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LAND TO THE REAR OF 1-3 LAKESIDE VIEW, HALEWOOD

Site Investigation & Ground Assessment



Prepared for:

MAC ROOFING AND CONTRACTING LIMITED

Report Ref: BEK-23116-2

November 2023



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Project Quality Assurance Information Sheet

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LAND TO THE REAR OF NO 1-3 LAKESIDE VIEW, HALEWOOD

Site Investigation & Ground Assessment

PROJECT NO: 23116

REPORT REF: BEK-23116-2

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REVISION STATUS / HISTORY

Rev	Date	Issue / Comment	Prepared	Checked

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Unless explicitly agreed otherwise, in writing, this report has been prepared under BEK's limited standard Terms and Conditions as included within our proposal to the Client. The report needs to be considered in the light of the BEK proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

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1. INTRODUCTION

1.1 Appointment

1.1.1 BEK Enviro (BEK) has been commissioned by MAC Roofing and Contracting Limited to carry out a site investigation & contamination assessment for the land located to the rear of No 1-3 Lakeside View (hereafter referred to as 'the site'). The site investigation will inform a quantitative risk assessment with respect to contamination and will include a geotechnical assessment to provide recommendations for foundation design.

1.1.2 The site occupies an irregular shaped plot of land of approximately 2.14 hectares (24100 m²) which largely comprises well-kempt grassland, shrubs, a car park area to the south-west and a large central lake.

1.1.3 The site location and layout is illustrated on BEK Drawing No 23116-1 and 23116-2, copies of which are presented in Appendix E.

1.2 Proposed Development

1.2.1 This report has been produced to support a planning application for the construction of No. 18 residential dwellings including associated access, car parking, and other amenities at the Halewood site.

1.2.2 The proposed layout is presented on Architectural Emporium Drawing No 2.002 entitled 'Proposed Site Plan 02' dated 25th August 2023, a copy of which is presented in Appendix E and an extract of which is provided below.



Figure 1: Extract from the Proposed Development

1.3 Objective & Scope of Work

- 1.3.1 The site investigation was undertaken by BEK during October 2023 in accordance with the recommendations detailed in the BEK Preliminary Risk Assessment (PRA), Report Ref: BEK-23116-1, dated September 2023.
- 1.3.2 This report has been prepared to provide a summary of the site details and ground conditions encountered as well as provide a geotechnical assessment for foundation design.
- 1.3.3 The PRA should be read in conjunction with this report.

1.4 Limitations

- 1.4.1 The conclusions and recommendations presented in this report are the result of our professional interpretation of the information currently available. BEK reserve the right to amend the conclusions and recommendations if further information becomes available.
- 1.4.2 However, it should be noted that much of the information has been derived from reports written by others and BEK takes no responsibility for the accuracy of that information. Notwithstanding the above, the reports reviewed have all been written by professional environmental consultants with a duty of care to provide relevant and accurate information.
- 1.4.3 The comments given in this report and the opinions expressed are based on review of reports provided to BEK, ground conditions encountered during site works and the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigations and therefore could not be taken into account.
- 1.4.4 The presence of invasive plant species (ie Japanese Knotweed) is outside the remit of this assessment.

2. BACKGROUND INFORMATION

2.0.1 This section provides an overview of the findings and recommendations presented in the PRA.

2.1 Site Location, Layout & History

2.1.1 The site occupies an area of land located to the north-east of Lower Road. The site is located approximately 11.5 km south-east of Liverpool centre and approximately 14.7 km west of Warrington centre. The National Grid Reference for the centre of the site is 345818, 385925.

Site History

2.1.2 Based on the earliest available maps dating from 1849 the site was occupied by vacant undeveloped land with a pond in the northernmost part of the site. The site remained vacant until circa 1890-1893 when a building was noted to be present in the west of the site and railway sidings were noted to infringe on the southern site periphery; the pond was absent at this time. No changes to the site were then noted until circa 1967-1971 where an additional building was present to the east of the existing building in the west of the site. The site then remained relatively unchanged until circa 2000 when a large lake was noted to be present in the east and centre of the site. Trucks, trailers and gravel tracks were present on site circa 2000. The building present in the west of the site was demolished circa 2016 and a hardstanding carpark built in the same place.

2.2 Environmental Setting

Geology

2.2.1 The superficial deposits comprise Devensian Till (Boulder Clay) that is laterally continuous on a regional scale. This strata generally has low permeability.

2.2.2 The underlying solid geology comprises the 'Wilmslow Sandstone Formation' which typically comprises 'red-brown to brick-red, fine to medium grained sandstones with sporadic siltstones'. This strata generally has a high permeability.

Linear Features

2.2.3 There is one fault line located some 18 m south-west of the site

Mining and Ground Stability

2.2.4 Information in the Enviro+GeoInsight Report indicates that the site is located in an area that may have been affected by coal mining. However, the site is not located within a Coal Authority designated 'Development High Risk Area' and in accordance with the Coal Authority 'Risk Based Approach to Development Management' the risks from coal mining are not considered further.

2.2.5 There are two records of surface ground workings located within 250 m of the site as shown in Table 1 below:

Location	Land Use	Year of Mapping
20 m south-west	Ponds	1851
39 m east	Refuse Heap	1989

Table 1: Summary of Surface Ground Workings

2.2.6 Hazard ratings associated with ground subsidence at the site, as summarised below:

Shrink-Swell Clay:	Very Low
Landslides:	Very Low/Low
Dissolution of Soluble Rocks:	Negligible
Compressible Deposits:	Negligible
Collapsible Deposits:	Very Low
Running Sands:	Very Low

2.2.7 It can be seen from the above that the site is unlikely to be affected by natural ground instability issues.

Hydrogeology

2.2.8 Superficial Boulder Clay underlying the site is classified by the Environment Agency (EA) as 'Secondary (Undifferentiated)' aquifer which is assigned where it is not possible to attribute a category.

2.2.9 The underlying bedrock is classified as 'Principal' aquifer which are described as 'Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base on a strategic scale'. These aquifers were formerly referred to as 'major aquifers'.

2.2.10 The majority of the site is located within a Zone 3 (Total catchment) groundwater source protection zone. The northern corner of the site is located within a Zone 2 (Outer catchment) groundwater source protection zone.

Hydrology

- 2.2.11 A lake is located in the center and east of the site. A drainage ditch is present off-site and borders the eastern site periphery. Both features are noted to contain water all year round.
- 2.2.12 There are 14 off site surface water features located within 250 m of the site as summarised in Table 2 below.

Location	Type	Ground Level	Name
49 m south-west	Inland River	Surface	N/A
53 m south-west	Inland River	Underground	N/A
59 m south-west	Inland River	Surface	N/A
62 m south-east	Inland River	Surface	N/A
80 m south-east	Inland River	Surface	N/A
91 m east	Inland River	Surface	N/A
130 m north-east	Inland River	Surface	N/A
143 m south-east	Inland River	Surface	N/A
191 m north-east	Inland River	Surface	N/A
191 m south	Inland River	Surface	N/A
220 m north-east	Inland River	Surface	N/A
224 m north-east	Inland River	Surface	Ditton Brook
239 m north-east	Inland River	Underground	Ditton Brook
249 m north-east	Inland River	Surface	N/A

Table 2: Summary of Surface Water Features

- 2.2.13 There are two registered licensed discharge consents located in the east of the site summarised in Table 3 below. The receiving water for both discharges was a tributary to the 'Ditton Brook' which is likely to represent the drainage channel identified during the site walkover.

Location	Effluent Type	Permit Number	Effective Date
On site	Sewage Discharges – Pumping Station – Water Company	016982114	01/01/1900
On site	Sewage Discharges – Pumping Station – Water Company	01KNW0007	01/01/1995

Table 3: Summary of Registered Licensed Discharge Consents

Contaminated Land & Landfill Activities

- 2.2.14 There are no records of current/historic landfills or waste management facilities located on or within 250 m of the site.

2.2.15 There are 30 registered waste exemptions located within 250 m of the site, the closest of which refers to the 'use of waste in construction' circa 77 m south of the site. These are unlikely to impact on the site.

2.2.16 There are two Environmental Agency pollution incidents located within 250 m of the site as summarised in Table 4 below:

Location	Incident ID	Pollutant Description	Impact	Incident Date
18 m west	141478	Crude Sewage	Water: Minor	06/03/2003
			Land: No Impact	
			Air: No Impact	
77 m south	1857	Crude Sewage	Water: Minor	07/04/2001
			Land: No Impact	
			Air: No Impact	

Table 4: Summary of EA Pollution Incidents located within 250 m of the site.

2.2.17 There are five historical potentially contaminative land uses located within 250 m of the site as summarised in Table 5 below.

Location	Land Use	Date
On site (east)	Unspecified Works	1967
On site (east)	Unspecified Commercial/Industrial	1989
On site (east)	Unspecified Commercial/Industrial	1975
39 m east	Refuse Heap	1989
80 m east	Unspecified Tanks	1950 - 1989

Table 5: Summary of Historical Potentially Contaminative land uses

2.2.18 The closest current potentially contaminative land use to the site is a pump located 7 m west of the site.

Sensitive Land Uses

2.2.19 The site is not affected by any of the ecological systems identified as a statutory receptor in the DETR Circular 01/2006.

Radon

2.2.20 Groundsure reports that 'less than 1% of homes are above the action trigger level' and that no radon protective measures are necessary in the construction of new dwellings or extensions.

Unexploded Ordnance

- 2.2.21 The regional unexploded bomb risk map from Zetica (2014) indicates that the site is in an area at LOW risk from possible Unexploded Ordnance (UXO) resulting from the Second World War. BEK do not consider any further assessment to be required with respect to UXO.

2.3 Conclusions & Recommendations

- 2.3.1 Based on the findings of the Preliminary Risk Assessment, low-level risks were identified to human health, controlled waters, flora and property (including services) with respect to the re-development of the site to residential.
- 2.3.2 BEK recommended that site investigation works should be carried out to characterise the shallow ground conditions and to quantify the potential risks identified. The site investigation would also provide sufficient information to support a geotechnical assessment to inform foundation design options.
- 2.3.3 If the ground conditions differed from those expected it was deemed necessary to recover samples for chemical testing as part of a quantitative risk assessment.

3. SITE INVESTIGATION

3.1 General

- 3.1.1 This section provides a summary of the site investigation works undertaken by BEK during October 2023.
- 3.1.2 The site investigation has been designed to provide indicative information for the ground conditions across the site and to provide a quantitative assessment of potential risks associated with contamination and ground gas. The site investigation was also designed to provide recommendations with respect to foundation design.
- 3.1.3 Seventeen exploratory locations were set out by the site engineer to establish representative conditions at the site. The exploratory locations are illustrated on BEK Drawing No 23116-3, a copy of which is presented in Appendix E.

3.2 Trial Pits

- 3.2.1 Eleven trial pits were excavated across the site using a JCB 3CX machine to a maximum depth of 2.0 m.
- 3.2.2 Representative samples were recovered for chemical testing in accordance with the requirements set out in the PRA.
- 3.2.3 The ground conditions were recorded by an engineer from BEK and copies of the trial pit records are presented in Appendix A. A series of photographs showing the trial pits are presented in Appendix E.
- 3.2.4 All exploratory locations are illustrated on BEK Drawing No 23116-3 presented in Appendix E.

3.3 Window Sample Boreholes

- 3.3.1 Six window samples were drilled using a window sample borehole rig to a maximum depth of 5.45 m. Borehole locations were set out by the site engineer in order to establish representative conditions at the site. In-situ testing (SPTs) were carried out in each of the boreholes.
- 3.3.2 The ground conditions were recorded by an engineer from BEK and samples were recovered for chemical testing. Gas and groundwater monitoring probes were installed in four of the boreholes (Borehole No WS2, WS3, WS5 & WS6), the details of which are presented in the borehole records.

- 3.3.3 Copies of the borehole records are presented in Appendix A. The window sample borehole locations are illustrated on BEK Drawing No 23116-3 presented in Appendix E.

3.4 Laboratory Testing

- 3.4.1 Following a review of the ground conditions, BEK selected representative samples for chemical testing based on the recommendations set out in the PRA and ground conditions encountered during the investigation.

- 3.4.2 The samples were delivered to the UKAS laboratory of Envirolab for the following selected analysis:

Nine samples were tested: Arsenic (Total), Cadmium (Total), Copper (Total), Lead (Total), Nickel (Total), Zinc (Total), Chromium (Total), Selenium (Total), Mercury (Total), Boron (Soluble), Hexavalent Chromium, Cyanide (Total), pH, 16 EPA Poly-Aromatic Hydrocarbons (PAH), Total Phenols, Total Sulphate, Sulphate 2:1 extract, Soil Organic Matter, Total Petroleum Hydrocarbon Compounds (TPH-CWG) and Asbestos Screen

One sample was tested for Semi-volatile Organic Compounds (SVOCs) and Volatile Organic Compounds (VOCs).

Three samples of natural strata were tested for pH and Water Soluble Sulphate 2:1

- 3.4.3 Copies of the chemical test results are presented in Appendix B.

Geotechnical Testing

- 3.4.4 Geotechnical testing was carried out on three bulk samples by the UKAS accredited laboratory of Murray Rix.

- 3.4.5 Three samples were tested for Plasticity Index testing and Natural Moisture Content.

- 3.4.6 Copies of the geotechnical test results are presented in Appendix C.

3.5 Ground Conditions

Made Ground – South-west of Site (Car Park and Grassed Areas)

- 3.5.1 The south-west of the site is overlain by laterally continuous heterogenous made ground to depths varying from 0.5 m (Trial Pit TP10) to 1.4 m (Borehole No WS6).

- 3.5.2 Made ground present in the south-west of the site generally comprised the following subtypes:

'Brown/Blackish brown ashy clayey sandy gravel. Sand is fine to course. Gravel is fine to course brick, concrete and clinker' – This strata was encountered at the surface of Trial Pit TP10 to a depth of 0.2 m, as well as below ground in Trial Pits TP10 and TP11 to depths varying from 0.5 m (Trial Pit TP10) to 0.6 m (Trial Pit TP11). This strata was noted to contain fragmented sandstone and whole brick within Trial Pit TP11.

'Partially broken hardstanding of concrete, tarmac and brick with sticky bituminous material. Slight hydrocarbon odor' – This strata was encountered within Trial Pit TP10 between 0.2 m and 0.3 m depth.

'Grass onto brown sandy slightly gravelly clay. Sand is fine to course. Gravel is fine to medium brick and concrete' – This strata was encountered at the surface of Trial Pit TP11 to a depth of 0.1 m.

'Grass onto black ashy gravelly sand. Sand is fine to course. Gravel is fine to course brick, concrete, clinker and stone of mixed lithologies' – This strata was encountered at the surface of Borehole WS6 to a depth of 0.6 m.

'Loose greyish brown slightly ashy slightly gravelly clay. Sand is fine to course. Gravel is fine to course brick and stone of mixed lithologies. Occasional black ashy lenses' – This strata was encountered within Borehole WS6 between 0.6 m and 1.4 m depth.

Made Ground – North, East and Central Areas (Land surrounding Lake)

- 3.5.3 The north, east and central areas of the site are overlain by laterally continuous heterogenous made ground to depths varying from 0.15 m (Borehole No WS5) to within excess of 1.3 m (Trial Pit TP4).

- 3.5.4 Made ground present in these areas of the site generally comprised the following subtypes:

'Beige sandy gravel. Sand is fine to course. Gravel is fine to medium angular limestone' – This strata was encountered at the surface of Trial Pit TP1 to a depth of 0.15 m and at the surface of Borehole No WS4. This strata represents a gravel path which follows the perimeter of the lake. This path was in part grassed over and contained a weed control membrane at the base of the layer.

'Brown slightly sandy slightly gravelly CLAY' Sand is fine to course. Gravel is fine to course brick, concrete and stone of mixed lithologies' – This strata was encountered in Trial Pits TP1, TP2, TP3, TP7, TP8 & TP9, as well as at the surface of Borehole No WS1, WS2 & WS4. This strata was noted to contain varying proportions of whole/broken brick, pottery and plastic.

'Brown sandy gravelly CLAY. Sand is fine to course. Gravel is fine to course brick, concrete, glass and pottery. Occasional concrete cobbles' – This strata was encountered at the surface of Trial Pits TP4, TP5 & TP9 and was noted to contain frequent whole/broken brick in Trial Pits TP4 and TP9 and varying proportions of wood, plastic, metal, rags and fabric within each trial pit.

'Grass onto dark brown ashy gravelly clayey sand. Sand is fine to course. Gravel is fine to course brick and concrete. Occasional brick cobbles, concrete cobbles, plastic, glass and pottery' – This strata was encountered at the surface of Trial Pit TP6 to a depth of 0.7 m and was noted to contain a band of 'hard black ashy clinker' at 0.4 m depth.

'Grass onto brown slightly sandy slightly gravelly clay. Sand is fine to course. Gravel is fine to medium stone of mixed lithologies. (TOPSOIL)' – This strata was encountered at the surface of Borehole No WS3 to a depth of 0.3 m.

'Dark brown slightly ashy slightly sandy slightly gravelly clay. Sand is fine to course. Gravel is fine to course brick, concrete, clinker and stone of mixed lithologies' – This strata was encountered at the surface of Borehole No WS5 to a depth of 0.15 m.

- 3.5.5 The base of made ground was proven in all exploratory locations excluding Trial Pit TP4 due to a water strike and subsequent pit collapse.

Natural Strata

- 3.5.6 Natural strata underlying the made ground was generally uniform across the site as described below:

'Reddish brown mottled slightly sandy slightly gravelly clay. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML. (Boulder Clay)' was encountered below made ground in all exploratory locations excluding Trial Pit TP4 to depths within excess of 5.45 m (Boreholes WS3 and WS5).

'Reddish brown slightly gravelly sandy clay. Sand is fine to course. Gravel is fine to medium stone of mixed lithologies' was encountered in Borehole No WS3, WS4 & WS5 to depths varying from 1.1 m (Borehole No WS3) to 2.4 m (Borehole No WS5).

'Grey clayey silty fine to medium sand' was encountered below made ground in Trial Pit TP2 between 0.5 m and 0.6 m depth.

3.5.7 Bedrock was not encountered during the site investigation works.

Visual Evidence of Contamination

3.5.8 Made ground encountered within Trial Pits TP6, TP10 & TP11, as well as within Borehole No WS5 & WS6 contained varying proportions of ash and clinker. A slight hydrocarbon odour was noted within made ground at Trial Pit TP10 comprising 'partially broken hardstanding of concrete, tarmac and brick with sticky bituminous material'.

Groundwater

3.5.9 A summary of groundwater encountered during the site investigation is presented in Table 6 below:

Location	Depth to Water (m) bgl	Depth to Base (m) bgl	Comment
TP4	1.2	1.3	Water strike
TP8	1.1	1.2	Water strike
TP9	1.1	1.1	Water strike
TP10	1.0	1.5	Water strike
WS5	1.0	5.45	Water strike

Table 6: Summary of Groundwater Encountered During Site Investigation

3.6 Environmental Monitoring

3.6.1 Gas and groundwater monitoring is ongoing and the results will be assessed within an addendum report which will be completed when the gas monitoring programme has been completed.

3.6.2 However, a summary of the monitoring undertaken to date (2 monitoring visits) is provided below.

Groundwater

3.6.3 Groundwater levels have been monitored in the boreholes and are summarised in Table 7 below.

Location	Depth to Water (m) bgl	Depth to Base (m) bgl
WS2	0.59 - 0.69	3.00
WS3	0.3 - 0.63	4.06 - 4.07
WS5	0.11 - 0.67	4.19 - 4.20
WS6	1.10 – 1.14	4.29 - 4.33

Table 7: Summary of Groundwater Encountered During Groundwater Monitoring

- 3.6.4 Note that this is the result of two monitoring visits. Seasonal variations in water levels cannot be accounted for over the short monitoring period.

Gas Monitoring

- 3.6.5 The boreholes have been monitored for ground gas on 3 occasions to date and a summary of the gas monitoring results are presented in Table 8 below.

Location	Range of Concentrations (% v/v)			Max Flow Rate (l/hr) (steady state)
	Carbon Dioxide	Methane	Oxygen	
WS2	0.9 – 4.6	0	17.1 - 20	0
WS3	0 – 3.1	0	13.9 – 20.8	0
WS5	2.2 - 2.3	0	18 – 18.2	0
WS6	2.2 - 6	0	10.4 - 16.2	0

Table 8: Summary of Gas Monitoring Data

- 3.6.6 It can be seen from the above table that all the gas flow rates are zero l/hr for all boreholes. This resulted GSVs for carbon dioxide and methane which fall below the lowest threshold (0.07 l/hr) for all locations at the site, meaning the site would be classified as Characteristic Situation 1 (very low risk) as per guidance document CIRIA C665 (Assessing Risks Posed by Hazardous Ground Gases to Buildings).
- 3.6.7 However, consideration must be given to the ‘typical maximum’ concentrations for methane (1%) and carbon dioxide (5%). Where concentrations exceed the typical maximum, consideration should be given to increasing the risk level. It can be seen from Table 8 above, that the typical maximum concentration for carbon dioxide was exceeded in Borehole No WS6 (concentration of 6 %).
- 3.6.8 Based on the ground gas monitoring to date (3 monitoring visits), the risks from ground gas at the site are considered to be low and measures in accordance with Characteristic Situation 2 may be required.
- 3.6.9 The Gas Risk Assessment will be prepared as a separate report.

4. CONTAMINATION RISK ASSESSMENT

4.1 Potentially Significant Pollutant Linkages

4.1.1 Potentially significant pollutant linkages have been identified in the PRA as listed below:

- (i) Human Health - risks associated with contamination in the made ground and/or natural strata: risk via ingestion (soil or home-grown produce), inhalation (dust or vapour) or direct contact.
- (ii) Human Health - risks associated with indoor inhalation of volatile organic compounds and/or ground gas.
- (iii) Controlled Waters - risks associated with contamination in the site soil and made ground affecting water quality in the bedrock Secondary A aquifer, as well as the quality of perched water/surface water features on/within the vicinity of the site. Risks are associated with dissolution of contamination into perched water/leachate and lateral/vertical migration to water receptors.
- (iv) Property - risks associated with contamination affecting concrete, service pipes and flora.

4.2 Risk Assessment: Human Health Risks from Exposure to Contaminated Soil

4.2.1 The risks to human health have been assessed by inspection of shallow soils for the presence of elevated contaminants based on the expected contaminant findings detailed in the conceptual model and completion of a quantitative risk assessment.

4.2.2 The soil contamination concentrations have initially been compared to a range of generic assessment criteria. These include the use of the Land Quality Management and Chartered Institute of Environmental Health assessment criteria (S4ULs), the Contaminated Land: Applications in Real Environments assessment criteria (CL:AIRE) Category 4 Screening Levels (C4SLs) and the ATKINS ATRISK Screening Criteria.

4.2.3 These assessment criteria have been derived using the CLEA model and fully justified input parameters. The derivation of the assessment criteria assumes a residential end use with plant uptake. The initial assessment assumes a soil organic matter (SOM) of 1% as a conservative approach.

4.2.4 Table 9 summarises the chemical test results for the samples tested and lists the relevant assessment criteria and the samples with a concentration in excess of the assessment criteria. Note that only determinands with a concentration above the laboratory limit of detection are presented in the table below:

Determinand	Range of Concentrations (mg/kg)	Assessment Criteria (mg/kg)	Samples Fail
Arsenic	<1 - 83	37 ¹	TP11 (0.4 m)
Cadmium	<0.5 – 2.3	11 ¹	---
Copper	9 - 400	2400 ¹	---
Chromium	8 - 29	910 ¹	---
Lead	8 - 271	210 ²	TP4 (0.6 m)
Nickel	7 - 57	180 ¹	---
Selenium	<1 - 1	250 ¹	---
Zinc	17 - 614	3700 ¹	---
Acenaphthene	0.01 – 1.52	210 ¹	---
Acenaphthylene	<0.01 - 0.32	170 ¹	---
Anthracene	<0.02 – 2.22	2400 ¹	---
Benzo(a)anthracene	0.1 – 11.6	7.2 ¹	TP8 (0.1 m)
Benzo(a)pyrene	0.11 – 11.4	5 ²	TP8 (0.1 m)
Benzo(b)fluoranthene	0.08 – 13.2	2.6 ¹	TP8 (0.1 m), TP9 (0.2 m)
Benzo(ghi)perylene	<0.05 – 6.12	320 ¹	---
Benzo(k)fluoranthene	<0.07 – 4.33	77 ¹	---
Chrysene	0.09 – 9.82	15 ¹	---
Dibenzo(ah)anthracene	<0.04 – 1.37	0.24 ¹	TP8 (0.1 m), TP9 (0.2 m)
Fluoranthene	0.1 – 21.9	280 ¹	---
Fluorene	<0.01 – 2.22	170 ¹	---
Indeno(123-cd)pyrene	0.04 – 8.15	27 ¹	---
Napthalene	<0.03 – 1.76	2.3 ¹	---
Phenanthrene	0.07 – 8.25	95 ¹	---
Pyrene	0.1 – 19.4	620 ¹	---
2-Methylnapthalene	0.189	10.98 ³	---
1,1,2,2-Tetrachloroethane	0.212	1.6 ³	---
1,2,4-Trimethylbenzene	0.029	9.30 ³	---
Ali HCs >C6-C8	<0.01 - 0.03	100 ¹	---
Ali HCs >C8-C10	<1 - <20	27 ¹	---
Ali HCs >C10-C12	<1 - 64	130 ¹	---
Ali HCs >C12-C16	<1 - 250	1100 ¹	---
Ali HCs >C16-C21	<1 - 267	65000 ^{*1}	---
Ali HCs >C21-C35	4 - 1190	65000 ^{*1}	---
Aro HCs >C8-C10	<1 - <20	34 ¹	---
Aro HCs >C10-C12	<1 - 49	74 ¹	---
Aro HCs >C12-C16	1 - 321	140 ¹	TP10 (0.3 m)
Aro HCs >C16-C21	2 - 200	260 ¹	---
Aro HCs >C21-C35	4 - 298	1100 ¹	---
Asbestos ID	1 of 9 samples	N.A.D	TP9 (0.2 m)

Table 9: Summary of Elevated Contaminants of Concern in Soils

1 CIEH/LQM Derived Assessment Criteria (S4ULs based on 1% SOM)

2 Category 4 Screening Levels (C4SL)

3 BEK Derived Assessment Criteria

4.2.5

It can be seen from the above that there are elevated concentrations of arsenic, lead, several PAH compounds (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and dibenzo(ah)anthracene) and speciated Total Petroleum Hydrocarbons (Aro >C12-C16).

- 4.2.6 It can also be seen that one of the nine samples tested positive for the presence of asbestos.

Further Assessment – Arsenic, Lead & Polycyclic Aromatic Hydrocarbons

- 4.2.7 Further assessment of the elevated concentrations of arsenic, lead and PAH compounds shows that there are no identifiable point sources for contamination as the contamination is relatively widespread within several subtypes of made ground throughout the western, north-western, southern and central areas of the site.
- 4.2.8 The principal routes of exposure for the elevated arsenic, lead and PAH compounds comprise the ‘consumption of homegrown produce and attached soil’ and the ‘ingestion of soil and indoor dust’ pathways.
- 4.2.9 Specific mitigation measures will be required to address the arsenic, lead and PAH contamination at the site. Considering that all contaminant levels were less than one order of magnitude more than their respective generic assessment criteria, the mitigation measures will comprise a robust capping system in soft landscaped areas to mitigate the risks to end users from the underlying arsenic, lead and PAH contamination within the made ground. This will form a physical barrier between the source of contamination and the end user breaking the major pathways of dermal contact, ingestion of soil and consumption of home grown produce.

Further Assessment – Speciated Total Petroleum Hydrocarbons

- 4.2.10 Elevated speciated total petroleum hydrocarbons (Aro >C12-C16) were encountered within Trial Pit TP10 (0.3 m) within made ground described as *‘partially broken hardstanding of concrete, tarmac and brick with sticky bituminous material’*. This correlates with olfactory observations within the strata described as a ‘slight hydrocarbon odour’.
- 4.2.11 Given that this specific fraction of hydrocarbons is regarded as relatively non-volatile and the principal route of exposure is through the ‘consumption of homegrown produce and attached soil’ and the ‘ingestion of soil and indoor dust’, the mitigation measures for this contaminant will also comprise a robust capping system in soft landscaped areas.

Further Assessment - Asbestos

- 4.2.12 In order to provide an assessment of the potential risks from asbestos within the soils, additional quantification testing was carried out on the sample which proved positive with respect to the presence of asbestos.

- 4.2.13 The location of the positive asbestos sample, the type of asbestos contained within the sample and the quantification result for each asbestos component is provided within Table 10 below:

Location/Depth	Asbestos Type/ Matrix Description	Quantification Result (% w/w)	
		Board	Loose Fibres
TP9 (0.2 m)	Amosite & Chrysotile – Board & Loose Fibres	0.079	<0.001

Table 10: Summary of Asbestos Quantification Testing in Positive Samples

- 4.2.14 It can be seen from the above table that the sample recovered from Trial Pit TP9 contained an asbestos concentration of 0.079 %. The majority of asbestos present was found to be asbestos board at 0.079%, whilst loose asbestos fibres were found to be at trace (<0.001%).
- 4.2.15 To further assess the potential issues with the asbestos present at the site, site specific information (ie type, concentration and end use) were input into the 'Joint Industry and Working Group' (JIWG) risk scoring algorithm for receptor ranking. Where parameters were unknown, the most conservative data was input into the algorithm.
- 4.2.16 From this assessment it can be seen that the combined hazard, receptor and exposure ranking for the asbestos encountered within Trial Pit TP9 is low. Based on the testing carried out work on the soils/made ground within the vicinity of Trial Pit TP9 should be regarded as non-licensed work.
- 4.2.17 It may be prudent to carry out all sub-surface ground works in accordance with an Asbestos Management Plan given the potential for further asbestos to be present on site.
- 4.2.18 As BEK cannot rule out further localised hotspots of asbestos within the made ground across the site, specific mitigation measures will be required within the soft landscaped areas of the development to mitigate the risks to end users associated with the potential presence of asbestos in the shallow soils at the site.

4.3 Risk Assessment: Human Health Risks from Exposure to Hazardous Gases

- 4.3.1 Based on the ground gas monitoring to date (2 monitoring visits), the risks from ground gas at the site are considered to be low and measures in accordance with Characteristic Situation 2 may be required.
- 4.3.2 The Gas Risk Assessment will be prepared as a separate report.

4.4 Risk Assessment: Controlled Waters

- 4.4.1 Potential risks to the quality of surface water and groundwater have been identified in the ground conceptual model.
- 4.4.2 The nearest surface water to the site is a lake located in the centre and east of the site. Further surface water features include a drainage ditch located immediately east of the eastern site periphery which is noted to drain into Netherley Brook some 220 m north-east of the site. The superficial deposits at the site comprise Boulder Clay and are not considered to represent a potential receptor. The PRA also identified that the underlying bedrock is classified as a 'Principal' aquifer and is therefore a potential receptor.
- 4.4.3 The site investigation encountered groundwater in five of the 17 exploratory locations. This water is considered to represent perched water held within the made ground/more permeable horizons of the superficial boulder clay.
- 4.4.4 The site investigation works also encountered the presence of laterally continuous Boulder Clay extending to depths within excess of 5.45 m. It is considered likely that this relatively impermeable layer will inhibit the vertical migration of contamination to the underlying bedrock. As such, the potential risks to the water quality of the bedrock aquifer are considered to be very low to negligible and are not considered further.
- 4.4.5 However, risks still remain with respect to the shallow perched water which has the potential to migrate to the on-site lake and off-site drainage ditch. Therefore, BEK considered it prudent to recover groundwater samples from the borehole installations at the site. The chemical test results for the groundwater samples recovered and the further risk assessment is presented below.

Chemical Test Results & Assessment

- 4.4.6 As part of a Tier 1 assessment the concentrations have been compared with the UK DWS Water Supply (Water Quality) Standards (DWS).
- 4.4.7 Where no UK DWS have been established professional judgement has been used to select alternative criteria derived from various sources, e.g. UK Environmental Quality Standards (EQS) derived from the River Basin Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2015), USEPA standards and the Scotland Private Water Supply Regulations (Scotland 2006 SI209).

4.4.8 This is considered to be a conservative approach and consistent with the EA “GP3” Framework¹. Note that only determinands with a concentration above the laboratory limit of detection are presented in the table.

Surface and Groundwater Concentrations

4.4.9 The assessment of the surface and groundwater concentrations is summarised in Table 11. Note that only determinands with a concentration above the laboratory limit of detection are presented in Table 11. Where elevations are noted above the screening criteria requirement for further assessment has been assigned. Further assessment has also been denoted for determinands elevated above the laboratory limit of detection in the absence of screening criteria for a given determinand.

Determinand	Units	Range of Concentrations	Screening Criteria	Further Assessment Required
pH (w)	pH	7.79 – 8.13	6.0 - 9.0	---
Ammoniacal nitrogen as N (w)	mg/l	0.28 – 0.37	0.5 ⁵	---
Chloride (w)	mg/l	21 - 126	250 ²	---
Sulphate (w)	mg/l	83 - 125	250 ¹	---
DOC - Dissolved Organic Carbon (w)	mg/l	8.6 – 10.6	NA	WS2
Arsenic (dissolved)	µg/l	4 - 5	10 ¹	---
Boron (dissolved)	µg/l	77 - 139	1000 ¹	---
Copper (dissolved)	µg/l	4 - 5	2000 ¹	---
Lead	µg/l	<1 - 2	10 ¹	---
Nickel (dissolved)	µg/l	4 - 8	20 ¹	---
Selenium (dissolved)	µg/l	3	10 ¹	---
Zinc (dissolved)	µg/l	3 - 17	5000 ¹	---
Acenaphthene	µg/l	<0.01 - 0.07	5.8 ³	---
Fluoranthene	µg/l	<0.01 – 0.02	0.12 ²	---
Anthracene	µg/l	<0.01 - 0.02	0.1 ²	---
Fluorene	µg/l	<0.01 - 0.04	3 ³	---
Naphthalene	µg/l	<0.01 - 0.07	2.4 ²	---
Phenanthrene	µg/l	<0.01 - 0.11	0.4 ³	---
Pyrene	µg/l	<0.01 – 0.01	0.025 ³	---
Aliphatic Hydrocarbons >C21-C35	µg/l	<5 - 13	6000 ⁴	---
Aromatic Hydrocarbons >C16-C21	µg/l	<5 - 8	90 ⁴	---

Table 11: Summary of Groundwater Assessment

- 1 DWS - UK DWS Water Supply (Water Quality) Regs (England & Wales 2000 SI 3184 & 2010 SI 994, Scotland 2001 SI 207, Northern Ireland 2007 No. 147)
- 2 EQS¹ - UK EQS Water Framework Directive (Standards and Classification Directions (England and Wales) 2015
- 3 USEPA - USEPA Region 3 Freshwater Screening Benchmarks (7/2006)
- 4 WHO DWS – World Health Organisation Drinking Water Standard
- 5 RPV –Scottish Resource Protection Value
- NA No criteria available

¹ Environment Agency, 2013 “Groundwater Protection: Principles and Practice (GP3)”

4.4.10 It can be seen from the above table that there are no elevated concentrations of contaminants within the groundwater on site. Notwithstanding, concentrations of dissolved organic carbon are above the laboratory limit of detection for the sample recovered from Borehole No WS2 where no assessment criteria is currently available.

4.4.11 With consideration to the above, risks to controlled water are considered to be very low to negligible and are not considered further.

4.5 Risk Assessment: Buildings

4.5.1 Risks to buildings include the assessment of the aggressive nature of the shallow ground with respect to concrete, the risks to the degradation of water pipes and flora due to contamination.

Risk to Concrete

4.5.2 To assess the potential risks to concrete, BEK has compared the previous site investigation data to assessment criteria presented in the BRE Special Digest 1: Concrete in Aggressive Ground.

4.5.3 The sulphate concentrations (water soluble 2:1) in the shallow ground range between <0.01 to 0.53 g/l which exceeds the maximum concentration for the BRE 2:1 water/soil extract concentration of Class DS-1 concrete.

4.5.4 However, there is only one exceedance of the 12 samples tested for sulphate as all other sulphate concentrations fall below the maximum concentration for Class DS-1 concrete. The exceedance was present within Trial Pit TP9 at 0.2 m depth and as such, a class of DS-2 concrete will be necessary within proximity to Trial Pit TP9.

4.5.5 With consideration to the range of pH values, the concrete classification suitable for the site would be DS-1 AC-1, whilst a classification of DS-2 AC-2 will be suitable within proximity to Trial Pit TP9.

Risks to Services

4.5.6 Potable water supply pipes can be at risk from degradation if the shallow ground consists of specific organic contamination. Guidance published by UK WIR includes a methodology for the site investigation and risk assessment to determine pipe specification.

4.5.7 For brownfield sites, site investigation may be required along the intended route of the water pipeline and samples recovered from specific depths and tested for specific contaminants of concern.

- 4.5.8 On the basis of the ground conditions encountered, risks to water supply pipelines are considered to be low, however it is recommended that consultation is undertaken with the water service supplier to confirm this.

Risks to Flora

- 4.5.9 Copper, nickel and zinc are toxic to plants. The effects of copper, nickel and zinc are often regarded as additive.
- 4.5.10 The assessment criteria used for copper, nickel and zinc, are 'pseudo total concentrations' are derived from BS3882:2007 as follows:

Phytotoxic Contaminant	pH Range		
	<6.0	6.0 to 7.0	>7.0
Zinc (nitric acid extractable)	<200	<200	<300
Copper (nitric acid extractable)	<100	<135	<200
Nickel (nitric acid extractable)	<60	<75	<110

Table 12: Limits for Phytotoxic Contaminants (Units mg/kg)

- 4.5.11 By comparing the chemical test results (Appendix B) to the concentrations in the above table, it can be seen that there are a number of elevated phytotoxic contaminants of concern. These are summarised in the table below:

Determinand	Number of Elevated Samples	Location of Elevation
Zinc	5/9	TP4 (0.6 m), TP6 (0.4 m), TP9 (0.2 m), TP11 (0.4m), WS2 (1.0 m)
Copper	3/9	TP6 (0.4 m), TP11 (0.4 m), WS2 (1.0 m)

Table 13: Number of Elevated Phytotoxic Samples and their Respective Locations

- 4.5.12 It can be deduced from the above table that the elevated phytotoxic contaminants are relatively widespread and are not localised to any particular features or locations.

4.6 Risk Assessment: Conclusions

- 4.6.1 The site is overlain by laterally continuous heterogeneous made ground to depths varying from 0.15 m (Borehole No WS5) to 1.4 m (Borehole No WS6). The made ground comprised multiple subtypes but generally comprised reworked clays and gravels with varying proportions of brick and concrete. Also found in certain locations were varying proportions of clinker, pottery, glass, plastic, wood and metal. Asbestos described as 'Board & Loose Fibres' was identified within Trial Pit TP9 (0.2 m).

- 4.6.2 The base of made ground was proven at all exploratory locations excluding Trial Pit TP4 where influx of water held within the made ground resulted in collapse of the pit.
- 4.6.3 Natural strata comprising boulder clay was relatively consistent across the site and was encountered below made ground at all exploratory locations excluding Trial Pit TP4. Bedrock was not encountered during the site investigation.
- 4.6.4 Made ground and natural strata samples recovered from the site investigation have been tested for a wide range of contaminants in accordance with the recommendations outlined within the PRA and based on the observations made during the site investigation. The chemical test results have been compared to relevant generic assessment criteria to identify any potential contaminants of concern.
- 4.6.5 The potential risks to human health and flora identified are summarised within Table 14 below:

Receptor	Locations	Contaminants of Concern	Significant Pathway	Secondary Pathway
Human Health	Widespread Made Ground	Arsenic, Lead, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(ah)anthracene	Ingestion of soil and indoor dust	Consumption of homegrown produce and attached soil
	Made Ground described as 'partially broken hardstanding of concrete, tarmac and brick with sticky bituminous material' encountered within Trial Pit TP10	Aro >C12-C16	Consumption of homegrown produce and attached soil	Ingestion of soil and indoor dust
	Made Ground described as 'Brown sandy gravelly CLAY. Sand is fine to course. Gravel is fine to course brick, concrete, glass and pottery. Frequent whole and broken brick. Occasional concrete cobbles. Rare wood, plastic and metal' encountered within Trial Pit TP9	Asbestos	Inhalation	
Flora	Widespread Made Ground	Zinc and Copper	Assimilation by flora	

Table 14: Active Risk Pathways

- 4.6.6 Potential risks to services pipes are considered to be low but advice should be sought from the water supply provider. Risks to concrete are considered to be low and concrete classification of DS-1 AC-1 will be suitable for the majority of the site excluding the areas within proximity to Trial Pit TP9 which will require a classification of DS-2 AC-2.

- 4.6.7 Risks from ground gas have been identified, however the gas monitoring programme is on-going and a Ground Gas Risk Assessment will be prepared as a separate report on completion of the monitoring.
- 4.6.8 Risks to controlled waters are considered to be very low to negligible.

5. GEOTECHNICAL ASSESSMENT

5.1 General

5.1.1 The proposed development consists of the construction of new residential properties, the units are presumed to be a mix of detached, semi-detached and terraced dwelling houses. It is anticipated that the new dwellings will be of two storey masonry construction with concrete ground floors, timber upper floors and timber trussed rafter roofs. The guidance given herein will therefore need to be reviewed in terms of the actual building type to be adopted, by a suitably qualified and experienced engineer. The properties are largely to be constructed around the perimeter of a small lake.

5.1.2 Site investigation has confirmed that the site is overlain with made ground, of varying depths of between 0.2 m and 1.4 m. The made ground is made up of grass over gravelly sands, with layers of sandy gravelly clays containing ash present in some areas. Beneath the made ground at Borehole No WS1, WS2 and WS6 there is stiff gravelly clays, which extend to the base of the borehole and become stiffer with depth. In Borehole No WS3 there is a band of sandy gravelly clay down to 1 m before the stiff gravelly clays are found, which extend to the base of the borehole. Borehole No WS4 is similar to WS3, with the stiff gravelly clays encountered at 1.5 m depth. In Borehole No WS5 the stiff gravelly clays have a band of the sandy gravelly clay embedded within it at depths between 1.5 m and 2.4 m.

5.1.3 Groundwater was encountered at a depth of 1.0 m within Borehole No WS5. All remaining boreholes remained dry during the course of the investigation. Bedrock is not believed to have been encountered at any borehole location.

5.1.4 Standard Penetration Tests (SPT) were conducted in the window sample boreholes, starting at a depth of 1.0 m and repeated at 1 m levels from 2 m onwards. The SPT results are summarised in Table 15 below:

Shear Readings (N)	Depth of Test				
	1.0 – 1.45m	2.0 - 2.45m	3.0 – 3.45m	4.0 – 4.45 m	5.0 – 5.45 m
WS1	11	15	18	21	-
WS2	13	15	20	-	-
WS3	13	15	19	22	26
WS4	15	16	21	23	-
WS5	14	18	18	19	20
WS6	8	13	19	21	-

Table 15: Window Sample SPT Results

5.1.5 From the trial pit logs, it can be seen that the made ground has depths varying between 0.5 m and in excess of 1.3 m. The made ground comprises sandy, gravelly clays with mixed materials of clays sands, brick fragments, clinker and ash.

- 5.1.6 Beneath the made ground at Trial Pits TP1, TP3, TP5, TP6, TP7, TP8, TP9 and TP10 is stiff gravelly clays also found in the boreholes. In Trial Pit TP2 there is a thin band of clayey silty sand between 0.5 m and 0.6 m before stiff gravelly clay is encountered. In Trial Pit TP4, the fill material extended over the full depth of the trial pit.
- 5.1.7 Groundwater was encountered at a depth of 1.2 m in Trial Pit TP4, within the made ground, at 1.1 m in the clay within Trial Pit TP8 and TP9 and at 1.0 m in the clay in Trial Pit TP10. The remaining trial pits remaining dry during the course of the investigation. Bedrock was again not believed to have been encountered at any of the trial pit locations.
- 5.1.8 Shear strength of the clay was measured via hand vanes in several trial pits, the results of which are summarised in Table 16 below:

Location	Shear Readings (kN/m ²) (Depth of Test)
TP1	>120 (0.9m)
TP2	90 (0.7m)
TP3	98 (0.8m)
TP4	-
TP5	110 (1.1m)
TP6	95 (1.0m)
TP7	>120 (1.1m)
TP8	98 (0.8m)
TP9	-
TP10	115 (0.8m)

Table 16: Trial Pit Shear Vane Results

- 5.1.9 Clay samples were taken from Borehole No WS2 and WS3. Atterberg tests were undertaken under laboratory conditions to determine the plasticity index of the clay. The modified plasticity index for each sample was calculated in accordance with NHBC guidance and summarised in Table 17 below:

Plastic Limit Test Results						Modified P.I. (%)
Sample	Location	Depth (m)	Plasticity Index (P.I.)	Retaining 425 Sieve	Passing 425 Sieve	
1	WS2	2.0 - 2.5m	22	9.0%	91.0%	20.0
2	WS3	1.5 - 2.0m	24	15.0%	85.0%	20.4
3	WS3	1.0 - 1.5m	21	20.0%	80.0%	16.8
Average			22.3		Average	19.1

Table 17: Plasticity Results

- 5.1.10 The plasticity results are reasonably consistent and can be categorised as medium volume change potential. Foundation formation depths should therefore be taken based on medium volume change potential, requiring a footing depth of 0.9m below existing or proposed ground level, whichever is the lower, in areas where clay soils are present. Clay heave potential must be considered as part of the foundation design and must be appraised in accordance with NHBC Ch.4.2 requirements.

5.2 Assessment and Conclusions

- 5.2.1 The underlying soils have generally been found to be stiff clays. The clays close to the surface and at relatively shallow depth in Borehole No WS5 have been found to have a relatively regular consistency with SPT results generally at 100 kN/m² capacity or above. The SPT results for Borehole No WS6 at the west end of the site have been found to be slightly lower, with a bearing capacity of approximately 95 kN/m² found at formation depth. The shear vane results within the nearby Trial Pit TP10, however, indicates that bearing capacities of well over 100 kN/m² are likely. It is therefore recommended that bearing capacities of 100 kN/m² can be adopted over the whole site.
- 5.2.2 We understand that the proposed properties are likely be formed from masonry walling, timber upper floors and roof and concrete ground floors. This is likely to generate foundation loadings of between 50 and 60 kN/m, which indicates that strip footings would be suitable to the underlying clay strata. Excavations must extend down onto the natural stiff gravelly clays. Formations within the fill materials noted in localised areas must be removed with the footings extending deeper as required. Should soft clays be encountered at formation depth, it is recommended that the formation of footings extended down to clays of suitable strength is encountered, with the over-dig backfilled with lean mix concrete.
- 5.2.3 All formations must be checked on site to confirm that the design bearing capacity is extent before foundations are installed. Should areas of poor ground be encountered, the excavations may require extending until suitable strata is found, and the design engineer's instruction must be sought.
- 5.2.4 As variations of the natural ground have been encountered across the site, adopting ground bearing slabs is not recommended. All ground floor slabs should be designed to be suspended and supported on walls or dwarf walls that are supported by the strip foundations.
- 5.2.5 Local trees may have a bearing on the proposed building foundations, which will need to be appraised by the foundation designer. Formation levels must be designed to comply with LABC requirements and NHBC Ch.4.2 guidance.

- 5.2.6 All foundation designs must be reviewed and designed by a suitably qualified design engineer. The above advice is based upon the ground condition information obtained during the survey. The design engineer must satisfy themselves that the information meets with their design requirements.

6. CONCLUSIONS & RECOMMENDATIONS

- 6.1 This report provides an assessment of the ground conditions based on the assessment of available site investigation information by quantifies the potential risks associated with contamination with consideration to the proposed re-development of the site for a residential end use (with home grown produce). The report also provides recommendations for foundation design considering the redevelopment proposals.

Contamination Assessment

- 6.2 Based on the results of the contamination risk assessment undertaken at the land to the rear of No 1-3 Lakeside View, Halewood, and with consideration to the environmental setting and the proposed redevelopment of the site for residential use, potential risks to human health and flora have been identified.
- 6.3 To mitigate the potential risks, the following works are recommended:
- (i) All soft landscaped/garden areas will be capped with a minimum of 600 mm of clean suitable soil (450 mm subsoil and 150 mm topsoil). The capping soils should be underlain by a 100 mm granular no-dig layer or a geotextile marker membrane to prevent mixing.
 - (ii) An Asbestos Management Plan (AMP) should be prepared to manage and mitigate the potential risks from asbestos. The AMP should consider the findings of this report to implement safe working procedures and mitigate any potential risks to contractors on site or the general public adjacent to the site.
 - (iii) All groundworks should be carried out in accordance with the recommendations presented in the AMP. The groundworkers risk assessment and method statements should reflect the information presented herein and the AMP.
 - (iv) Made ground within the location of Trial Pit TP9, where asbestos concentrations are in excess of the laboratory limit of detection (0.001 %), should be either removed from site or placed in areas of non-sensitivity (below hardstanding/buildings) or at depth (>1.0 m) to prevent future exposure.
 - (v) A Remediation Method Statement will need to be prepared to include a contingency strategy for dealing with suspected contaminated material. The RMS will need to include the methodology for the placement and validation of clean soils in the landscaped areas.

- (vi) All groundworkers should adopt standard PPE when on site and remain vigilant during ground excavations for the presence (or suspected presence) of contamination.

- 6.4 The ground conditions should be as anticipated during all excavations. Advice should be sought if ground conditions are significantly different or if visual/olfactory evidence of contamination is encountered.
- 6.5 The concrete classification suitable for the site would be DS-1 AC-1 whilst the area within proximity to Trial Pit TP9 which will require a classification of DS-2 AC-2.

Geotechnical Assessment

- 6.6 The underlying soils have generally been found to be stiff clays. The clays close to the surface and at relatively shallow depth in Borehole No WS5 have been found to have a relatively regular consistency with SPT results generally at 100 kN/m² capacity or above. The SPT results for Borehole No WS6 at the west end of the site have been found to be slightly lower, with a bearing capacity of approximately 95 kN/m² found at formation depth. The shear vane result within the nearby Trial Pit TP10, however, indicates that bearing capacities of well over 100 kN/m² are likely. It is therefore recommended that bearing capacities of 100 kN/m² can be adopted over the whole site.
- 6.7 We understand that the proposed properties are likely be formed from masonry walling, timber upper floors and roof and concrete ground floors. This is likely to generate foundation loadings of between 50 and 60 kN/m, which indicates that strip footings would be suitable to the underlying clay strata. Excavations must extend down onto the natural stiff gravelly clays. Formations within the fill materials noted in localised areas must be removed with the footings extending deeper as required. Should soft clays be encountered at formation depth, it is recommended that the formation of footings extended down to clays of suitable strength is encountered, with the over-dig backfilled with lean mix concrete.
- 6.8 All formations must be checked on site to confirm that the design bearing capacity is extent before foundations are installed. Should areas of poor ground be encountered, the excavations may require extending until suitable strata is found, and the design engineer's instruction must be sought.
- 6.9 As variations of the natural ground have been encountered across the site, adopting ground bearing slabs is not recommended. All ground floor slabs should be designed to be suspended and supported on walls or dwarf walls that are supported by the strip foundations.

- 6.10 Local trees may have a bearing on the proposed building foundations, which will need to be appraised by the foundation designer. Formation levels must be designed to comply with LABC requirements and NHBC Ch.4.2 guidance.
- 6.11 All foundation designs must be reviewed and designed by a suitably qualified design engineer. The above advice is based upon the ground condition information obtained during the survey. The design engineer must satisfy themselves that the information meets with their design requirements.

Waste Soil Management

- 6.12 Careful management of soils during the excavation works will ensure optimum utilisation of soil resources.
- 6.13 Excavated soils which require off-site disposal are anticipated to be classified in accordance with the following document: Guidance on the Disposal of “Contaminated Soils” Version 3 (April 2001); produced by the Environment Agency. On the basis it is considered likely that soils from the majority of the site would classify as “Non-hazardous”/“Inert” for disposal; however this is subject to confirmation of the potential landfill use.
- 6.14 In all cases where excess soils require off-site disposal, the materials needs to be managed under the appropriate legislation and consideration given to any remedial techniques that could be used to improve the soil.
- 6.15 If waste soils are to be re-used on site then a suitable permit exemption should be put in place (if appropriate) or a Material Management Plan should be prepared as part of compliance with the CL:AIRE Definition of Waste:Code of Practice.

Water Pipe Specification

- 6.16 Consideration should be given to the requirements of the water supply provider. They are likely to require the UKWIR risk assessment to be completed to determine the specification for the water pipes. It is recommended that the water supply provider is contacted and enquiries made.

APPENDIX A

Exploratory Logs



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116	DATE 19th October 2023
PROJECT NAME Lakeside View, Halewood	DRILLING METHOD Trial Pit
CLIENT MAC Roofing and Contracting Limited	BOREHOLE NO TP1
	SHEET 1/11

COMPLETION	CASING	SCREEN
COMMENTS Trial pit dry. Shear vane at 0.9 m >120KPa		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.1	D= 0.1 m					MADE GROUND: Grass onto beige sandy GRAVEL. Sand is fine to course. Gravel is fine to medium angular limestone. Weed control membrane at base of layer	0.1
0.2	0.2	D= 0.2 m					MADE GROUND: Brown slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course slate, limestone, brick and pottery. Occasional clay nodules. Rare whole/broken brick cobbles	0.2
0.3								0.3
0.4								0.4
0.5								0.5
0.6								0.6
0.7							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.7
0.8								0.8
0.9								0.9
1	1.0	D= 1.0 m						1
1.1								1.1
1.2							Termination Depth at: 1.2 m	1.2
1.3								1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Limited	DATE 19th October 2023 DRILLING METHOD Trial Pit BOREHOLE NO TP2 SHEET 2/11
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COMPLETION	CASING	SCREEN
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COMMENTS Trial pit dry. Shear vane at 0.7 m 90KPa
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Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.15	D= 0.15 m					MADE GROUND: Grass onto brown slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course brick and stone of mixed lithologies	0.1
0.2								0.2
0.3								0.3
0.4								0.4
0.5							Grey clayey silty fine to medium SAND	0.5
0.6							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.6
0.7								0.7
0.8								0.8
0.9								0.9
1								1
1.1								1.1
1.2							Termination Depth at: 1.2 m	1.2
1.3								1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Limited	DATE 19th October 2023 DRILLING METHOD Trial Pit BOREHOLE NO TP3 SHEET 3/11
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COMPLETION	CASING	SCREEN
COMMENTS Trial pit dry. Shear vane at 0.8 m >98KPa		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1							MADE GROUND: Grass onto dark brown sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to medium stone of mixed lithologies and brick. Occasional rootlets. Rare bricks.	0.1
0.2	0.2	D= 0.2 m						0.2
0.3								0.3
0.4								0.4
0.5								0.5
0.6								0.6
0.7							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.7
0.8								0.8
0.9								0.9
1								1
1.1								1.1
1.2								1.2
1.3							Termination Depth at: 1.3 m	1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116	DATE 19th October 2023
PROJECT NAME Lakeside View, Halewood	DRILLING METHOD Trial Pit
CLIENT MAC Roofing and Contracting Limited	BOREHOLE NO TP4
	SHEET 4/11

COMPLETION	CASING	SCREEN
COMMENTS Pit collapsed to 1.3 m due to water strike at 1.2 m. Standing water in base of pit. Shear vane unsuitable		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.1	D= 0.1 m					MADE GROUND: Grass onto brown sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse brick, concrete, pottery and glass. Frequent whole/broken brick. Occasional concrete slabs, wood, plastic, metal and rags.	0.1
0.2								0.2
0.3								0.3
0.4								0.4
0.5								0.5
0.6	0.6	D= 0.6 m						0.6
0.7								0.7
0.8								0.8
0.9								0.9
1								1
1.1								1.1
1.2				∇				1.2
1.3							Termination Depth at: 1.3 m	1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Limited	DATE 19th October 2023 DRILLING METHOD Trial Pit BOREHOLE NO TP5 SHEET 5/11
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COMPLETION	CASING	SCREEN
COMMENTS Trial pit dry. Shear vane at 1.1 m >110KPa		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.15	D= 0.15 m					MADE GROUND: Grass onto brown sandy gravelly CLAY. Sand is fine to course. Gravel is fine to course brick, concrete and glass. Occasional plastic, fabric and pottery. Rare whole brick and concrete cobbles	0.1
0.2								0.2
0.3								0.3
0.4								0.4
0.5								0.5
0.6								0.6
0.7							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). Occasional fine to medium sand lenses. Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.7
0.8								0.8
0.9								0.9
1								1
1.1								1.1
1.2								1.2
1.3								1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2							Termination Depth at: 2.0 m	2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116	DATE 19th October 2023
PROJECT NAME Lakeside View, Halewood	DRILLING METHOD Trial Pit
CLIENT MAC Roofing and Contracting Limited	BOREHOLE NO TP6
	SHEET 6/11

COMPLETION	CASING	SCREEN
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COMMENTS Trial pit dry. Shear vane at 1.0 m 95KPa
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Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.1	D= 0.1 m					MADE GROUND: Grass onto dark brown ashy gravelly clayey SAND. Sand is fine to course. Gravel is fine to course brick and concrete. Occasional brick cobbles, concrete cobbles, plastic, glass and pottery. Band of hard black ashy clinker at 0.4 m	0.1
0.2								0.2
0.3								0.3
0.4	0.4	D= 0.4 m						0.4
0.5								0.5
0.6								0.6
0.7								0.7
0.8							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.8
0.9								0.9
1								1
1.1								1.1
1.2							Termination Depth at: 1.2 m	1.2
1.3								1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116	DATE 19th October 2023
PROJECT NAME Lakeside View, Halewood	DRILLING METHOD Trial Pit
CLIENT MAC Roofing and Contracting Limited	BOREHOLE NO TP7
	SHEET 7/11

COMPLETION	CASING	SCREEN
COMMENTS Trial pit dry. Shear vane at 1.1 m >120KPa		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1							MADE GROUND: Grass onto brown sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course brick and concrete. Occasional rootlets. Rare plastic	0.1
0.2	0.2	D= 0.2 m						0.2
0.3								0.3
0.4								0.4
0.5								0.5
0.6								0.6
0.7								0.7
0.8								0.8
0.9								0.9
1							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). In part siltier. Rare rounded cobbles and boulders of SOML. (Boulder Clay)	1
1.1								1.1
1.2								1.2
1.3								1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9							Termination Depth at: 1.9 m	1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116	DATE 19th October 2023
PROJECT NAME Lakeside View, Halewood	DRILLING METHOD Trial Pit
CLIENT MAC Roofing and Contracting Limited	BOREHOLE NO TP8
	SHEET 8/11

COMPLETION	CASING	SCREEN
COMMENTS Water strike at 1.1 m. Shear vane at 0.8 m 98KPa		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.1	D= 0.1 m					MADE GROUND: Grass onto brown sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course brick and concrete. Occasional rootlets. Rare plastic	0.1
0.2								0.2
0.3								0.3
0.4								0.4
0.5								0.5
0.6								0.6
0.7								0.7
0.8								0.8
0.9								0.9
1							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). In part siltier. Rare rounded cobbles and boulders of SOML. (Boulder Clay)	1
1.1								1.1
1.2							Termination Depth at: 1.2 m	1.2
1.3								1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116	DATE 19th October 2023
PROJECT NAME Lakeside View, Halewood	DRILLING METHOD Trial Pit
CLIENT MAC Roofing and Contracting Limited	BOREHOLE NO TP9
	SHEET 9/11

COMPLETION	CASING	SCREEN
COMMENTS Water strike at 1.1 m. Shear vane unsuitable		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1							MADE GROUND: Grass onto brown sandy gravelly CLAY. Sand is fine to course. Gravel is fine to course brick, concrete, glass and pottery. Frequent whole and broken brick. Occasional concrete cobbles. Rare wood, plastic and metal	0.1
0.2	0.2	D= 0.2 m						0.2
0.3								0.3
0.4								0.4
0.5								0.5
0.6								0.6
0.7							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). In part siltier. Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.7
0.8								0.8
0.9								0.9
1								1
1.1								1.1
1.2							Termination Depth at: 1.1 m	1.2
1.3								1.3
1.4								1.4
1.5								1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Limited	DATE 19th October 2023 DRILLING METHOD Trial Pit BOREHOLE NO TP10 SHEET 10/11
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COMPLETION	CASING	SCREEN
COMMENTS Water strike at 1.0 m. Shear vane at 0.8 m >115KPa		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.15	D= 0.15 m					MADE GROUND: Grass onto brown ashy clayey sandy GRAVEL. Sand is fine to course. Gravel is fine to course brick, concrete and clinker	0.1
0.2							MADE GROUND: Partially broken hardstanding of concrete, tarmac and brick with sticky bituminous material. Slight hydrocarbon odor	0.2
0.3	0.3	D= 0.3 m					MADE GROUND: Grass onto brown ashy clayey sandy GRAVEL. Sand is fine to course. Gravel is fine to course brick, concrete and clinker	0.3
0.4								0.4
0.5								0.5
0.6							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). In part siltier. Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.6
0.7								0.7
0.8								0.8
0.9								0.9
1								1
1.1								1.1
1.2								1.2
1.3								1.3
1.4								1.4
1.5							Termination Depth at: 1.5 m	1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Limited	DATE 19th October 2023 DRILLING METHOD Trial Pit BOREHOLE NO TP11 SHEET 11/11
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COMPLETION	CASING	SCREEN
COMMENTS Trial pit dry. Shear vane at 0.7 m >116KPa		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.1	0.1	D= 0.1 m					MADE GROUND: Grass onto brown sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to medium brick and concrete	0.1
0.2							MADE GROUND: Blackish brown ashy slightly clayey sandy GRAVEL. Sand is fine to course. Gravel is fine to medium clinker, brick, concrete and fragmented sandstone. Rare sandstone cobbles and whole brick.	0.2
0.3								0.3
0.4	0.4	D= 0.4 m						0.4
0.5								0.5
0.6							Reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course rounded and sub-rounded stone of mixed lithologies (SOML). In part siltier. Rare rounded cobbles and boulders of SOML. (Boulder Clay)	0.6
0.7								0.7
0.8								0.8
0.9								0.9
1								1
1.1								1.1
1.2								1.2
1.3								1.3
1.4								1.4
1.5							Termination Depth at: 1.5 m	1.5
1.6								1.6
1.7								1.7
1.8								1.8
1.9								1.9
2								2



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Ltd	DATE 19th October 2023 DRILLING METHOD Window Sample Borehole BOREHOLE NO WS1 SHEET 1/6
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COMPLETION	CASING uPVC	SCREEN uPVC Factory Slotted
COMMENTS Borehole dry.		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.2	0.1	D=0.1 m					MADE GROUND: Grass onto brown slightly sandy gravelly CLAY. Sand is fine to course. Gravel is fine to course brick and concrete. Occasional rootlets	0.2
0.4								0.4
0.6								0.6
0.8								0.8
1	1.0 - 1.45	SPT (C) N= 11	2,2/2,3,3,3				Stiff becoming very stiff reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML.(Boulder Clay)	1
1.2								1.2
1.4								1.4
1.6	1.5	D= 1.5 m						1.6
1.8								1.8
2	2.0 - 2.45	SPT (C) N=15	3,3/3,4,4,4					2
2.2								2.2
2.4								2.4
2.6								2.6
2.8								2.8
3	3.0 - 3.45	SPT (C) N=18	3,3/4,4,5,5					3
3.2								3.2
3.4								3.4
3.6								3.6
3.8								3.8
4	4.0 - 4.45	SPT (C) N=21	4,4/5,5,5,6					4
4.2								4.2
4.4								4.4
4.6							Termination Depth at: 4.45 m	4.6
4.8								4.8



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Ltd	DATE 19th October 2023 DRILLING METHOD Window Sample Borehole BOREHOLE NO WS2 SHEET 2/6
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COMPLETION	CASING uPVC	SCREEN uPVC Factory Slotted
COMMENTS Borehole dry. Refusal on barrel at 3.9 m.		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.2	0.25	D=0.25 m					MADE GROUND: Grass onto brown slightly sandy gravelly CLAY. Sand is fine to course. Gravel is fine to course brick and concrete. Occasional rootlet	0.2
0.4								0.4
0.6								0.6
0.8								0.8
1	1.0	D= 1.0 m						1
1.2	1.0 - 1.45	SPT (C) N= 13	2,3/3,3,3,4					1.2
1.4								1.4
1.6								1.6
1.8								1.8
2	2.0 - 2.45	SPT (C) N=15	3,3/3,4,4,4					2
2.2								2.2
2.4								2.4
2.6	2.0 - 2.5	B= 2.0 - 2.5 m						2.6
2.8								2.8
3								3
3.2	3.0 - 3.45	SPT (C) N= 20	4,4/5,5,5,5					3.2
3.4								3.4
3.6								3.6
3.8								3.8
4								4
4.2							Termination Depth at: 4.0 m	4.2
4.4								4.4



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Ltd	DATE 19th October 2023 DRILLING METHOD Window Sample Borehole BOREHOLE NO WS3 SHEET 3/6
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COMPLETION	CASING uPVC	SCREEN uPVC Factory Slotted
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COMMENTS Borehole dry.

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.5	0.2	D=0.2 m					MADE GROUND: Grass onto brown slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to medium stone of mixed lithologies. (TOPSOIL)	0.5
	0.5	D= 0.5 m					Reddish brown slightly gravelly sandy CLAY. Sand is fine to course. Gravel is fine to medium stone of mixed lithologies	
1	1.0 - 1.45	SPT (C) N= 13	2,2/3,3,3,4					1
1.5	1.2	D = 1.2 m					Stiff becoming very stiff reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML.(Boulder Clay)	1.5
	1.5 - 2.0	B= 1.5 - 2.0 m						
2	2.0 - 2.45	SPT (C) N=15	3,3/3,4,4,4					2
2.5								2.5
3	3.0 - 3.45	SPT (C) N=19	4,4/4,5,5,5					3
3.5								3.5
4	4.0 - 4.45	SPT (C) N=20	4,4/5,5,6,6					4
4.5								4.5
5	5.0 - 5.45	SPT (C) N=26	5,5/6,6,7,7					5
5.5							Termination Depth at: 5.45 m	5.5



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Ltd	DATE 19th October 2023 DRILLING METHOD Window Sample Borehole BOREHOLE NO WS4 SHEET 4/6
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COMPLETION	CASING uPVC	SCREEN uPVC Factory Slotted
COMMENTS Borehole dry		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.2	0.15	D=0.15 m					MADE GROUND: Grey angular gravel onto brown sandy gravelly CLAY. Sand is fine to course. Gravel is fine to course brick, concrete and stone of mixed lithologies	0.2
0.4								0.4
0.6								0.6
0.8								0.8
1	1.0	D= 1.0 m						1
1.2	1.0 - 1.45	SPT (C) N= 15	2,3/3,4,4,4					1.2
1.4								1.4
1.6								1.6
1.8								1.8
2	2.0	D= 2.0 m						2
2.2	2.0 - 2.45	SPT (C) N=16	3,3/3,4,4,5					2.2
2.4								2.4
2.6								2.6
2.8								2.8
3								3
3.2	3.0 - 3.45	SPT (C) N=21	3,4/4,5,6,6					3.2
3.4								3.4
3.6								3.6
3.8								3.8
4								4
4.2	4.0 - 4.45	SPT (C) N=23	4,4/4,6,6,7					4.2
4.4								4.4
4.6							Termination Depth at: 4.45 m	4.6
4.8								4.8



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Ltd	DATE 19th October 2023 DRILLING METHOD Window Sample Borehole BOREHOLE NO WS5 SHEET 5/6
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COMPLETION	CASING uPVC	SCREEN uPVC Factory Slotted
COMMENTS Water Strike at 1.0 m		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)			
0.5	0.1	D= 0.1 m	2,2/3,3,4,4	▽			MADE GROUND: Dark brown slightly ashy slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course brick, concrete, clinker and stone of mixed lithologies	0.5			
	0.5	D= 0.5 m						Stiff reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML.(Boulder Clay)	1		
1	1.0 - 1.45	SPT (C) N= 14					1.5	1.0 - 1.5	B= 1.0 - 1.5 m	Very stiff reddish brown slightly sandy slightly gravelly silty CLAY. Sand is fine to course. Gravel is fine to course stone of mixed lithologies	1.5
2	2.0	D= 2.0 m						2.0 - 2.45	SPT (C) N=18		3,3/4,4,5,5
2.5							3	3.0	D= 3.0 m	Very stiff reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to course. Gravel is fine to course stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML.(Boulder Clay)	2.5
3	3.0 - 3.45	SPT (C) N=18						3,3/4,4,5,5	3		
3.5											3.5
4	4.0 - 4.45	SPT (C) N=19					4,4/4,4,5,6				4
4.5											4.5
5	5.0 - 5.45	SPT (C) N=20					4,4/5,5,5,5				5
5.5							Termination Depth at: 5.45 m	5.5			



GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING

PROJECT NUMBER 23116 PROJECT NAME Lakeside View, Halewood CLIENT MAC Roofing and Contracting Ltd	DATE 19th October 2023 DRILLING METHOD Window Sample Borehole BOREHOLE NO WS6 SHEET 6/6
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COMPLETION	CASING uPVC	SCREEN uPVC Factory Slotted
COMMENTS Borehole dry.		

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.2	0.15	D=0.15 m					MADE GROUND: Grass onto black ashy gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse brick, concrete, clinker and stone of mixed lithologies	0.2
0.4								0.4
0.6								0.6
0.8	0.8	D= 0.8 m					MADE GROUND: Loose greyish brown slightly ashy slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse brick and stone of mixed lithologies. Occasional black ashy lenses	0.8
1	1.0 - 1.45	SPT (C) N= 8	2,2/2,2,2,2					1
1.2								1.2
1.4								1.4
1.6							Stiff becoming very stiff reddish brown mottled slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is fine to coarse stone of mixed lithologies (SOML). Rare rounded cobbles and boulders of SOML.(Boulder Clay)	1.6
1.8								1.8
2	2.0	D= 2.0 m						2
2.2	2.0 - 2.45	SPT (C) N=13	2,2/3,3,3,4					2.2
2.4								2.4
2.6								2.6
2.8								2.8
3	3.0 - 3.45	SPT (C) N=19	3,3/4,4,5,6					3
3.2								3.2
3.4								3.4
3.6								3.6
3.8								3.8
4	4.0 - 4.45	SPT (C) N=21	4,4/5,5,5,6					4
4.2								4.2
4.4								4.4
4.6							Termination Depth at: 4.45 m	4.6
4.8								4.8

APPENDIX B

Chemical Test Results

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/10301
Issue Number: 1

Date: 01 November, 2023

Client: BEK Enviro Ltd
2 Landwick Court
Metcalf Drive
Altham Business Park
Altham
Lancashire
BB5 5GY

Project Manager: Mick Buckley/James Mashiter
Project Name: Lakeside View
Project Ref: Not specified
Order No: 7967-23116-AH
Date Samples Received: 18/10/23
Date Instructions Received: 19/10/23
Date Analysis Completed: 01/11/23

Approved by:



Gemma Berrisford
Deputy Client Services Supervisor

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/1	23/10301/2	23/10301/3	23/10301/4	23/10301/5	23/10301/6	23/10301/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP3	TP4	TP6	TP8	TP9			
Depth to Top	0.10	0.15	0.20	0.60	0.40	0.10	0.20			
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	4ABE	6AE	6AE	6AE	4A	4ABE	4ABE			
% Stones >10mm _A	37.7	4.5	5.9	9.2	18.0	13.4	<0.1	% w/w	0.1	A-T-044
Asbestos in soil _D [#]	NAD	NAD	NAD	NAD	NAD	NAD	Amosite & Chrysotile			A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-	-	Board & Loose Fibres			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	N/A	N/A	N/A	N/A	No			A-T-045
Asbestos in soil % composition (hand picking and weighing) _D	-	-	-	-	-	-	0.079	% w/w	0.001	A-T-054
pH _D ^{M#}	8.59	7.89	6.86	8.43	8.12	8.37	8.09	pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	<0.01	0.11	0.04	0.04	0.05	0.03	0.53	g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	<200	1500	680	570	680	810	1100	mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	1.7	2.1	4.9	2.9	36.0	4.5	1.2	% w/w	0.1	A-T-032s
Arsenic _D ^{M#}	<1	5	13	6	33	12	6	mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium _D ^{M#}	<0.5	<0.5	0.8	<0.5	2.3	0.5	<0.5	mg/kg	0.5	A-T-024s
Copper _D ^{M#}	9	27	76	29	175	81	65	mg/kg	1	A-T-024s
Chromium _D ^{M#}	11	29	26	26	22	23	26	mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead _D ^{M#}	8	37	77	271	78	79	126	mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	7	23	26	23	39	27	18	mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	<1	<1	<1	<1	1	mg/kg	1	A-T-024s
Zinc _D ^{M#}	17	53	145	203	614	145	533	mg/kg	5	A-T-024s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/1	23/10301/2	23/10301/3	23/10301/4	23/10301/5	23/10301/6	23/10301/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP3	TP4	TP6	TP8	TP9			
Depth to Top	0.10	0.15	0.20	0.60	0.40	0.10	0.20			
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	4ABE	6AE	6AE	6AE	4A	4ABE	4ABE			
PAH-16MS										
Acenaphthene _A ^{M#}	0.01 ^U	0.01 ^U	0.06 ^U	1.52 ^U	0.01 ^U	0.72 ^U	0.10 ^U	mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	<0.01	<0.01	<0.01	0.01	<0.01	0.13	0.03	mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	<0.02	<0.02	0.10	1.22	<0.02	2.22	0.29	mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	0.10	0.06	0.41	1.12	0.07	11.6	1.56	mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.11	0.07	0.39	0.69	0.08	11.4	2.55	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	0.14	0.08	0.46	0.82	0.10	13.2	2.77	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.08	<0.05	0.24	0.29	0.06	6.12	1.70	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	<0.07	<0.07	0.22	0.34	<0.07	4.33	0.84	mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	0.13	0.09	0.46	1.10	0.11	9.82	1.54	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A	<0.04	<0.04	0.05	0.07	<0.04	1.37	0.35	mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	0.18	0.10	0.91	4.57	0.14	21.9	2.10	mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	<0.01	<0.01	0.03	0.88	0.01	0.58	0.09	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.09	0.04	0.30	0.38	0.06	8.15	2.12	mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	<0.03	<0.03	<0.03	0.96	0.04	0.29	0.04	mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	0.09	0.07	0.48	8.25	0.12	5.90	0.81	mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	0.17	0.10	0.78	3.54	0.13	19.4	2.32	mg/kg	0.07	A-T-019s
Total PAH-16MS _A	1.10	0.62	4.89	25.8	0.93	117	19.2	mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/1	23/10301/2	23/10301/3	23/10301/4	23/10301/5	23/10301/6	23/10301/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP1	TP2	TP3	TP4	TP6	TP8	TP9			
Depth to Top	0.10	0.15	0.20	0.60	0.40	0.10	0.20			
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23			
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL			
Sample Matrix Code	4ABE	6AE	6AE	6AE	4A	4ABE	4ABE			
TPH CWG with Clean Up										
Ali >C5-C6 _A	<0.01	<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	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<1	<1	<1	<1	<1	<10	mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	<1	<1	<1	<1	<1	<10	mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	<1	<1	<1	<1	<1	<10	mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	<1	<1	<1	<1	<1	4	<10	mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	6	4	18	38	6	209	738	mg/kg	1	A-T-055s
Total Aliphatics _A	6	4	18	38	6	214	738	mg/kg	1	Calc-As Recd
Aro >C5-C7 _A [#]	<0.01	<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	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	1	<1	2	1	1	2	<20	mg/kg	1	A-T-055s
Aro >C10-C12 _A	<1	<1	2	2	1	2	<10	mg/kg	1	A-T-055s
Aro >C12-C16 _A ^{M#}	2	1	3	6	2	10	<10	mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	3	2	8	23	2	71	27	mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	5	4	25	51	7	298	237	mg/kg	1	A-T-055s
Total Aromatics _A	11	8	41	83	13	383	264	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35) _A	17	12	60	121	19	597	1000	mg/kg	1	Calc-As Recd
BTEX - Benzene _A [#]	<0.01	<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	<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	<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	<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	<0.01	mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP10	WS2	WS4	WS6					
Depth to Top	0.40	0.30	1.0	2.0	2.0					
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL					
Sample Matrix Code	4ABE	6AE	3	6A	6A					
% Stones >10mm _A	7.4	36.1	<0.1	2.6	3.6			% w/w	0.1	A-T-044
Asbestos in soil _D [#]	NAD	NAD	-	-	-					A-T-045
Asbestos Matrix (visual) _D	-	-	-	-	-					A-T-045
Asbestos Matrix (microscope) _D	-	-	-	-	-					A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _D	N/A	N/A	-	-	-					A-T-045
pH _D ^{M#}	8.00	8.37	8.46	8.59	8.48			pH	0.01	A-T-031s
Sulphate (water sol 2:1) _D ^{M#}	0.02	0.01	<0.01	0.03	0.03			g/l	0.01	A-T-026s
Sulphate (acid soluble) _D ^{M#}	1000	450	-	-	-			mg/kg	200	A-T-028s
Cyanide (total) _A ^{M#}	<1	<1	-	-	-			mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC _A	<0.2	<0.2	-	-	-			mg/kg	0.2	A-T-050s
Organic Matter _D ^{M#}	30.7	7.6	-	-	-			% w/w	0.1	A-T-032s
Arsenic _D ^{M#}	83	3	-	-	-			mg/kg	1	A-T-024s
Boron (water soluble) _D ^{M#}	<1.0	<1.0	-	-	-			mg/kg	1	A-T-027s
Cadmium _D ^{M#}	1.0	<0.5	-	-	-			mg/kg	0.5	A-T-024s
Copper _D ^{M#}	400	13	-	-	-			mg/kg	1	A-T-024s
Chromium _D ^{M#}	21	8	-	-	-			mg/kg	1	A-T-024s
Chromium (hexavalent) _D	<1	<1	-	-	-			mg/kg	1	A-T-040s
Lead _D ^{M#}	151	26	-	-	-			mg/kg	1	A-T-024s
Mercury _D	<0.17	<0.17	-	-	-			mg/kg	0.17	A-T-024s
Nickel _D ^{M#}	57	8	-	-	-			mg/kg	1	A-T-024s
Selenium _D ^{M#}	<1	<1	-	-	-			mg/kg	1	A-T-024s
Zinc _D ^{M#}	206	38	-	-	-			mg/kg	5	A-T-024s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP10	WS2	WS4	WS6					
Depth to Top	0.40	0.30	1.0	2.0	2.0					
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL					
Sample Matrix Code	4ABE	6AE	3	6A	6A					
PAH-16MS										
Acenaphthene _A ^{M#}	0.14 ^U	1.07 ^U	-	-	-			mg/kg	0.01	A-T-019s
Acenaphthylene _A ^{M#}	0.03	0.32	-	-	-			mg/kg	0.01	A-T-019s
Anthracene _A ^{M#}	0.33	0.29	-	-	-			mg/kg	0.02	A-T-019s
Benzo(a)anthracene _A ^{M#}	1.09	0.30	-	-	-			mg/kg	0.04	A-T-019s
Benzo(a)pyrene _A ^{M#}	0.99	0.17	-	-	-			mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene _A ^{M#}	1.09	0.12	-	-	-			mg/kg	0.05	A-T-019s
Benzo(ghi)perylene _A ^{M#}	0.65	0.12	-	-	-			mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene _A ^{M#}	0.43	0.14	-	-	-			mg/kg	0.07	A-T-019s
Chrysene _A ^{M#}	1.02	0.87	-	-	-			mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene _A	0.15	0.06	-	-	-			mg/kg	0.04	A-T-019s
Fluoranthene _A ^{M#}	2.15	0.20	-	-	-			mg/kg	0.08	A-T-019s
Fluorene _A ^{M#}	0.10	2.22	-	-	-			mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene _A ^{M#}	0.81	0.05	-	-	-			mg/kg	0.03	A-T-019s
Naphthalene _A ^{M#}	0.07	1.76	-	-	-			mg/kg	0.03	A-T-019s
Phenanthrene _A ^{M#}	1.20	4.15	-	-	-			mg/kg	0.03	A-T-019s
Pyrene _A ^{M#}	1.88	0.56	-	-	-			mg/kg	0.07	A-T-019s
Total PAH-16MS _A	12.1	12.4	-	-	-			mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP10	WS2	WS4	WS6					
Depth to Top	0.40	0.30	1.0	2.0	2.0					
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL					
Sample Matrix Code	4ABE	6AE	3	6A	6A					
SVOC										
4-Bromophenyl phenyl ether _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Hexachlorobenzene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Diethyl phthalate _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Dimethyl phthalate _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Dibenzofuran _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Carbazole _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Butylbenzyl phthalate _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Bis(2-ethylhexyl)phthalate _A	-	<500	-	-	-			µg/kg	500	A-T-052s
Bis(2-chloroethoxy)methane _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Bis(2-chloroethyl)ether _A	-	<100	-	-	-			µg/kg	100	A-T-052s
4-Nitrophenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
3+4-Methylphenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
4-Chloro-3-methylphenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2-Nitrophenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2-Methylphenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
1,2,4-Trichlorobenzene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2-Chlorophenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2,6-Dinitrotoluene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2,4-Dinitrotoluene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2,4-Dimethylphenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2,4-Dichlorophenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2,4,6-Trichlorophenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2,4,5-Trichlorophenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
1,4-Dichlorobenzene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
1,3-Dichlorobenzene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
1,2-Dichlorobenzene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2-Chloronaphthalene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
2-Methylnaphthalene _A	-	189	-	-	-			µg/kg	100	A-T-052s
Acenaphthylene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Acenaphthene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Anthracene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Benzo(a)anthracene _A	-	<100	-	-	-			µg/kg	100	A-T-052s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP10	WS2	WS4	WS6					
Depth to Top	0.40	0.30	1.0	2.0	2.0					
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL					
Sample Matrix Code	4ABE	6AE	3	6A	6A					
Benzo(b)fluoranthene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Benzo(k)fluoranthene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Benzo(a)pyrene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Benzo(ghi)perylene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Chrysene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Fluoranthene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Fluorene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Indeno(1,2,3-cd)pyrene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Phenanthrene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Pyrene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Naphthalene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Dibenzo(ah)anthracene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Bis(2-chloroisopropyl)ether _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Phenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Pentachlorophenol _A	-	<100	-	-	-			µg/kg	100	A-T-052s
n-Nitroso-n-dipropylamine _A	-	<100	-	-	-			µg/kg	100	A-T-052s
n-Dioctylphthalate _A	-	<500	-	-	-			µg/kg	500	A-T-052s
n-Dibutylphthalate _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Nitrobenzene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Isophorone _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Hexachloroethane _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Hexachlorobutadiene _A	-	<100	-	-	-			µg/kg	100	A-T-052s
Perylene _A	-	<100	-	-	-			µg/kg	100	A-T-052s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP10	WS2	WS4	WS6					
Depth to Top	0.40	0.30	1.0	2.0	2.0					
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL					
Sample Matrix Code	4ABE	6AE	3	6A	6A					
VOC										
Dichlorodifluoromethane _A	-	<25	-	-	-			µg/kg	1	A-T-006s
Chloromethane _A	-	<250	-	-	-			µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene) _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Bromomethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Chloroethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Trichlorofluoromethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,1-Dichloroethene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Carbon Disulphide _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Dichloromethane _A	-	<125	-	-	-			µg/kg	5	A-T-006s
trans 1,2-Dichloroethene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,1-Dichloroethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
cis 1,2-Dichloroethene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
2,2-Dichloropropane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Bromochloromethane _A [#]	-	<125	-	-	-			µg/kg	5	A-T-006s
Chloroform _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,1,1-Trichloroethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,1-Dichloropropene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Carbon Tetrachloride _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,2-Dichloroethane _A [#]	-	<50	-	-	-			µg/kg	2	A-T-006s
Benzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Trichloroethene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,2-Dichloropropane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Dibromomethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Bromodichloromethane _A [#]	-	<250	-	-	-			µg/kg	10	A-T-006s
cis 1,3-Dichloropropene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Toluene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
trans 1,3-Dichloropropene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,1,2-Trichloroethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,3-Dichloropropane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Tetrachloroethene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Dibromochloromethane _A [#]	-	<75	-	-	-			µg/kg	3	A-T-006s
1,2-Dibromoethane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP10	WS2	WS4	WS6					
Depth to Top	0.40	0.30	1.0	2.0	2.0					
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL					
Sample Matrix Code	4ABE	6AE	3	6A	6A					
Chlorobenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane _A	-	<25	-	-	-			µg/kg	1	A-T-006s
Ethylbenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
m & p Xylene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
o-Xylene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Styrene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Bromoform _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Isopropylbenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane _A	-	212	-	-	-			µg/kg	1	A-T-006s
1,2,3-Trichloropropane _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
Bromobenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
n-Propylbenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
2-Chlorotoluene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
4-Chlorotoluene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
tert-Butylbenzene _A [#]	-	<50	-	-	-			µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene _A [#]	-	29	-	-	-			µg/kg	1	A-T-006s
sec-Butylbenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
4-Isopropyltoluene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,3-Dichlorobenzene _A	-	<25	-	-	-			µg/kg	1	A-T-006s
1,4-Dichlorobenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
n-Butylbenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,2-Dichlorobenzene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP) _A	-	<50	-	-	-			µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene _A	-	<75	-	-	-			µg/kg	3	A-T-006s
Hexachlorobutadiene _A [#]	-	<25	-	-	-			µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene _A	-	<75	-	-	-			µg/kg	3	A-T-006s

Envirolab Job Number: 23/10301

Client Project Name: Lakeside View

Client Project Ref: Not specified

Lab Sample ID	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12			Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	TP11	TP10	WS2	WS4	WS6					
Depth to Top	0.40	0.30	1.0	2.0	2.0					
Depth To Bottom										
Date Sampled	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23	17-Oct-23					
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL					
Sample Matrix Code	4ABE	6AE	3	6A	6A					
TPH CWG with Clean Up										
Ali >C5-C6 _A	<0.01	<0.01	-	-	-			mg/kg	0.01	A-T-022s
Ali >C6-C8 _A	<0.01	0.03	-	-	-			mg/kg	0.01	A-T-022s
Ali >C8-C10 _A	<1	<20	-	-	-			mg/kg	1	A-T-055s
Ali >C10-C12 _A ^{M#}	<1	64	-	-	-			mg/kg	1	A-T-055s
Ali >C12-C16 _A ^{M#}	<1	250	-	-	-			mg/kg	1	A-T-055s
Ali >C16-C21 _A ^{M#}	1	267	-	-	-			mg/kg	1	A-T-055s
Ali >C21-C35 _A ^{M#}	17	1190	-	-	-			mg/kg	1	A-T-055s
Total Aliphatics _A	19	1770	-	-	-			mg/kg	1	Calc-As Recd
Aro >C5-C7 _A [#]	<0.01	<0.01	-	-	-			mg/kg	0.01	A-T-022s
Aro >C7-C8 _A [#]	<0.01	<0.01	-	-	-			mg/kg	0.01	A-T-022s
Aro >C8-C10 _A	2	<20	-	-	-			mg/kg	1	A-T-055s
Aro >C10-C12 _A	2	49	-	-	-			mg/kg	1	A-T-055s
Aro >C12-C16 _A ^{M#}	7	321	-	-	-			mg/kg	1	A-T-055s
Aro >C16-C21 _A ^{M#}	19	200	-	-	-			mg/kg	1	A-T-055s
Aro >C21-C35 _A ^{M#}	67	266	-	-	-			mg/kg	1	A-T-055s
Total Aromatics _A	98	837	-	-	-			mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35) _A	116	2600	-	-	-			mg/kg	1	Calc-As Recd
BTEX - Benzene _A [#]	<0.01	<0.01	-	-	-			mg/kg	0.01	A-T-022s
BTEX - Toluene _A [#]	<0.01	<0.01	-	-	-			mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene _A [#]	<0.01	<0.01	-	-	-			mg/kg	0.01	A-T-022s
BTEX - m & p Xylene _A [#]	<0.01	0.01	-	-	-			mg/kg	0.01	A-T-022s
BTEX - o Xylene _A [#]	<0.01	0.02	-	-	-			mg/kg	0.01	A-T-022s
MTBE _A [#]	<0.01	<0.01	-	-	-			mg/kg	0.01	A-T-022s

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 within the same delivery, will be disposed of **six weeks** after the 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 our scope of accreditation.
 The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client.
 A deviating sample 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.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "A"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

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.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

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 by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
 Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.
 Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the accreditation range and as such are unaccredited.

Please contact your client manager if you require 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: BEK Enviro Ltd, 2 Landwick Court, Metcalfe Drive, Altham Business Park,
Altham, Lancashire , BB5 5GY

Project: Lakeside View

Clients Project No:

Project No: 23/10301

Date Received: 19/10/2023 (am)

Cool Box Temperatures (°C): 12.8

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	23/10301/1	23/10301/2	23/10301/3	23/10301/4	23/10301/5	23/10301/6	23/10301/7	23/10301/8	23/10301/9	23/10301/10	23/10301/11	23/10301/12
Client Sample No												
Client Sample ID/Depth	TP1 0.10m	TP2 0.15m	TP3 0.20m	TP4 0.60m	TP6 0.40m	TP8 0.10m	TP9 0.20m	TP11 0.40m	TP10 0.30m	WS2 1.0m	WS4 2.0m	WS6 2.0m
Date Sampled	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23	17/10/23
A-T-006s									27/10/2023			
A-T-019s	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023			
A-T-022s	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023			
A-T-024s	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023			
A-T-026s	30/10/2023	30/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023
A-T-027s	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023			
A-T-028s	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023			
A-T-031s	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023
A-T-032s	31/10/2023	31/10/2023	31/10/2023	31/10/2023	31/10/2023	31/10/2023	01/11/2023	31/10/2023	31/10/2023			
A-T-040s	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023	26/10/2023			
A-T-042sTCN	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023			
A-T-044	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023	27/10/2023
A-T-045	20/10/2023	20/10/2023	20/10/2023	20/10/2023	20/10/2023	20/10/2023	20/10/2023	20/10/2023	20/10/2023			
A-T-050s	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023	30/10/2023			
A-T-052s									31/10/2023			
A-T-054							23/10/2023					
A-T-055s	29/10/2023	29/10/2023	29/10/2023	29/10/2023	29/10/2023	29/10/2023	30/10/2023	29/10/2023	30/10/2023			
Calc-As Recd	29/10/2023	29/10/2023	29/10/2023	29/10/2023	29/10/2023	29/10/2023	30/10/2023	29/10/2023	30/10/2023			

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

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/10618
Issue Number: 1

Date: 06 November, 2023

Client: BEK Enviro Ltd
2 Landwick Court
Metcalf Drive
Altham Business Park
Altham
Lancashire
BB5 5GY

Project Manager: Mick Buckley/James Mashiter
Project Name: Lakeside View, Halewood
Project Ref: Not specified
Order No: 7973-23116-AH
Date Samples Received: 26/10/23
Date Instructions Received: 27/10/23
Date Analysis Completed: 06/11/23

Approved by:



Richard Wong
Client Manager

Envirolab Job Number: 23/10618

Client Project Name: Lakeside View, Halewood

Client Project Ref: Not specified

Lab Sample ID	23/10618/1	23/10618/2	23/10618/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS2	WS5	WS6							
Depth to Top										
Depth To Bottom										
Date Sampled	25-Oct-23	25-Oct-23	25-Oct-23							
Sample Type	WATER - EW	WATER - EW	WATER - EW							
Sample Matrix Code	N/A	N/A	N/A							
pH (w) [#]	7.79	8.13	7.99					pH	0.01	A-T-031w
Ammoniacal nitrogen as N (w) [#]	0.32	0.28	0.37					mg/l	0.05	A-T-033w
Chloride (w) [#]	21	21	126					mg/l	1	A-T-026w
Sulphate (w) [#]	83	84	125					mg/l	1	A-T-026w
Cyanide (total) (w) [#]	<0.005	<0.005	<0.005					mg/l	0.005	A-T-042wTCN
Phenols - Total by HPLC (w) _A	<0.10	<0.10	<0.10					mg/l	0.01	A-T-050w
DOC - Dissolved Organic Carbon (w) [#]	10.6	8.6	9.9					mg/l	2	A-T-032w
Arsenic (dissolved) _A [#]	5	5	4					µg/l	1	A-T-025w
Boron (dissolved) _A [#]	77	81	139					µg/l	10	A-T-025w
Cadmium (dissolved) _A [#]	<0.2	<0.2	<0.2					µg/l	0.2	A-T-025w
Copper (dissolved) _A	5	4	12					µg/l	4	A-T-025w
Chromium (dissolved) _A [#]	<1	<1	<1					µg/l	1	A-T-025w
Chromium (hexavalent) (w) _A [#]	<0.01	<0.01	<0.01					mg/l	0.01	A-T-040w
Lead (dissolved) _A [#]	2	<1	<1					µg/l	1	A-T-025w
Mercury (dissolved) _A [#]	<0.1	<0.1	<0.1					µg/l	0.1	A-T-025w
Nickel (dissolved) _A [#]	8	4	4					µg/l	2	A-T-025w
Selenium (dissolved) _A [#]	3	3	3					µg/l	1	A-T-025w
Zinc (dissolved) _A [#]	17	13	3					µg/l	2	A-T-025w

Envirolab Job Number: 23/10618

Client Project Name: Lakeside View, Halewood

Client Project Ref: Not specified

Lab Sample ID	23/10618/1	23/10618/2	23/10618/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS2	WS5	WS6							
Depth to Top										
Depth To Bottom										
Date Sampled	25-Oct-23	25-Oct-23	25-Oct-23							
Sample Type	WATER - EW	WATER - EW	WATER - EW							
Sample Matrix Code	N/A	N/A	N/A							
PAH 16MS (w)										
Acenaphthene (w) _A [#]	<0.01	0.07	<0.01					µg/l	0.01	A-T-019w
Acenaphthylene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Anthracene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Benzo(a)anthracene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Benzo(a)pyrene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Benzo(b)fluoranthene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Benzo(ghi)perylene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Benzo(k)fluoranthene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Chrysene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Dibenzo(ah)anthracene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Fluoranthene (w) _A [#]	<0.01	0.02	<0.01					µg/l	0.01	A-T-019w
Fluorene (w) _A [#]	<0.01	0.04	<0.01					µg/l	0.01	A-T-019w
Indeno(123-cd)pyrene (w) _A [#]	<0.01	<0.01	<0.01					µg/l	0.01	A-T-019w
Naphthalene (w) _A [#]	<0.01	0.07	<0.01					µg/l	0.01	A-T-019w
Phenanthrene (w) _A [#]	0.02 ^U	0.11 ^U	<0.01 ^U					µg/l	0.01	A-T-019w
Pyrene (w) _A [#]	<0.01	0.01	<0.01					µg/l	0.01	A-T-019w
Total PAH 16MS (w) _A [#]	0.02	0.32	<0.01					µg/l	0.01	A-T-019w

Envirolab Job Number: 23/10618

Client Project Name: Lakeside View, Halewood

Client Project Ref: Not specified

Lab Sample ID	23/10618/1	23/10618/2	23/10618/3					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS2	WS5	WS6							
Depth to Top										
Depth To Bottom										
Date Sampled	25-Oct-23	25-Oct-23	25-Oct-23							
Sample Type	WATER - EW	WATER - EW	WATER - EW							
Sample Matrix Code	N/A	N/A	N/A							
TPH CWG (w) with Clean Up										
Ali >C5-C6 (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
Ali >C6-C8 (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
Ali >C8-C10 (w) _A [#]	<5	<5	<5					µg/l	5	A-T-055w
Ali >C10-C12 (w) _A [#]	<5	<5	<5					µg/l	5	A-T-055w
Ali >C12-C16 (w) _A [#]	<5	<5	<5					µg/l	5	A-T-055w
Ali >C16-C21 (w) _A [#]	<5	<5	<5					µg/l	5	A-T-055w
Ali >C21-C35 (w) _A [#]	<5	13	<5					µg/l	5	A-T-055w
Total Aliphatics (w) _A [#]	<5	13	<5					µg/l	5	Calc-As Recd
Aro >C5-C7 (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
Aro >C7-C8 (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
Aro >C8-C10 (w) _A	<5	<5	<5					µg/l	5	A-T-055w
Aro >C10-C12 (w) _A [#]	<5	<5	<5					µg/l	5	A-T-055w
Aro >C12-C16 (w) _A [#]	<5	<5	<5					µg/l	5	A-T-055w
Aro >C16-C21 (w) _A [#]	7	8	<5					µg/l	5	A-T-055w
Aro >C21-C35 (w) _A	<10	<10	<10					µg/l	10	A-T-055w
Total Aromatics (w) _A	<10	<10	<10					µg/l	10	Calc-As Recd
TPH (Ali & Aro >C5-C35) (w) _A	<10	21	<10					µg/l	10	Calc-As Recd
BTEX - Benzene (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
BTEX - Toluene (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
BTEX - Ethyl Benzene (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
BTEX - m & p Xylene (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
BTEX - o Xylene (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w
MTBE (w) _A [#]	<1	<1	<1					µg/l	1	A-T-022w

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 within the same delivery, will be disposed of **six weeks** after the 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 our scope of accreditation.
 The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client.
 A deviating sample 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.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "A"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

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.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs

Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.

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 by method A-T-007:

For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
 Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:

EPH CWG results have humics mathematically subtracted through instrument calculation.
 Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:

Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the accreditation range and as such are unaccredited.

Please contact your client manager if you require 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: BEK Enviro Ltd, 2 Landwick Court, Metcalfe Drive, Altham Business Park,
Altham, Lancashire , BB5 5GY

Project: Lakeside View, Halewood

Clients Project No:

Project No: 23/10618

Date Received: 27/10/2023 (am)

Cool Box Temperatures (°C): 11.4

NO DEVIATIONS IDENTIFIED

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, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	23/10618/1	23/10618/2	23/10618/3
Client Sample No			
Client Sample ID/Depth	WS2	WS5	WS6
Date Sampled	25/10/23	25/10/23	25/10/23
A-T-019w	01/11/2023	01/11/2023	01/11/2023
A-T-022w	01/11/2023	01/11/2023	01/11/2023
A-T-025w	02/11/2023	02/11/2023	02/11/2023
A-T-026w	03/11/2023	03/11/2023	03/11/2023
A-T-031w	03/11/2023	03/11/2023	03/11/2023
A-T-032w	11/01/2023	11/01/2023	11/01/2023
A-T-033w	03/11/2023	03/11/2023	03/11/2023
A-T-040w	03/11/2023	03/11/2023	03/11/2023
A-T-042wTCN	01/11/2023	01/11/2023	01/11/2023
A-T-050w	06/11/2023	06/11/2023	06/11/2023
A-T-055w	31/10/2023	31/10/2023	31/10/2023
Calc-As Recd	01/11/2023	01/11/2023	01/11/2023

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

APPENDIX C

Geotechnical Test Results

TEST REPORT

Client BEK Enviro Ltd

Address Suite One
No. 3 Mitton Road Business Park
Mitton Road
Whalley
Lancashire
BB7 9YE

Contract Lakeside View

Job Number MRN 4627/48
Date of Issue 30 October 2023
Page 1 of 4

Approved Signatories

S J Hutchings, O P Davies

Notes

- 1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.
- 2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.
- 3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.
- 4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.
- 5 The results included within the report are representative of the samples submitted for analysis.
- 6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.



Andrew House, Hadfield Street, Dukinfield, Cheshire SK16 4QX Tel: 0161 475 0870
Email: enquiries@murrayrix.com Website: www.murrayrix.com

Also at: London: 020 8523 1999

Murray Rix is the trading name of Murray Rix (Northern) Limited. Registered in England 2878361

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

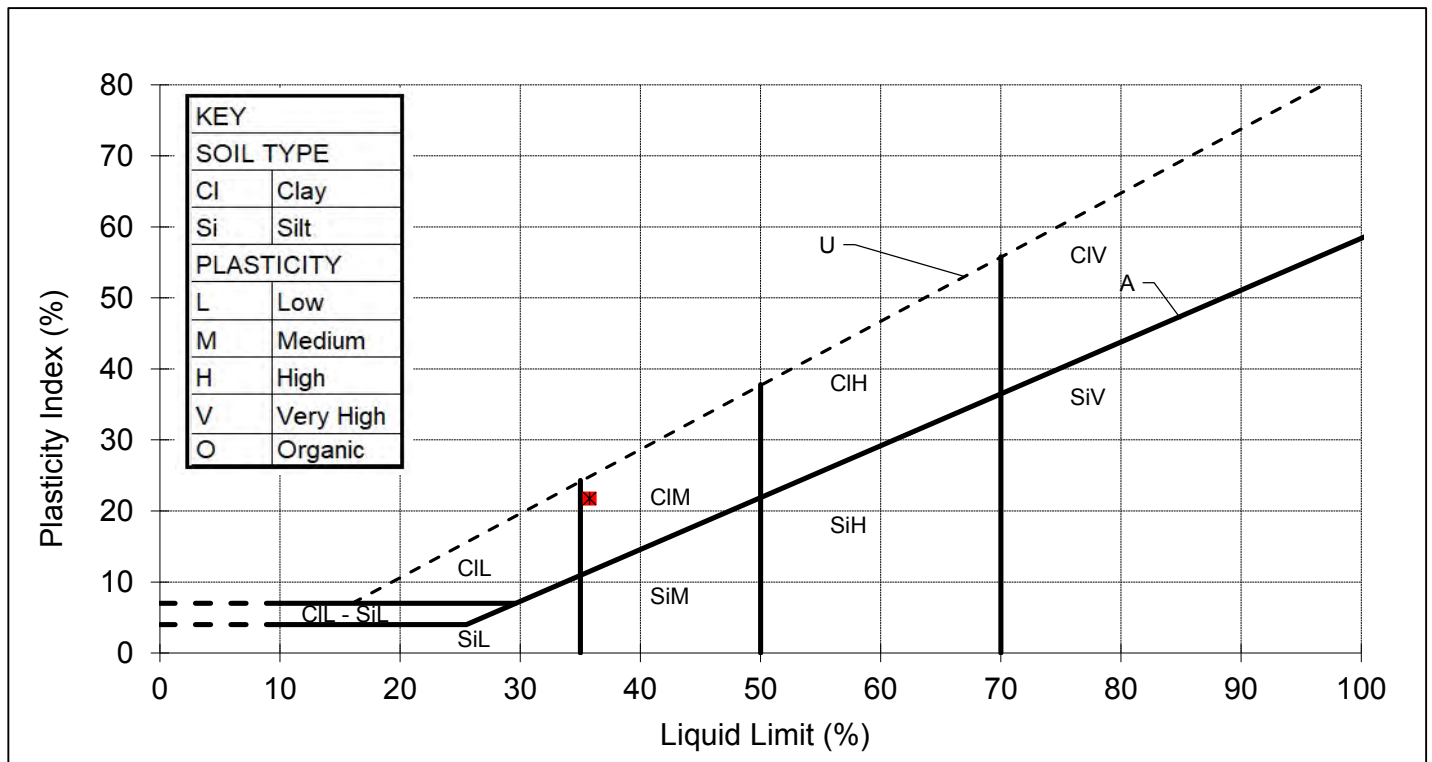
CLIENT	BEK Enviro Ltd
SITE	Lakeside View
JOB NUMBER	MRN 4627/48

SAMPLE LABEL	WS2 (2-2.5m)	DATE SAMPLED	17-Oct-23
SAMPLE No.	132834	DATE RECEIVED	18-Oct-23
DATE TESTED	23-Oct-23	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.8	36.2	0.989	
Determination 2 (avg)	20.6	36.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18.7	36	14	22	91



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

30-Oct-23

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A2:2022 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014+A1:2022

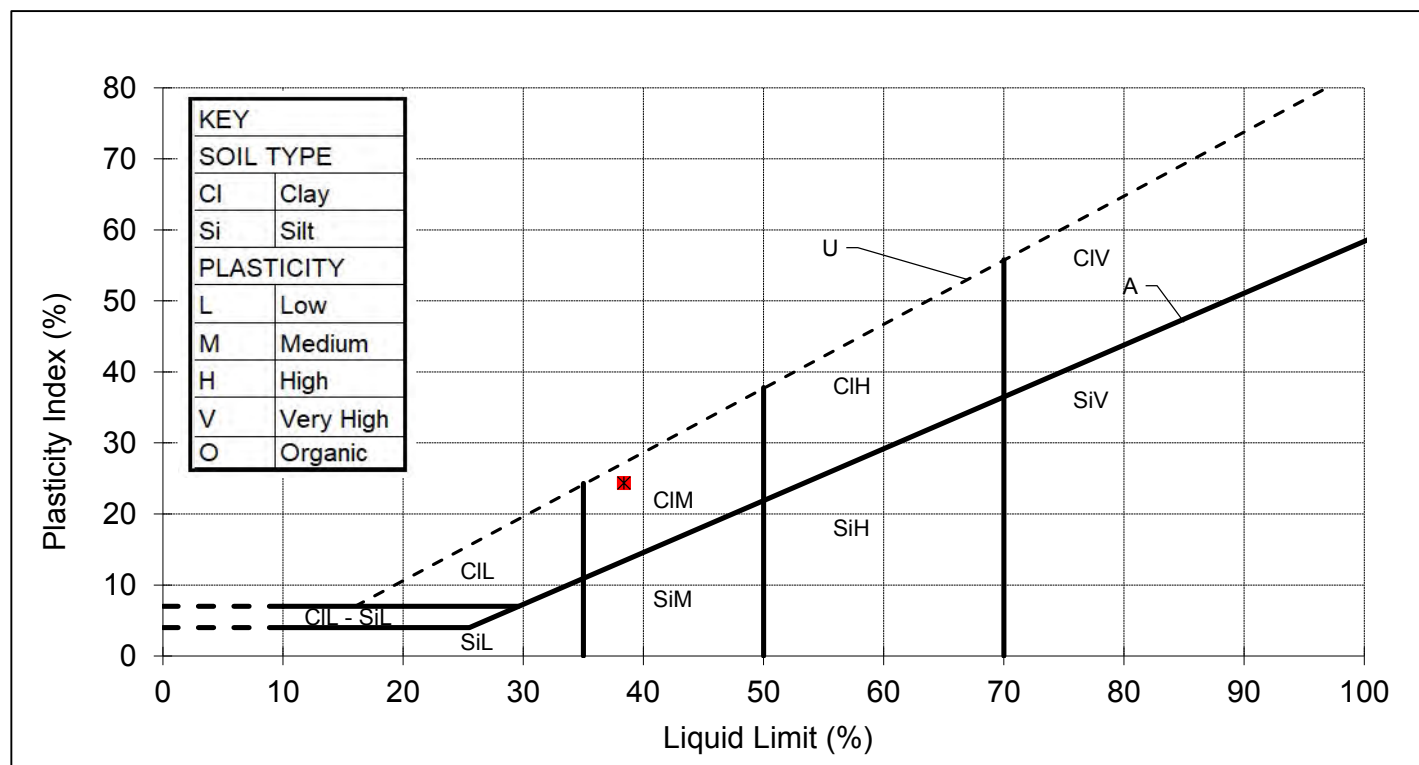
CLIENT	BEK Enviro Ltd
SITE	Lakeside View
JOB NUMBER	MRN 4627/48

SAMPLE LABEL	WS3 (1.5-2m)	DATE SAMPLED	17-Oct-23
SAMPLE No.	132835	DATE RECEIVED	18-Oct-23
DATE TESTED	23-Oct-23	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	18.0	37.0	1.035	
Determination 2 (avg)	18.3	37.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14.7	38	14	24	85



REMARKS

SIGNED

NAME

O.P. Davies BA (Hons)
(Laboratory Manager)

DATE

30-Oct-23

APPENDIX D

Photographs



P1: Trial Pit TP1



P2: Trial Pit TP2



P3: Trial Pit TP3



P4: Trial Pit TP4



P5: Trial Pit TP5



P6: Trial Pit TP6



This appendix is for illustrative purposes only and is for use only in conjunction with associated reports relating to the project details adjacent. BEK accepts no liability for the misinterpretation or use of this illustration by any other parties.

Site: Land to the rear of No 1-3 Lakeside View, Halewood
Title: Appendix D - Photographs

Photographs 1 to 6

Project No: 23116	Created By: AH	Date: November 2023
Client: MAC Roofing and Contracting Limited		



P7: Trial Pit TP7

P8: Trial Pit TP8



P9: Trial Pit TP9

P10: Trial Pit TP10



P11: Trial Pit TP10

P12: Trial Pit TP11



This appendix is for illustrative purposes only and is for use only in conjunction with associated reports relating to the project details adjacent. BEK accepts no liability for the misinterpretation or use of this illustration by any other parties.

Site: Land to the rear of No 1-3 Lakeside View, Halewood

Title: Appendix D - Photographs

Photographs 7 to 12

Project No: 23116

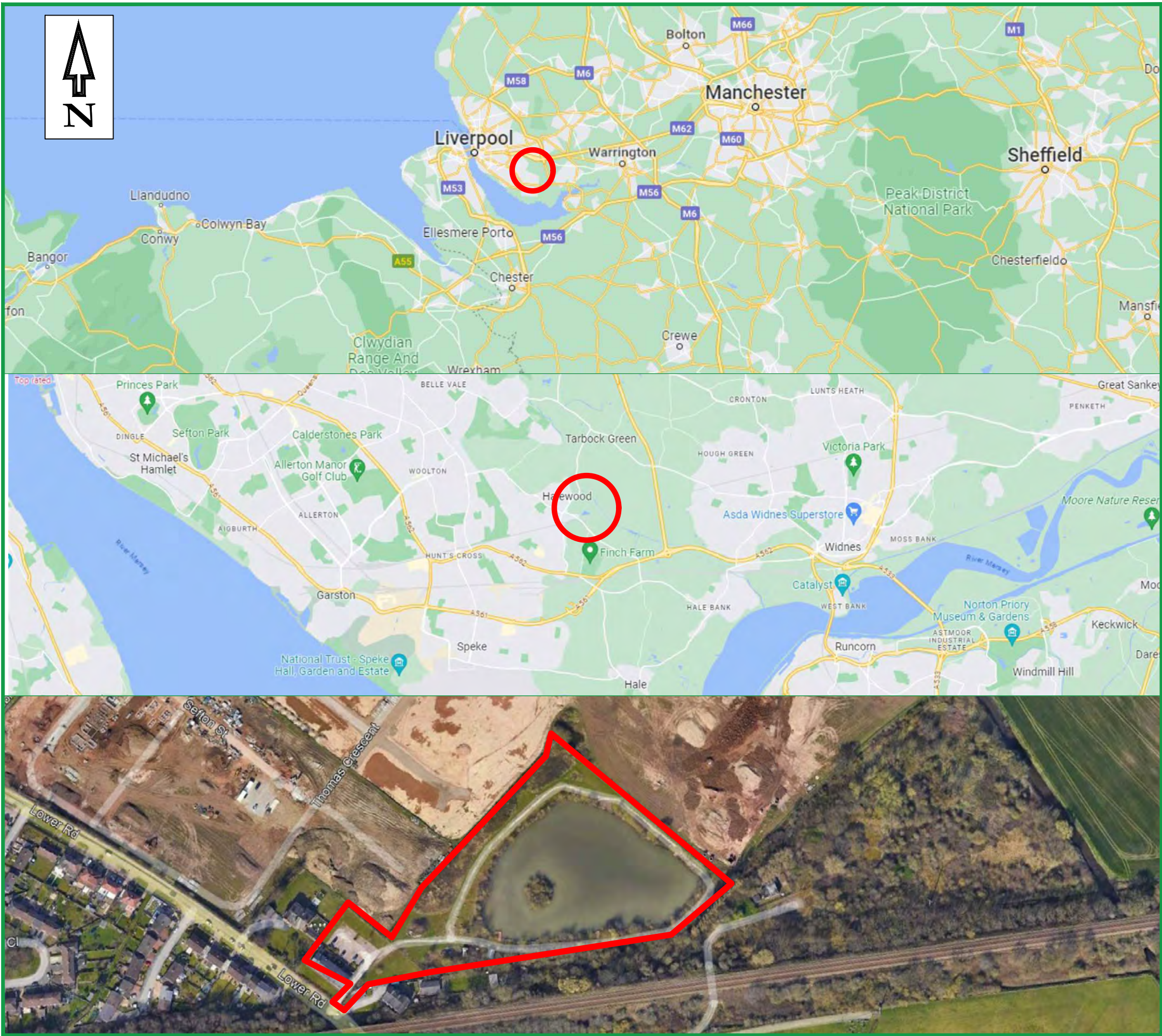
Created By:
AH

Date: November 2023

Client: MAC Roofing and Contracting Limited

APPENDIX E

Drawings



LEGEND

— SITE LOCATION

REV	DESCRIPTION	DATE	BY



GEO-ENVIRONMENTAL CONSULTING ENGINEERS
No 2 Landiwick Court, Metcalf Drive, Altham Business Park, Lancashire
Tel: 01254 377622 Mob: 07906753583
Email: mbuckley@bekenviro.co.uk
Web: www.bekenviro.co.uk

CLIENT.

MAC ROOFING AND CONTRACTING LTD

JOB TITLE.

LAND TO REAR OF NO 1-3 LAKESIDE VIEW, HALEWOOD

DRAWING TITLE.

SITE LOCATION PLAN

SCALE © A3. N.T.S	DRAWN BY. D.E.	APPROVED BY. M.B.	DATE. 18/08/23
DRAWING No. 23116-1			REV. -



LEGEND

APPROXIMATE
SITE BOUNDARY

REV	DESCRIPTION	DATE	BY



GEO-ENVIRONMENTAL CONSULTING ENGINEERS
No 2 Landiwick Court, Metcalf Drive, Altham Business
Park, Lancashire, BB5 5GY
Tel: 01254 377622 Mob: 07906753583
Email: mbuckley@bekenviro.co.uk
Web: www.bekenviro.co.uk

CLIENT.

MAC ROOFING AND
CONTRACTING LTD

JOB TITLE.

LAND TO REAR OF NO 1-3
LAKESIDE VIEW, HALEWOOD

DRAWING TITLE.

SITE LAYOUT

SCALE © A3. NTS	DRAWN BY. D.E.	APPROVED BY. M.B.	DATE. 18/08/23
DRAWING No. 23116-2	REV. -		



LEGEND

-  WINDOW SAMPLE BOREHOLE
-  WINDOW SAMPLE BOREHOLE (GAS/ GROUNDWATER PROBE)
-  TRIAL PIT

REV	DESCRIPTION	DATE	BY



GEO-ENVIRONMENTAL CONSULTING
No 2 Landwick Court, Metcalf Drive, Altham Business Park, Lancashire, BB5 5GY
Tel: 01254 377622 Mob: 07906753583
Email: mbuckley@bekenviro.co.uk
Web: www.bekenviro.co.uk

CLIENT.

MAC ROOFING AND CONTRACTING LTD

JOB TITLE.

LAND TO REAR OF NO 1-3 LAKESIDE VIEW, HALEWOOD

DRAWING TITLE.

SITE INVESTIGATION PLAN

SCALE © A3. N'TS	DRAWN BY. D.E.	APPROVED BY. M.B.	DATE. 23/10/23
DRAWING No. 23116-3			REV. -