**

## Ground Gas Monitoring Round 4

BETTS GEO CONSULTING ENGINEERS

| Borehole | Gas Flow (l/hr) | Atmospheric Pressure (mB) | Methane $CH_4$(%v/v) | | Carbon Dioxide $CO_2$ (% v/v) | | Oxygen (%v/v) | | Other Gases | | | Depth to Water | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Peak | Steady | Peak | Steady | Min | Steady | PID | $H_2S$ | CO | (mbgl) | BH depth |
| **WS01** | 0 | 1010 | 0 | 0 | 5.9 | 5.9 | 14.2 | 14.2 | - | - | 1 | DRY | 2.80 |
| **WS02** | 0 | 1010 | 0 | 0 | 0.1 | 0.1 | 20 | 20 | - | - | - | DRY | 4.00 |
| **WS03** | 0 | 1010 | 0 | 0 | 0.3 | 0.3 | 14.1 | 14.4 | - | - | - | DRY | 4.00 |
| **WS04** | WELL DESTROYED | | | | | | | | | | | | |
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**Notes:**
Monitoring order is left to right across the table
Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

| Relevant Information at the Time of Monitoring | |
|---|---|
| **Monitored by:** | TOMMY |
| **Weather:** | WET AND MILD |
| **Equipment Used:** | GA5000 |
| | Solinst Mini Interface Meter |
| | |
| **Visible signs of damage/stress:** | |
| **Other Comments/Observations:** | PRESSURE STABLE |

**Site:Crab tree lane openshawe**
**Job Number: 21MCI001**
**Date of Monitoring: 07/12/2021**

## Ground Gas Monitoring Round 5

BETTS GEO CONSULTING ENGINEERS

| Borehole | Gas Flow (l/hr) | Atmospheric Pressure (mB) | Methane $CH_4$(%v/v) | | Carbon Dioxide $CO_2$ (% v/v) | | Oxygen (%v/v) | | Other Gases | | | Depth to Water | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Peak | Steady | Peak | Steady | Min | Steady | PID | $H_2S$ | CO | (mbgl) | BH depth |
| **WS01** | 0 | 1002 | 0 | 0 | 5.1 | 5.1 | 15.5 | 15.5 | - | - | - | DRY | 2.97 |
| **WS02** | 0 | 1002 | 0.1 | 0.1 | 0.2 | 0.2 | 20 | 20 | - | - | - | 0.35 | 4.00 |
| **WS03** | 0 | 1002 | 0 | 0 | 0.2 | 0.2 | 16.6 | 16.6 | - | - | - | DRY | 2.50 |
| **WS04** | ELL DESTROYED | | | | | | | | | | | | |
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**Notes:**
Monitoring order is left to right across the table
Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

| Relevant Information at the Time of Monitoring | |
|---|---|
| **Monitored by:** | TOMMY |
| **Weather:** | RAINING AND COLD |
| **Equipment Used:** | GA5000 |
| | Solinst Mini Interface Meter |
| | |
| **Visible signs of damage/stress:** | ONE WELL DESTROYED |
| **Other Comments/Observations:** | WEATHER PRESSURE RISING |

**Site:Crab tree lane openshawe**
**Job Number: 21MCI001**
**Date of Monitoring: 12/12/2021**

## Ground Gas Monitoring Round 6

BETTS GEO CONSULTING ENGINEERS

| Borehole | Gas Flow (l/hr) | Atmospheric Pressure (mB) | Methane $CH_4$(%v/v) | | Carbon Dioxide $CO_2$ (% v/v) | | Oxygen (%v/v) | | Other Gases | | | Depth to Water | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Peak | Steady | Peak | Steady | Min | Steady | PID | $H_2S$ | CO | (mbgl) | BH depth |
| **WS01** | 0 | 1010 | 0 | 0 | 5.5 | 5.5 | 15.4 | 15.4 | - | - | - | DRY | 2.90 |
| **WS02** | 0 | 1010 | 0.1 | 0.1 | 0.2 | 0.2 | 20.1 | 20.1 | - | - | - | Dry | 4.00 |
| **WS03** | 0 | 1010 | 0 | 0 | 0.2 | 0.2 | 15.7 | 15.8 | - | - | - | DRY | 3.50 |
| **WS04** | ELL DESTROYED | | | | | | | | | | | | |
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**Notes:**

Monitoring order is left to right across the table

Monitoring should be for **not less** than 3 minutes. However, if high concentrations of gases are initially recorded, monitoring should be for up to 10 minutes

| Relevant Information at the Time of Monitoring | |
|---|---|
| **Monitored by:** | TOMMY |
| **Weather:** | RAINING AND COLD |
| **Equipment Used:** | GA5000 |
| | Solinst Mini Interface Meter |
| | |
| **Visible signs of damage/stress:** | ONE WELL DESTROYED |
| **Other Comments/Observations:** | WEATHER PRESSURE RISING |

## APPENDIX F

### (i) Conceptual Model

The report aims to identify land which could potentially be affected by contamination, such that it could affect the value or re-use of the land, or such that mitigation would be required for certain proposed end uses of the land.

The assessment also aims to identify land which would be regarded as 'contaminated land' under the terms of the Environmental Protection Act 1990, Part IIa. This act includes a stricter test for contaminated land than that outlined above. Land is considered to be contaminated if either:

- the land is causing significant harm to people, ecosystems or infrastructure; or
- there is a significant possibility that such harm could be caused; or
- Pollution of controlled waters is being, or is likely to be, caused.

The following situations are defined as being where harm is to be regarded as significant:

- chronic or quite toxic effect, serious injury or death to humans;
- irreversible or other adverse harm to the ecological system;
- substantial damage to or failure of buildings;
- death of, or disease or other physical damage affecting, livestock or crops;
- Pollution of controlled waters.

The risk assessment uses a 'Source-Pathway-Receptor' methodology for assessing whether a source of contamination could potentially lead to harmful consequences. This means that there needs to be a pollutant linkage from source to receptor for harm to be caused, this linkage consisting of:

- a source of pollution;
- a pathway for the pollutant to move along;
- A receptor that is affected by the pollutant.

As an example, the pollutant source could be an identified leak of oil or an area of dumped waste.





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The pathways could include transport of the contaminant by groundwater, surface water, windblown dust, or vapours, and for human receptors will include the means, by which contaminants enter the body, for example skin contact, ingestion and inhalation.

Receptors include people, other living organisms, the built environment and groundwater and surface waters (these latter two also being contaminant pathways).

The source-pathway-receptor methodology relationship allows an assessment of the environmental risk to be determined, based on the nature of the source, the degree of exposure of the receptor to the source and the sensitivity of the receptor.

This section of the report is based on the information set out in the previous sections of the report and should not be read independently of such sections.

**Initial Conceptual Model**

From the available information the preliminary conceptual model is visualised as follows:

| **Target (Receptor)** | **POTENTIAL SOURCE-PATHWAY LINKAGE** |
|---|---|
| **Site users / residents** | Inhalation of soil gas, odours or dust. |
| | Ingestion of, and skin contact with, contaminated soil. |
| | Ingestion of contaminants in vegetables etc. or in soils adhering to vegetables, etc. |
| **Construction/ maintenance workers.** | Inhalation of soil gas, odours or dust |
| | Ingestion of, and skin contact with, contaminated soil |
| **Plants** | Adverse effects on growth caused by presence of contaminants in soil |
| **Buildings and Structures** | Flow of ground gas into buildings. Asphyxiation, toxicity, explosion and fire hazards |
| | Sulphate attack of foundations |
| | Hydrocarbons penetrating plastic water supply pipes |
| **Groundwater** | Migration of soluble contaminants into groundwater on or off site. Migration of oils into groundwater on or off site. |
| **Surface water** | Migration of soluble contaminants and/or direct run-off of contaminants. Migration of oils into groundwater on or off site. |


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## Initial Environmental Risk Assessment

### General

It is accepted that an environmental risk assessment can be based on a source-pathway-target model. An examination is carried out as to whether a target will be at risk from a contamination source, that a source exists, and whether there are any pathways (routes of exposure) which might actually link the source to the target.

Environmental risk assessments rely heavily on numerical trigger concentrations or guidelines because exposure of targets to contamination is difficult to quantify directly. Quantification of risk is therefore mainly undertaken for general scenarios in order to derive trigger levels. These are derived for various contaminants for particular targets and routes of exposure. An example of a sensitive target would be users of a domestic back garden, where routes of exposure might be skin contact, dust inhalation, direct ingestion and indirect ingestion via cultivation and consumption of fruit and vegetables.

In March 2002, the first parts of the new CLEA risk assessment guidance were released by DEFRA/Environment Agency.

The risk assessment approach is an extension of the 'fit for use' concept whereby land is cleaned up to a standard fit for the proposed use, that is, so all remaining risks are acceptable. However, as well as being 'fit for use', the environmental risk assessment approach also addresses the soil and water environment so that these are also safeguarded where necessary. For example if a site was contaminated with heavy metals and the development comprised the proposed construction of hard standings and buildings only, the fit-for-use approach might require no remediation for the site. However, consideration of the wider environment needs to address whether groundwater is being contaminated, and if so whether remediation is required for this reason.

The following classification presented by CIRIA has been used in the assessment of risk:

| **Estimation of risk from consideration of magnitude, consequences and probabilities** | | | | |
|---|---|---|---|---|
| **Probability** | **Consequences** | | | |
| | **Severe** | **Moderate** | **Mild** | **Minor** |
| **High** | Very high | High | Moderate | Moderate / Low |
| **Medium** | High | Moderate | Moderate / Low | Low |
| **Low** | Moderate | Moderate / Low | Low | Very Low |
| **Unlikely** | Moderate / Low | Low | Very Low | Very Low |

Reference: Contaminated Land Risk Management; A Guide to Good Practice, CIRIA C552:2001

### CIRIA C665 Situation A Ground Gas Conceptual Model

The risk table contained in C665 is basically a modified risk assessment from CIRIA 152 1995, by which a conceptual model and semi-quantitative risk assessment can be made.


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## APPENDIX G

(i) Notes on Ground Gas

### Ground Gas

The Building Regulations and BRE Report 212 state that precautions are not mandatory against carbon dioxide unless 5.0% volume is exceeded. These documents do not give a threshold level for methane, but Baker suggests that this level is 0.1% volume. For methane up to 1.0% volume, and carbon dioxide above 5.0% volume, the Building Regulations and BRE Report state that passive measures may be adopted. Above 1.0% methane further specific guidance must be sought.

CIRIA Report 149 gives further guidance on the appropriate precautions for various gas regimes, called characteristic situations in this report. In the DETR Guide for Design by Ove Arup, various types of passive measures are assessed for performance with different gas regimes. The assessments used computational fluid dynamic (CFD) modelling.

A gas regime is essentially defined by two parameters:

i) The concentration of the gas (e.g. % methane)

ii) The emission rate of the gas from the ground.

The fact that two parameters are used is problematic if the site is to be classified on the basis of Table 28 in CIRIA Report 149. This is because high gas concentrations are often encountered which fall into an onerous gas regime; whereas the low flow rates which are also frequently encountered fall into less onerous gas regimes.

In order to use the Guide for Design to decide if passive measures are suitable, it is necessary to combine the gas concentration and the emission rate.

Three recent publications are used for ground gas risk assessment:

- CIRIA C665 for high rise residential / flats
- 'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present' Report Edition No.04 March 2007 NHBC – designed for use with low rise residential properties
- BS8485:2007 'Code of practice for the characterization and remediation from ground gas in affected developments'

These documents improve upon the approach used in previous CIRIA and Wilson /Card Papers, by placing emphasis on gas flow rates, but still retain some reliance on the gas concentrations themselves.


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## CIRIA C665 Situation A Ground Gas Conceptual Model

The risk table contained in C665 is basically a modified risk assessment from CIRIA 152 1995, by which a conceptual model and semi-quantitative risk assessment can be made.

### High Rise / Flats (CIRIA 665 Table 8.5)

| Characteristic Situation (CIRIA Report 149) | Risk Classification | Gas Screening Value (CH4 or CO2) (l/hr) [1] | Additional factors | Typical source of generation |
|---|---|---|---|---|
| **1** | Very low risk | **<0.07** | Typically methane ≤1%v/v and/or carbon dioxide ≤5%v/v. Otherwise consider increase to Situation 2 | Natural soils with low Organic content. "Typical" Made Ground |
| **2** | Low risk | **<0.7** | Borehole flow rate not to exceed 70l/hr. Otherwise consider increase to Situation 3 | Natural soil, high peat/organic content. "Typical" Made Ground |
| **3** | Moderate risk | **<3.5** | | Old landfill, inert waste, mineworking flooded |
| **4** | Moderate to high risk | **<15** | Quantitative risk assessment required to evaluate scope of protective measures | Mineworking susceptible to flooding, completed landfill (WMP 26B criteria) |
| **5** | High risk | **<70** | | Mineworking unflooded inactive with shallow workings near surface |
| **6** | Very high risk | **>70** | | Recent landfill site |

**Notes:**
1. Gas screening value: litres of gas/hour is calculated by multiplying the gas concentration (%) by the measured borehole flow rate (l/hr);
2. Site characterisation should be based on gas monitoring of concentrations and borehole flow rates for the minimum periods as defined within within CIRIA Report 665;
3. Source of gas and generation potential/performance must be identified;
4. Soil gas investigation to be in accordance with guidance contained within CIRIA Report 665;
5. If there is no detectable flow, use the limit of detection of the instrument;
6. The boundaries between the Partners in Technology classifications do not fit exactly with the boundaries for the above classification.

**Typical scope of protective measures (extract from CIRIA Report 665 Table 8.6)**


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| Characteristic Situation (from Table 8.5) | Number of levels of protection | Typical scope of protective measures for residential building (not low-rise traditional housing)[1] |
|---|---|---|
| **1** | None | No special precautions |
| **2** | 2 | a) Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM and under-floor venting<br>b) Beam and block or pre-cast concrete and 2000 g DPM/reinforced gas membrane and under-floor venting. All joints and penetrations sealed. |
| **3** | 2 | All types of floor slab as above. All joints and penetrations sealed. Proprietary gas resistant membrane and passively ventilated or positively pressurised under-floor sub-space. |
| **4** | 3 | All types of floor slab as above. All joints and penetrations sealed.<br>Proprietary gas resistant membrane and passively ventilated under-floor subspace or positively pressurised under-floor sub-space, over-site capping or blinding and in ground venting layer |
| **5** | 4 | Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft). All joints and penetrations sealed. Proprietary gas resistant membrane and ventilated or positively pressurised under-floor sub-space, over-site capping and in ground venting layer and in ground venting wells or barriers. |
| **6** | 5 | Not suitable unless gas regime is reduced first and quantitative risk assessment carried out to assess design of protection measures in conjunction with foundation design. |

**Notes:**

1. Not suitable for use with low rise traditional housing. (Use the NHBC document instead);
2. Typical scope of protective measures may be rationalised for specific developments on the basis of quantitative risk assessments;
3. Note the type of protection is given for illustration purposes only. Information on the detailing and construction of passive protection measures is given in BR414 (Johnson, 2001). Individual site specific designs should provide the same number of separate protective methods for any given characteristic situation. See CIRIA Report 49;
4. In all cases there should be minimum penetration of ground slabs by services and minimum number of confined spaces such as cupboards above the ground slab. Any confined spaces should be ventilated;
5. Foundation design must minimise differential settlement particularly between structural elements and ground-bearing slabs;
6. Commercial buildings with basement car parks, provided with ventilation in accordance with the Building Regulations, may not require gas protection for Characteristic Situations 3 and 4;
7. Floor slabs should provide an acceptable formation on which to lay the gas membrane. If a block beam floor is used it should be well detailed so it has no voids in it that membranes have to span, and all holes for service penetrations should be filled. The minimum density of the blocks should be 600kg/m3 and the top surface should have a 4:1 ratio sand to cement grout brushed into all joints before placing any membrane (this is also good practice to stabilise the floor and should be carried out regardless of the need for ground gas membranes);
8. The ground gas-resistant membrane can also act as the damp-proof membrane;
9. Based on Building Regulations Approved Document C (Office of the Deputy Prime Minister, 2004a),which states that "a membrane below the concrete could be formed with a sheet of polyethylene, which should be at least 300mu thick (1200 gauge)". Please note the alteration from 300mm (as stated in the Approved Document C) to 300mu, as 300mm is a typographical error that has been recognised and corrected for within this report and CIRIA Report 665.

## Low Rise Residential (NHBC)


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**Table 14.1: Gas Risk Assessment - Traffic Lights with Typical Maximum Concentrations and Gas Screening Values**

| | Methane [1] | | Carbon Dioxide [1] | |
|---|---|---|---|---|
| **Classification** | **Typical Maximum Concentration** [3] (%v/v) | **Gas Screening Value** [2,4] (l/hr) | **Typical Maximum Concentration** [3] (%v/v) | **Gas Screening Value** [2,4] (l/hr) |
| Green | | | | |
| | 1 | **0.13** | 5 | **0.78** |
| Amber 1 | | | | |
| | 5 | **0.63** | 10 | **1.60** |
| Amber 2 | | | | |
| | 20 | **1.60** | 30 | **3.10** |
| Red | | | | |

**Notes:**

1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst case temporal conditions that the site may be expected to encounter will be the decider as to what Traffic Light is allocated;
2. Borehole Gas Volume Flow Rate, in litres per hour as defined in Wilson and Card (1999), is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The Typical Maximum Concentrations can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

**Table 14.2: Ground Gas Protection Measures Required for the Traffic Lights**

| Traffic Light | Ground Gas Protection Measures Required |
|---|---|
| **Green** | Ground gas protection measures are not required. (note based on standard NHBC house detail with 150mm void space under suspended floor) |
| **Amber 1** | Low-level ground gas protection measures are required, using a membrane and ventilated sub-floor void that creates a permeability contrast to limit the ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. Ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours. |
| **Amber 2** | High-level ground gas protection measures are required, creating a permeability contrast to prevent ingress of gas into buildings. Gas protection measures are to be installed as prescribed in BRE 414. **Membranes used should always be fitted by a specialist contractor and should be fully certified (see Appendix G).** As with Amber 1, ventilation of the sub-floor void should be designed to provide a minimum of one complete volume change per 24 hours. |
| **Red** | Standard residential housing is not normally acceptable without further Ground Gas Risk Assessment and/or possible remedial mitigation measures to reduce/remove the source of the ground gases. In certain circumstances, active protection methods could be applied, but only when there is a legal agreement assuring the management and maintenance of the system for the life of the property. |

**BS8485: 2007**

**Table 2: Required Gas Protection By Characteristic Gas Situation & Type Of Building**


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| Characteristic gas situation, CS | NHBC traffic light | Required gas protection | | | |
|---|---|---|---|---|---|
| | | Non-managed property, e.g. private housing | Public building [A] | Commercial buildings | Industrial buildings [B] |
| 1 | Green | 0 | 0 | 0 | 0 |
| 2 | Amber 1 | 3 | 3 | 2 | 1 [C] |
| 3 | Amber 2 | 4 | 3 | 2 | 2 |
| 4 | Red | 6 [D] | 5 [D] | 4 | 3 |
| 5 | | | 6 [E] | 5 | 4 |
| 6 | | | | 7 | 6 |

*NOTE Traffic light indications are taken from NHBC Report no.: 10627-R01 (04) [3] and are mainly applicable to low-rise residential housing. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.*

A) Public buildings include, for example, managed apartments, schools and hospitals.
B) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building.
C) Maximum methane concentration 20% otherwise consider an increase to CS3.
D) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.
E) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any protection scheme.

**Table 3: Solutions Scores**

| PROTECTION ELEMENT/SYSTEM | | SCORE | COMMENTS |
|---|---|---|---|
| **a) Venting/dilution (See Annex A)** | | | |
| Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.) A) | Very good performance | 2.5 | Ventilation performance in accordance with Annex A.<br><br>If passive ventilation is poor this is generally unacceptable, and some form of active system will be required. |
| | Good performance | 1 | |
| Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.) A) | | 2.5 | There have to be robust management systems in place to ensure the continued maintenance of any ventilation system.<br><br>Active ventilation can always be designed to meet good performance.<br><br>Mechanically assisted systems come in two main forms: |


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| | | | |
|---|---|---|---|
| | | | extraction and positive pressurization. |
| Ventilated car park (basement or undercroft) | | 4 | Assumes car park is vented to deal with car exhaust fumes, designed to Building Regulations Document F [5] and IStructE guidance [6]. |
| **b) Barriers** | | | |
| **Floor slabs** | | | It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum.<br><br>Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances. |
| Block and beam floor slab | | 0 | |
| Reinforced concrete ground bearing floor slab | | 0.5 | |
| Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab | | 1.5 | |
| Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and at joints | | 1.5 | |
| Fully tanked basement | | 2 | |
| **c) Membranes** | | | |
| Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation B), C) | | 0.5 | The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation, and the integrity of joints |
| Proprietary gas resistant membrane to reasonable levels of workmanship/in line with current good practice under independent inspection (CQA) B), C) | | 1 | |
| Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation | | 2 | |
| **d) Monitoring and detection (not applicable to non-managed property, or in isolation)** | | | |
| Intermittent monitoring using hand held equipment | | 0.5 | |
| Permanent monitoring and alarm system A) | Installed in the underfloor venting/ dilution system | 2 | Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe |
| | Installed in the building | 1 | |
| **e) Pathway Intervention** | | | |
| Pathway intervention | | - | This can consist of site protection measures for off-site or on-site sources (see Annex A). |

*NOTE In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection*

A) It is possible to test ventilation systems by installing monitoring probes for post installation validation.

B) If a 1 200 g DPM material is to function as a gas barrier it should be installed according to BRE 212 [8]/BRE 414 [9], being taped and sealed to all penetrations.

C) Polymeric Materials >1 200 g can be used to improve confidence in the barrier. Remember that their gas resistance is robust and resistant to site damage.


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## APPENDIX H

### (i) Off-site Disposal of Surplus Soil Guidance Notes

The disposal of waste (including surplus soils and contaminated soils) to landfill sites is governed by the *Landfill (England & Wales) Regulations 2002*, the *Hazardous Waste Technical Guidance document WM2 (2003)* and associated legislation.

One of the aims of the above legislation is to encourage waste producers (including developers disposing of surplus soils etc) to reduce their waste (and not just discard and disown it). This can be achieved by recycling or reusing the waste. In the case of contaminated sites where leaving contaminated material in-situ poses a risk to a potential receptor such as groundwater resources, further testing and assessment for such risk could reduce the quantities requiring disposal. If there is still unacceptable risk from contaminated soil being left in place, then it may be possible to reduce the risk to an acceptable level (such that the material can be left in place) by in-situ or ex-situ clean-up of the soils.

Before waste can be disposed of, the producer of the waste must undertake a number of steps. '*Initial Waste Testing and Characterisation'* is firstly undertaken to determine whether the waste is non-hazardous or hazardous. The exceptions are that some wastes such as coal tars, 'tank bottom sludge's', etc are immediately classed as hazardous, regardless of any testing or threshold concentrations.

Any inert or hazardous waste destined for landfill must undergo '*Compliance Testing'* using the Waste Acceptance Criteria (WAC). There are different inert and hazardous WAC limits relating to landfill sites that are correspondingly licensed to accept inert or hazardous waste.

If the '*Initial Waste Testing and Characterisation'* shows a waste to be hazardous, then it is a requirement that the material be tested against the WAC-hazardous suite of tests. If it *passes* the WAC-hazardous testing, then it can be taken to a hazardous waste landfill site. If the material *fails* the WAC-hazardous testing, then the material must be treated before undergoing re-characterisation, further WAC-hazardous testing and then potential disposal at a hazardous waste disposal site.

If the '*Initial Waste Testing and Characterisation'* shows a waste to be non-hazardous, then it can be taken to a non-hazardous waste landfill site, without further testing. The producer may however decide to undertake WAC-inert testing, in an attempt to reclassify the waste as inert, in which case the waste could then go to an inert landfill site.

The volumes of soils associated with potential hotspots on a site (be they hazardous or non-hazardous) which might require off-site disposal, could potentially be reduced by further on-site sampling and subsequent testing.

With regard to the *Compliance Testing*, it should be noted that some landfill sites are permitted to increase the standard WAC-hazardous/inert limit concentrations, such that they might accept waste that would normally fail such limits.


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We would recommend that the contamination testing results (including the history of the site) be presented to the proposed landfills, to determine if they will accept waste generated at the site and what classification they would impose.


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## APPENDIX I

(i) Validation Report Guidance Notes

### Unforeseen Hotspots of Contamination

Given the existence of made ground on the site it would be prudent to maintain vigilance during site clearance and construction, in case any further areas of suspected contamination are encountered.

If areas are found then a suitably qualified person should undertake appropriate sampling, testing and further risk assessment.

Any hotspots encountered during site clearance, not previously encountered in the ground investigation, are to be removed to a suitably licensed landfill site.

A validation report (see below) will be produced on completion of these works. This report will serve to confirm that the works were undertaken in accordance with the relevant legislation, the method statement, specification and planning conditions.

### Validation Report Recommendations

It is suggested that the following records will be kept on site to provide a basis for the validation report:

- Daily record sheets of the remediation works to include a summary of the day's activities
- Weather conditions
- Plant, personnel and visitors to the remediation site
- Aspects relating to Health & Safety, environmental control or non-compliance with the specification or the Method Statements.
- All in situ and laboratory testing results.

All requirements of the remediation specification should be complied with; on completion of the remediation a validation report should be provided. This report will comprise the relevant site records and act as certification that the remedial and ground preparation works have been carried out in accordance with the specification.

The validation report will include the following:

- A description of the works undertaken.
- Records of any remediation works, including daily diary sheets.
- Progress photographs.
- Any chemical and geotechnical validation test results.
- As built surveys, including base excavations and top and bottom of capping layer.
- A statement that the works have been undertaken in accordance with the agreed specification


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## APPENDIX J

### (i) Notes on Limitations

This report does not consider ecological impacts (e.g. bats) or botanical risks (e.g. Japanese knotweed). It is recommended that these are considered as part of the assessment of development constraints for the site.

The assessment and judgements given in this report are directed by both the finite data on which they are based and the proposed works to which they are addressed. The data essentially comprised a study of available documented information from various sources (including Client Furnished reports) together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our environmental conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information. Actual risks can only be assessed following a physical investigation of the site.

The site investigation has been carried out to provide information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. Betts Geo Environmental Ltd undertake to exercise all reasonable skill, care and due diligence in the exercise of the investigation with respect to sampling techniques, sample storage and report interpretation.

The assessments and judgement given in this report are directed by both the finite data on which they are based and the proposed works to which they are addressed. Data acquisition is subject to the limitations of the methods of investigation used. Exploratory holes undertaken during fieldwork investigate small a small volume of ground in relation to the size of the site and as such can only provide an indication of site conditions. There may be conditions pertaining to the site and the proposed development i.e. localised “hotspots” of contamination, which have not been disclosed by the investigations.

The findings and opinions are relevant to the dates of our site works and should not be relied upon to represent conditions at substantially later dates. Conditions at the site will change over time due to natural variations and anthropogenic activities. Groundwater, surface water and soil gas conditions should be anticipated to change with diurnal, seasonal and meteorological variations.

The opinions expressed in this report regarding any contamination are based on simple statistical analysis and comparison with available guidance values. No liability can be accepted for the retrospective effects of any changes or amendments to these values.

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