

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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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 1964-1968 1:1,250 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

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.

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.

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

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;



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;



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

3 SITE HISTORY

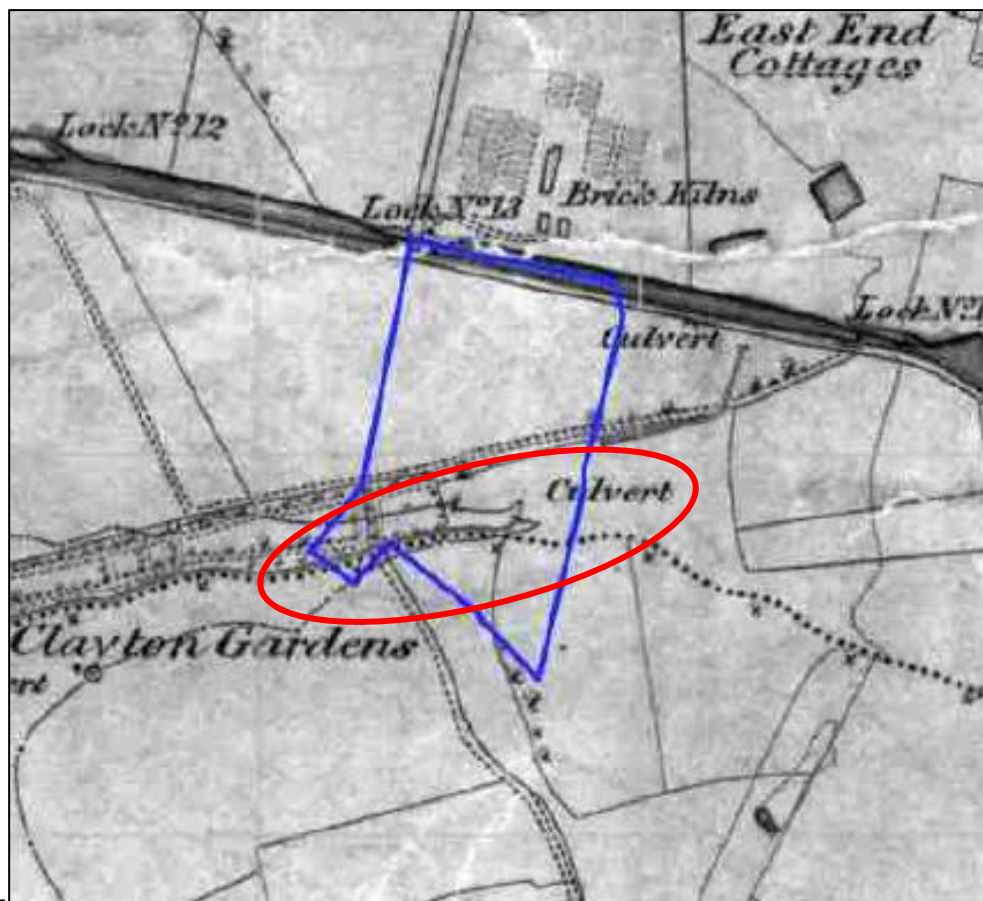
A search of available historic maps was undertaken to establish the land use history of the site. Extracts of the maps discussed below and can be found in full in Appendix F of this report. All maps are Ordnance Survey unless otherwise stated. All distances quoted on OS maps are taken from the site boundary,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

3.1 Summary of Site History

3.1.1 On Site

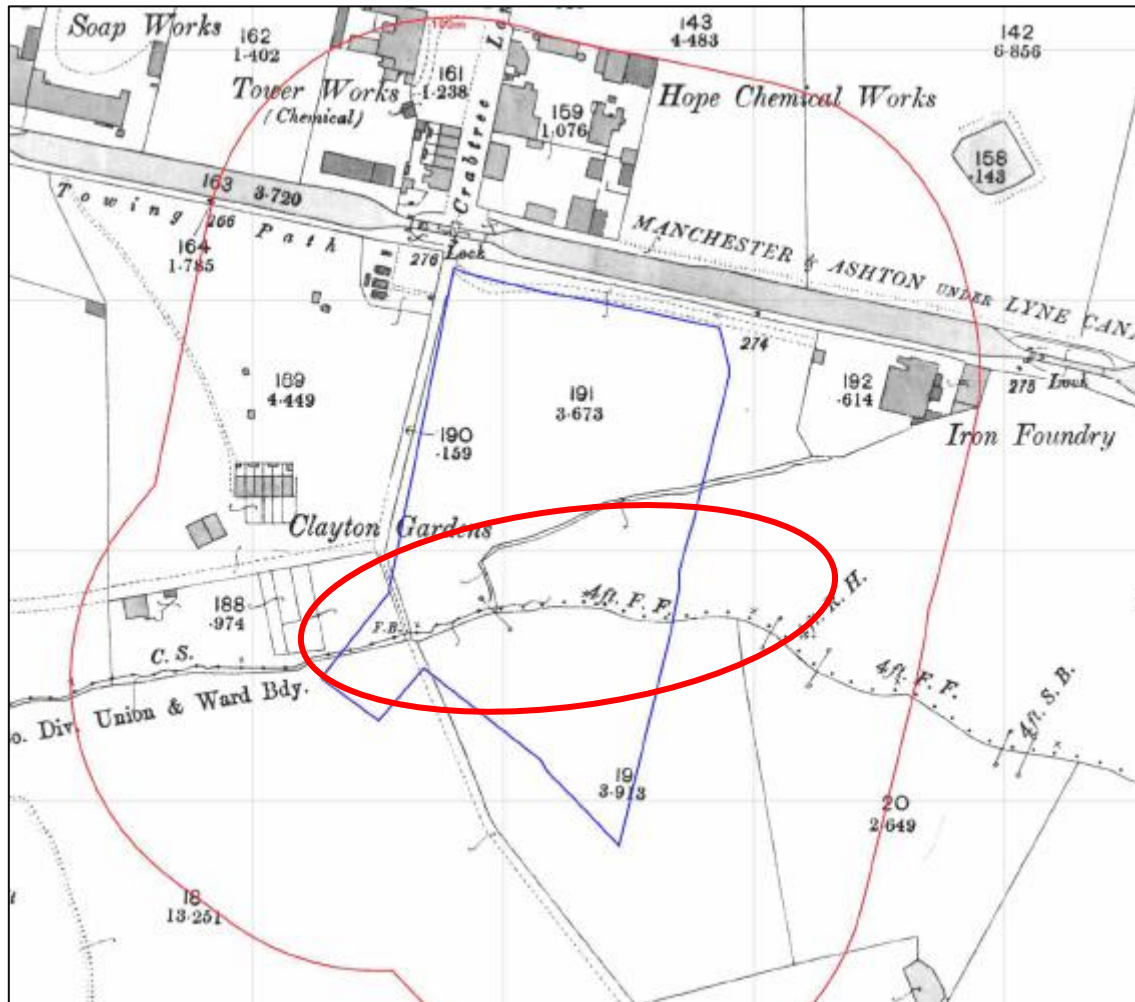
The earliest available map of site is the 1845 1:10,560 map which shows the site to be largely undeveloped land with a culvert crossing the site. An extract of this map is shown below;

1845 1:10,560 Map



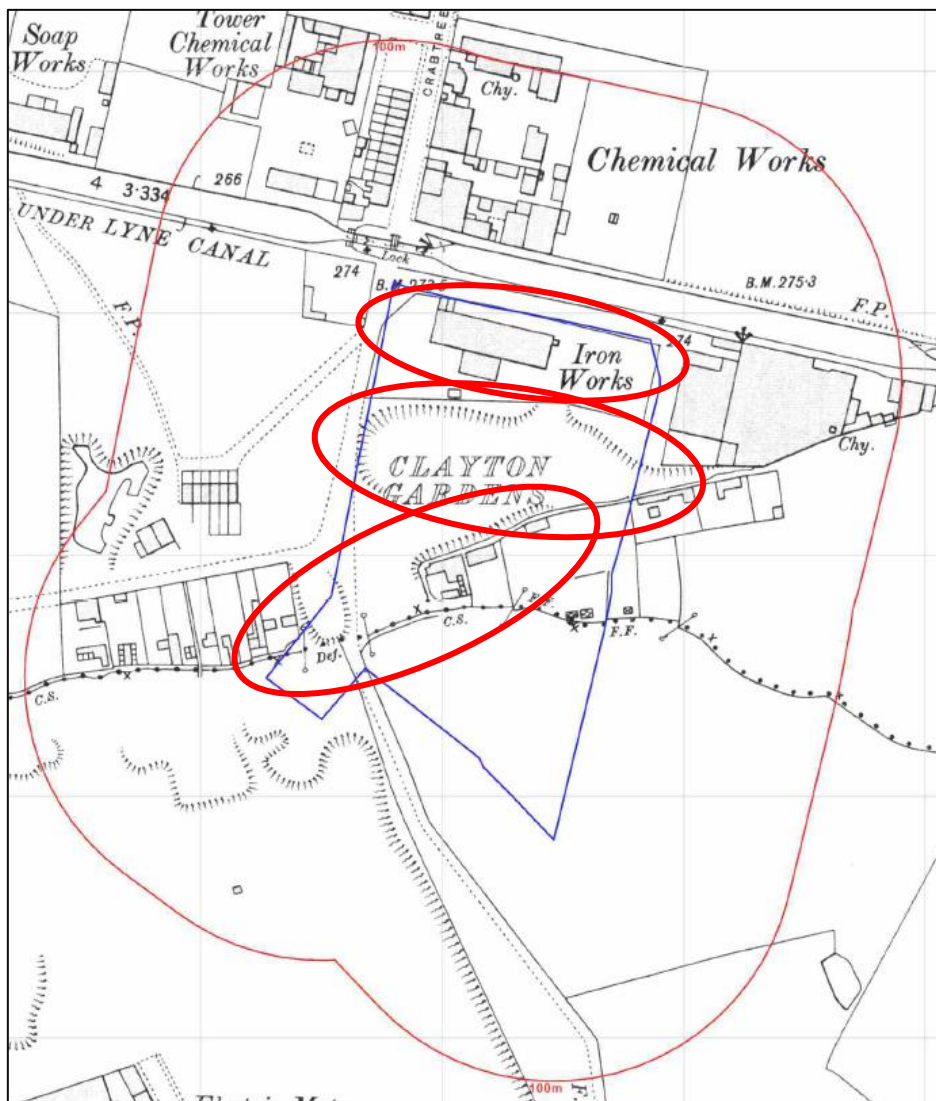
The 1893 1:10,560 map which shows a change of position of the culvert / stream. An extract of this map is shown below;

1893 1:2,500 Map



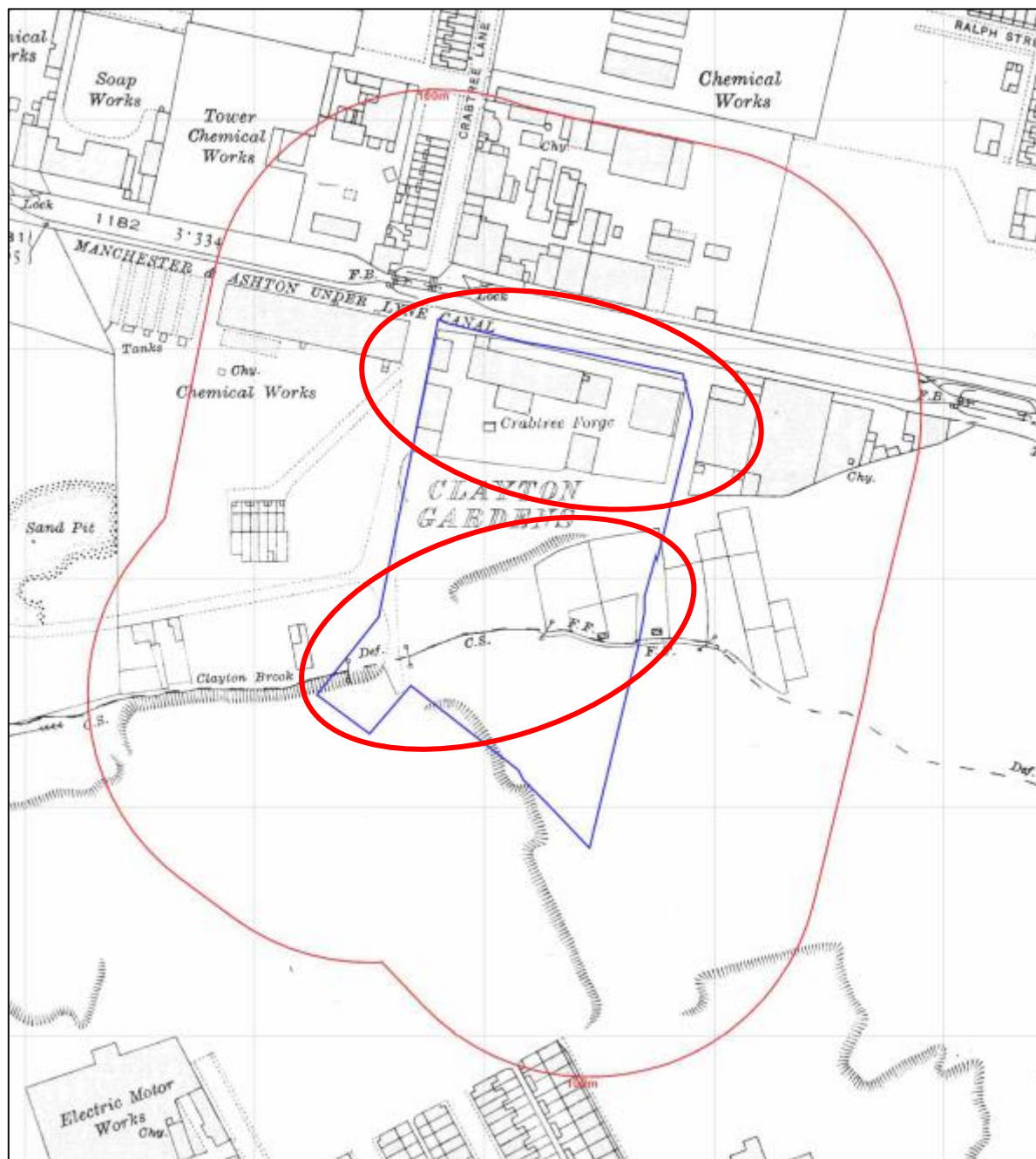
The 1908 1:2,500 map which shows the construction of a number of buildings in the north, and central areas of the site. The northern building is labelled as an iron works. The area to the south of the works is detailed as steep slopes indicating removal of materials. A smaller slope is also present in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

1908 1:2,500 Map



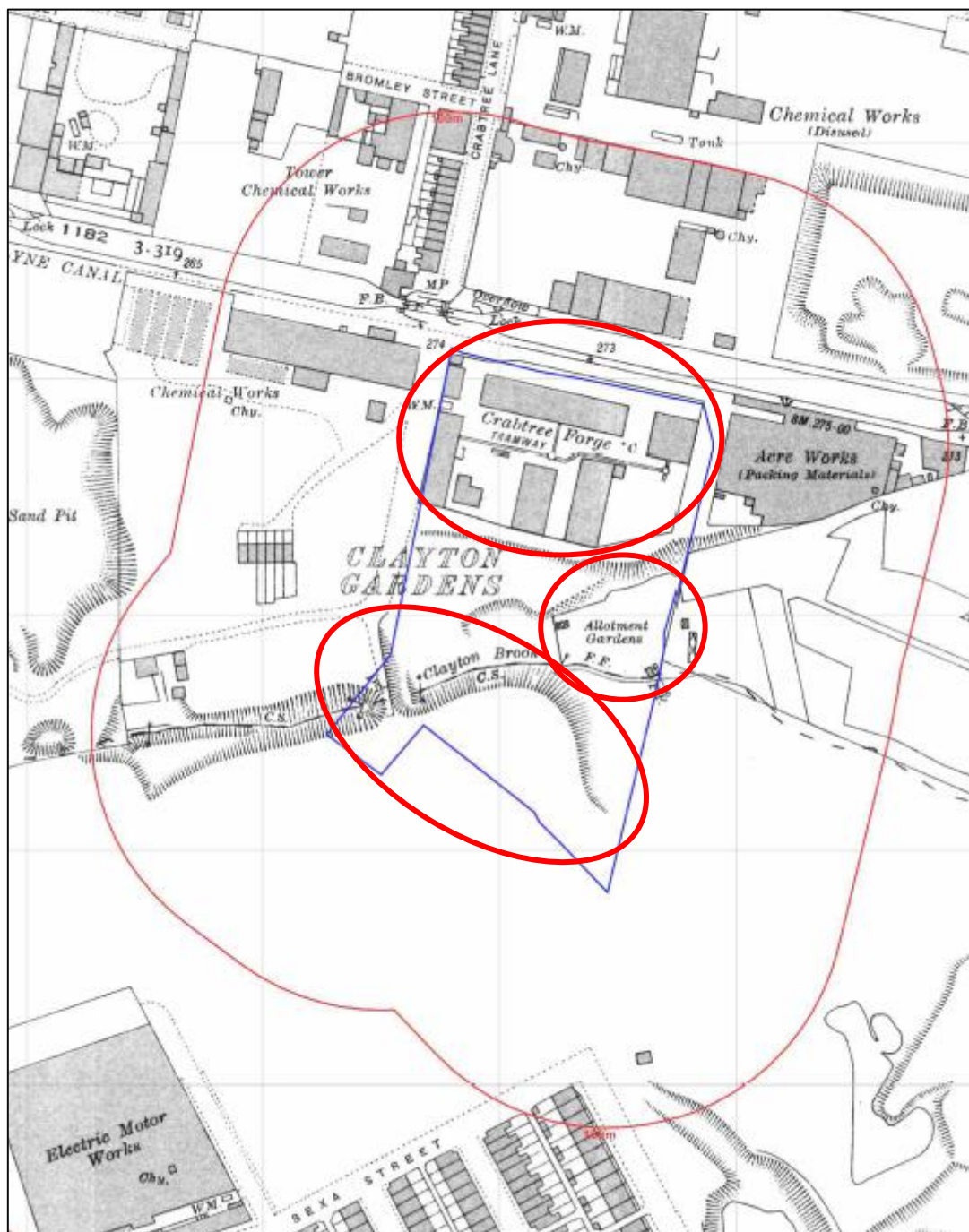
The 1922 1:2,500 map which shows the construction of additional buildings in the north, and demolition in the south with alterations of the steep slopes. An extract of this map is shown below;

1922 1:2,500 Map



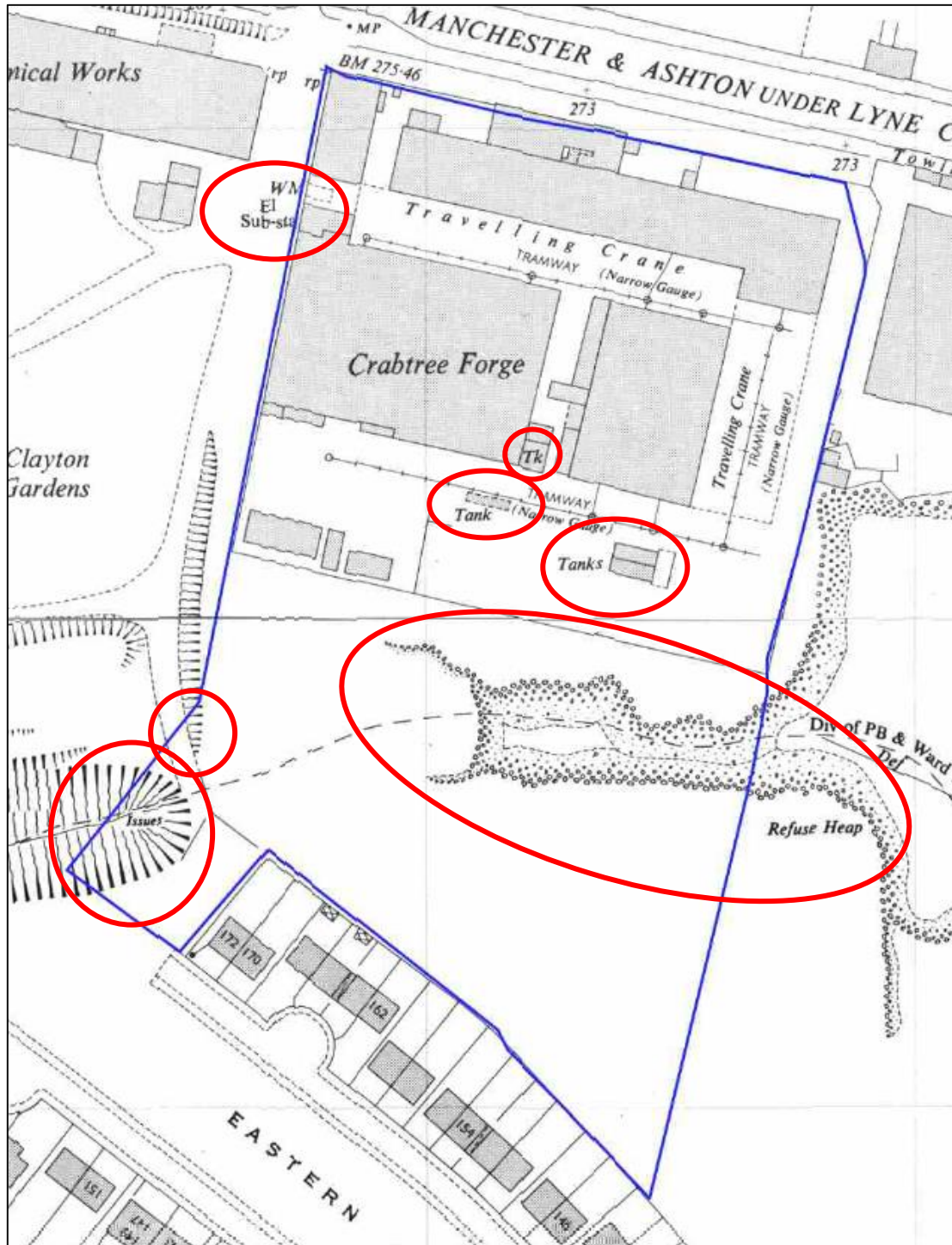
The 1932-1933 1:2,500 map which shows further construction in the north, and demolition with creation of allotment gardens in the south, again with alterations of the steep slopes. An extract of this map is shown below;

1932-1933 1:2,500 Map



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



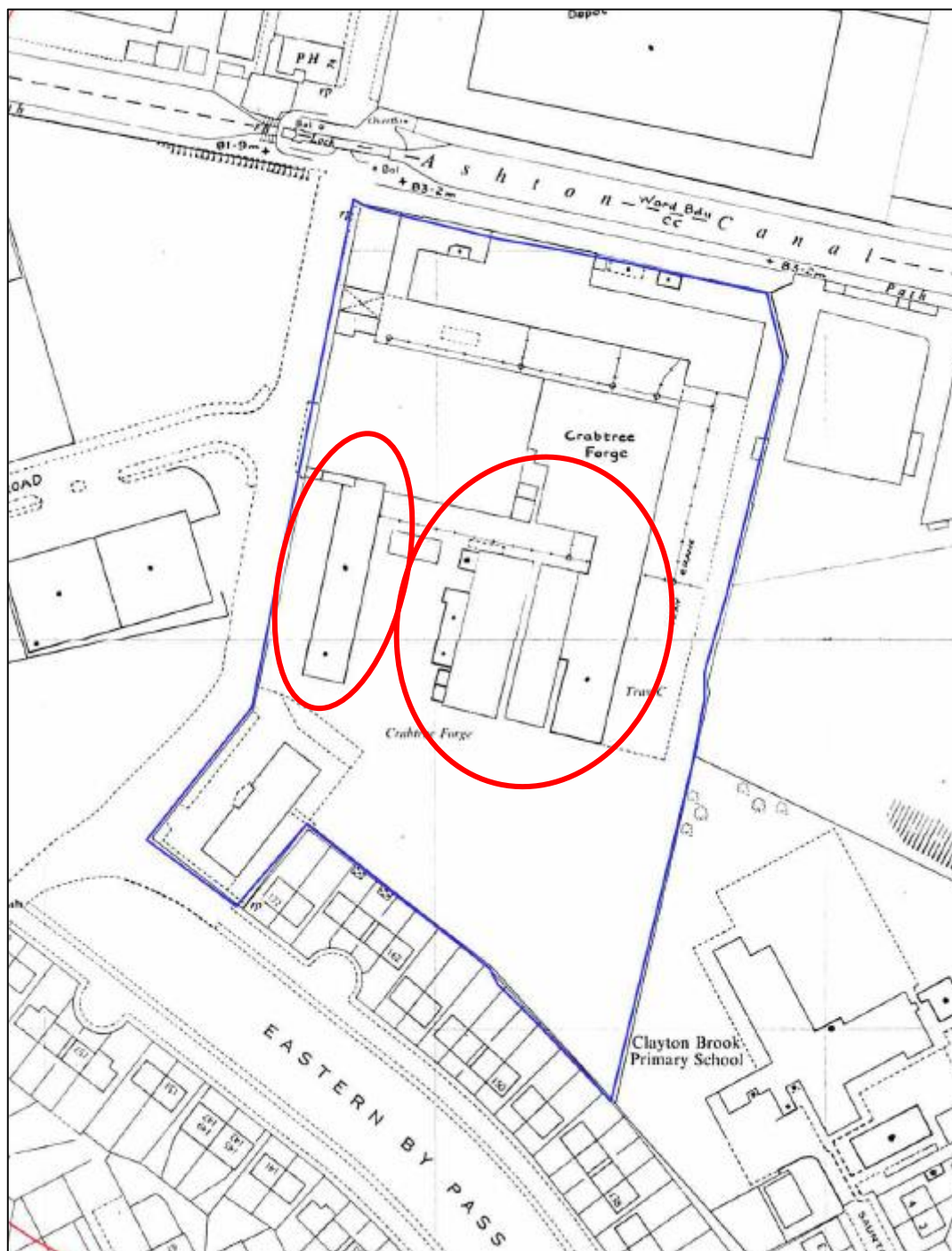
The 1964-1968 1:1,250 map shows significant changes across the site, with the extension of existing buildings and construction of new ones. An extract of this map is shown below;

1964-1968 1:1,250 Map



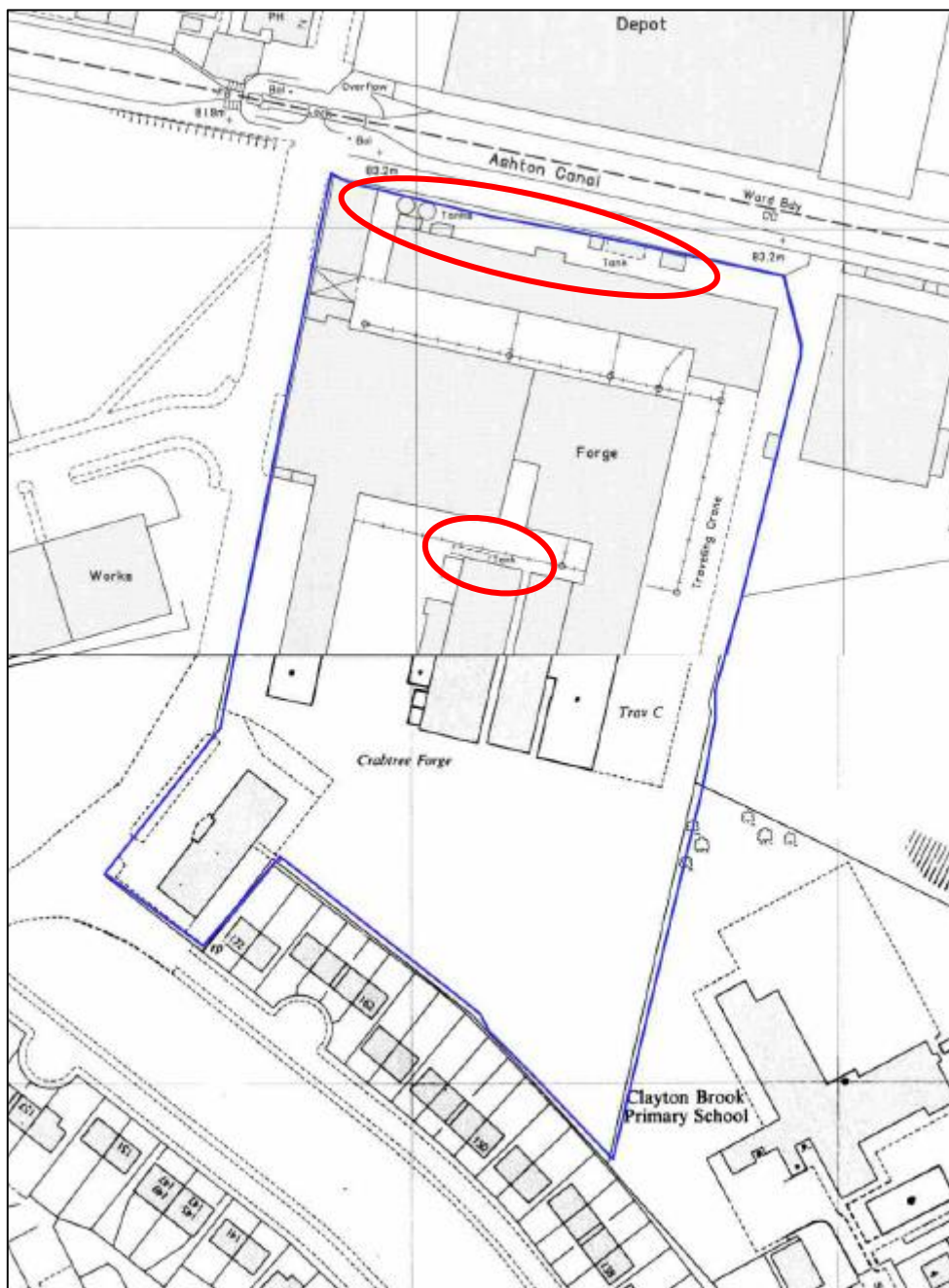
The 1983-1986 1:1,250 map shows significant changes across the site, with the extension of existing buildings and construction of new ones. Clayton Brook no longer shown. An extract of this map is shown below;

1983-1986 1:1,250 Map



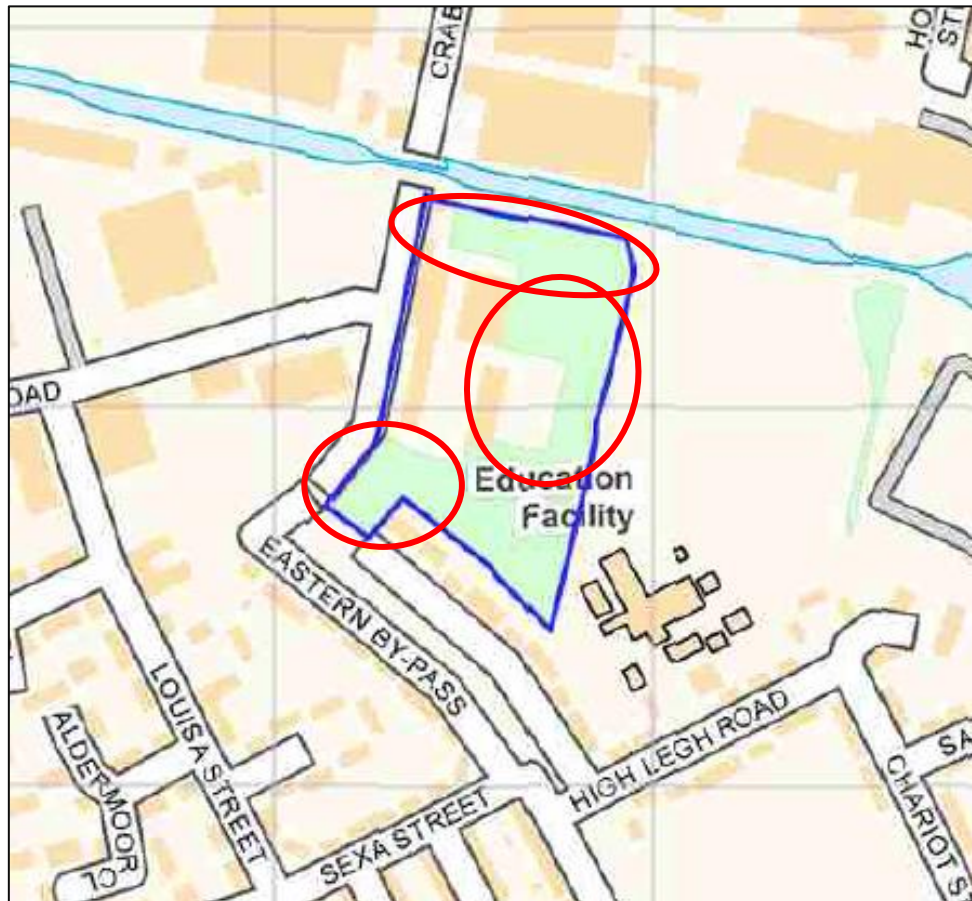
The 1988-1991 1:1,250 map shows additional tanks in the north and the centre of the site. An extract of this map is shown below;

1983-1986 1:1,250 Map



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



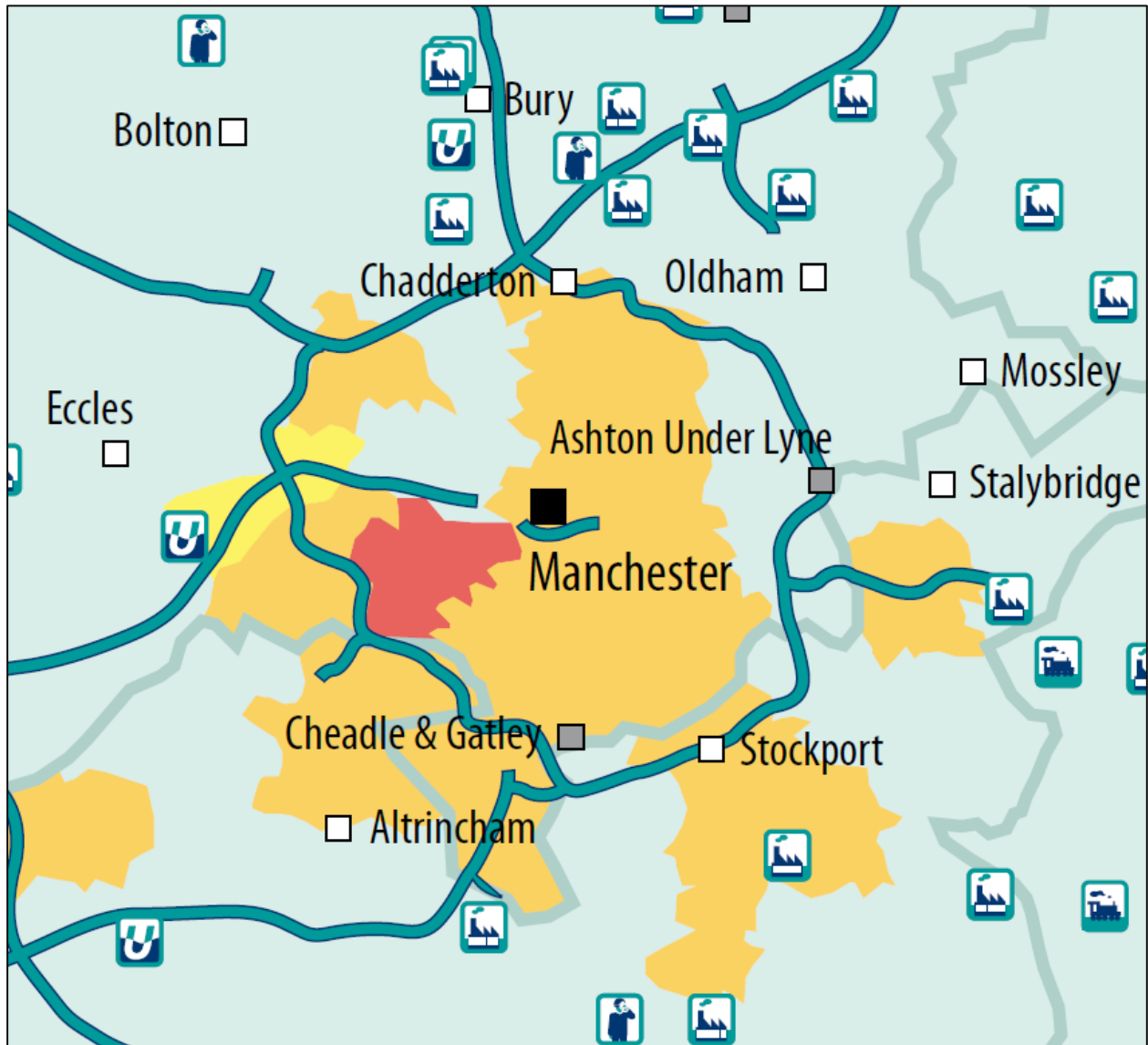
3.1.2 Surrounding Area

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

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 significant number of various works and railways / railway sidings and located in close proximity.

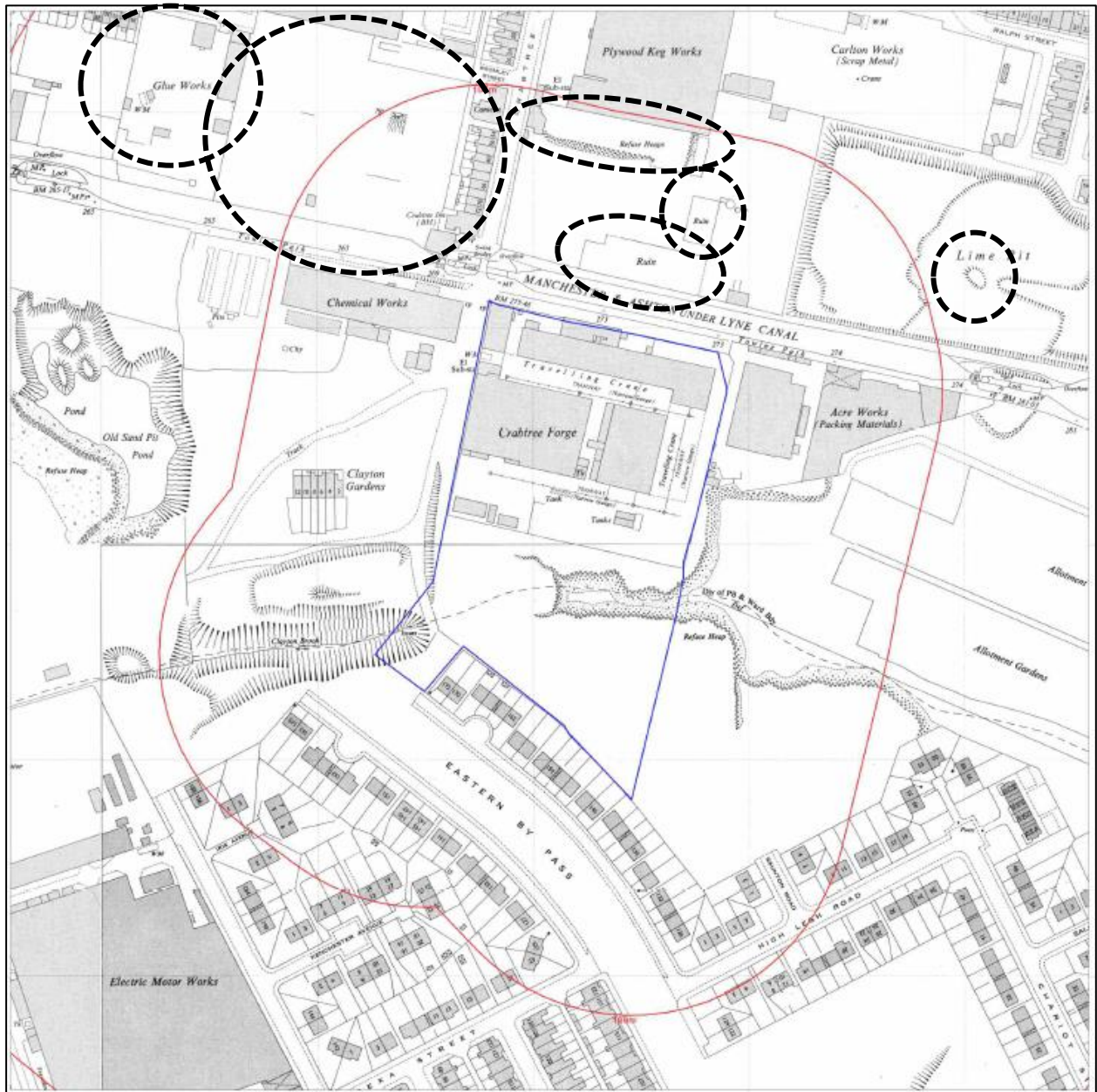
A brief internet search of open source records and historical mapping provided by GroundSure has shown there were a number of bomb strikes on and around the site, with at least one recorded strike on the north of the site (firebombs), as shown on the extracts listed below. This mapping ONLY covers the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



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.

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 outside 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 consultant is considered prudent.

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

	
Pre-Desk Study Assessment	
Site:	Crabtree Lane, Manchester
Client:	Betts Geo
Contact:	Kris Rodway
Date:	6 th 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: ■ Transport infrastructure and public utilities. ■ Industries important to the war effort, including munitions factories and engineering works. ■ Royal Flying Corps (RFC) Alexandra Park. ■ 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: ■ Transport infrastructure and public utilities. ■ Industries important to the war effort, including engineering works. ■ Military camps and training areas. ■ 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). 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. 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.

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.

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	-	-	-	-
Gypsum Areas	-	-	-	-
Tin Mining	-	-	-	-
Clay Mining	-	-	-	-

5.4.1 BritPits

ID	Location	Details	Description
4	79m N	Name: East End Brick Field Address: Clayton, MANCHESTER, Lancashire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site 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 Address: Clayton, MANCHESTER, Lancashire Commodity: Sand & Gravel Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site 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 Address: Openshaw, MANCHESTER, Lancashire Commodity: Clay & Shale Status: Ceased	Type: A surface mineral working. It may be termed Quarry, Sand Pit, Clay Pit or Opencast Coal Site 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

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

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

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				
Licensed 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	-

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.

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
Licensed 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	-	-	-	-

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 Status: Historical Permit Permit Type: Part B	Enforcement: No Enforcement Notified Date of enforcement: No Enforcement Notified 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

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.

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

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 Planning application reference: 49492 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. Data source: Historic Planning Application Data Type: Point	-
B	117m N	Site Address: N/A	Type of Site: Scrap Metal Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1950
B	117m N	Site Address: N/A	Type of Site: Scrap Yard Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1988
B	117m N	Site Address: N/A	Type of Site: Scrap Metal Works Planning application reference: N/A Description: N/A Data source: Historic Mapping Data Type: Polygon	1950
4	191m W	Site Address: N/A	Type of Site: Incinerator Planning application reference: N/A Description: N/A Data source: Historic Mapping 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/JF0101M G/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

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

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

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

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

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

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

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

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.

7.2.4 Foundations

Consideration to use of vibro-compaction to form deep stone columns after discussion with a suitable contractor. 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.

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, and no visits were undertaken below 1000mb atmospheric pressure.

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

9 INITIAL CONCEPTUAL SITE MODEL

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

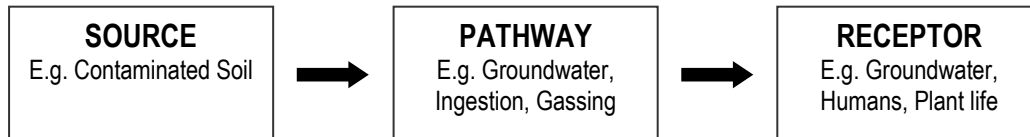
This section of the report aims to identify land which could potentially be affected by contamination, such that it could affect the value or re-use of the land, or such that mitigation would be required for certain proposed end uses of the land.

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.



Type of Contamination	Potential Sources	Potential Pathway	Potential Receptors	Pollution Linkage	Comment	Estimated Level of Risk
Ground Gas	Current Land Use- onsite	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
	Historic Land use	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
	Made Ground					
	Surrounding Land Use					
Surface and Near Surface Contaminants Within Soils	Current Land Use- onsite	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
	Historic Land use	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
	Made Ground					
	Surrounding Land Use					
Mobile Contaminants, Leachables e.g. from Pollution Sources Adjacent to Site/On Site	Current Land Use- onsite	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
	Historic Land use	Off-site Migration in Groundwater	Abstractions	Potentially Active	There are no potable groundwater abstractions within 500m of site.	Low
	Made Ground		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
	Surrounding Land Use					
Organic and Inorganic Contaminants Within Soils / Groundwater	Current Land Use- onsite	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
	Historic Land use					
	Made Ground					
	Surrounding Land Use					

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

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.

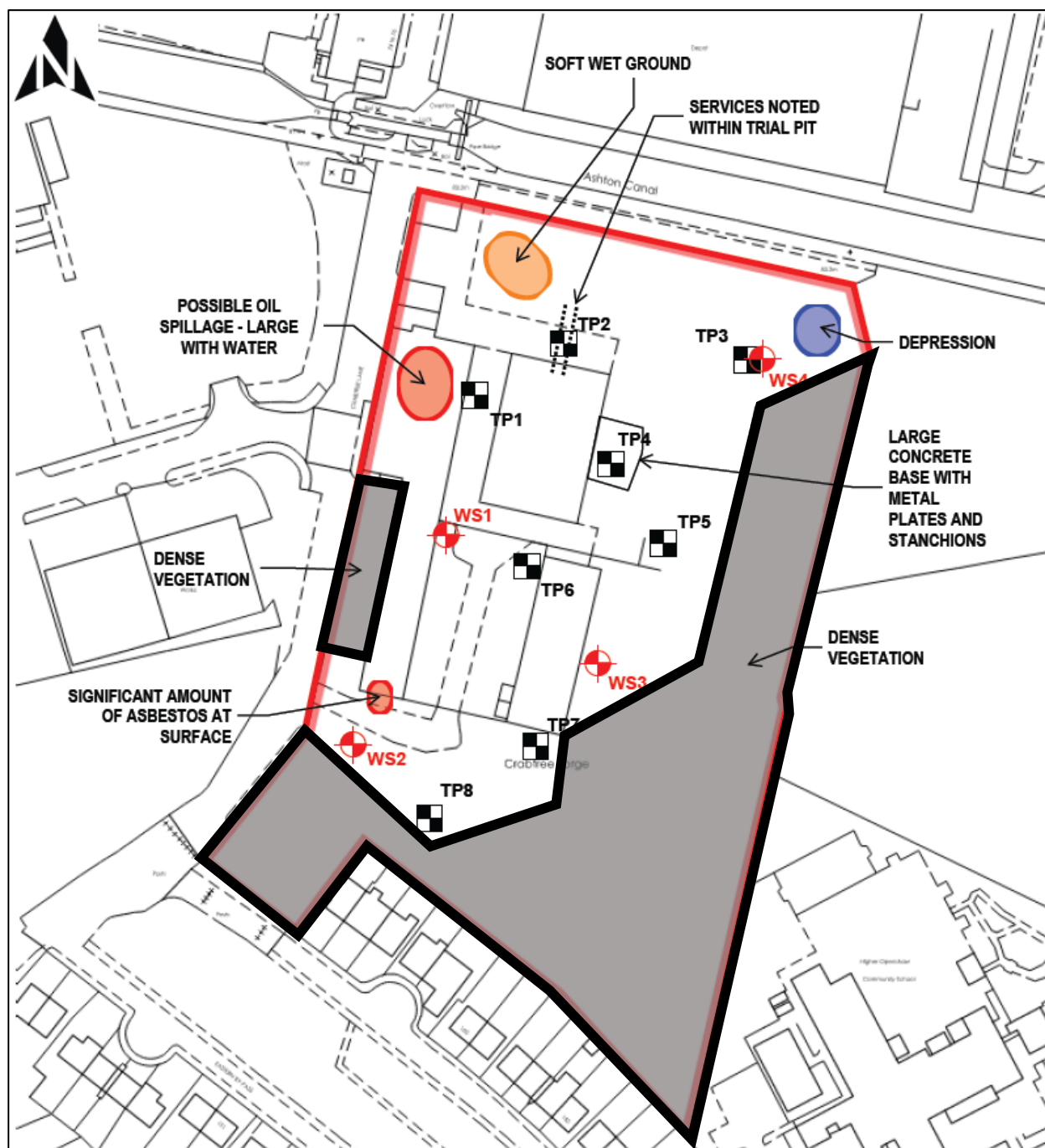
Prior to any intrusive works, each location was checked for services using a cable avoidance tool (CAT) and review of statutory service plans.

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.

10.4 Areas Not Accessed

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



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.

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

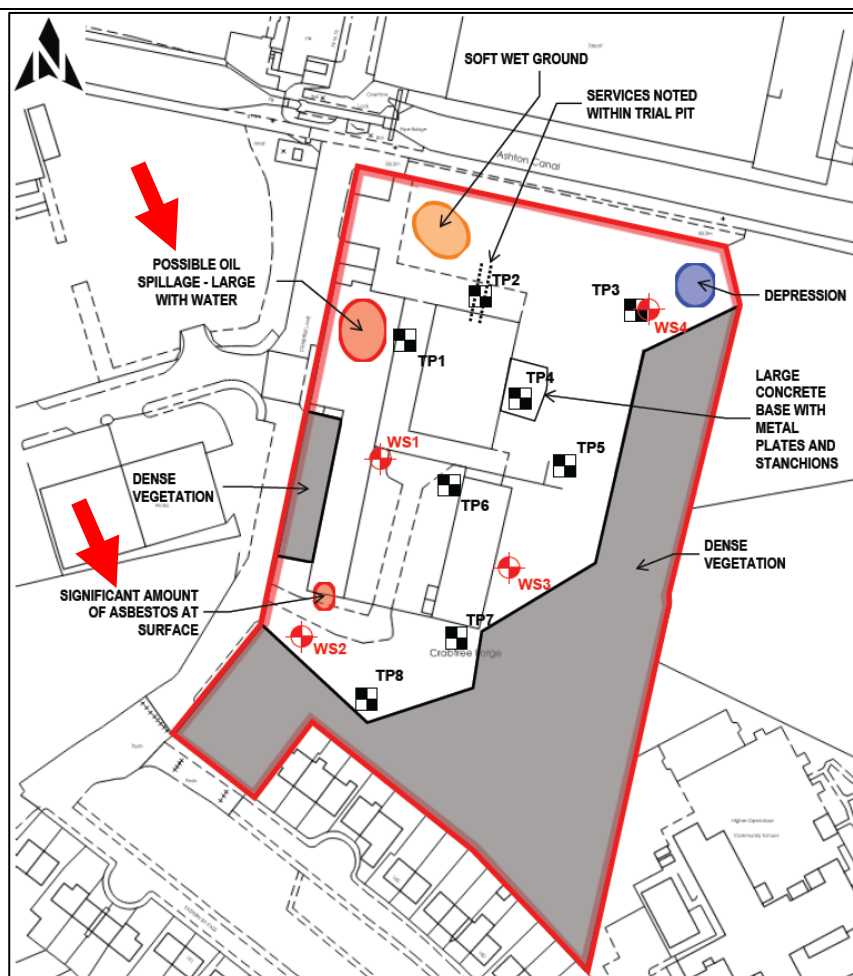
Depth (mbgl)						
1.20-1.65	1	2	1	1	1	2
2.00-2.45	1	0	0	0	0	0
3.00-3.45	3	2	1	2	2	2
4.00-4.45	2	2	2	2	2	3

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;



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.

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 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) 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

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 is 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.

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	52	32	37
		Copper	6570	4790	-
		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%
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	2	1.51	4.95
		Naphthalene	3.1	0.829	-
BH07	4.85	Arsenic	48.8	32	37
		Lead	322	-	200
		Benzo(a)anthracene	9	4.52	-
		Benzo(a)pyrene	11.6	1.51	4.95
		Benzo(b)fluoranthene	13.1	7.72	-
		Dibenzo(ah)anthracene	1.6	0.838	-
		Naphthalene	2.1	0.829	-
BH08	4.85	Benzo(a)anthracene	10.9	4.52	-
		Benzo(a)pyrene	14.4	1.51	4.95
		Benzo(b)fluoranthene	14.6	7.72	-
		Dibenzo(ah)anthracene	1.7	0.838	-
BH10	2.75	Benzo(a)anthracene	17.5	4.52	-
		Benzo(a)pyrene	21	1.51	4.95
		Benzo(b)fluoranthene	17.9	7.72	-
		Dibenzo(ah)anthracene	4.1	0.838	-
		Naphthalene	1.5	0.829	-
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.

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	384	-
		Carbazole	465	-
		2-Methylnaphthalene	317	-
		Perylene	523	-
WS102	3.80	2-Methylnaphthalene	322	-
TP2	0.85	Carbazole	140	-
		2-Methylnaphthalene	269	-
		Perylene	537	-
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.

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.

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.

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:

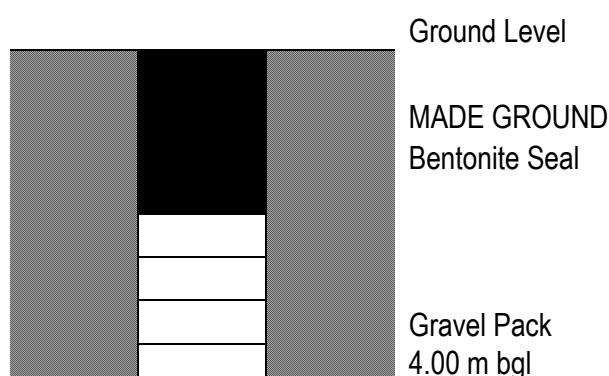
- 'Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present', Report Edition No.04 March 2007 NHBC – designed for use with low rise residential properties
- CIRIA C665 'Assessing risks posed by hazardous ground gases for buildings' 2007 - for high rise residential / 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.

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.

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

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.

17 OUTLINE STRATEGY FOR RISK REDUCTION/REMEDIAL 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).

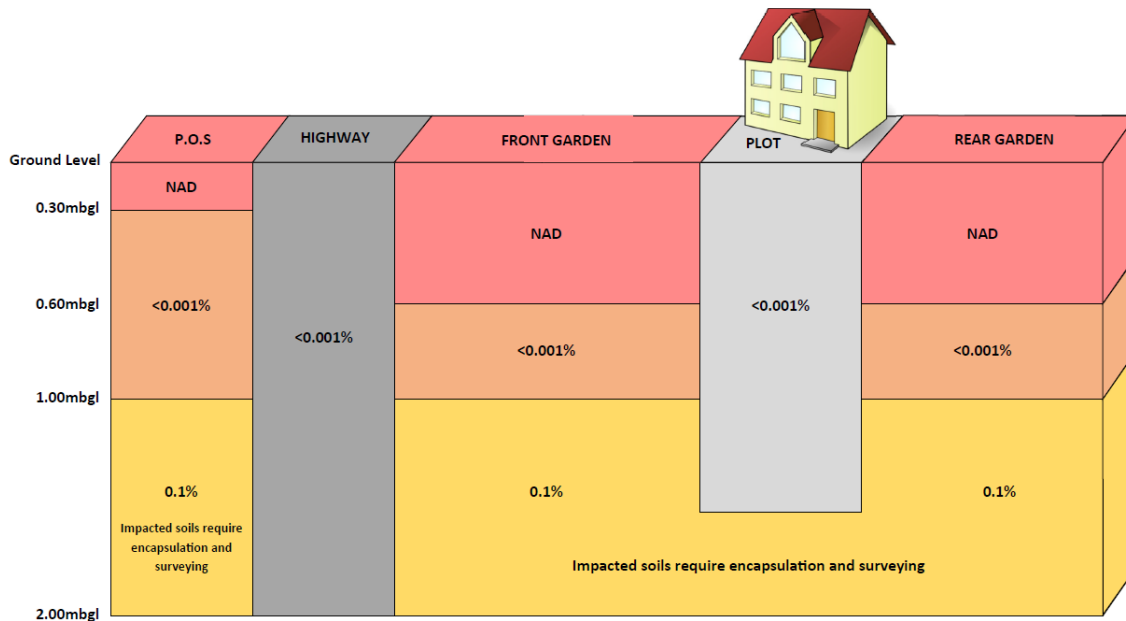
17.2 Construction/Maintenance Workers

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;



Notes:

P.O.S. - Public Open Space

NAD - No Asbestos Detected

0.001% - Soils may contain $\leq 0.001\%$ 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 $>1.00\text{mbgl}$ 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 placed 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.

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.

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.

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/m²
- Stiff CLAY strata with an allowable bearing pressure of 125kN/m²

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.

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.

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

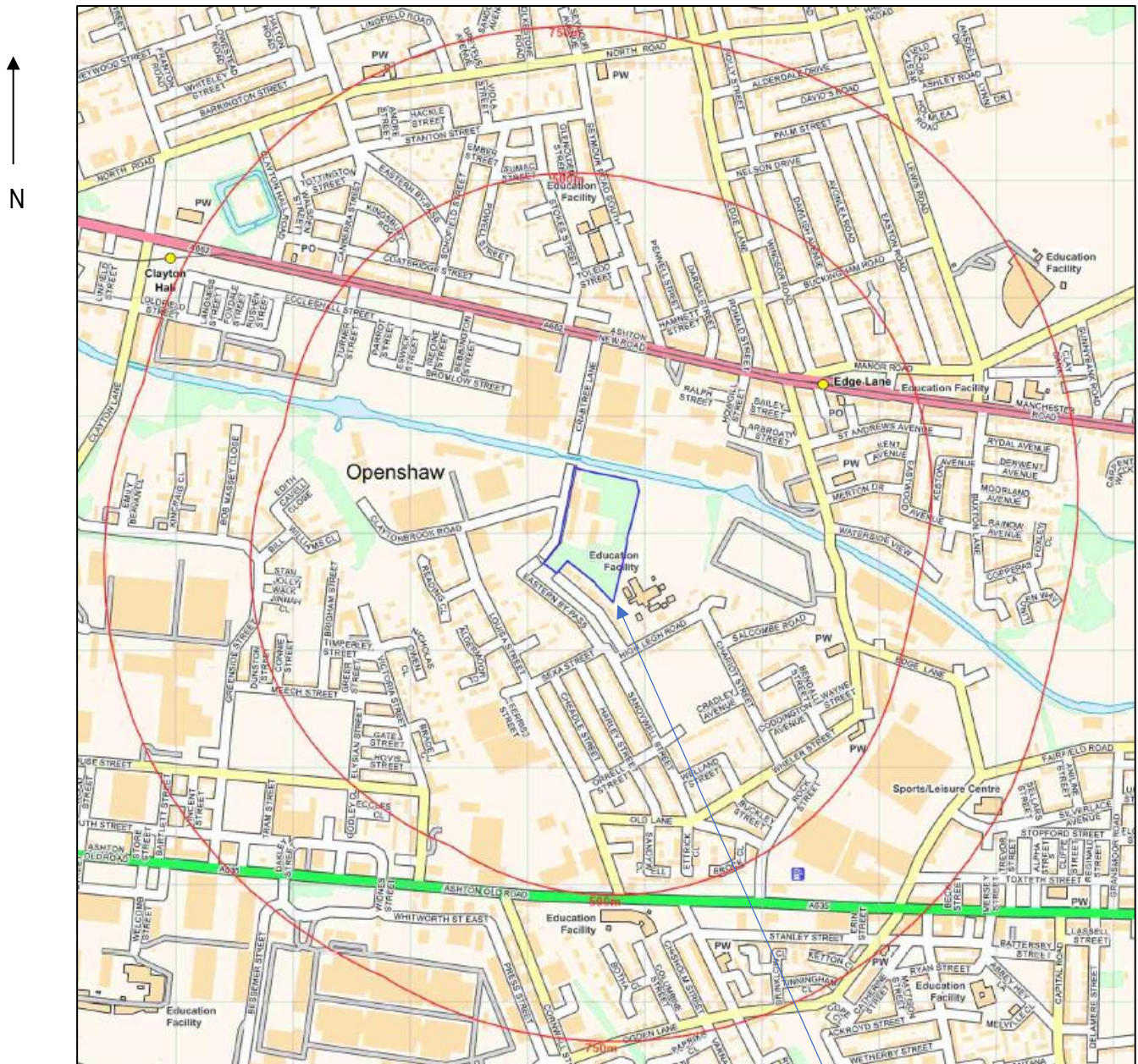
19 REFERENCES

- 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*

APPENDIX A

(i) Site Location Plan



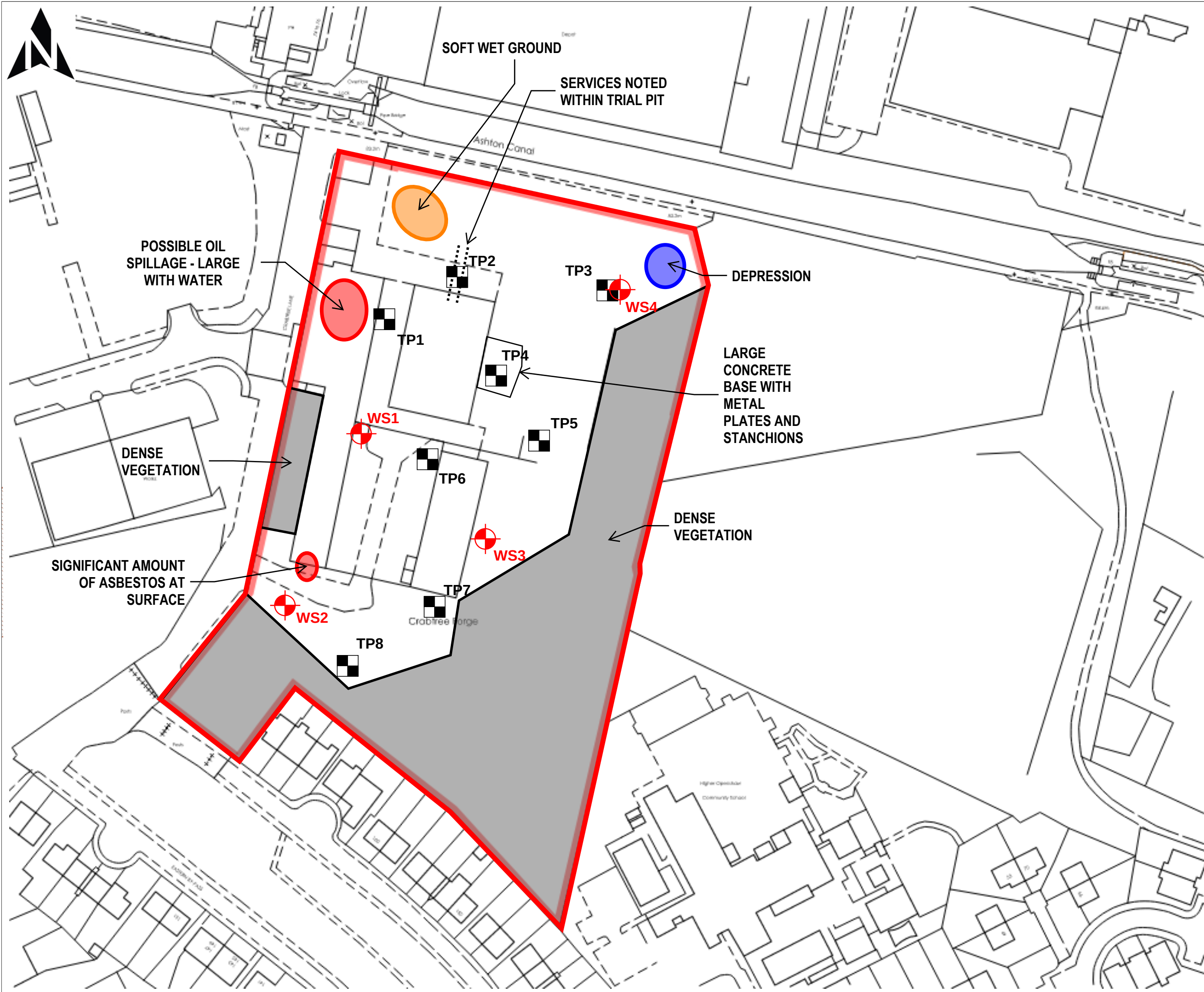
Site Location Plan

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.

APPENDIX B

(i) Drawings and Plans



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 288176 Fax: 01244 288179 enquiries@betts-geo.co.uk

MCI

PROJECT:

CRABTREE LANE, OPENSHAW

TITLE:

EXPLORATORY HOLE LOCATION PLAN

DATE:	AUG 21	SCALE:	NTS	DRAWN:	KR	CHECKED:	BL
PROJECT No:	21CHE276	DRAWING No:	EXP001	REV:	/		

APPENDIX C

(i) Betts Exploratory Hole Logs

TRIAL PIT LOG

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

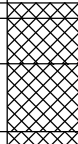
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Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											Dry
All dimensions in metres Scale 1:50		Client MCI Developments				Method/ Plant Used 6t Tracked Excavator				Logged By KR	

AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSHAW.GPJ GINT STD AGS 3 1.GDT 17/8/21

TRIAL PIT LOG

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

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)		
0.85	ES					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.	
						0.95	MADE GROUND: Soft to firm black CLAY. Slight creosote odour. Aborted on second service pipe.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											Possible live (on CAT) service pipes at 0.85 and 0.95mbgl. Both left intact.
All dimensions in metres Scale 1:50		Client MCI Developments				Method/ Plant Used		6t Tracked Excavator			Logged By KR

AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSHAW.GPJ GINT STD AGS 3 1.GDT 17/8/21

TRIAL PIT LOG

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

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)	DESCRIPTION		
						(0.50) 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		

[illegible]

All dimensions in metres Scale 1:50	Client	MCI Developments	Method/ Plant Used	6t Tracked Excavator	Logged By	KR
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AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSHAW.GPJ GINT STD AGS 3 1.GDT 17/8/21

TRIAL PIT LOG

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

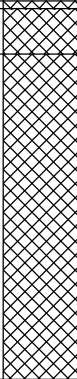
SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
1.50	ES					(0.45) 0.45		
						(1.85) 2.30		
						(0.40) 2.70		

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 Scale 1:50			Client MCI Developments			Method/ Plant Used 6t Tracked Excavator			Logged By KR		

AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSASH GPJ GINT STD AGS 3.1 GDT 17/8/21

TRIAL PIT LOG

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

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)	DESCRIPTION		
1.00	ES					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.			
				(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	Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Dry

AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSHAW.GPJ GINT STD AGS 3 1.GDT 17/8/21

TRIAL PIT LOG

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

SAMPLES & TESTS			STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)		
1.00	ES					0.05		
						(0.55)		
						0.60		
						(2.35)		
						2.95		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											Dry
All dimensions in metres Scale 1:50			Client MCI Developments			Method/ Plant Used 6t Tracked Excavator			Logged By KR		

AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSASH GPJ GINT STD AGS 3.1 GDT 17/8/21

TRIAL PIT LOG

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

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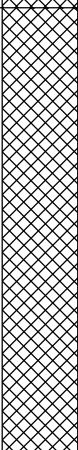
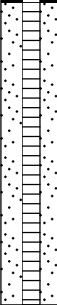
Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											Hole aborted due to lots of pieces of possible asbestos sheet

All dimensions in metres Scale 1:50	Client	MCI Developments	Method/ Plant Used	6t Tracked Excavator	Logged By	KR
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AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSHAW.GPJ GINT STD AGS 3 1.GDT 17/8/21

BOREHOLE LOG

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

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
0.50	ES					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.		
						(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.		
1.20		N5							
2.00		N0							
3.00		N7							
3.40	ES					3.40			
						3.50	MADE GROUND: Soft black and brown sandy CLAY.		
						3.70	Firm yellowish brown slightly sandy CLAY.		
4.00		N9				4.00	Firm to stiff brown and mottled grey slightly sandy CLAY.		

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. Possible void at 2.00mbgl.
All dimensions in metres Scale 1:50			Client MCI Developments			Method/ Plant Used Competitor Rig			Logged By KR		

BOREHOLE LOG

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

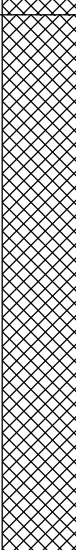
SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick- ness)	DESCRIPTION		
	ES	N6				(0.50) 0.50	MADE GROUND: Brown fine to coarse SAND with occasional limestone gravel.		
1.20								MADE GROUND: Very loose to loose dense black fine to coarse SAND & GRAVEL. Gravel is fine to coarse angular to subrounded of ash, clinker and brick.	
2.00		N4				(3.00)			
3.00		N2				3.50			
3.80						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.		
4.00		N4				4.00	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 Scale 1:50			Client MCI Developments			Method/ Plant Used Competitor Rig			Logged By KR		

AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSRAW GPJ GINT STD AGS 3.1 GDT 18/8/21

BOREHOLE LOG

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

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION		
1.20	ES	N6				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.			
					(3.55)	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.			
2.00 2.00		N10							
3.00		N5							
4.00		N4				4.00			
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									
									

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 Scale 1:50						Client MCI Developments		Method/ Plant Used Competitor Rig		Logged By KR	

AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSASH GPJ GINT STD AGS 3.1 GDT 18/8/21

BOREHOLE LOG

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

[illegible]

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											WS location followed by TP attempt large hard concrete block / base.

All dimensions in metres Scale 1:50	Client	MCI Developments	Method/ Plant Used	Competitor Rig	Logged By KR
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AGS3 UK BH 21MCI001 - CRABTREE LANE, OPENSHAW.GPJ GINT STD AGS 3 1.GDT 18/8/21

APPENDIX D

- (i) Contamination Test Results
- (ii) Geotechnical Test Results

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 SR4 ASSUMING NO FREE PRODUCT WAS OBSERVED DURING FIELDWORK- SEE 'GUIDANCE NOTES ON CONTAMINATION'.

SGVs are derived from the EA 2009 SGVs 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

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	

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 against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

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

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 against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

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 SGVs 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

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	

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 against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

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

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 against RESIDENTIAL GUIDELINES WITH HOMEGROWN PRODUCE WITH NO FREE PRODUCT.

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 [#]	NAD	NAD	-	Chrysotile & Amosite	Chrysotile	NAD	Chrysotile			A-T-045
Asbestos Matrix (visual) _o	-	-	-	loose insulation	-	-	-			A-T-045
Asbestos Matrix (microscope) _o	-	-	-	loose fibres	loose fibres	-	loose fibres			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _o	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) _o	-	-	-	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: 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					
% 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 [#]	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			µg/kg	100	A-T-052s
Hexachloroethane _A	-	-	<100	<100	-					
Hexachlorocyclopentadiene _A	-	-	<100	<100	-					
Perylene _A	-	-	537	<100	-					

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.

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 $5 \pm 3^{\circ}\text{C}$), 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
Testing Started 23-August-2021
Testing Completed 31-August-2021

Client Reference 21/08758
Client Order No. P0747154
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:

21MCI001

Job No:

750277



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

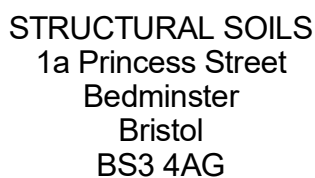


- 3.2 - Moisture Content
- 4.3 - Cone Penetrometer Method
- 4.4 - One Point Cone Penetrometer Method
- 4.6 - One Point Casagrande Method
- 5.3 - Plastic Limit Method
- 5.4 - Plasticity Index

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)



S. Reed

31/08/21

21MCI001

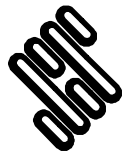
750277



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



**STRUCTURAL
SOILS LTD**

Contract:

21MCI001

Contract Ref:

750277





ECoS 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



ECoS 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 ECoS Environmental

Approved signatories:

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



ECoS 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	Accreditation	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
Cadmium (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
Naphthol	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
Chloride (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
Benzo(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



ECoS Environmental

Low Moor Business Park,
Common Road, Bradford BD12 8ND
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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	Method of Detection	Sample Pretreatment	Limit of Detection	Accreditation	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
Amosite (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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Project Number: F13785

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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
Phlogopite	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



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Project Number: F13785

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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							
ECoS Sample ID			15/02/05	15/02/05	15/02/05	15/02/05	15/02/05
Matrix Type			S0503663	S0503664	S0503665	S0503666	S0503667
			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
Phenols	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



ECoS 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

BH/TP	Top Depth / m	Bottom Depth / m	Customer ID	Sample Type	Date Sampled	Receipt Date	ECoS Sample ID	Matrix Type	BH07	BH08	BH09	BH10	BH10
									4.85	4.85	6.95	2.75	4.85
Determinand	Units								008	008	011	004	008
									15/02/05	15/02/05	15/02/05	15/02/05	15/02/05
									S0503663	S0503664	S0503665	S0503666	S0503667
									Soil	Soil	Soil	Soil	Soil
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
Anthrophyllite	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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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
Phenols	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



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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		
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
Asbestos (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



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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

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.



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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



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Reporting Date: Wednesday 2 March 2005

Comments

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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

Signed: 

For and on behalf of ECoS 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

Date of Monitoring: 09/09/2021



Ground Gas Monitoring Round 1

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

Date of Monitoring: 29/09/2021



Ground Gas Monitoring Round 2

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 ₂ S	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 DESTROYED												

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 DESTROYED ON WELL 3. REPLACED. DRY AND MILD
Equipment Used:	GA5000
	Solinst Mini Interface Meter
Visible signs of damage/stress:	
Other Comments/Observations:	pressure steady

Date of Monitoring: 01/11/2021



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

Date of Monitoring: 16/11/2021



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

Date of Monitoring: 07/12/2021



Ground Gas Monitoring Round 5

[illegible]

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

Date of Monitoring: 12/12/2021



Ground Gas Monitoring Round 6

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 ₂ S	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	WELL DESTROYED												

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.



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.

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.

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.

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 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)

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 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. 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 300µ thick (1200 gauge)". Please note the alteration from 300mm (as stated in the Approved Document C) to 300µ, as 300mm is a typographical error that has been recognised and corrected for within this report and CIRIA Report 665.

Low Rise Residential (NHBC)

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

Classification	Methane ¹		Carbon Dioxide ¹	
	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				
Amber 1	1	0.13	5	0.78
	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

21CHE267/DSGI

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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. 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. Active ventilation can always be designed to meet good performance. Mechanically assisted systems come in two main forms:

			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.
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	Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances.
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.

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.

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.

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

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.

This report was prepared by Betts Geo Environmental Ltd for the sole and exclusive use of MCI Developments Homes. In response to particular instructions, any other parties using the information

contained in this report do so at their own risk and any duty of care to those parties is excluded.

This document has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Betts Geo Environmental Ltd must be sought.

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