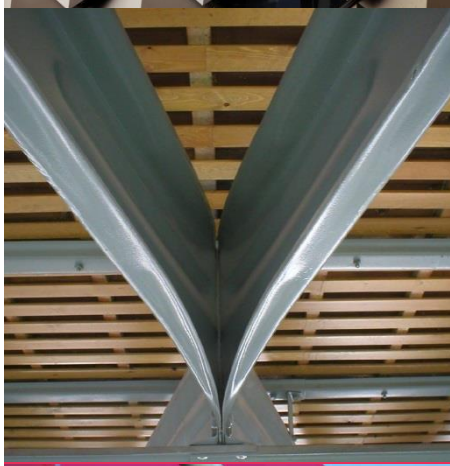
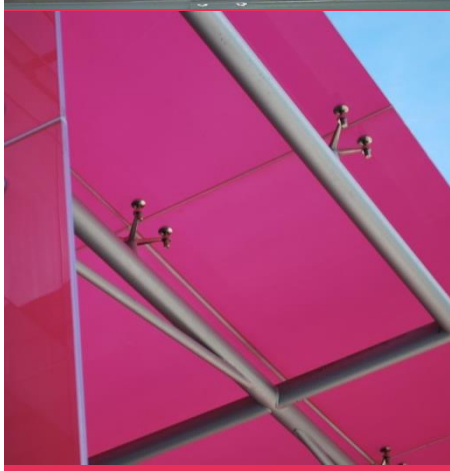




Blackwin Street, Manchester

Phase 2 Ground Investigation

Curtins Ref: 081862-CUR-XX-XX-RP-GE-00003

Revision: P02

Issue Date: 24th July 2023

Client Name: One Manchester Housing

Client Address: Lovell House, Archway 6, Hulme, Manchester, M15 5RN

Site Address: Former Forrester House, Blackwin Street, Manchester, M12 5JY.

Curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester, M1 5WG
Tel: 0161 236 2394
www.curtins.com

CIVILS & STRUCTURES • TRANSPORT PLANNING • ENVIRONMENTAL • INFRASTRUCTURE • GEOTECHNICAL • CONSERVATION & HERITAGE • PRINCIPAL DESIGNER
Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham

Rev	Description	Issued by	Checked	Date
P01	Report Issue	MH	NF	27/02/2023
P02	Updated following completion of gas monitoring	RT	NF	24/07/2023

This report has been prepared for the sole benefit, use, and information for the client. The liability of Curtins Limited with respect to the information contained in the report will not extend to any third party.

Author	Signature	Date
R Taylor BSc (Hons), MSc, GradCIWEM Graduate Geo-Environmental Engineer		27 February 2023

Reviewed	Signature	Date
M Holroyd BSc (Hons) MSc Senior Geo-Environmental Engineer		27 February 2023

Authorised	Signature	Date
Niall Farnworth BSc (Hons) MCIWEM Principal Geo-Environmental Engineer		27 February 2023

Executive Summary

Appointment	Curtins were instructed by One Manchester Housing to undertake a Phase 2 Ground Investigation of a site located of Blackwin St, Gorton, Manchester, M12 5JY. This report has been undertaken in support of the geo-environmental and geotechnical design of 7 No. low-rise houses with associated infrastructure, hardstanding and soft landscaping (private gardens and public open space). The proposed development plans (at the time of writing) are presented in Appendix A.
Current Site Status	The development site is located off Blackwin St in Manchester with an approximate area of the site is 0.13Ha. The National Grid Reference for the centre of the site is 387460, 36800. The development site is located on Blackwin Street, south of Danett Close and Valance Close. The site is currently occupied by open space, with rough surface cover and some vegetation cover. A metal palisade fence and red brick wall surrounds the site.
Summary of Preliminary Site Assessment and Previous Site Investigation	Earliest available mapping (1848) records the site as undeveloped land, forming part of wider agricultural fields. The surrounding area was also undeveloped fields with field boundaries and Gorton Old Road to the north. The 1893 map still shows the site to be mostly undeveloped but the surrounding area to the north, east and west is developed into residential housing. Between 1908 and 1933, Further residential development were evident in the surrounding area with surrounding streets having different names to present day nomenclature. Development of local infrastructure includes All Saints Church, Police Station, Schools with local industry comprising Iron Works, Chemical Works and breweries. By 1968, Forrester House had been constructed on site with an electricity sub-station just outside the north-eastern boundary. Additionally, during this time Gorton Clinic is shown to the south with a large rectangular open space marked on the other side of the renamed Blackwin Street. By 2020, Forrester House has been demolished with site clearance occurring at some time between 2006 and 2020. Made Ground deposits are anticipated accounting for historical development on the site. Superficial soils are indicated by thew BGS as Glacial Till (clay) deposits overlying the Chester Pebble Beds Formation (Sandstone) and Halesowen & Etruria Formation (Mudstone). Environmental Agency data indicates the Glacial till superficial strata is associated with a Secondary – Undifferentiated Aquifer. The Chester Sandstone Formation is recorded as a Principal Aquifer and the Halesowen & Etruria Formation is associated with a Secondary A Aquifer. The site is not situated within an Environmental Agency groundwater Protection Zone (SPZ) and there are no potable groundwater abstractions within 1km nor commercial abstractions within 500m of the subject site. There are no surface water features within 250m of the subject site. Risk mapping for UXO's has placed the site in a Moderate risk area. Moderate-risk regions are those with a bombing density of up to 15 to 49 bombs per 1000 acres. These areas are considered to have a moderate UXB risk. A Detailed Unexploded Ordance Risk Assessment was consequently procured from 1st Line Defence to further assess risk of encountering UXO in Curtins Ground Investigation works. 1st Line Defence assessed the site as **Low** risk on the basis that: no positive evidence of bombing on site has been found in available record sets; post-war aerial imagery does not show any signs of damage within the site boundary, such as cratering, scattered earth or damage to the buildings in the north-western section of the site and, the site uses at the time UXO is likely to have been detected. It was however recommended that the following is undertaken for Curtins works: UXO Risk Management Plan and Site Specific UXO Awareness Briefings to all personnel conducting intrusive works. Contractors undertaking excavations should undertake their own risk assessments with regards to Unexploded Ordnance.
Fieldworks Undertaken	Site investigation works were undertaken by Curtins between 05th and the 12th of December 2022 and included 5No. window sample boreholes, 1No. cable percussive borehole and 6No. machine excavated trial pits. Ground gas and groundwater monitoring standpipes were installed within WS1–WS5 and CP1. Selected soil samples were subjected to laboratory analysis. Six rounds of groundwater and ground gas monitoring have been undertaken between 09th January 2023 and 27th March 2023.
Encountered Ground Conditions	Surface cover encountered typically comprised Made Ground and/or topsoil deposits overlying cohesive Glacial Till deposits. Topsoil was recorded in the northwestern extent of the site with depths of strata ranging between 0.15m bgl and 0.29m bgl, with the greatest thickness of topsoil recorded in the landscaped area in the north of site. No topsoil was recorded in the southwest of the site boundary, where surface cover was comprised of Made Ground soils. Depths of Made Ground ranged between 0.45m bgl and 0.84m bgl and typically comprised of granular demolition fill. During the site investigation no evidence of gross contamination was recorded within the Made Ground strata, however anthropogenic materials such as metals and plastics were occasionally observed. Subsoil across the Blackwin St site predominantly comprised of firm or stiff/very stiff cohesive Glacial Till deposits directly beneath the Made Ground. Final depth of this strata was not proven during the investigation works. Perched water may be encountered in shallow site soils. Six rounds of gas monitoring have been undertaken with a maximum carbon dioxide concentration of 3.2% recorded, maximum methane concentration of <0.1% recorded. In accordance with NHBC guidance, the hazardous gas flow rate of

	0.0032 l/hr for carbon dioxide, consistent with a Green classification, requiring no gas protection measures. This is further supported by the low concentrations of carbon dioxide and methane recorded. Further monitoring is recommended as part of the site investigation works.
Environmental Laboratory Testing	With respect to the 'Residential with home grown produce' end-use thresholds, no exceedances have been noted (exceedances for Mercury were discounted). No asbestos containing materials (ACMs) were identified during the ground investigation. Three Made Ground soil samples identified loose fibres of amosite, and one recorded chrysotile as bitumen product.
Ground Contamination and Ground Gas Assessment	A **Moderate**/**Low** risk rating is currently identified to site end-users and construction workers, from soils and dust from inhalation and ingestion, accounting for the presence of asbestos containing materials (ACMs) in shallow Made Ground soils. A **Low** to **Very Low** risk rating is currently identified to controlled waters in relation to groundwater and surface water receptors, accounting for the limited sources of contamination encountered within site soils and limited pathways for migration. A **Low**-risk rating is currently identified to site end users from ground gases arising from Made Ground. This corresponds to a NHBC Green Classification. The assessments note that ground risk has not been fully uncharacterised and will required investigation and further assessment.
Geotechnical Assessment	Any buried structures e.g. possible relic sewer encountered will need to be grubbed out as part of the enabling works and voids backfilled with a suitable engineered fill. Depending on proposed building loads, shallow foundations are likely to be feasible, founding in the firm to stiff cohesive Glacial Till (with a minimum Cu of 60 kPa) below the Made Ground encountered at depths between 0.45m to 0.84m bgl. If a higher bearing resistance is required for the proposed loads, pad foundations are being considered or changes in the foundation dimensions are proposed, then further assessment/review should be undertaken. The NHBC Technical Standards 2023 state that ground bearing floors may only be used where the depth of fill (Made Ground) is less than 600mm deep and properly compacted. Where Made Ground exceeds this thickness a suspended floor slab is likely to be required. It is recommended that the minimum foundation depths and heave precautions (if required) as stated in the NHBC Technical Standards are considered in conjunction with a Low to Medium volume change potential and the areas of proposed planting. The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 AC-1.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: 1. Where required, liaison with the Local Authority, NHBC or other warranty provider regarding the suitability of ground bearing floor slabs is recommended. 2. Where building loads are to be transferred to soils in which the possible relic sewer is placed, the relic sewer should be removed and replaced with suitably compacted granular fill, under the instruction of an earthworks specification. *3.* It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within *Appendix C.* *4.* Allowance should be made for provision of a suitable thickness of clean and inert cover in all areas of soft landscaping, contractors to employ suitable asbestos control measures, to be detailed in a Remediation Strategy. 5. A Remediation Strategy and Verification report will be required to detail and approve the above measures.

Copyright ©2023 Curtins Consulting Ltd

Table of Contents

1.0 Introduction 1
1.1 Project Background 1
1.2 Scope of Services 1
2.0 Phase 1 Site Preliminary Site Assessment Summary 2
2.1 Current Setting 2
2.2 Surrounding Area Details 3
2.3 Previous Site Use 3
2.4 Published Geology 4
2.4.1 Made Ground Deposits 4
2.4.2 Mining and Quarrying 4
2.4.3 Other Ground Stability Issues 5
2.4.4 Ground Gas 5
2.5 Hydrogeology and Hydrology 5
2.6 Unexploded Ordnance (UXO) Risk Assessment 6
2.7 Summary of Phase 1 Conceptual Site Model 7
3.0 Ground Investigation Scope of Works 9
3.1 Soil Logging and Sampling 9
3.2 Monitoring Well Installations 10
3.3 Post-Investigation Monitoring 10
3.3.1 Groundwater and Ground Gas Monitoring 10
4.0 Laboratory Testing 11
4.1 Geo-environmental Soil Analysis 11
4.2 Geotechnical Testing 12
5.0 Ground Conditions 13
5.1 Encountered Ground Conditions 13
5.2 Made Ground/Topsoil 13
5.3 Glacial Till 14

Copyright ©2023 Curtins Consulting Ltd

5.4 Observed Potential Contamination 14
5.5 Obstructions Encountered 14
5.6 Groundwater 14
6.0 Ground Model 16
6.1 Topsoil and Made Ground 16
6.2 Cohesive Glacial Till Deposits 16
6.3 Aggressive Ground Conditions 23
7.0 Ground and Groundwater Contamination Assessment 24
7.1 Human Health 24
7.1.1 Adopted Soil Human Health GACs Screening Methodology 25
7.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results 25
8.0 Ground Gas Assessment 27
8.1 Ground Gas Monitoring Results 27
8.2 Ground Gas Assessment 28
8.3 Radon 29
9.0 Revised Conceptual Site Model 30
9.1 Summary of Significant Pollutant Linkages 32
10.0 Geotechnical Assessment and Recommendations 33
10.1 Introduction 33
10.2 Summary of Ground Conditions 33
10.3 Geotechnical Considerations 33
10.4 Preliminary Foundation Design 33
10.5 Ground Bearing Floors 34
10.6 Volume Change Potential 34
10.7 Concrete Classification 34
10.8 Excavation and Support 34
10.9 Presence of Existing Services 35
11.0 Conclusions & Recommendations 36

Copyright ©2023 Curtins Consulting Ltd

11.1 Geotechnical 36
11.2 Ground and Groundwater Contamination 36
11.3 Recommendations 37
12.0 References 0

Appendices

Appendix A Drawings
Appendix B Exploratory Hole Logs
Appendix C Chemical Laboratory Testing Results
Appendix D Geotechnical Laboratory Testing Results
Appendix E Ground Gas Monitor Results
Appendix F GAC Screening Thresholds
Appendix G Detailed UXO Report
Appendix G Risk Assessment Methodology

1.0 Introduction

1.1 Project Background

Curtins were instructed by One Manchester Housing to undertake a Phase 2 Ground Investigation of a site located of Blackwin Street, Gorton, Manchester, M12 5JY.

This report relates to geo-environmental and geotechnical assessment of the site centred on National Grid Reference (NGR) SJ 387460, 36800 and covers an area of approximately 0.13 Ha.

It is understood that the proposed site development includes the construction of 7 No. low-rise residential houses with associated infrastructure, hardstanding and soft landscaping (private gardens and public open space). The proposed development plans are presented in Appendix A.

1.2 Scope of Services

This Phase 2 Ground Investigation Report will characterise the environmental and geotechnical conditions of the site. The ground investigation has been undertaken to assess the ground and groundwater conditions across the site.

The Phase 2 Ground Investigation Report is intended to:

a) Determine the risk of the proposed end-user being adversely impacted by potential contamination in shallow site soils that may be present on the site due to its known current, recent and historical use;
b) Determine if there is a risk to the end-user from soil gases including methane, carbon dioxide, carbon monoxide and hydrogen sulphide;
c) Characterise site wide natural soils and provide classification of soils for re-use;
d) Recommendations for the design of foundations and building ground floor slabs; and
e) Recommendations for the specification of sub-structure concrete.

Detailed flood risk assessment, ecology and archaeological studies are outside of the scope of this report.

Copyright ©2023 Curtins Consulting Ltd

2.0 Phase 1 Site Preliminary Site Assessment Summary

This section presents a summary of the current site setting, history, geology, and hydrogeology/hydrology of the subject site. This information has been extracted from Curtins Phase 1 report (Ref. 1). As such it is advised that this report is read in conjunction with the Phase 1 report (Ref. 1).

This information will feed into the geo-environmental risk assessment (refer to Section 7.0) and geotechnical assessment (refer to Section 10.0).

2.1 Current Setting

The development site is located on Blackwin Street, south of Danett Close and Valance Close. The site is currently occupied by open space, with rough surface cover and some vegetation cover. A metal palisade fence and red brick wall surrounds the site.

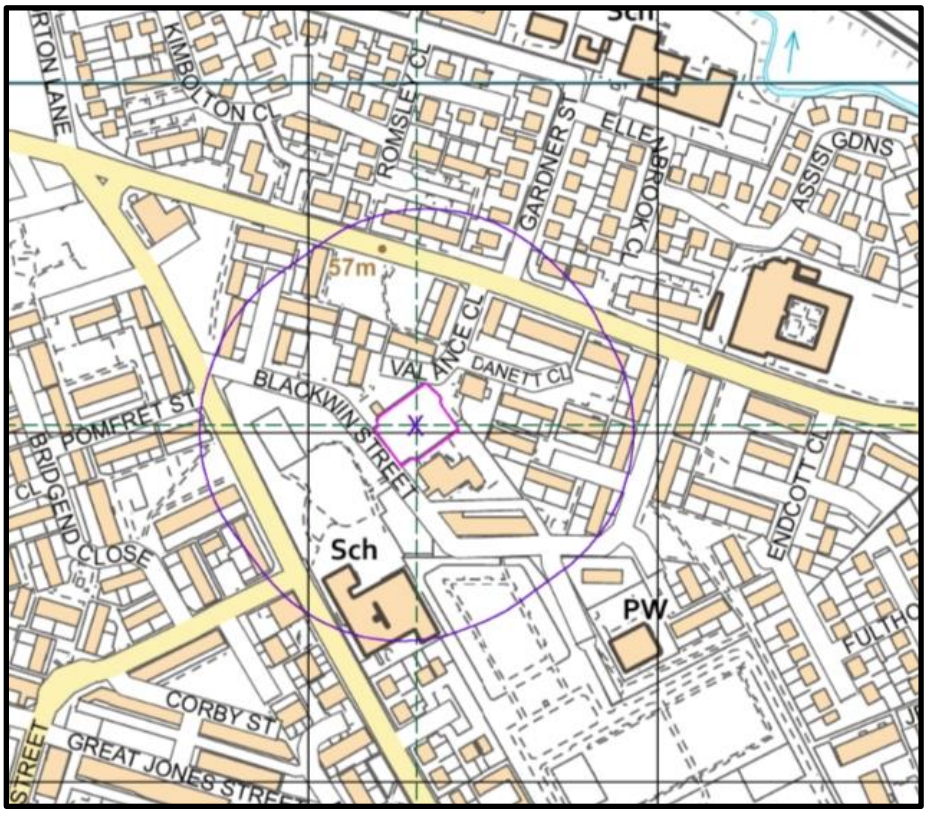


Figure 2.1 *– Site Location Plan (Site boundary shown in pink).*
Crown Copyright. License Number 100022432.

2.2 Surrounding Area Details

The following information was also established through undertaking an environmental database search as part of the Curtins Phase 1 report (Ref. 1).

Table 2.2 – *Surrounding Area*

Surrounding Area	**N**	Danett Close and Valance Close with public open space and residential dwellings.
	E	Laurence Close and continuation of Blackwin Street. With residential dwellings and public open space.
	W	Public open space and then residential dwellings along Bell Vue Street.
	S	Gorton Clinic, public open space with residential dwellings and commercial properties along Bell Vue Street.

2.3 Previous Site Use

A review of the available historical mapping information for the site, as presented within Curtins Phase 1 report (ref. 1) has been undertaken with specific reference to potential sources of contamination.

Earliest available mapping (1848) records the site as undeveloped land, forming part of wider agricultural fields. The surrounding area was also undeveloped fields with field boundaries and Gorton Old Road to the north. The 1893 map still shows the site to be undeveloped but the surrounding area to the north, east and west is developed into residential housing.

Between 1908 and 1933, further residential development was evident in the surrounding area with surrounding streets having different names to present day nomenclature. There was development of local infrastructure includes All Saints Church, Police Station, Schools with local industry comprising Iron Works, Chemical Works and breweries, all >100m from the site.

By 1968, Forrester House was constructed on site with an electricity sub-station just outside the western boundary. Additionally, during this time Gorton Clinic is shown to the south with a large rectangular open space marked on the other side of the renamed Blackwin Street.

By 2020, Forrester House has been demolished with site clearance occurring at some time between 2006 and 2020.

Copyright ©2023 Curtins Consulting Ltd

2.4 Published Geology

A study of the Envirocheck Report acquired for the Curtins Phase 1 report (Ref. 1) and the British Geological Survey (BGS) 1:50,000 mapping records (Bedrock and Superficial Editions) for Manchester (Sheet 085) (Ref. 2) indicates the following geological and hydrogeological succession underlying the site:

- Glacial Till
- Chester Formation (Sandstone)
- Halesowen & Etruria Formation (Sandstone & Mudstone)

The BGS website site show the site to lie on a north south trending normal fault separating Chester Formation and the Halesowen & Etruria formations. A number of other faults are shown in the wider area.

One fault is located approximately 600m south west of the site, orientated approximately WNW-ESE, and another, a further 500m south west also with similar orientations, to the south (300m, 500m and 900m).

The nearest BGS recorded borehole logs are located approximately 300m south of the site, located off Hyde Lane (Ref. 3). These are summarised in *Table* 2.4 below:

Table 2.4 – *Historical Borehole Record from Surrounding Area*

Borehole Ref.	Location (Easting, Northing)	Details (depth to top of strata/lithology/thickness)	
SJ89NE646	300m south (387400, 396460)	0.00m to 0.10m bgl 0.10m to 0.30m bgl 0.30m to 10.00 bgl *10.00m bgl*	MADE GROUND – Concrete (0.10m) MADE GROUND Quarry Waste (0.20m) Silty gravelly CLAY (9.70m) *Borehole terminated*

2.4.1 Made Ground Deposits

Made Ground deposits are not indicated on the geological maps; however, it is anticipated that Made Ground of unknown composition will be present given the history of development on site.

2.4.2 Mining and Quarrying

A review of the Coal Authority interactive mapping (Ref. 3) for the area indicates that the site is located within a Coal Mining Reporting Area, however it is not located within a Development High-Risk Area. The nearest Development High-Risk Areas are associated with coal outcrops to the northwest of the site.

Copyright ©2023 Curtins Consulting Ltd

The nearest coal mine entries are located at the site of Ashbury's Train Station approximately 500m northwest of the site.

There are no recorded coal workings and no probable coal workings within 500m of the site.

Consequently, the risk to development from historic coal mining is considered to be **Low**. No further actions are required to further asses the risk to development from historic coal mining.

The closest recorded BGS mineral sites is located 488m northeast of the site, a recycling aggregate site at Ashbury Rail Depot.

2.4.3 Other Ground Stability Issues

The Envirocheck Report (Ref. 1) confirms that there is a no hazard to low risk from the following ground stability hazards on the site; collapsible ground, compressible ground, ground dissolution, landslide ground, running sands and shrinking or swelling clay.

2.4.4 Ground Gas

There are no BGS recorded landfill sites within 500m of the site. A historic landfill site is located 324m northeast of the site. It was in use from 31st December 1985 to 31st December 1994 but no waste classification information has been given.

The nearest area of infilled land is located 60m west, which is an infilled pond. A further 27 other infilled water features exist within 500m of the site.

The Envirocheck Report and BGS Radon Mapping (Ref. 4) confirms the site is situated in an area where between 1% and 3% of homes are above the radon action level. Radon protection measures are therefore not considered necessary within the proposed development.

2.5 Hydrogeology and Hydrology

The Curtins Phase 1 Report (Ref. 1) indicates that the geological sequence underlying the site has the following hydrogeological characteristics:

Geology	Associated Hydrogeological Classification
Made Ground deposits are not recorded on geological mapping, however, the site's historic land use as residential dwellings, suggests that Made Ground may be present.	N/A
Glacial Till – Devensian, Diamicton[1]	Secondary Aquifer, Undifferentiated[2]
Chester Pebble Beds Formation – Sandstone[3]	Principal Aquifer[4]
Halesowen & Etruria Formation – Sandstone & Mudstone[5]	Secondary A Aquifer[6]

Copyright ©2023 Curtins Consulting Ltd

Notes:
1. *A heterogenous mixture of clay, sand, gravel, and boulders varying widely in size and shape.*
2. *These layers have not been assigned an attribute either category A or B rock type due to not being possible. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.*
3. *Base of sequence dominated by sandstone containing pebbles and conglomerates. Fine to coarse grained sandstones, commonly with pebbles, conglomerates and sporadic siltstones. – Early Triassic in age.*
4. *Layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.*
5. *Halesowen Formation – green grey sandstone and green grey mudstone with thin coals and limestones. Etruria Formation – red brown to commonly green mottled mudstone with sandstone and conglomerate inclusions.*
6. *Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.*

There are no surface water features within 250m of the subject site. There are no discharge consents for the site and no pollution incidents to controlled waters have been recorded on-site.

There are no potable groundwater abstractions within 1 km and no commercial abstractions within 500m of the subject site. The site is not within an Environment Agency groundwater Source Protection Zone (SPZ).

2.6 Unexploded Ordnance (UXO) Risk Assessment

Military activities including those conducted as part of both the First and Second World Wars have resulted in a legacy of unexploded ordnance (UXO) being present within the shallow soils of the UK.

UXO result from various sources including both allied (military training) and German (bombing raids) with a guide figure of approximately 10% of all munitions failing to function as designed.

The likelihood of UXO being encountered on a development site is influenced by several factors including; the proximity to strategic targets, the nature of the development works being undertaken and evidence of local damage in the post-war periods amongst others. To determine the likelihood of UXO being present on a site, a step-wise risk assessment process is followed. This process is outlined within CIRIA C681 Unexploded Ordnance: A Guide for the Construction Industry (Ref. 6) with the following commentary considered to represent a Preliminary Risk Assessment intended to guide if and where there is a requirement for a Detailed Risk Assessment.

Preliminary UXO Assessment

Risk mapping for UXO's has placed the site in a **Moderate** risk area. Moderate-risk regions are those with a bombing density of up to 15 to 49 bombs per 1000 acres. These areas are considered to have a moderate UXB risk. In general, further action to mitigate the risk is considered prudent, although not essential. Care is required when assessing the risk for specific sites where the risk may be higher because of local wartime activity.

A review of the available historic mapping did not identify any evidence of bomb damage onsite or within close proximity of the site boundary. No ruins were recorded in the immediate vicinity of the

Copyright ©2023 Curtins Consulting Ltd

development site, and no buildings appear to have been demolished following WWII on or surrounding the site. Detailed bomb strike mapping does not record any strikes or damage on the site.

Considering the above, an elevated risk of encountering potential UXO as part of future intrusive works was considered and it was considered prudent to procure a Detailed Unexploded Ordnance Risk Assessment from 1st Line Defence to further assess the risk for Curtins ground investigation works.

Detailed Unexploded Ordnance Risk Assessment

1st Line Defence's Detailed Unexploded Ordnance Risk Assessment Report is enclosed within Appendix G.

1st Line Defence assessed the site as **Low** risk on the basis that: no positive evidence of bombing on site has been found in available record sets; post-war aerial imagery does not show any signs of damage within the site boundary, such as cratering, scattered earth or damage to the buildings in the north-western section of the site and, the site uses at the time UXO is likely to have been detected.

The following risk mitigation measures were however recommended to support the proposed Curtins GI works at Blackwin Street, Manchester:

- UXO Risk Management Plan.
- Site Specific UXO Awareness Briefings to all personnel conducting intrusive works.

Contractors undertaking excavations should undertake their own risk assessments with regards to Unexploded Ordnance.

2.7 Summary of Phase 1 Conceptual Site Model

Table 2.7 records initial Potential Pollutant Linkages (PPL) identified which are to be assessed further through the Phase 2 Investigation.

Table 2.7 – *Potential Pollutant Linkages*

Source	Pathway	Receptor	Risk Rating
Potential sources of on-site contamination: • Made Ground of unknown composition from uncontrolled deposition of	Direct contact, ingestion, inhalation (dust and vapours)	**Site End Users** (Residential)	**Moderate/Low**
		Construction and Maintenance Workers	

Copyright ©2023 Curtins Consulting Ltd

Source	Pathway	Receptor	Risk Rating
materials onsite during the construction and demolition of the properties onsite. Potential sources of off-site contamination: • Uncontrolled deposition of Made Ground during the construction of roads and structures adjacent to the site's boundaries. • Potential for PCB contamination from electricity sub-station located just outside the western boundary. • Made Ground of unknown composition from uncontrolled deposition of materials onsite during the construction and demolition of the properties onsite.	Vertical and horizontal migration through the superficial deposits (soils)	**Controlled Waters** Secondary A Aquifer (Bedrock), overlain by Glacial Till Deposits (Secondary Aquifer – Undifferentiated).	**Low**
	Horizontal migration over and through the superficial deposits (soils)	**Controlled Waters** (Surface Water) Nearest surface water feature is a drain 257m northeast. No surface water abstraction points within 1km.	**Low**
Potential sources of ground gas: • Any localised organic rich deposits present within the natural soils. • Coal mining reporting area (outside of development high risk area). • Presence of numerous infilled former water features in the surrounding area.	Vertical and horizontal migration through underlying superficial deposits into buildings and air spaces	**Site End Users** (Residential)	**Moderate**

Potential contaminants of concern associated with the sources identified within the Conceptual Site Model in *Section 6.0* of this reporting include but are not limited to: broad range aliphatic and aromatic hydrocarbons present within any fuel oils; polycyclic aromatic hydrocarbons (PAHs); inorganic compounds including heavy metals; and asbestos present in discarded building materials.

It is noted that an electric substation is located directly west of the site. Accounting for their low mobility in soil and anticipated cohesive superficial soils, it is unlikely that PCBs will be present beneath the site, and therefore a Low risk is presented to site end users. Should exploratory hole logs identify visual or olfactory evidence of contamination in exploratory holes, PCB analysis of made ground soil samples may be undertaken.

Potential contaminants associated with the airborne dust/particulates include but are not limited to: polycyclic aromatic hydrocarbons and inorganic compounds including toxic metals that are also accounted for by potential onsite contaminants of concern.

Copyright ©2023 Curtins Consulting Ltd

3.0 Ground Investigation Scope of Works

Site investigation works were undertaken by Curtins between 5th December and 12th December 2022.

The scope of the ground investigation was designed in general accordance with current UK guidance including:

- LCRM (Ref. 7);
- British Standard (BS) 10175:2011+A2:2017 (Ref. 8);
- BS5930:2015+A1:2020 (Ref. 9); and
- BS EN1997: Part 2:2007 Eurocode 7 (Ref. 11).

The scope and rationale are summarised in *Table 3.0*.

Table 3.0 – *Scope and Rationale of Fieldwork Undertaken*

Exploratory Hole Type	Exploratory Hole Ref.	Ground level (m AOD)	Exploratory Hole Depth (m bgl)	Rationale
Window Sample Boreholes	WS1 WS2 WS3 WS4 WS5	57.74 57.28 57.52 57.81 57.84	5.45 5.45 5.45 5.45 5.45	Confirm shallow ground and groundwater conditions in accessible areas of the site. Collect soils samples for chemical analysis. Collect samples for geotechnical soil testing; Gas and groundwater level monitoring.
Cable Percussive Borehole	CP1	57.94	9.95	Confirm shallow and deep ground and groundwater conditions in accessible areas of the site. Collect soils samples for chemical analysis. Collect samples for geotechnical soil testing; Gas and groundwater level monitoring.
Machine Excavated Trial Pits	TP1 TP2 TP3 TP4 TP5 TP6	57.08 57.45 57.83 57.80 57.91 57.07	2.40 2.39 2.80 2.50 2.60 2.50	Confirm shallow ground conditions and record potential buried obstructions in accessible areas of the site. Collect soils samples for chemical analysis.

For the location of the exploratory holes refer to Curtins drawing reference. 081427-CUR-00-XX-DR-GE-001_V01 enclosed in Appendix A. Ground level and GPS coordinates were recorded during utility clearance and recorded on the exploratory hole logs.

Exploratory hole logs can be referred to in *Appendix B*.

3.1 Soil Logging and Sampling

Exploratory hole arisings were logged onsite by a qualified Engineer from Curtins and in accordance with the requirements of BS5930 (Ref. 9), including visual and olfactory indications of contamination where recorded. Exploratory hole logs can be referred to *Appendix B*.

Copyright ©2023 Curtins Consulting Ltd

3.2 Monitoring Well Installations

Ground gas and groundwater level monitoring 50mm diameter slotted pipes were installed within six exploratory boreholes (WS1 to WS5 and CP1). A bentonite seal was placed at the top and bottom of each of the exploratory holes, surrounding the screened sections of the pipe. A gravel surround was installed in the annulus between the sides of the borehole and the slotted section of the pipe.

The monitoring wells were designed to assess the potential for ground gas and monitor groundwater levels in all exploratory holes. No groundwater samples were collected.

The screened sections focused on the more permeable deposits where encountered, when possible, where ground gas and groundwater may be encountered.

A summary of the response zone is presented in *Table 3.2*.

Table 3.2 – *Monitoring Well Response Zones*

Borehole Ref.	Response Zone m bgl (m AOD)	Strata Description(s)
WS1	1.00 – 5.00 (56.74 – 52.74)	Cohesive Glacial Till
WS2	1.00 – 5.00 (56.28 – 52.28)	Cohesive Glacial Till
WS3	1.00 – 5.00 (56.52 – 52.52)	Cohesive Glacial Till
WS4	1.00 – 5.00 (56.81 – 52.81)	Cohesive Glacial Till
WS5	1.00 – 5.00 (56.84 – 51.84)	Cohesive Glacial Till
CP1	5.00 – 9.95 (52.94 – 47.99)	Cohesive Glacial Till

A copy of the borehole logs can be referred to in *Appendix B* of this report.

3.3 Post-Investigation Monitoring

3.3.1 Groundwater and Ground Gas Monitoring

Six groundwater level and ground gas monitoring visits have been undertaken to date between the 09th January 2023 to the 27th March 2023.

The results of the groundwater level monitoring are detailed in *Section 5.7.*

Copyright ©2023 Curtins Consulting Ltd

4.0 Laboratory Testing

4.1 Geo-environmental Soil Analysis

Representative soil samples were selected for laboratory chemical analysis, based on field observations and to provide information about the encountered ground conditions.

Selected soil samples for chemical testing were placed in laboratory provided containers and stored in cool boxes prior to being transported to the nominated laboratory under the laboratory's chain of custody documentation. The laboratory selected by Curtins for chemical analysis was Envirolab (UKAS and MCERTS accredited) and for geotechnical analysis was Ian Farmers Associates (UKAS accredited).

Given the lack of any obvious sources of potential contamination the sampling positions were generally located in a non-targeted, systematic array, to give adequate and representative coverage of the sites proposed end use and the immediate environmental setting, concentrated in the near surface deposits. The location of the historic building footprint on the site was targeted where possible, and in proximity to the western site boundary close to the electrical sub-station.

The source material of contaminants of concern potentially present on the site was considered to include, amongst others; organic matter, ash and fill, hydrocarbons (e.g. fuel/oils), polyaromatic hydrocarbons (PAHs), heavy metals and asbestos.

The extent of the above is captured by the broad environmental testing suites listed in *Table 4.1.*

Table 4.1 – *Environmental Chemistry Analysis Suite: Soils*

Suite Ref.	Analyte	LOD
Soils Suite A	Asbestos Screen	-
	pH Value	0.01 pH
	2:1 Water Soluble Sulphate	0.01 g/l
	Soil Organic Matter (SOM)	0.1% w/w
	Arsenic, Chromium, Chromium VI, Copper, Lead, Nickel, Selenium	1 mg/kg
	Zinc	5 mg/kg
	Boron (water soluble)	1 mg/kg
	Cadmium	0.5 mg/kg
	Mercury	0.17 mg/kg
	Cyanide (total)	1 mg/kg
	Phenols (screen)	0.2 mg/kg
	PAHs (USEPA 16)	0.01 to 0.08 mg/kg

Copyright ©2023 Curtins Consulting Ltd

Suite Ref.	Analyte	LOD
	TPH (Aro/Ali Split)	0.01 to 1 mg/kg

A total of twelve Made Ground and seven natural soil samples were obtained and tested for Suite A.

Copies of the environmental chemistry testing certificates are presented in *Appendix C*.

4.2 Geotechnical Testing

Soil samples for testing were prepared in accordance with BS1377: Part 1:2016 (Ref. 11).

The undertaken geotechnical testing is summarised in *Table 4.2.*

Table 4.2 – *Geotechnical Testing*

Test Type	Quantity	Standard
In Situ Testing		
Standard Penetration Testing	30	BS 5930: 2015, Clause 41
Laboratory Testing (General Testing - Foundation Design)		
Atterberg Limit	8	BS1377 1990, Part 2 (clause 4.5, 5.3 & 5.4)
Moisture Content	8	BS1377 1990, Part 2
Water Soluble Sulphate*	26	IS0 17025 MCERTS
pH Value*	26	IS0 17025 MCERTS
Single Stage Quick Undrained Triaxial Test	2	BS1377 1990 Part 2 (Clause 9.2)
Oedometer One Dimensional Consolidation Test	1	BS1377 1990 Part 5 (Clause 3.3, 3.4, 3.5)

* Includes soil samples tested as part of Environmental chemistry analysis suite.

The results of the geotechnical testing are summarised in *Section 6.0* of this report.

Copies of the geotechnical testing certificates can be referred to in *Appendix D*.

Copyright ©2023 Curtins Consulting Ltd

5.0 Ground Conditions

The ground conditions across the site, determined during the Curtins ground investigation works, generally comprised Made Ground overlying cohesive Glacial Till deposits.

5.1 Encountered Ground Conditions

A summary of the ground conditions encountered during the site investigation works is presented below, with detailed information presented on the exploratory hole logs included in *Appendix B*.

A summary of the geotechnical test results recorded within the superficial deposits are presented in *Section 6.0*. Full details of the geotechnical results can be found in *Appendix D*.

Table 5.1 – *Summary of Ground Conditions Encountered*

Strata	Depth to Top of Strata		Depth to Bottom of Strata		Thickness		Description
	Min m bgl m AOD	Max m bgl m AOD	Min m bgl m AOD	Max m bgl m AOD	Min (m)	Max (m)	
Made Ground (Topsoil)	Ground Level		0.15 (57.57)	0.29 (57.52)	0.15	0.29	Dark brown slightly gravelly slightly cobbly clay with frequent rootlets. Gravel fragments of brick, concrete and ceramic. Cobbles of brick.
Made Ground (Granular)	Grou-nd Level	0.26 (57.57)	0.45 (57.40)	0.84 (56.49)	0.33	0.76	Brown gravelly, cobbly sand, with fragments of concrete, brick and ceramics fragments.
Glacial Till (Cohesive)	0.29 (57.52)	0.84 (56.99)	2.39 (55.06)	9.95 (47.99)	1.81[1]	9.41[1]	Firm, stiff or very stiff reddish brown and grey mottled sandy gravelly clay. With gravels consisting of mudstones, siltstones, quartzite and coal fragments.

1 Thickness not proven.

5.2 Made Ground/Topsoil

Surface cover encountered during the ground investigation typically comprised topsoil or granular Made Ground.

Topsoil was recorded in six locations in the north-western extent of the subject site. Depths of topsoil ranged between 0.15m bgl (57.12m AOD) and 0.29m bgl (57.52m AOD), with the greatest thickness recorded in the landscaped area surrounding the existing off-site sub-station. Topsoil typically comprised dark brown slightly gravelly slightly cobbly clay with frequent rootlets. The gravel fraction includes brick, concrete and ceramic, and cobbles of brick.

No topsoil was recorded in the south-western area of the site, where surface cover was comprised of granular Made Ground soils.

Copyright ©2023 Curtins Consulting Ltd

Granular Made Ground was recorded in all exploratory holes, either beneath topsoil or from the site surface. Maximum depths of Made Ground range between 0.45m bgl (56.62m AOD) and 0.84m bgl (56.99m AOD). Made Ground was typically described as a very gravelly, very cobbly sand, containing concrete, brick and ceramics fragments. Granular Made Ground deposits identified on site, are likely remnants of the demolition of Forrester House.

A relic brick lined feature (possible sewer) was identified within TP2, from 2.03m to 2.39m bgl. The extent of the sewer beneath the site is unknown and is not shown within utility plans. This may have been overlain by reworked cohesive glacial till, however there was no visual difference between this material and cohesive Glacial Till encountered elsewhere across the site.

5.3 Glacial Till

Firm, stiff or very stiff cohesive Glacial Till was encountered in all exploratory holes, beneath Made Ground, and typically comprised of a reddish brown and grey mottled sandy gravelly clay. With gravels consisting of mudstones, siltstones, quartzite and coal fragments. The full extent of this strata was not proven during the site investigation.

5.4 Observed Potential Contamination

No potential visual or olfactory contamination was observed during the intrusive investigation works.

5.5 Obstructions Encountered

A possible relic sewer was observed in exploratory hole TP2 recorded at depths of 2.03m bgl (55.42m AOD) and 2.39m bgl (55.06m AOD). Detailed information is presented on the exploratory hole logs included in *Appendix B*.

5.6 Groundwater

No groundwater was encountered during the initial site investigation works.
Four rounds of groundwater monitoring have been undertaken to date, between 09th January and 27th March 2023, the results of which are presented in *Table 5.6a*.

Copyright ©2023 Curtins Consulting Ltd

Table 5.6a – *Groundwater Monitoring Results*

Borehole Ref.	Installation Strata	Response Zone m bgl (m AOD)	Depth, m bgl (m AOD)					
			09/01/2023	01/02/2023	17/01/2023	24/02/2023	16/03/2023	27/03/2023
WS1	1.00 – 5.00 (56.74 – 52.74)	Cohesive Glacial Till	Dry	4.84 (52.90)	4.39 (53.35)	4.17 (53.47)	3.71 (54.04)	3.49 (54.25)
WS2	1.00 – 5.00 (56.28 – 52.28)	Cohesive Glacial Till	- [2]	0.44[1] (56.84)	0.67[1] (56.61)	0.66[1] (56.62)	0.25 (57.03)	0.35 (56.93)
WS3	1.00 – 5.00 (56.52 – 52.52)	Cohesive Glacial Till	0.74[1] (56.79)	0.55[1] (56.98)	0.67[1] (56.85)	0.62[1] (56.90)	0.48 (57.04)	0.52 (57.00)
WS4	1.00 – 5.00 (56.81 – 52.81)	Cohesive Glacial Till	2.19 (55.62)	1.69 (56.12)	1.48 (56.33)	1.41 (56.40)	1.22 (56.59)	1.09 (56.72)
WS5	1.00 – 5.00 (56.84 – 51.84)	Cohesive Glacial Till	- [2]	1.22 (56.62)	1.22 (56.62)	1.19 (56.65)	1.16 (56.68)	1.15 (56.69)
CP1	5.00 – 9.95 (52.94 – 47.99)	Cohesive Glacial Till	5.20[1] (52.74)	4.40[1] (53.54)	4.14[1] (53.80)	3.82[1] (54.12)	3.51 (54.43)	3.18 (54.76)

(1) Response zone noted as flooded
(2) Borehole not monitored on 09th January 2023 visit

Table 6.7a illustrates that perched water may be encountered in shallow site soils, with variable groundwater levels recorded within the shallow wells across the monitoring period. Groundwater or perched water ingress into excavations should be controlled by pumping from sumps.

Copyright ©2023 Curtins Consulting Ltd

6.0 Ground Model

6.1 Topsoil and Made Ground

A limited thickness of topsoil and Made Ground was encountered across the site, to a maximum depth of 0.84m bgl. Accounting for the limited thickness and variable nature of these soils, no geotechnical parameters have been derived.

6.2 Cohesive Glacial Till Deposits

Glacial Till deposits were encountered beneath Made Ground in all exploratory holes typically comprised reddish brown sandy gravelly clay.

The geotechnical results are summarised in *Table 6.2.1* below.

Thirty in-situ SPT 'N' values were undertaken within the cohesive Glacial Till which have been summarised in Table 6.2.1 below.

Table 6.2.1 – *Summary of geotechnical test results – Cohesive Glacial Till*

Parameter		No. of Tests	Results	
			Minimum	Maximum
In-Situ Tests				
SPT 'N' Value – Cohesive		30	11	48
Laboratory Tests				
Atterberg Test	Liquid Limit (%)	8	33	45
	Plastic Limit (%)	8	17	23
	Plasticity Index (%)	8	16	27
	Modified Plasticity Index (%)(1)	8	14.72	27
Moisture Content (%)		15	10	25
pH		14	8.1	11.5
Water Soluble Sulphate (mg/l)		14	10	140
Coefficient of Consolidation, Mv (m^2/MN)		1	0.13	
Undrained Shear Strength, Cu (kPa)		2	170	254

(1) Modified plasticity index is the plasticity of components <425µm.

The results of the Atterberg Limits are presented in *Figure 6.2.1a*. The samples indicated typically medium plasticity clay, with exception of WS4 which was low plasticity clay.

Copyright ©2023 Curtins Consulting Ltd

The SPT N results are presented on *Figure 6.2.1b* and *Figure 6.2.1c.*

The Undrained Shear Strength, C_u, of cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 12) using Equation 1:

$c_u = f_1 \times SPT\ N$ **Equation 1**

Where:

c_u *is the Undrained Shear Strength*

f_1 *is the Stroud Factor determined from Figure 1.5 (Ref. 12)*

SPT N is Characteristic Standard Penetration Test Result

Using an f_1 factor of 5 based upon the average plasticity index result of 21%, c_u values ranging between 55 and 240 kPa were determined. The estimated results indicate medium to very high strength clay, generally increasing in strength with depth. The majority of results indicate high strength cohesive soil.

Two Quick Undrained Single Stage Triaxial Tests were undertaken. The tests were undertaken at depths of 4.00m and 9.50m bgl (53.94m and 48.44m AOD) recoding soil strengths of 170 kPa to 254 kPa respectively at approximate overburden pressure. The results indicate very high strength clay and are generally consistent with estimated undrained shear strengths, illustrated in Figure 6.3.1d and Figure 6.3.1e.

A moderately conservative unit weight of 19 - 23 kN/m^3 is deemed suitable for the cohesive soils above the groundwater table in accordance with BS8002 (Ref. 13).

The Coefficient of Consolidation, Mv, of the cohesive soils can be estimated from the correlation between Plasticity Indices (PI) and SPT N values (Ref. 12) described by Equation 2.

$Mv = 1/(f_2 \times SPT\ N)$ **Equation 2**

Where:

Mv is the coefficient of consolidation

f_2 *is the Stroud Factor determined from Figure 1.5*

SPT N is Characteristic Standard Penetration Test Result

Using an f_2 factor of 0.5 for an average plasticity index of 21%, Mv values range between 0.041 and 0.181 m^2/MN. The results suggest a low to medium compressibility clay, locally described as very low compressibility.

One Oedometer test was undertaken on an undisturbed sample taken at a depth of 6.50m bgl (51.44m AOD) a derived bulk density of 2.26 mg/m^3 was reported. A coefficient of volume compressibility of 0.13 m^2/MN was reported, confirming the medium compressibility clay at this depth.

Copyright ©2023 Curtins Consulting Ltd

The Angle of Shearing Resistance (φ), for the cohesive Glacial Till has been derived from a correlation with Plasticity Indices (Ref. 14). An undrained Angle of Shearing Resistance (φ') of 22° is appropriate , increasing to 28° in drained conditions.

Copyright ©2023 Curtins Consulting Ltd

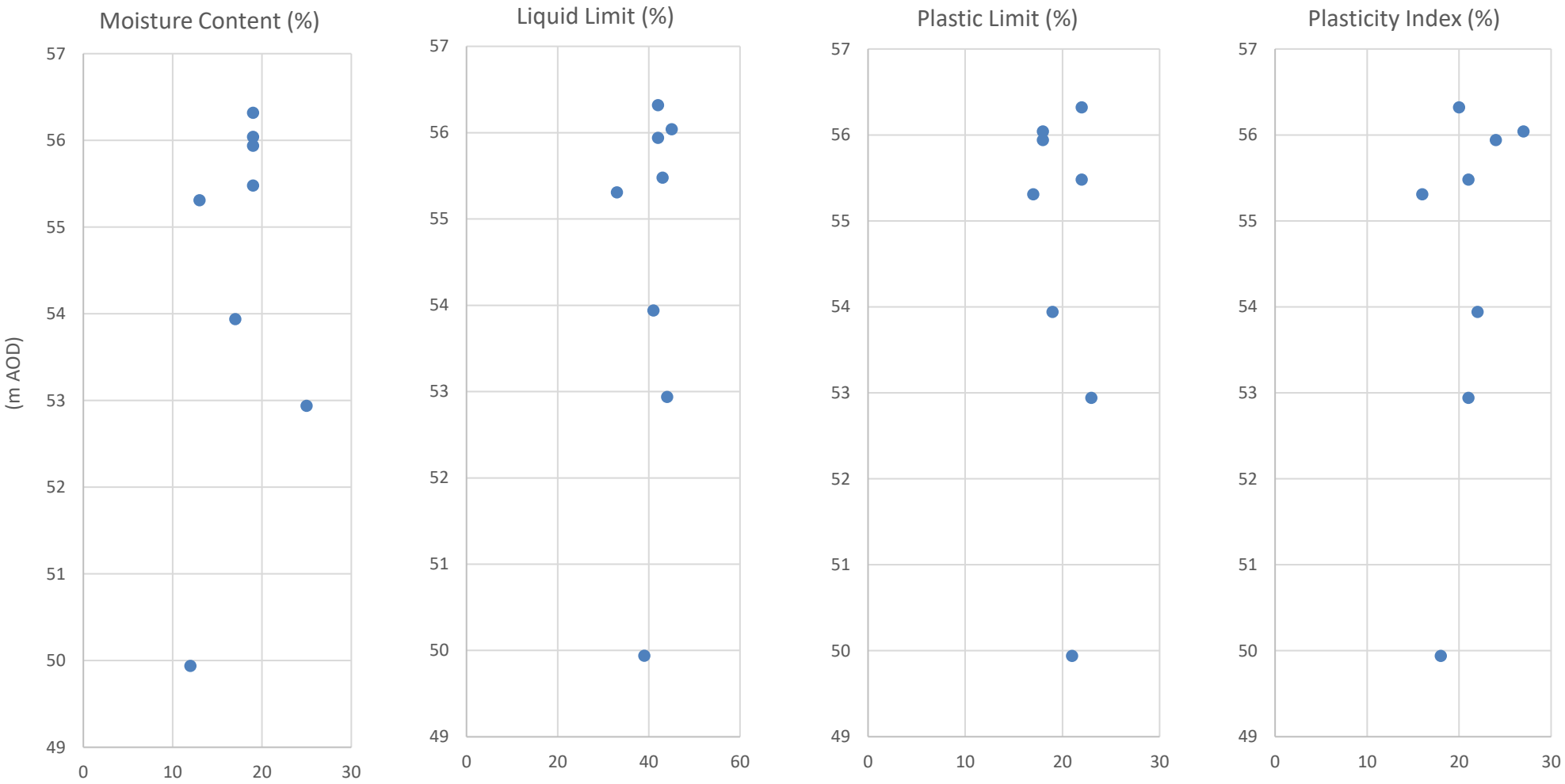


Figure 6.2.1a – *Summary of Atterberg Test Results vs. Depth (m AOD)*

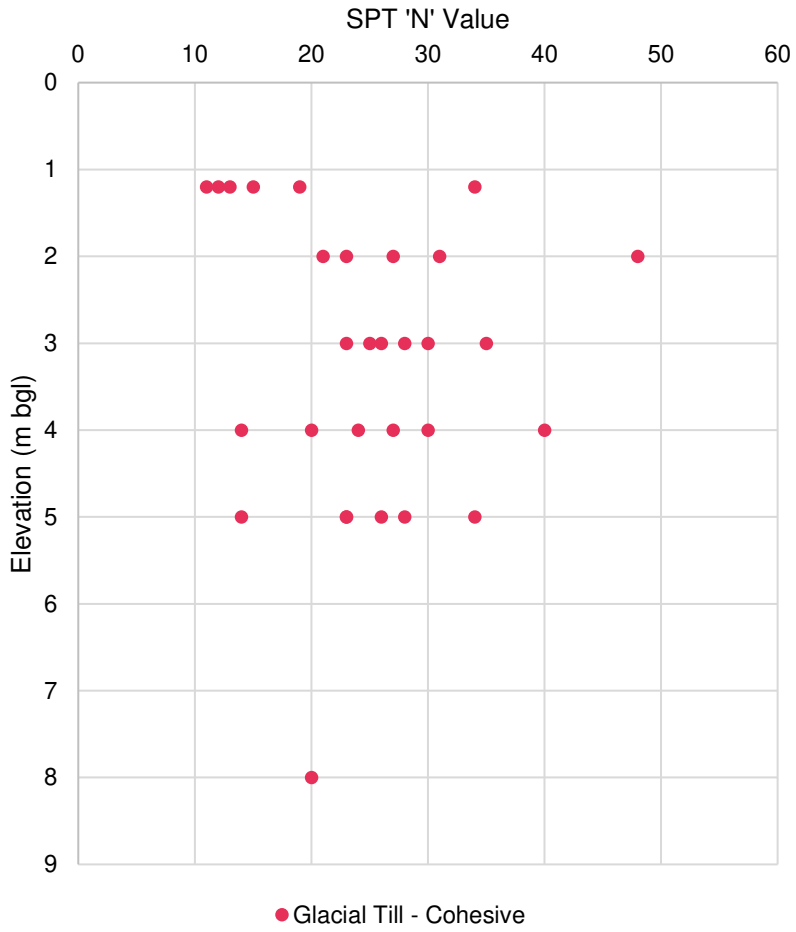


Figure 6.2.1b – *Standard Penetration Test vs. Depth (m bgl)*

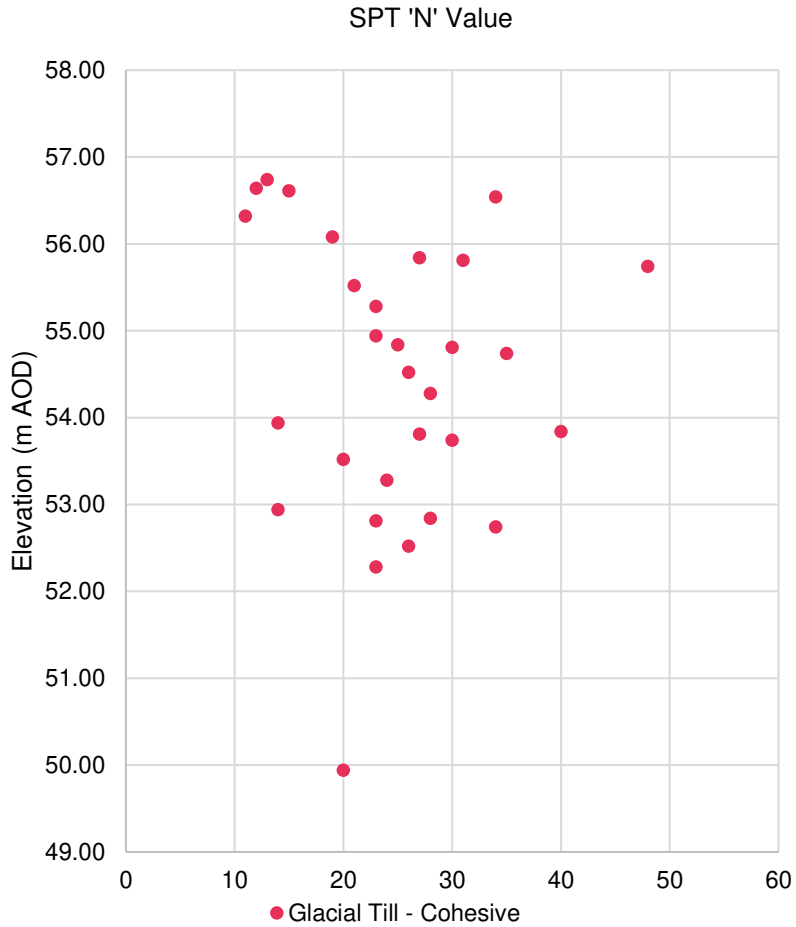


Figure 6.2.1c – *Standard Penetration Test vs. Elevation (m AOD)*

Copyright ©2023 Curtins Consulting Ltd

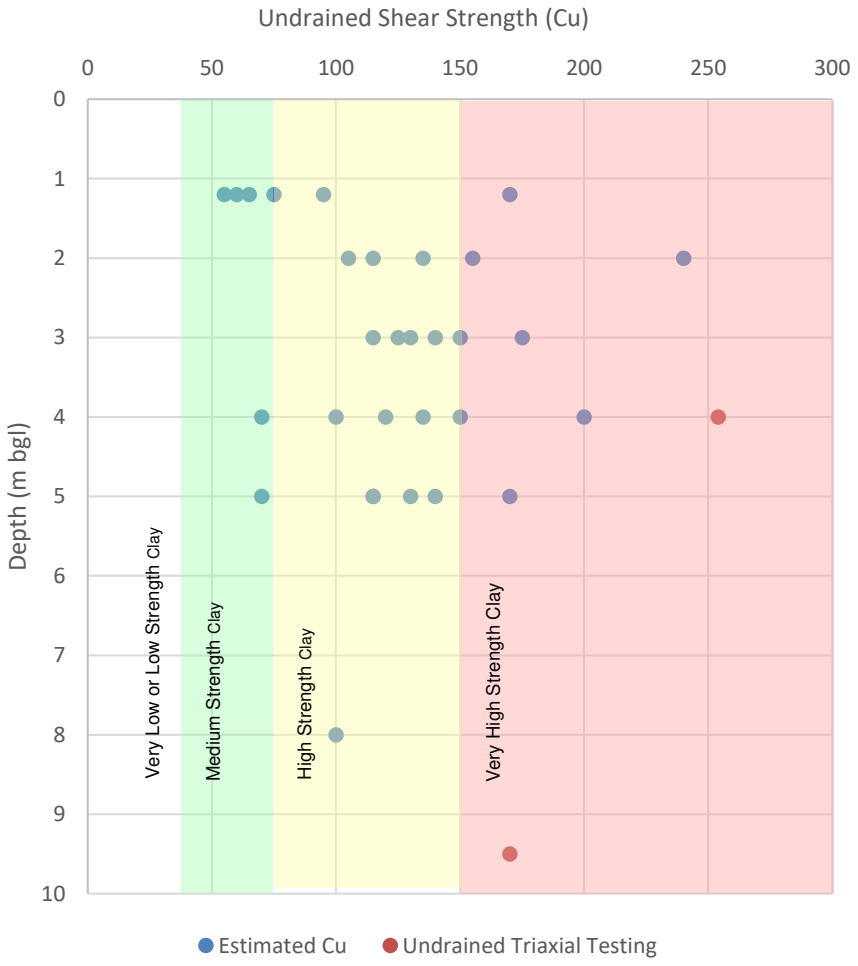


Figure 6.2.1d – *Estimated Undrained Shear Strength vs Depth (m bgl)*

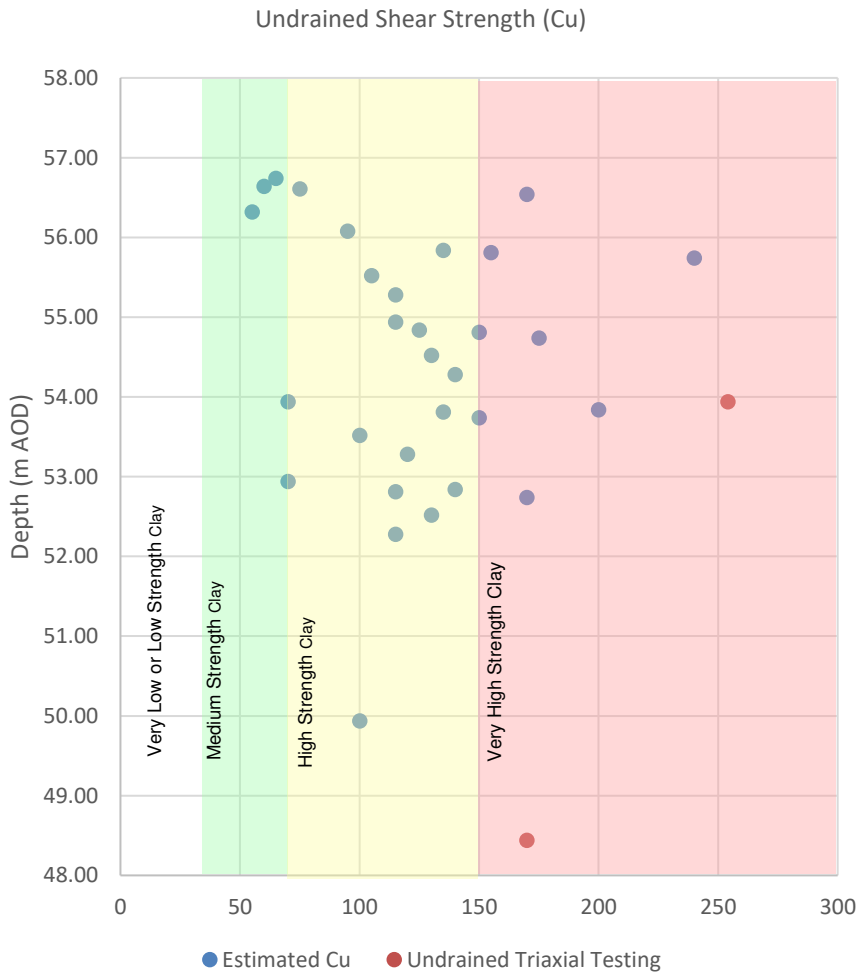


Figure 6.2.1e – *Estimated Undrained Shear Strength vs Elevation (m AOD)*

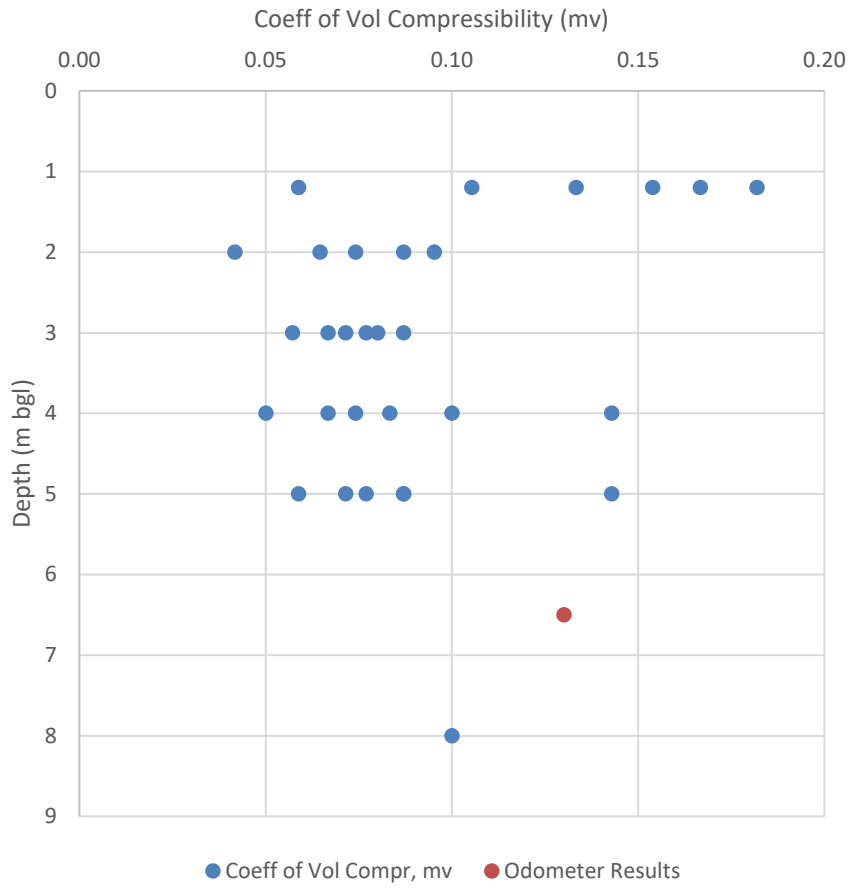


Figure 6.2.1f – *Estimated Coefficient of Volume Compressibility (Mv) vs Depth (m bgl)*

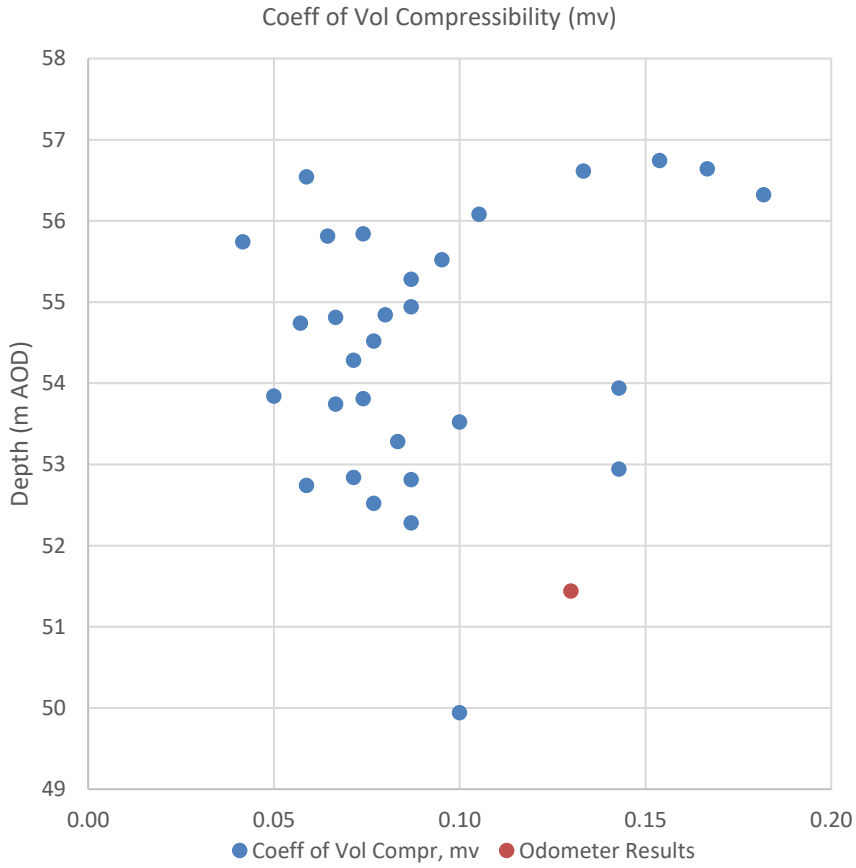


Figure 6.2.1g – *Estimated Coefficient of Volume Compressibility (Mv) vs Elevation (m AOD)*

Copyright ©2023 Curtins Consulting Ltd

6.3 Aggressive Ground Conditions

The classification of the site in terms of concrete in aggressive ground is based on the guidance provided in Table C2 of the Building Research Establishment (BRE) Special Digest 1, 3rd Edition of 2005 (Ref. 15). A summary of the results obtained as a part of the ground investigation are summarised in *Table 6.3*a below.

Table 6.3a –*Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

Stratum	Test Type	Range
Made Ground / Glacial Till	pH	8.1 – 11.5
	Water Soluble Sulphate (mg/l)	10 - 210

The results have been considered in line with the guidance provided in BRE SD1 and the results for pH and water soluble sulphate classify the soils at the site as follows.

Table 6.3b – *Aggressive Chemical Environment for Concrete (ACEC) Site Classification*

Stratum	Design Sulphate Class	ACEC Class (1)
Made Ground / Glacial Till	DS-1	AC-1

(1) ACEC assessment was based on the *mobile* groundwater condition in a *pyritic natural ground* location

The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 AC-1 assuming mobile groundwater.

Copyright ©2023 Curtins Consulting Ltd

7.0 Ground and Groundwater Contamination Assessment

This section of the report includes the assessment of the potential contamination, solid, liquid and gas, identified on the subject site which may present a risk to the proposed end-users, associated utilities and the wider environment.

In guidance published by the Environment Agency, the risk to human health or controlled waters is determined through an assessment of pollutant linkages between a source of contamination (within the ground or groundwater either on or off site) and a sensitive receptor such as end-users of the site, building materials, edible plants grown in gardens or groundwater abstracted for drinking. This is termed a source-pathway-receptor relationship. The same model is applied to the assessment of risk arising from ground gases as detailed within BS8576:2013 (Ref.16).

These models have a common approach, which is one of a tiered assessment. At each stage of the assessment further detail can be applied to the conceptual site model to provide a detailed interpretation on a site-by-site basis. As part of the planning process this approach is adopted to establish either if the site is 'suitable for use' or whether additional work or else remedial work is required for the site to be deemed so.

The sub-sections hereafter therefore incorporate the first tier (Tier 1) of this approach otherwise referred to as the Generic Quantitative Risk Assessment (GQRA). The GQRA builds on the qualitative risk assessment presented in the Phase 1 Desk Study in conjunction with observations made during the ground investigation and is based solely on the results of the chemical and other testing data obtained as part of Curtins ground investigation. The GQRA is used to build/refine the Conceptual Site Model (CSM) for the site as detailed and presented in *Section 10.0* of this report.

The following sections present more detail on the risk assessment methodology rationale for the main receptors.

7.1 Human Health

The soil results will be screened against the relevant Generic Assessment Criteria (GAC) where available, including:

i) **Soil Guideline Values (SGVs):** These have been published by the Environment Agency and are trigger values for screening out low risk areas of land contamination. SGV's give an indication of representative average concentrations of chemicals in soil, below which long-term health risks are likely to be minimal. SGVs have been published for several contaminants including arsenic, cadmium, mercury, nickel, selenium, BTEX, phenols and dioxins, furans and dioxin-like PCB substances for land uses including residential, allotments and commercial. The SGVs have been developed for a sandy loam soil with 6% soil organic matter (SOM) content;

ii) **Supplementary Screening Values (SSVs):** In addition to the SGVs developed by the EA, other third-party organisations have derived SSVs for a wider range of contaminants and land uses using the CLEA Model. Curtins have adopted these numbers where applicable, including

Copyright ©2023 Curtins Consulting Ltd

those developed by Atkins AtriskSoil™, the LQM/CIEH Suitable for Use Levels (S4UL) and EIC/AGS/CL:AIRE published thresholds;

iii) **Category 4 Screening Levels (C4SLs):** In March 2014 Defra published C4SLs for arsenic, benzene, benzo(a)pyrene, cadmium, hexavalent chromium and lead. These values were derived to support the revised Part 2A Statutory Guidance issued in 2012 (Ref. 17) in which four categories of contaminated land are included, ranging from Category 1 (significant/high risk) to Category 4 (low risk). C4SLs are not representative of significant possibility of significant harm (SPoSH) and are low risk levels which, and therefore where the C4SLs are not exceeded, land can be demonstrated to be in Category 4 and cannot be determined as contaminated land.

7.1.1 Adopted Soil Human Health GACs Screening Methodology

Current development proposals indicate the construction of low-rise residential housing with associated infrastructure, hardstanding and soft landscaping (private gardens and public open space). This proposed use is analogous with a *Residential With Homegrown Produce* End Use.

Assessment has therefore been undertaken against the following GACs, in order of preference:

1. Environment Agency Soil Guideline Values,
2. CL:AIRE, AGS, EIC. Soil Generic Assessment Criteria for Human Health Risk Assessments,
3. LQM/CIEH 2015 S4ULs for Human Health Risk Assessment, and
4. DEFRA Category 4 Screening Levels.

The soil organic matter (SOM) content has an influence on the volatilisation of organic contaminants (i.e. the higher the SOM, the lower the volatilisation rate and therefore inhalation exposure risk). Soil organic matter (SOM) values for soils ranged from 0.4% to 6.04%. High organic matter concentrations were recorded in the samples of Made Ground in TP4 (5.9%), TP3 (5.4%) and WS5 (5.1%). High organic matter concentrations were recorded in natural soils in WS1 (6.4%).

With consideration for a calculated geometric average, a geomean SOM of 2.7% was determined for Made Ground soils. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM 2.5% for the identified end use thresholds have been adopted for Made Ground soils. Additionally, a geomean of 1.5% was determined for natural soils. As such, a comparison against Generic Assessment Criteria (GAC) thresholds for a conservative SOM 1% for the identified end use thresholds have been adopted for natural soils.

The adopted GACs can be referred to in *Appendix F*.

7.1.2 Generic Assessment Criteria Screening of Soil Laboratory Results

The results of the environmental testing can be referred to in *Appendix C*.

Copyright ©2023 Curtins Consulting Ltd

With respect to the '*Residential with home grown produce*' end-use thresholds, four exceedances has been determined.

Table 7.1.2 – *Chemical Exceedances in Soils, Summary of Identification and Quantification*

Determinant	GAC Threshold (mg/kg)	Concentration (mg/kg)			
		TP1 (0.2 – 0.3m)	TP2 (0.2 – 0.3m)	TP5 (0.3 – 0.4m)	WS3 (0.2 – 0.3m)
Mercury (elemental)	1	1.34[1]	1.21[1]	2.01[1]	1.32[1]

1- Concentration recorded represent total mercury.

Mercury exceedances have been recorded within four exploratory hole locations in Made Ground soils. However, concentrations recorded represent total mercury rather than the GAC threshold for elemental mercury. No speciation of mercury has been completed as part of the site investigation, and without an obvious historical source of elemental mercury present on site, it's likely that concentrations recorded comprise predominantly inorganic mercury. As such, this exceedance has therefore not been considered further.

No asbestos containing materials (ACMs) were identified during the ground investigation. Three Made Ground soil samples identified loose fibres of amosite, and one recorded chrysotile as bitumen product. These findings are summarised in Table 7.1.3.

Table 7.1.3 – *Asbestos in Soils, Summary of Identification and Quantification*

Exploratory Hole I.D.	Depth (m bgl)	Strata	Asbestos Type	Quantification (% w/w)
WS2	0.2 – 0.3	MADE GROUND	Amosite Loose Fibres	0.002
TP1	0.2 – 0.3	MADE GROUND	Chrysotile Bitumen Product	0.002
TP2	0.2 – 0.3	MADE GROUND	Amosite Loose Fibres	0.047
TP5	0.3 – 0.4	MADE GROUND	Amosite Loose Fibres	0.001

It is likely that asbestos may be present within Made Ground soils beyond the findings of this investigation.

Copyright ©2023 Curtins Consulting Ltd

8.0 Ground Gas Assessment

The assessment of risk presented by ground gases is assessed with reference to guidance published by CIRIA Assessing Risks Posed by Hazardous Ground Gases to Buildings, C665 (Ref. 18), BSI Publication code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings BS8485:2019 (Ref. 19) and other broadly accepted references such as the Ground Gas Handbook 2009 (Ref. 20).

The gas risk assessment adopts a tiered approach. In the first instance this involves a re-evaluation of the Conceptual Site Model described within the Phase 1 Preliminary Risk Assessment (desk study) (Ref. 1) and thereafter validating this conceptual model with the ground gas data, the semi-quantitative risk assessment.

8.1 Ground Gas Monitoring Results

To characterise the site's ground gas regime and validate the qualitative assessment of ground gas risk, standpipe installations were incorporated within six of the boreholes (CP1 and WS1-WS5) as detailed in *Section 3.2*.

A programme of six gas monitoring visits over a 3-month period were proposed, this was completed between 9th January 2023 and 27th March 2023, with barometric pressure recorded between 987 mb and 1019 mb. Steady barometric pressure was recorded on visits 1,2 and 3 and rising barometric pressure was recorded on Visits 4, 5 and six.

The log results sheets are contained within *Appendix E* and summarised in *Table 8.1.*

Table 8.1– *Summary of Ground Gas Monitoring Results*

Exploratory Hole ID	Maximum Methane Concentration (%)	Maximum Carbon Dioxide Concentration (%)	Minimum Steady Oxygen Concentration (%)	Maximum Flow (l/hr)	Steady State Flow (l/hr)
CP1[1]	<0.1	3.2	6.1	107.4	5.0
WS1	<0.1	2.4	3.7	3.6	<0.1
WS2[1]	<0.1	1.2	18.7	-4.2	<0.1
WS3[1]	<0.1	0.6	14.5	86.5	0.4
WS4	<0.1	1.8	10.5	-2	<0.1
WS5	<0.1	2.1	14.7	14	<0.1

1 Response zone noted as flooded

Methane concentrations were recorded below the limit of detection of the monitoring instrument in all monitoring wells throughout the monitoring period.

The greatest concentrations of carbon dioxide was recorded in CP1 on the fifth monitoring visit at 3.2% $^{v}/_{v}$.

Maximum hydrogen sulphide was recorded below the instruments limit of detection throughout the monitoring programme.

Carbon monoxide concentrations were recorded between <0.1ppm and 27ppm.

Air flow rates were recorded at maximum values of between <0.1 l/hr and 107.4 l/hr, this frequently reduced to a steady state of <0.1 l/hr (below the limit of detection of the monitoring instrument) excepting one visit (CP01 & WS03 fourth visit). Negative air flow rates were also recorded. The greatest peak air flow rates and negative air flow rates were typically recorded where the monitoring well was flooded.

From a review of groundwater level monitoring and the response zones of the monitoring wells (*Table 5.7a)* it can be seen that the response zones within CP1, WS2, WS3 and WS5 were flooded during the monitoring visits. It is considered that the peak air flow rates in these flooded boreholes is likely to be linked to rising shallow groundwater in the solid section of the well installation causing an increase or decrease in internal pressure within the pipework, which is released, and subsequently equalised, when the valve tap is opened. This is detailed within BS8485:2015 (Ref. 19) and CL:AIRE Research Bulletin RB 17 (Ref. 21). A similar process may be occurring within WS4 and WS5, where the monitoring well is almost completely flooded and surrounded by cohesive Glacial Till.

Considering the above, and using professional judgement, the elevated peak flow readings from the affected boreholes have been omitted from the calculations used in assessment of gas risk on site, with remaining peak flow readings considered to give a more representative approach to calculating the gas screening value for the site. The elevated steady state flow rates from CP1 and WS3 are also discounted given these were only monitored for 30 and 10 seconds respectively. Given all other peak flows dissipated to 0.0l/hr it is considered that these too would have given sufficient time and use of the elevated flow rates is likely to give rise to unnecessarily conservative protection measures.

8.2 Ground Gas Assessment

The Conceptual Site Model presented in *Section 2.6* highlighted Made Ground as a potential source of ground gas generation. The report suggests no records of historic or active landfills within close proximity to the site. Some areas of historically infilled land are noted locally but given the underlying geology migration pathways are limited. The site is situated within a coal mining reporting area but not within a development high risk area. Historically the construction and demolition of Forrester House has taken place on site which may have led to uncontrolled deposition of Made Ground containing putrescible content. Noxious and asphyxiate gases were attributed to include, but not limited to, carbon dioxide, carbon monoxide, methane and hydrogen sulphide. The Phase 1 identified a **Moderate** Risk.

Made Ground was encountered on site with some minor inclusions of putrescible material noted to include plastics. No evidence of elevated VOCs was determined.

Copyright ©2023 Curtins Consulting Ltd

Additionally, cohesive natural ground (Glacial Till) was encountered across the entirety of the site and was noted to contain coal fragments. This low permeability cohesive material is considered likely to act as a barrier for any pathway of ground gas onto the site.

It is understood that the proposed site development is for the construction of low-rise residential housing with associated infrastructure, hardstanding and soft landscaping (private gardens and public open space).

As such, this assessment has been undertaken in accordance with NHBC guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present (Ref.25) for assessment for low rise residential housing.

A total of six monitoring visits have been undertaken to date, in various atmospheric conditions, including during precipitation events.

Given methane concentrations were recorded below the limit of detection of the monitoring instrument throughout the monitoring period, the risk presented to site end users from methane gas build up and explosion is Low.

With consideration of steady state air flow rates and carbon dioxide concentrations, the worst case Q_{hg} is taken as 0.0032 l/hr, accounting for maximum gas concentrations of 3.2% $^{v}/_{v}$ and steady state air flow of <0.1 l/hr. 0.0032 l/hr is taken as the gas screening value for the site, consistent with a Green classification, not requiring specific gas protection measures.

Should development plans indicate the properties will not be constructed in accordance with the NHBC Model Residential Property (Figure F1 of Ref. 25), an assessment in accordance with BS8485:2019 should be undertaken.

The potential risks from ground gases to the excavations are to be dealt with by the Contractor, in accordance with the Confined Space Regulations, during construction. Appropriate ground gas monitoring and safety measures should be in place during the works, as the potential presence of ground gases could pose a risk in any confined spaces of deep excavations.

8.3 Radon

The Envirocheck report (Ref. 1) and UK Maps of Radon (Ref. 4) confirm the site is is situated in an area where between 1% and 3% of homes are above the radon action level. Radon protection measures are therefore not considered necessary within the proposed development. However, where the new development incorporates a basement the advice of a specialist Radon assessor must be obtained.

9.0 Revised Conceptual Site Model

The Preliminary Conceptual Site Model (PCSM) presented in the Phase 1 report has been revised following the preliminary GQRA in above. The Revised Conceptual Site Model (CSM) is summarised in the table overleaf.

The CSM details the source-pathway-receptor linkages or potential pollutant linkages (PPL) that have been identified as relevant for the site. The GQRA details the associated level of risk relating to these potential pollutant linkages.

The CSM follows the framework outlined within CIRIA C552.

The 'risk rating' within the CSM refers to the risk that the source, pathway, receptor linkage or PPL is complete. Unless specifically stated it does not necessarily refer to an immediate risk and is intended to be used as a tool to assess the necessity for further assessment/investigation.

Under current health and safety legislation, employers are required to carry out their own appropriate risk assessments and mitigation to protect themselves and their employees, other human receptors and the environment from potential contamination. Such risks must be adequately mitigated by law, specifically the Construction Design Management (CDM) Regulations, 2015 (Ref. 26) which require that potential risks to human health and the environment from construction activities are appropriately identified and all necessary steps taken to eliminate / manage that risk.

It has been assumed that any future construction works on site will be undertaken in compliance with these requirements. This assumption is factored into the conceptual site model. Reference should be given to the environmental testing results discussed within Section 7.

Copyright ©2023 Curtins Consulting Ltd

Qualitative Risk Assessment → Generic Quantitative Risk Assessment → Detailed Quantitative Risk Assessment or; Remedial Action

- The table below represents the Second stage in the land quality risk assessment process; the Revised Conceptual Site Model following the Quantitative Risk Assessment.
- For a development site to be deemed 'suitable for use' the level of risk needs to be brought down to acceptable levels, i.e. low to very low risk. The purpose of each stage of risk assessment is ultimately to establish if there is a requirement for additional levels of assessment to be made to have sufficient confidence to support a risk characterisation or management decision, e.g. remedial action.
- In the absence of specific site data, a Generic Quantitative Risk Assessment is invariably recommended.

Conceptual Site Model			Generic Qualitative Risk Assessment			Comments	Action
Identified Source	**Pathway(s)**	**Receptor(s)**	**Consequence**	**Likelihood of Occurrence**	**Risk Rating**		
Made Ground Soils Asbestos identified in shallow Made Ground soil samples. No contaminant exceedance identified within Made Ground soils in relation to Residential with home grown produce.	Direct contact and dermal uptake, soil and dust ingestion, dust and migration inhalation (indoor & outdoor air)	**Site end users** (Residential)	**Medium** Human Health Risk	**Low Likelihood**	**Moderate/ Low**	Four Made Ground samples have been identified as containing asbestos (WS2, TP1, TP2 and TP5). No exceedances identified in relation to Residential with 'Home Grown produce' Generic Assessment Criteria (exceedances of Mercury discounted). The risk to construction workers and the general public can be managed by suitable health and safety precautions, an asbestos management plan and environmental controls.	Allow for provision of a suitable thickness of clean and inert cover in all areas of soft landscaping as part of future development works, detailed in a Remediation Strategy. Asbestos control measures during construction works. Should unexpected contamination be observed during demolition/construction, works should be stopped with advice obtained from an appropriate specialist.
		Construction and maintenance workers		**Low Likelihood**			
		Residents and general public		**Low Likelihood**			
	Vertical and horizontal migration through the superficial deposits (soils) and bedrock	**Controlled Waters** (Surface Water) There are no surface water features within 250m of the subject site. No surface water abstraction points within 1km	**Mild** (pollution of non-sensitive water resources)	**Unlikely**	**Very Low**	No evidence of free product or gross contamination during the ground investigation. There are no surface water features within 250m of the site boundary. Considering the low permeability of the underlying ground conditions (glacial till) lateral migration will be limited and this SPR linkage likelihood is considered unlikely.	No further action required
		Controlled Waters (groundwater) Secondary A (bedrock) & Secondary Undifferentiated Aquifer (superficial deposits). There are no potable groundwater abstractions within 1km. The site is not located in a Zone III Source Protection Zone.	**Medium** (Pollution of sensitive water resources)	**Unlikely**	**Low**	No evidence of free product or gross contamination was evident during the ground investigation. Site is not located in a Source Protection Zone. No Potable abstractions listed within 1km of the site. Considering the above and the low permeability of the underlying ground conditions (glacial till) this SPR linkage likelihood is considered unlikely.	
Ground gas generating sources Limited thicknesses of Made Ground up to 0.76m bgl. Limited putrescible material identified in Made Ground and natural soils. Organic matter, although limited, may be source material for the generation of ground gas.	Ground gas & vapour migration and inhalation.	**Site End Users** (Residential)	**Medium** Human Health Risk	**unlikely**	**Low**	Methane concentrations recorded below the limit of detection throughout the monitoring period. Maximum carbon dioxide concentrations of 3.2% $^{v}/_{v}$ recorded in CP01. Gas Screening Value taken as 0.0032 l/hr for carbon dioxide. Green Traffic Light classification in accordance with NHBC guidance.	No gas protection measures required. Risk from ground gases from excavations are to be dealt with in accordance with Confined Space Regulations.
		Construction and maintenance workers					

Copyright ©2023 Curtins Consulting Ltd

9.1 Summary of Significant Pollutant Linkages

A **Moderate/Low** risk rating is identified to site end-users and construction workers and adjacent residents, from soils and dust from inhalation and ingestion, accounting for the presence of low concentrations of asbestos in four locations within shallow Made Ground.

No evidence of gross/mobile phase contamination was encountered and the shallow natural soils are cohesive with low permeability. With consideration of this, it is unlikely that a source-pathway-receptor linkage exists to present a risk to surface water ang groundwater. A **Very Low** & **Low** risk rating is identified to controlled waters.

A **Low-risk** rating is identified to site end users from ground gases arising from Made Ground. This corresponds to a Green traffic light classification, requiring no gas protection measures.

Copyright ©2023 Curtins Consulting Ltd

10.0 Geotechnical Assessment and Recommendations

10.1 Introduction

This section will discuss the ground and groundwater conditions encountered across the site and assess their associated risks for the proposed scope of the works.

It is understood that the proposed site development includes the construction of low-rise residential housing with associated infrastructure, hardstanding and soft landscaping (private gardens and public open space). Proposed loadings were not available for review at the time of writing.

10.2 Summary of Ground Conditions

Surface cover encountered during the Blackwin St December 2022 ground investigation typically comprised topsoil and Made Ground, to a maximum recorded depth of 0.84m bgl. Made Ground is underlain by firm, stiff or very stiff cohesive Glacial Till, comprising reddish brown and grey mottled sandy gravelly clay, with gravel comprising mudstone, siltstone, quartzite and coal fragments.

10.3 Geotechnical Considerations

A relic brick structure (possible sewer) was encountered in TP2 at 2.03m bgl, comprising a concrete slab surface, with two red brick walls extending from 2.13m to 2.39m bgl, with approximate width of 0.65m bgl. The relic sewer and any other buried structures will need to be grubbed out as part of the enabling works and voids backfilled with a suitable engineered fill, under the instruction of an earthworks specification.

10.4 Preliminary Foundation Design

It is understood that the proposed development is to consist of residential low-rise housing. The following advice is based on the information obtained during the ground investigation.

Depending on proposed building loads, shallow foundations may be considered feasible, founding in the firm to stiff cohesive Glacial Till present below the Made Ground, encountered at depths of between 0.45m to 0.84m bgl.

It is recommended that shallow strip foundations are cast at a minimum depth of 1.20m bgl in the cohesive Glacial Till, comprising firm or stiff clay exhibiting an undrained shear strength in excess of 60kPa. This will need to be deepened through areas of thicker Made Ground, where relic structures remain in place (sewers etc.) or if the cohesive Glacial Till is <60kPa.

At 1.20m bgl and within high strength clay, a presumed bearing resistance of 100 kPa is considered appropriate, for a 0.60m wide strip foundation (accounting for estimated settlement of less than 25mm).

Copyright ©2023 Curtins Consulting Ltd

If a higher bearing resistance is required for the proposed loads, pad foundations are being considered or changes in the foundation dimensions are proposed, then further assessment/review should be undertaken.

10.5 Ground Bearing Floors

The NHBC Technical Standards 2023 state that ground bearing floors may only be used where the depth of fill (Made Ground) is less than 600mm deep and properly compacted. Where made ground exceeds this thickness a suspended floor slab is likely to be required. A beam and block suspended floor may be appropriate.

10.6 Volume Change Potential

The NHBC class cohesive soils with a Modified Plasticity Index (I'p) >10% as shrinkable and fluctuations in moisture content associated with seasons and the action of tree roots can result in shrinkage or swelling of the soil which can cause subsidence or heave damage to foundations, the structures they support and services.

Based on the Atterberg results, the derived I'p ranges between 14.72% and 27% and the NHBC classify cohesive soils with an I'p <20% as having a low to medium volume change potential.

It is recommended that the minimum foundation depths and heave precautions (if required) as stated in the NHBC Technical Standard are considered alongside the masterplan and areas of proposed planting.

10.7 Concrete Classification

As detailed in Section 6.5 the preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 AC-1 assuming mobile groundwater.

10.8 Excavation and Support

The trial pits undertaken as part of the ground investigation were mostly recorded to be stable (to maximum excavation depths of 2.80m bgl), however granular Made Ground is present in places and instability, especially in granular soils, cannot be discounted.

In accordance with Health and Safety Regulations, side support for safety purposes should be provided to all excavations which appear unstable, including where groundwater is encountered, and those more than 1.20 m deep. Excavations shallower than 1.20 m deep, requiring personnel access, will require closed side support.

The chosen contractor should provide details on how they intend to ensure the safety and stability of proposed excavations.

Copyright ©2023 Curtins Consulting Ltd

10.9 Presence of Existing Services

The presence of existing services may require capping and/or diversion associated with the development, which should be managed through the appropriate utility suppliers during the construction phase. The Principal Contractor should ensure that appropriate mitigation measures are put in place during the construction phase (i.e. during excavation of foundations).

Copyright ©2023 Curtins Consulting Ltd

11.0 Conclusions & Recommendations

11.1 Geotechnical

Any buried structures e.g. relic sewers will need to be grubbed out as part of the enabling works and voids backfilled with a suitable engineered fill, under instruction of an earthworks specification.

Depending on proposed building loads, shallow foundations are likely to be feasible, founding in the firm cohesive Glacial Till below the Made Ground, with allowable bearing pressure of 100 kPa, accounting for settlement of less than 25mm. If a higher bearing resistance is required than that stated, or alternative foundation layouts are proposed (pads etc.), further review should be undertaken.

It is recommended that the minimum foundation depths and heave precautions (if required) as stated in the NHBC Technical Standards are considered in conjunction with a Low volume change potential and the areas of proposed planting.

The preliminary design of buried concrete according to Table C2 of BRE Special Digest 1:2005 should be in accordance with Class DS-1 AC-1.

11.2 Ground and Groundwater Contamination

With respect to the 'Residential with home grown produce' end-use thresholds, no exceedances were noted within soil samples collected (exceedances for Mercury were discounted). Four Made Ground soil samples identified asbestos, present as loose fibres of amosite in three samples and as bitumen product in one sample, at concentrations between 0.001% $^{w}/_{w}$ and 0.047% $^{w}/_{w}$.

A **Moderate**/Low risk rating is currently identified to site end-users and construction workers, from soils and dust from inhalation and ingestion, accounting for the presence of asbestos within shallow Made Ground soils. An engineered capping layer is recommended in soft landscaped areas to break the SPR linkage, to be detailed in a Remediation Strategy. The risk to construction workers and adjacent residents should be managed appropriately during construction.

A **Low to Very Low** risk rating is currently identified to controlled waters in relation to groundwater and surface water receptors respectively, accounting for the limited sources of contamination encountered within site soils and limited pathways for migration.

A **Low-risk** rating is currently identified to site end users from ground gases arising from Made Ground and cohesive glacial till, corresponding with an NHBC Green Traffic Light classification, not requiring gas protection measures.

Copyright ©2023 Curtins Consulting Ltd

11.3 Recommendations

Based on the findings of the ground investigation, the following recommendations are made:

1. Where required, liaison with the Local Authority, NHBC or other warranty provider regarding the suitability of ground bearing floor slabs is recommended.
2. Where building loads are to be transferred to soils in which the relic sewer is placed, the relic sewer should be removed and replaced with suitably compacted granular fill, under the instruction of an earthworks specification.
3. It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within *Appendix C.*
4. Allowance should be made for provision of a suitable thickness of clean and inert cover in all areas of soft landscaping, contractors to employ suitable asbestos control measures, to be detailed in a Remediation Strategy.
5. A Remediation Strategy and Verification report will be required to detail and approve the above measures.

Copyright ©2023 Curtins Consulting Ltd

12.0 References

1. Curtins (2021) *Phase 1 Preliminary Risk Assessment, Former Forrester House,* Ref. 077873-CUR-00-XX-RP-GE-031
2. British Geological Survey (BGS) 1:50,000 (Bedrock and Superficial Edition, Sheet No. 085, 2011) for Manchester
3. Coal Authority Interactive Map Viewer [online], http://mapapps2.bgs.ac.uk/coalauthority/home.html (accessed February 2023).
4. UK Maps of Radon [online], https://ukradon.org/information/ukmaps (accessed January 2023).
5. Zetica Regional Unexploded Bomb Risk, Risk Map, https://zeticauxo.com/downloads-and-resources/risk-maps/ (accessed February 2023).
6. Environmental Agency (2020) Land Contamination Risk Management (LCRM)
7. British Standards Institution (2011) Investigation of Potentially Contaminated Sites: Code of Practice (report no. BS10175:2011+A2:2017).
8. British Standards Institution BSI (2015+2000) Code of Practice for Site Investigations (report no. BS5930).
9. British Standards Institution (2006) Eurocode 7: Geotechnical Design (report no. BSEN1997).
10. British Standard (2016) Methods of test for soils for civil engineering purposes. General requirements and sample preparation (report no. BS1377-1).
11. Stroud, M. a. B. F. (1975) The Standard Penetration Test and the Engineering Properties of Glacial Materials.
12. British Standards Institution (2015) Code of Practice for Foundations (Report No. BS8004)
13. Gibson, R. E. (1953) Experimental Determination of the True Cohesion and True Angle of Internal Friction in Clays.
14. Building Research Establishment (2005) Concrete in Aggressive Ground (Special Digest 1).
15. British Standards Institution (2013) Guidance on Investigations for Ground Gas, Permanent Gas and Volatile Organic Compounds (VOCs) (Report No. BS8576:2013).
16. Department of Environment Food and Rural Affairs (DEFRA). (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (report no. PB13735).
17. CIRIA (2007) Assessing Risks Posed by Hazardous Ground Gases to Buildings (report no. C665).
18. British Standards Institution (2015) Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (report no.BS8485:2015 +A1:2019).
19. S Wilson, G Card, S Haines (2009) Ground Gas Handbook Cathness, Scotland, Whittles Publishing.
20. CL:AIRE (2012) *Research Bulletin 17, A Pragmatic Approach to Ground Gas Risk Assessment*
21. CIRIA (2001) Contaminated Land Risk Assessment. A guide to good practice (report no. C552).
22. CITB (2015) Construction (Design and Management) Regulations.

Copyright ©2023 Curtins Consulting Ltd

23. British Standards Institute (1990) Methods of test for soils for civil engineering purposes 1377: Part 9: 1990.
24. NHBC (2007) Guidance on Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present. Report Edition 04.

Copyright ©2023 Curtins Consulting Ltd

Appendix A – Drawings

- Curtins Drawing, Exploratory Hole Location Plan – 081427-CUR-00-XX-DR-GE-V01.
- Triangle Architects, Proposed Site Plan Final – 20-0505 - SK11

Copyright ©2023 Curtins Consulting Ltd

NOTES:

- THE CONTRACTOR IS RESPONSIBLE FOR CHECKING DIMENSIONS, TOLERANCES & REFERENCES. ANY DISCREPANCY TO BE VERIFIED WITH THE ARCHITECT BEFORE PROCEEDING WITH THE WORKS.
- WHERE AN ITEM IS COVERED BY DRAWINGS OF DIFFERENT SCALES, THE LARGER SCALE DRAWING TO BE WORKED TO.
- DO NOT SCALE FROM THE DRAWING. FIGURED DIMENSIONS TO BE WORKED TO IN ALL CASES.
- THIS DRAWING TO BE READ IN CONJUNCTION WITH:

Materials Key

- 450mm x 450mm concrete paving to front and 1800mm wide patios at rear of dwellings
- Tarmac areas
- Grassed areas
- Shrub planting
- Existing tree to be retained
- Existing tree to be removed
- New tree
- WB Water butt (volume to be a minimum of 200ltrs)

Boundary Treatments

- 2100mm high timber post with horizontal timber board fencing (used around existing electric substation.
- 1800mm high concrete post and timber panel fence (to separate rear gardens to a distance of 3000mm from the rear facade)
- 1500mm high concrete post with 1200mm high timber panel fence and 300mm timber trellis on top (used between rear gardens)
- 900mm high metal railings (from back of pavement to building line)
- 450mm high low brick wall with 450mm high metal railings, on low side (along back of pavement)

Existing Features

- LP Lamp post
- LP(R) Existing lamp post re-located
- UCP New uncontrolled crossing point

Schedule of Accommodation

Housetype	Description	Area/m2	Total	Plot Nos.
A	2B3P House	70.9	2	02, 03
B1	3B4P House	88.2	3	01, 05, 06
B2	3B4P House	88.2	1	07
C	4B5P House	100.6	1	04
Total			7	

(Car parking : 2 & 3-bed 100%; 4-bed 200% shown)

Rev	Date	By

Client:
One Manchester

Project:
Blackwin Street Development
Gorton

Description:
Proposed Site Plan
FINAL

Purpose of issue:
PRELIMINARY

Drawn by:	Checked by:	Scale:	
JH	MT	1:200@A1	
Date:	Project No:	Drawing No:	Rev:
Oct 21	20-050	SK11	

TRIANGLE ARCHITECTS

Manchester office: Raven House, 113 Fairfield Street, Manchester, M12 6EL Tel: 0161 272 3500 Fax: 0161 272 3501
studio@triangleartchitects.co.uk www.triangleartchitects.co.uk www.twitter.com/TriangleArch

Key:

Curtins Proposed Exploratory Holes (2022)

- Cable Percussion borehole to max depth 10.00m bgl
  * Denotes installation well included.
- Window Sample Borehole to max depth 5.45m bgl.
  * Denotes installation well to be included.
- Machine Excavated Trial Pit to max depth 3.5m bgl.
- Site Boundary

GENERAL NOTES:

Rev:	Description:	Date:	By:
--			

curtins
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG
t: 0161 234 8509
e: manchester@curtins.com
w: www.curtins.com

Civils & Structures • Transport Planning • Environmental • Infrastructure • Geotechnical • Conservation & Heritage • Principal Designer
Birmingham • Bristol • Cambridge • Cardiff • Douglas • Dublin • Edinburgh • Glasgow • Kendal • Leeds • Liverpool • London • Manchester • Nottingham

Project: Blackwin Street	Status: DRAFT
Drawing Title: Exploratory Hole Location Plan	Drawn By: JP / Checked By:
	Designed By: / Date: 13/01/2023
	Scale: NTS

Project No: Originator: Zone: Level: Type: Discipline: Category/Number: Rev:

081427-CUR-00-XX-DR-GE-001-V01

Appendix B – Exploratory Hole Logs

- Window Sample Borehole Logs, WS1 – WS5
- Machine Excavated Trial Pit Logs, TP1 – TP6
- Cable Percussive Borehole Logs, CP1

Copyright ©2023 Curtins Consulting Ltd

Borehole Log

Borehole No.
WS1
Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387442.33 - 396801.58	Hole Type WS
Location: Blackwin Street, Gorton		Level: 57.74	Scale 1:50
Client: One Manchester		Dates: 05/12/2022 - 06/12/2022	Logged By RT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.17	57.57		MADE GROUND: Grass overlying dark brown very sandy slightly gravelly, slightly cobbly topsoil with frequent rootlets. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick and concrete fragments. Cobbles are sub-angular brick fragments.
		0.40 - 0.50	ES		0.55	57.19		MADE GROUND: Dark brown very gravelly moderately cobbly sand. Sand is fine to coarse. Gravels are frequent fine to coarse sub-angular brick and concrete fragments. Cobbles are occasional sub-angular brick, concrete and sandstone fragments.
		1.20		N=34 (4,6/6,9,9,10)				
		1.20 - 1.30	ES		1.50	56.24		
		2.00		N=48 (7,7/11,11,12,14)	2.00	55.74		Very stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
								No recovery (suspected very stiff clay).
		3.00		N=35 (7,7/7,8,10,10)				Very stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
		3.80 - 4.00	D					
		4.00		N=30 (5,6/6,7,8,9)				*From 4.00m to 4.45m bgl material is stiff to very stiff.*
		5.00		N=34 (5,6/8,8,9,9)				
					5.45	52.29		End of borehole at 5.45 m

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Remarks
Hand excavated service clearance to 1.20m bgl. No groundwater encountered.

Borehole Log

Borehole No.
WS2
Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387458.98 - 396790.37	Hole Type WS
Location: Blackwin Street, Gorton		Level: 57.28	Scale 1:50
Client: One Manchester		Dates: 06/12/2022 - 06/12/2022	Logged By RT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.30	ES		0.15	57.12		MADE GROUND: Grass overlying dark brown very sandy slightly gravelly, slightly cobbly topsoil with frequent rootlets. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick, concrete and ceramic fragments. Cobbles are sub-angular brick fragments.
					0.48	56.80		MADE GROUND: Light grey very gravelly moderately cobbly sand. Sand is fine to coarse. Gravels are frequent fine to coarse sub-angular brick, concrete, ceramic and glass fragments. Cobbles are occasional sub-angular brick and concrete fragments.
		1.20		N=19 (3,5/4,5,5,5)				
		1.20 - 1.30	ES					
		1.80 - 2.00	D					
		2.00		N=23 (2,3/5,6,6,6)				Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments. *From 1.20m to 1.65m bgl material is firm to stiff.*
		3.00		N=28 (6,6/7,7,7,7)				
		4.00		N=24 (5,4/5,6,6,7)				
		5.00		N=23 (4,3/4,6,6,7)				
					5.45	51.82		End of borehole at 5.45 m

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Remarks
Hand excavated service clearance to 1.20m bgl. No groundwater encountered.

AGS

Borehole Log

Borehole No.
WS3
Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387470.56 - 396809.31	Hole Type WS
Location: Blackwin Street, Gorton		Level: 57.52	Scale 1:50
Client: One Manchester		Dates: 06/12/2022 - 06/12/2022	Logged By RT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.20 - 0.30	ES		0.76	56.76		MADE GROUND: Light brown very gravelly moderately cobbly sand. Sand is fine to coarse. Gravels are frequent fine to coarse sub-angular brick, concrete, ceramic and plastic fragments. Cobbles are occasional sub-angular brick fragments.
		1.20 1.20 - 1.40	D	N=11 (1,2/2,2,3,4)				Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments. *From 1.20m to 1.65m bgl material is soft to firm.*
		2.00		N=21 (2,2/3,5,6,7)				*From 2.00m to 2.45m bgl material is firm to stiff.*
		3.00		N=26 (2,4/4,7,7,8)				
		4.00		N=20 (3,4/4,5,5,6)				*From 4.00m to 4.45m bgl material is firm to stiff.*
		5.00		N=26 (4,5/6,6,7,7)				
					5.45	52.07		End of borehole at 5.45 m

Remarks
Hand excavated service clearance to 1.20m bgl. No groundwater encountered.

AGS

Borehole Log

Borehole No.
WS4
Sheet 1 of 1

Project Name:	Blackwin Street	Project No. 081427-Blackwin	Co-ords:	387461.72 - 396818.34	Hole Type WS
Location:	Blackwin Street, Gorton		Level:	57.81	Scale 1:50
Client:	One Manchester		Dates:	05/12/2022 - 05/12/2022	Logged By RT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.10 - 0.20	ES		0.29	57.52		MADE GROUND: Grass overlying dark brown very sandy slightly gravelly, slightly cobbly topsoil with frequent rootlets. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick, concrete and ceramic fragments. Cobbles are sub-angular brick fragments.
		1.20		N=15 (1,2/3,4,4,4)				Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments. *From 1.20m to 2.00m bgl material is firm to stiff.*
		2.00		N=31 (4,5/6,7,9,9)				*From 2.00m to 2.45m bgl material is very stiff.*
		2.50 - 2.70	D					
		3.00		N=30 (5,5/6,7,8,9)				*From 3.00m to 3.45m bgl material is stiff to very stiff.*
		4.00		N=27 (5,5/6,7,7,7)				
		5.00		N=23 (5,6/6,5,6,6)				
					5.45	52.36		End of borehole at 5.45 m

Remarks
Hand excavated service clearance to 1.20m bgl. No groundwater encountered.

AGS

Borehole Log

Borehole No.
WS5
Sheet 1 of 1

Project Name:	Blackwin Street	Project No. 081427-Blackwin	Co-ords:	387443.76 - 396815.78	Hole Type WS
Location:	Blackwin Street, Gorton		Level:	57.84	Scale 1:50
Client:	One Manchester		Dates:	05/12/2022 - 05/12/2022	Logged By RT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.22	57.62		MADE GROUND: Grass overlying dark brown very sandy slightly gravelly, slightly cobbly topsoil with frequent rootlets. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick and concrete fragments. Cobbles are sub-angular brick fragments.
		0.40 - 0.50	ES		0.60	57.24		MADE GROUND: Dark brown very gravelly moderately cobbly clayey sand. Sand is fine to coarse and contains ash. Gravels are frequent fine to coarse sub-angular brick, concrete and plastic fragments. Cobbles are occasional sub-angular brick, concrete and sandstone fragments.
		1.20		N=12 (1,2/2,3,3,4)				
		1.20 - 1.30	ES					
		1.80 - 2.00	D					
		2.00		N=27 (3,4/5,7,7,8)				Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
								From 1.20m to 1.65m bgl material is firm.
		3.00		N=25 (3,3/5,6,7,7)				
		4.00		N=40 (4,6/10,10,10,10)				*From 4.00m to 4.45m bgl material is stiff to very stiff.*
		5.00		N=28 (5,5/6,7,7,8)				
					5.45	52.39		End of borehole at 5.45 m

Depth scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Remarks
Hand excavated service clearance to 1.20m bgl. No groundwater encountered.

AGS

Trial Pit Log

Trialpit No **TP1**

Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387465.72 - 396794.16 Level: 57.08	Date 12/12/2022
Location: Blackwin Street, Gorton		Dimensions (m): 2.47 × 0.8 Depth 2.40	Scale 1:25
Client: One Manchester			Logged RT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20 - 0.30	ES					MADE GROUND: Light brown very gravelly very cobbly sand. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick, concrete and ceramic fragments. Cobbles are sub-angular brick and concrete fragments.
				0.31	56.77		MADE GROUND: Reddish brown moderately gravelly sand. Sand is fine medium to coarse. Gravels are occasional sub-rounded mudstone fragments.
				0.59	56.49		Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
				2.40	54.68		End of pit at 2.40 m

1 2 3 4 5

Remarks: Trial pit backfilled in arisings. No groundwater encoutered.

Stability: Stable

AGS

Trial Pit Log

Trialpit No
TP2
Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387458.89 - 396802.10 Level: 57.45	Date 12/12/2022
Location: Blackwin Street, Gorton		Dimensions (m): 2.72 × 0.79	Scale 1:25
Client: One Manchester		Depth 2.39	Logged RT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20 - 0.30	ES					MADE GROUND: Light brown very gravelly very cobbly sand. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick, concrete and ceramic fragments. Cobbles are sub-angular brick and concrete fragments.
				0.48	56.97		Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments. (Reworked Glacial Till)
	1.20 - 1.30	ES					
							Relic sewer present from 2.03m to 2.39m bgl running in a north-east to south-west trajectory.
				2.39	55.06		End of pit at 2.39 m

1
2
3
4
5

Remarks: Trial pit backfilled in arisings. No groundwater encountered. Relic sewer encountered at 2.03m to 2.29m bgl. Sewer comprised of concrete flags overlying two rows of red brick. An organic slurry was observed within the sewer pipe.

Stability: Stable

AGS

Trial Pit Log

Trialpit No
TP3
Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387443.07 - 396820.84 Level: 57.83	Date 12/12/2022
Location: Blackwin Street, Gorton		Dimensions (m): 2.6 × 0.77	Scale 1:25
Client: One Manchester		Depth 2.80	Logged RT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.26	57.57		MADE GROUND: Grass overlying dark brown very sandy slightly gravelly, slightly cobbly topsoil with frequent rootlets. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick and concrete fragments. Cobbles are sub-angular brick fragments.
	0.50 - 0.60	ES					MADE GROUND: Brown very gravelly very cobbly sand. Sand is fine to coarse. Gravels are frequent fine to coarse sub-angular brick, concrete, clinker and ceramic fragments. Cobbles are frequent sub-angular brick, concrete and ferrous metal fragments.
	0.90 - 1.10	ES		0.84	56.99		Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
				2.80	55.03		End of pit at 2.80 m

1
2
3
4
5

Remarks: Trial pit backfilled in arisings. No groundwater encountered.

Stability: Stable

AGS

Trial Pit Log

Trialpit No
TP4
Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387453.36 - 396824.44 Level: 57.80	Date 12/12/2022
Location: Blackwin Street, Gorton		Dimensions (m): 2 × 0.76 Depth 2.50	Scale 1:25
Client: One Manchester			Logged RT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	57.65		MADE GROUND: Grass overlying dark brown very sandy slightly gravelly, slightly cobbly topsoil with frequent rootlets. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick and concrete fragments. Cobbles are sub-angular brick fragments.
	0.40 - 0.60	ES					MADE GROUND: Brown very gravelly very cobbly sand. Sand is fine to coarse. Gravels are frequent fine to coarse sub-angular brick, concrete, clinker and ceramic fragments. Cobbles are frequent sub-angular brick and concrete fragments.
				0.63	57.17		Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
				2.50	55.30		End of pit at 2.50 m

1
2
3
4
5

Remarks: Trial pit backfilled in arisings. No groundwater encountered.

Stability: Stable

AGS

Trial Pit Log

Trialpit No **TP5**

Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387452.46 - 396801.17 Level: 57.91	Date 12/12/2022
Location: Blackwin Street, Gorton		Dimensions (m): 2.41 × 0.81 Depth 2.60	Scale 1:25
Client: One Manchester			Logged RT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.30 - 0.40	ES					MADE GROUND: Light brown very gravelly very cobbly sand. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick, concrete and ceramic fragments. Cobbles are sub-angular brick and concrete fragments.
				0.51	57.40		Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
				2.60	55.31		End of pit at 2.60 m

1 2 3 4 5

Remarks: Trial pit backfilled in arisings. No groundwater encountered.

Stability: Stable

AGS

Trial Pit Log

Trialpit No
TP6
Sheet 1 of 1

Project Name: Blackwin Street	Project No. 081427-Blackwin	Co-ords: 387476.64 - 396801.26 Level: 57.07	Date 12/12/2022
Location: Blackwin Street, Gorton		Dimensions (m): 2.55 × 0.79	Scale 1:25
Client: One Manchester		Depth 2.50	Logged RT

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
	0.20 - 0.30	ES					MADE GROUND: Light brown very gravelly very cobbly sand. Sand is fine to coarse. Gravels are fine to coarse sub-angular brick, concrete and ceramic fragments. Cobbles are sub-angular brick and concrete fragments.
				0.45	56.62		
	0.60 - 0.70	ES					Stiff reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.
				2.50	54.57		End of pit at 2.50 m

1
2
3
4
5

Remarks: Trial pit backfilled in arisings. Perched water encountered at 0.15m bgl.

Stability: Stable

AGS

Borehole Log

Borehole No.
CP1
Sheet 1 of 1

Project Name:	Blackwin Street	Project No. 081427-Blackwin	Co-ords:	387461.72 - 396809.20	Hole Type CP
Location:	Blackwin Street, Gorton		Level:	57.94	Scale 1:50
Client:	One Manchester		Dates:	06/12/2022 - 06/12/2022	Logged By RT

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description	
		0.30 - 0.40	ES		0.54	57.40		MADE GROUND: Light brown very gravelly moderately cobbly sand. Sand is fine to coarse and contains ash. Gravels are frequent fine to coarse sub-angular brick, concrete, glass and plastic fragments. Cobbles are occasional sub-angular brick and concrete fragments.	
		1.20 1.20 - 1.65	ES	N=13 (2,2/2,3,4,4)				Firm reddish brown and grey mottled sandy gravelly CLAY. Sand is fine to coarse. Gravels are occasional sub-rounded to sub-angular mudstone, siltstone, sandstone, quartzite and coal fragments.	1
		2.00 - 2.45	B						2
		3.00		N=23 (3,4/5,5,6,7)				*From 3.00m to 3.45m bgl material is stiff.*	3
		4.00 4.00 - 4.45	U	N=14 (2,2/5,1,8,0)					4
		5.00 5.00 - 5.45	B	N=14 (1,2/3,3,4,4)					5
									6
		6.50 - 6.95	U						7
		8.00 8.00 - 8.45	B	N=20 (3,4/4,4,6,6)				*From 8.00m to 8.45m bgl material is firm to stiff.*	8
									9
		9.50 - 9.95	U						
					9.95	47.99		End of borehole at 9.95 m	10

Remarks
Hand excavated service clearance to 1.20m bgl. No groundwater encoutered.

AGS

Appendix C – Chemical Laboratory Testing Results

- Envirolab, Environmental Chemistry Analysis Results, Soils

Copyright ©2023 Curtins Consulting Ltd

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

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12136
Issue Number: 1 **Date:** 16 December, 2022

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: Niall Farnworth
Project Name: Blackwin St
Project Ref: 81427
Order No: 2538
Date Samples Received: 07/12/22
Date Instructions Received: 12/12/22
Date Analysis Completed: 16/12/22

Approved by:

Danielle Brierley
Deputy Client Services Supervisor

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

envirolab

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/1	22/12136/2	22/12136/3	22/12136/4	22/12136/5	22/12136/6	22/12136/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01	ES01	ES02	ES01	ES02			
Client Sample ID	WS5	WS5	WS4	WS1	WS1	CP1	CP1			
Depth to Top	0.40	1.20	0.10	0.40	1.20	0.30	1.20			
Depth To Bottom	0.50	1.30	0.20	0.50	1.30	0.40	1.65			
Date Sampled	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	06-Dec-22	06-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6A	4ABE	4AE	6AE	4A	6A			
% Stones >10mm$_{A}$	19.4	11.7	22.0	8.2	4.4	14.2	3.8	% w/w	0.1	A-T-044
pH$_{D}^{M\#}$	8.44	8.65	8.48	8.18	8.23	8.77	8.53	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_{D}^{M\#}$	<0.01	<0.01	0.10	0.02	0.04	0.12	0.06	g/l	0.01	A-T-026s
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$_{D}^{M\#}$	5.1	1.1	4.1	1.3	6.4	3.7	1.5	% w/w	0.1	A-T-032 OM
Arsenic$_{D}^{M\#}$	6	<1	5	10	<1	6	4	mg/kg	1	A-T-024s
Boron (water soluble)$_{D}$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_{D}^{M\#}$	1.0	0.8	0.6	0.7	0.8	0.8	0.9	mg/kg	0.5	A-T-024s
Copper$_{D}^{M\#}$	55	22	35	50	21	33	21	mg/kg	1	A-T-024s
Chromium$_{D}^{M\#}$	22	32	15	20	35	12	32	mg/kg	1	A-T-024s
Chromium (hexavalent)$_{D}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_{D}^{M\#}$	126	9	106	77	11	33	11	mg/kg	1	A-T-024s
Mercury$_{D}$	0.30	<0.17	<0.17	<0.17	<0.17	0.78	<0.17	mg/kg	0.17	A-T-024s
Nickel$_{D}^{M\#}$	22	30	12	21	35	14	38	mg/kg	1	A-T-024s
Selenium$_{D}^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_{D}^{M\#}$	239	52	81	71	46	147	48	mg/kg	5	A-T-024s

envirolab

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/1	22/12136/2	22/12136/3	22/12136/4	22/12136/5	22/12136/6	22/12136/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01	ES01	ES02	ES01	ES02			
Client Sample ID	WS5	WS5	WS4	WS1	WS1	CP1	CP1			
Depth to Top	0.40	1.20	0.10	0.40	1.20	0.30	1.20			
Depth To Bottom	0.50	1.30	0.20	0.50	1.30	0.40	1.65			
Date Sampled	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	06-Dec-22	06-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6A	4ABE	4AE	6AE	4A	6A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	NAD	NAD	NAD	NAD	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	N/A	N/A	N/A	N/A	N/A			A-T-045

envirolab

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/1	22/12136/2	22/12136/3	22/12136/4	22/12136/5	22/12136/6	22/12136/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01	ES01	ES02	ES01	ES02			
Client Sample ID	WS5	WS5	WS4	WS1	WS1	CP1	CP1			
Depth to Top	0.40	1.20	0.10	0.40	1.20	0.30	1.20			
Depth To Bottom	0.50	1.30	0.20	0.50	1.30	0.40	1.65			
Date Sampled	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	06-Dec-22	06-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6A	4ABE	4AE	6AE	4A	6A			
PAH-16MS										
Acenaphthene$_{A}^{M\#}$	0.04	<0.01	0.02	0.01	<0.01	0.01	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene$_{A}^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene$_{A}^{M\#}$	0.07	<0.02	0.05	0.02	<0.02	<0.02	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_{A}^{M\#}$	0.26	<0.04	0.35	0.12	<0.04	0.08	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_{A}^{M\#}$	0.29	<0.04	0.32	0.13	<0.04	0.07	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_{A}^{M\#}$	0.32	<0.05	0.36	0.14	<0.05	0.09	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_{A}^{M\#}$	0.17	<0.05	0.24	0.11	<0.05	0.05	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_{A}^{M\#}$	0.12	<0.07	0.14	<0.07	<0.07	<0.07	<0.07	mg/kg	0.07	A-T-019s
Chrysene$_{A}^{M\#}$	0.31	<0.06	0.40	0.15	<0.06	0.10	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_{A}^{M\#}$	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_{A}^{M\#}$	0.55	<0.08	0.79	0.21	<0.08	0.16	<0.08	mg/kg	0.08	A-T-019s
Fluorene$_{A}^{M\#}$	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_{A}^{M\#}$	0.18	<0.03	0.22	0.10	<0.03	0.05	<0.03	mg/kg	0.03	A-T-019s
Naphthalene $_{A}^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_{A}^{M\#}$	0.33	<0.03	0.24	0.11	<0.03	0.10	<0.03	mg/kg	0.03	A-T-019s
Pyrene$_{A}^{M\#}$	0.52	<0.07	0.74	0.20	<0.07	0.16	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS$_{A}^{M\#}$	3.18	<0.08	3.92	1.30	<0.08	0.87	<0.08	mg/kg	0.01	A-T-019s

envirolab

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/1	22/12136/2	22/12136/3	22/12136/4	22/12136/5	22/12136/6	22/12136/7	Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01	ES01	ES02	ES01	ES02			
Client Sample ID	WS5	WS5	WS4	WS1	WS1	CP1	CP1			
Depth to Top	0.40	1.20	0.10	0.40	1.20	0.30	1.20			
Depth To Bottom	0.50	1.30	0.20	0.50	1.30	0.40	1.65			
Date Sampled	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	05-Dec-22	06-Dec-22	06-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	6A	4ABE	4AE	6AE	4A	6A			
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	<1	mg/kg	1	A-T-055s
Ali >C10-C12$_{A}^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16$_{A}^{M\#}$	<1	<1	<1	<1	<1	1	<1	mg/kg	1	A-T-055s
Ali >C16-C21$_{A}^{M\#}$	<1	<1	<1	<1	<1	3	<1	mg/kg	1	A-T-055s
Ali >C21-C35$_{A}^{M\#}$	10	<1	72	2	1	98	<1	mg/kg	1	A-T-055s
Total Aliphatics$_{A}$	10	<1	73	2	1	102	<1	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$_{A}$	<3	<3	<3	<3	<3	<3	<3	mg/kg	1	A-T-055s
Aro >C10-C12$_{A}$	<1	<1	<1	<1	<1	1	<1	mg/kg	1	A-T-055s
Aro >C12-C16$_{A}$	2	<1	2	<1	<1	3	<1	mg/kg	1	A-T-055s
Aro >C16-C21$_{A}^{M\#}$	8	<1	7	1	<1	7	<1	mg/kg	1	A-T-055s
Aro >C21-C35$_{A}^{M\#}$	20	<1	30	2	<1	30	<1	mg/kg	1	A-T-055s
Total Aromatics$_{A}$	30	<3	38	3	<3	41	<3	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_{A}$	40	<3	111	5	<3	143	<3	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

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/8	22/12136/9	22/12136/10					Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01							
Client Sample ID	WS2	WS2	WS3							
Depth to Top	0.20	1.20	0.20							
Depth To Bottom	0.30	1.30	0.30							
Date Sampled	06-Dec-22	06-Dec-22	06-Dec-22							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4A	3	4ABE							
% Stones >10mm$_{A}$	<0.1	9.3	22.6					% w/w	0.1	A-T-044
pH$_{D}^{M\#}$	11.50	9.11	11.38					pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_{D}^{M\#}$	0.06	0.03	0.14					g/l	0.01	A-T-026s
Cyanide (total)$_{A}^{M\#}$	<1	<1	<1					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_{A}$	<0.2	<0.2	<0.2					mg/kg	0.2	A-T-050s
Organic Matter$_{D}^{M\#}$	2.3	1.7	1.4					% w/w	0.1	A-T-032 OM
Arsenic$_{D}^{M\#}$	1	<1	<1					mg/kg	1	A-T-024s
Boron (water soluble)$_{D}$	2.4	<1.0	1.9					mg/kg	1	A-T-027s
Cadmium$_{D}^{M\#}$	<0.5	0.7	<0.5					mg/kg	0.5	A-T-024s
Copper$_{D}^{M\#}$	18	16	19					mg/kg	1	A-T-024s
Chromium$_{D}^{M\#}$	11	19	18					mg/kg	1	A-T-024s
Chromium (hexavalent)$_{D}$	<1	<1	<1					mg/kg	1	A-T-040s
Lead$_{D}^{M\#}$	48	8	65					mg/kg	1	A-T-024s
Mercury$_{D}$	0.81	<0.17	1.32					mg/kg	0.17	A-T-024s
Nickel$_{D}^{M\#}$	10	22	13					mg/kg	1	A-T-024s
Selenium$_{D}^{M\#}$	<1	<1	<1					mg/kg	1	A-T-024s
Zinc$_{D}^{M\#}$	90	38	86					mg/kg	5	A-T-024s

envirolab

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/8	22/12136/9	22/12136/10					Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01							
Client Sample ID	WS2	WS2	WS3							
Depth to Top	0.20	1.20	0.20							
Depth To Bottom	0.30	1.30	0.30							
Date Sampled	06-Dec-22	06-Dec-22	06-Dec-22							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4A	3	4ABE							
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}$#	Amosite	NAD	NAD							A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-							A-T-045
Asbestos Matrix (microscope)$_{D}$	Loose Fibres	-	-							A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	N/A							A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing)$_{D}$	0.002	-	-					% w/w	0.001	A-T-054

envirolab

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/8	22/12136/9	22/12136/10					Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01							
Client Sample ID	WS2	WS2	WS3							
Depth to Top	0.20	1.20	0.20							
Depth To Bottom	0.30	1.30	0.30							
Date Sampled	06-Dec-22	06-Dec-22	06-Dec-22							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4A	3	4ABE							
PAH-16MS										
Acenaphthene$_{A}^{M\#}$	0.04	<0.01	0.02					mg/kg	0.01	A-T-019s
Acenaphthylene$_{A}^{M\#}$	0.05	<0.01	0.03					mg/kg	0.01	A-T-019s
Anthracene$_{A}^{M\#}$	0.07	<0.02	0.05					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_{A}^{M\#}$	0.35	<0.04	0.18					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_{A}^{M\#}$	0.31	<0.04	0.16					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_{A}^{M\#}$	0.35	<0.05	0.19					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_{A}^{M\#}$	0.21	<0.05	0.12					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_{A}^{M\#}$	0.14	<0.07	<0.07					mg/kg	0.07	A-T-019s
Chrysene$_{A}^{M\#}$	0.39	<0.06	0.22					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_{A}^{M\#}$	<0.04	<0.04	<0.04					mg/kg	0.04	A-T-019s
Fluoranthene$_{A}^{M\#}$	0.66	<0.08	0.40					mg/kg	0.08	A-T-019s
Fluorene$_{A}^{M\#}$	0.02	<0.01	0.02					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_{A}^{M\#}$	0.21	<0.03	0.12					mg/kg	0.03	A-T-019s
Naphthalene $_{A}^{M\#}$	<0.03	<0.03	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_{A}^{M\#}$	0.27	<0.03	0.19					mg/kg	0.03	A-T-019s
Pyrene$_{A}^{M\#}$	0.70	<0.07	0.38					mg/kg	0.07	A-T-019s
Total PAH-16MS$_{A}^{M\#}$	3.77	<0.08	2.08					mg/kg	0.01	A-T-019s

envirolab

Envirolab Job Number: 22/12136

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12136/8	22/12136/9	22/12136/10					Units	Limit of Detection	Method ref
Client Sample No	ES01	ES02	ES01							
Client Sample ID	WS2	WS2	WS3							
Depth to Top	0.20	1.20	0.20							
Depth To Bottom	0.30	1.30	0.30							
Date Sampled	06-Dec-22	06-Dec-22	06-Dec-22							
Sample Type	Soil - ES	Soil - ES	Soil - ES							
Sample Matrix Code	4A	3	4ABE							
TPH CWG with Clean Up										
Ali >C5-C6$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C6-C8$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Ali >C8-C10$_{A}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C10-C12$_{A}^{M\#}$	<1	<1	<1					mg/kg	1	A-T-055s
Ali >C12-C16$_{A}^{M\#}$	4	<1	<1					mg/kg	1	A-T-055s
Ali >C16-C21$_{A}^{M\#}$	12	<1	6					mg/kg	1	A-T-055s
Ali >C21-C35$_{A}^{M\#}$	225	2	135					mg/kg	1	A-T-055s
Total Aliphatics$_{A}$	241	2	142					mg/kg	1	Calc-As Recd
Aro >C5-C7$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C7-C8$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
Aro >C8-C10$_{A}$	<3	<3	4					mg/kg	1	A-T-055s
Aro >C10-C12$_{A}$	<1	<1	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_{A}$	5	<1	3					mg/kg	1	A-T-055s
Aro >C16-C21$_{A}^{M\#}$	16	1	11					mg/kg	1	A-T-055s
Aro >C21-C35$_{A}^{M\#}$	36	2	22					mg/kg	1	A-T-055s
Total Aromatics$_{A}$	57	3	40					mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_{A}$	298	5	181					mg/kg	1	Calc-As Recd
BTEX - Benzene$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Toluene$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
BTEX - o Xylene$_{A}^{\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-022s
MTBE$_{A}^{\#}$	<0.01	<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 with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

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

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

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

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

Asbestos:

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

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

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: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Blackwin St

Clients Project No: 81427

Project No: 22/12136

Date Received: 12/12/2022 (am)

Cool Box Temperatures (°C): 5.7, 2.8

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 ± 3°C), ISO 18400-105:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Envirolab Analysis Dates

Lab Sample ID	22/12136/1	22/12136/2	22/12136/3	22/12136/4	22/12136/5	22/12136/6	22/12136/7	22/12136/8	22/12136/9	22/12136/10
Client Sample No	ES01	ES02	ES01	ES01	ES02	ES01	ES02	ES01	ES02	ES01
Client Sample ID/Depth	WS5 0.40-0.50m	WS5 1.20-1.30m	WS4 0.10-0.20m	WS1 0.40-0.50m	WS1 1.20-1.30m	CP1 0.30-0.40m	CP1 1.20-1.65m	WS2 0.20-0.30m	WS2 1.20-1.30m	WS3 0.20-0.30m
Date Sampled	05/12/22	05/12/22	05/12/22	05/12/22	05/12/22	06/12/22	06/12/22	06/12/22	06/12/22	06/12/22
A-T-019s	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-022s	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-024s	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
A-T-026s	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-027s	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
A-T-031s	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-032 OM	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	16/12/2022	15/12/2022	15/12/2022
A-T-040s	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-042sTCN	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
A-T-044	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
A-T-045	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022	13/12/2022
A-T-050s	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022
A-T-054								15/12/2022		
A-T-055s	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022
Calc-As Recd	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022	15/12/2022

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

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

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 22/12229
Issue Number: 1 **Date:** 21 December, 2022

Client: Curtins Consulting (Manchester)
Merchant Exchange
17-19 Whitworth Street
Manchester
UK
M1 5WG

Project Manager: EBMA/Niall Farnworth/Russell Taylor
Project Name: Blackwin St
Project Ref: 81427
Order No: 2589
Date Samples Received: 12/12/22
Date Instructions Received: 13/12/22
Date Analysis Completed: 21/12/22

Approved by:

Gemma Berrisford
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

envirolab

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/1	22/12229/2	22/12229/3	22/12229/4	22/12229/5	22/12229/6	22/12229/7	Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01	ES01	ES01	ES02	ES01	ES01			
Client Sample ID	TP2	TP2	TP5	TP1	TP6	TP6	TP4			
Depth to Top	1.20	0.20	0.30	0.20	0.60	0.20	0.40			
Depth To Bottom	1.30	0.30	0.40	0.30	0.70	0.30	0.60			
Date Sampled	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	4AE	4AE	4AE	6A	1A	4AEB			
% Stones >10mm$_{A}$	<0.1	<0.1	<0.1	<0.1	4.9	12.2	20.3	% w/w	0.1	A-T-044
pH$_{D}^{M\#}$	8.56	10.91	10.15	10.78	8.68	10.76	8.49	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_{D}^{M\#}$	0.03	0.12	0.09	0.08	0.03	0.21	0.02	g/l	0.01	A-T-026s
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$_{D}^{M\#}$	1.8	1.8	1.9	2.6	1.5	0.4	5.9	% w/w	0.1	A-T-032 OM
Arsenic$_{D}^{M\#}$	<1	2	4	3	<1	<1	4	mg/kg	1	A-T-024s
Boron (water soluble)$_{D}$	<1.0	<1.0	1.1	1.3	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_{D}^{M\#}$	0.7	<0.5	<0.5	<0.5	0.6	<0.5	1.0	mg/kg	0.5	A-T-024s
Copper$_{D}^{M\#}$	25	25	25	22	22	9	54	mg/kg	1	A-T-024s
Chromium$_{D}^{M\#}$	28	13	12	11	26	7	19	mg/kg	1	A-T-024s
Chromium (hexavalent)$_{D}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_{D}^{M\#}$	12	48	69	228	10	10	132	mg/kg	1	A-T-024s
Mercury$_{D}$	<0.17	1.21	2.01	1.34	<0.17	<0.17	0.33	mg/kg	0.17	A-T-024s
Nickel$_{D}^{M\#}$	32	11	10	9	29	6	18	mg/kg	1	A-T-024s
Selenium$_{D}^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Zinc$_{D}^{M\#}$	57	86	92	96	54	18	166	mg/kg	5	A-T-024s

envirolab

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/1	22/12229/2	22/12229/3	22/12229/4	22/12229/5	22/12229/6	22/12229/7	Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01	ES01	ES01	ES02	ES01	ES01			
Client Sample ID	TP2	TP2	TP5	TP1	TP6	TP6	TP4			
Depth to Top	1.20	0.20	0.30	0.20	0.60	0.20	0.40			
Depth To Bottom	1.30	0.30	0.40	0.30	0.70	0.30	0.60			
Date Sampled	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	4AE	4AE	4AE	6A	1A	4AEB			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}$#	NAD	Amosite	Amosite	Chrysotile	NAD	NAD	NAD			A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope)$_{D}$	-	Loose Fibres	Loose Fibres	Bitumen Product	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	N/A	N/A	N/A	N/A	N/A	N/A			A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing)$_{D}$	-	0.047	0.001	0.002	-	-	-	% w/w	0.001	A-T-054

envirolab

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/1	22/12229/2	22/12229/3	22/12229/4	22/12229/5	22/12229/6	22/12229/7	Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01	ES01	ES01	ES02	ES01	ES01			
Client Sample ID	TP2	TP2	TP5	TP1	TP6	TP6	TP4			
Depth to Top	1.20	0.20	0.30	0.20	0.60	0.20	0.40			
Depth To Bottom	1.30	0.30	0.40	0.30	0.70	0.30	0.60			
Date Sampled	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	4AE	4AE	4AE	6A	1A	4AEB			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.03	0.01	0.01	<0.01	<0.01	0.12	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.07	0.02	0.03	<0.02	<0.02	0.12	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	0.34	0.18	0.16	<0.04	<0.04	0.28	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	0.30	0.18	0.18	<0.04	<0.04	0.24	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	0.38	0.22	0.23	<0.05	<0.05	0.30	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	0.16	0.12	0.13	<0.05	<0.05	0.12	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	0.15	0.09	<0.07	<0.07	<0.07	0.10	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	0.36	0.23	0.21	<0.06	<0.06	0.31	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	0.69	0.44	0.31	<0.08	<0.08	0.82	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.07	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	0.17	0.12	0.10	<0.03	<0.03	0.13	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	0.26	0.10	0.11	0.04	0.06	0.67	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	0.63	0.39	0.33	<0.07	<0.07	0.73	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	3.56	2.10	1.81	<0.08	<0.08	4.01	mg/kg	0.01	A-T-019s

envirolab

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/1	22/12229/2	22/12229/3	22/12229/4	22/12229/5	22/12229/6	22/12229/7	Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01	ES01	ES01	ES02	ES01	ES01			
Client Sample ID	TP2	TP2	TP5	TP1	TP6	TP6	TP4			
Depth to Top	1.20	0.20	0.30	0.20	0.60	0.20	0.40			
Depth To Bottom	1.30	0.30	0.40	0.30	0.70	0.30	0.60			
Date Sampled	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22	12-Dec-22			
Sample Type	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES	Soil - ES			
Sample Matrix Code	6AE	4AE	4AE	4AE	6A	1A	4AEB			
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	<1	mg/kg	1	A-T-055s
Ali >C10-C12$_{A}^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Ali >C12-C16$_{A}^{M\#}$	<1	<1	1	1	1	<1	<1	mg/kg	1	A-T-055s
Ali >C16-C21$_{A}^{M\#}$	<1	6	4	6	1	<1	<1	mg/kg	1	A-T-055s
Ali >C21-C35$_{A}^{M\#}$	<1	60	146	88	3	12	6	mg/kg	1	A-T-055s
Total Aliphatics$_{A}$	<1	66	152	95	5	12	6	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	0.08	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_{A}$	<3	<3	<3	6	<1	<3	<3	mg/kg	1	A-T-055s
Aro >C10-C12$_{A}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-055s
Aro >C12-C16$_{A}$	<1	1	6	2	1	<1	3	mg/kg	1	A-T-055s
Aro >C16-C21$_{A}^{M\#}$	<1	8	14	8	2	<1	10	mg/kg	1	A-T-055s
Aro >C21-C35$_{A}^{M\#}$	1	19	44	18	5	3	27	mg/kg	1	A-T-055s
Total Aromatics$_{A}$	<3	28	64	34	9	4	39	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_{A}$	<3	94	216	129	14	16	45	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	0.08	<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	0.08	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_{A}^{\#}$	<0.01	<0.01	<0.01	0.08	<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

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/8	22/12229/9						Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01								
Client Sample ID	TP3	TP3								
Depth to Top	0.90	0.50								
Depth To Bottom	1.10	0.60								
Date Sampled	12-Dec-22	12-Dec-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6A	4AEB								
% Stones >10mm$_{A}$	<0.1	21.6						% w/w	0.1	A-T-044
pH$_{D}^{M\#}$	8.50	8.64						pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_{D}^{M\#}$	0.04	0.02						g/l	0.01	A-T-026s
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$_{D}^{M\#}$	1.2	5.4						% w/w	0.1	A-T-032 OM
Arsenic$_{D}^{M\#}$	<1	5						mg/kg	1	A-T-024s
Boron (water soluble)$_{D}$	<1.0	<1.0						mg/kg	1	A-T-027s
Cadmium$_{D}^{M\#}$	0.9	0.7						mg/kg	0.5	A-T-024s
Copper$_{D}^{M\#}$	23	85						mg/kg	1	A-T-024s
Chromium$_{D}^{M\#}$	27	15						mg/kg	1	A-T-024s
Chromium (hexavalent)$_{D}$	<1	<1						mg/kg	1	A-T-040s
Lead$_{D}^{M\#}$	16	270						mg/kg	1	A-T-024s
Mercury$_{D}$	<0.17	0.27						mg/kg	0.17	A-T-024s
Nickel$_{D}^{M\#}$	36	14						mg/kg	1	A-T-024s
Selenium$_{D}^{M\#}$	<1	2						mg/kg	1	A-T-024s
Zinc$_{D}^{M\#}$	53	169						mg/kg	5	A-T-024s

envirolab

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/8	22/12229/9						Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01								
Client Sample ID	TP3	TP3								
Depth to Top	0.90	0.50								
Depth To Bottom	1.10	0.60								
Date Sampled	12-Dec-22	12-Dec-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6A	4AEB								
Asbestos in Soil (inc. matrix)										
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

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/8	22/12229/9						Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01								
Client Sample ID	TP3	TP3								
Depth to Top	0.90	0.50								
Depth To Bottom	1.10	0.60								
Date Sampled	12-Dec-22	12-Dec-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6A	4AEB								
PAH-16MS										
Acenaphthene$_{A}^{M\#}$	<0.01	0.06						mg/kg	0.01	A-T-019s
Acenaphthylene$_{A}^{M\#}$	<0.01	<0.01						mg/kg	0.01	A-T-019s
Anthracene$_{A}^{M\#}$	<0.02	0.13						mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_{A}^{M\#}$	<0.04	0.45						mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_{A}^{M\#}$	<0.04	0.44						mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_{A}^{M\#}$	<0.05	0.57						mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_{A}^{M\#}$	<0.05	0.26						mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_{A}^{M\#}$	<0.07	0.17						mg/kg	0.07	A-T-019s
Chrysene$_{A}^{M\#}$	<0.06	0.47						mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_{A}^{M\#}$	<0.04	0.05						mg/kg	0.04	A-T-019s
Fluoranthene$_{A}^{M\#}$	<0.08	0.98						mg/kg	0.08	A-T-019s
Fluorene$_{A}^{M\#}$	<0.01	0.05						mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_{A}^{M\#}$	<0.03	0.27						mg/kg	0.03	A-T-019s
Naphthalene $_{A}^{M\#}$	<0.03	0.06						mg/kg	0.03	A-T-019s
Phenanthrene$_{A}^{M\#}$	<0.03	0.66						mg/kg	0.03	A-T-019s
Pyrene$_{A}^{M\#}$	<0.07	0.90						mg/kg	0.07	A-T-019s
Total PAH-16MS$_{A}^{M\#}$	<0.08	5.52						mg/kg	0.01	A-T-019s

envirolab

Envirolab Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/8	22/12229/9						Units	Limit of Detection	Method ref
Client Sample No	ES02	ES01								
Client Sample ID	TP3	TP3								
Depth to Top	0.90	0.50								
Depth To Bottom	1.10	0.60								
Date Sampled	12-Dec-22	12-Dec-22								
Sample Type	Soil - ES	Soil - ES								
Sample Matrix Code	6A	4AEB								
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	<0.01						mg/kg	0.01	A-T-022s
Ali >C8-C10$_{A}$	<1	<1						mg/kg	1	A-T-055s
Ali >C10-C12$_{A}^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Ali >C12-C16$_{A}^{M\#}$	<1	<1						mg/kg	1	A-T-055s
Ali >C16-C21$_{A}^{M\#}$	<1	2						mg/kg	1	A-T-055s
Ali >C21-C35$_{A}^{M\#}$	<1	9						mg/kg	1	A-T-055s
Total Aliphatics$_{A}$	<1	13						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$_{A}$	<3	4						mg/kg	1	A-T-055s
Aro >C10-C12$_{A}$	<1	3						mg/kg	1	A-T-055s
Aro >C12-C16$_{A}$	<1	6						mg/kg	1	A-T-055s
Aro >C16-C21$_{A}^{M\#}$	<1	10						mg/kg	1	A-T-055s
Aro >C21-C35$_{A}^{M\#}$	<1	26						mg/kg	1	A-T-055s
Total Aromatics$_{A}$	<3	48						mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C35)$_{A}$	<3	61						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	<0.01						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 with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:

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

TPH analysis of water by method A-T-007:

Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

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

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

Asbestos:

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

Predominant Matrix Codes:

1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample, 9 = INCINERATOR ASH.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.

Secondary Matrix Codes:

A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:

IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve
Subscript "^" indicates analysis has dependant options against results. Testing dependant on results appear in the comments area of your sample receipt.
EPH CWG results have humics mathematically subtracted through instrument calculation
TPH results "with Cleanup" indicates results cleaned up with Silica during extraction

EPH CWG GCxGC ID from TPH CWG

Where we have identified humic substances in any ID's from TPH CWG with Clean Up please note that the concentration of these humic substances is not included in the quantified results and are included in the ID for information.

Please contact us if you need any further information.

v2

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: Curtins Consulting (Manchester), Merchant Exchange, 17-19 Whitworth Street , Manchester, UK, M1 5WG

Project: Blackwin St

Clients Project No: 81427

Project No: 22/12229

Date Received: 13/12/2022 (am)

Cool Box Temperatures (°C): 0.2

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	22/12229/1	22/12229/2	22/12229/3	22/12229/4	22/12229/5	22/12229/6	22/12229/7	22/12229/8	22/12229/9
Client Sample No	ES02	ES01	ES01	ES01	ES02	ES01	ES01	ES02	ES01
Client Sample ID/Depth	TP2 1.20-1.30m	TP2 0.20-0.30m	TP5 0.30-0.40m	TP1 0.20-0.30m	TP6 0.60-0.70m	TP6 0.20-0.30m	TP4 0.40-0.60m	TP3 0.90-1.10m	TP3 0.50-0.60m
Date Sampled	12/12/22	12/12/22	12/12/22	12/12/22	12/12/22	12/12/22	12/12/22	12/12/22	12/12/22
A-T-019s	19/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022
A-T-022s	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
A-T-024s	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
A-T-026s	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
A-T-027s	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
A-T-031s	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
A-T-032 OM	20/12/2022	21/12/2022	21/12/2022	21/12/2022	20/12/2022	21/12/2022	19/12/2022	19/12/2022	19/12/2022
A-T-040s	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022	20/12/2022
A-T-042sTCN	21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022	21/12/2022
A-T-044	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
A-T-045	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022	14/12/2022
A-T-050s	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022	16/12/2022
A-T-054		19/12/2022	19/12/2022	19/12/2022					
A-T-055s	19/12/2022	19/12/2022	19/12/2022	19/12/2022	21/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022
Calc-As Recd	19/12/2022	19/12/2022	19/12/2022	19/12/2022	21/12/2022	19/12/2022	19/12/2022	19/12/2022	19/12/2022

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 D – Geotechnical Laboratory Testing Results

- I2 Analytical Geotechnical Analysis Results

Copyright ©2023 Curtins Consulting Ltd

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

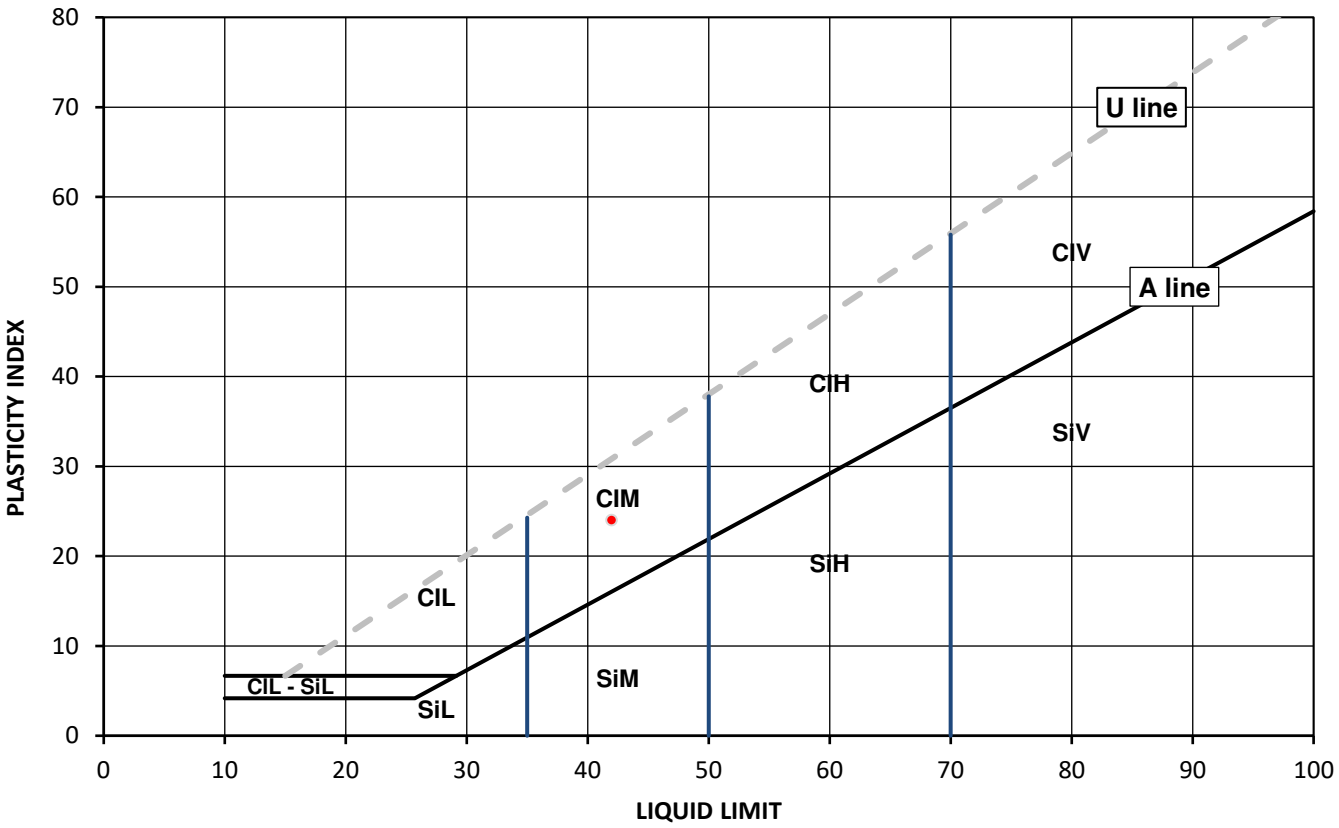
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	29/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535841	Depth Top [m]:	2.00
Hole No.:	CP1 - B1	Depth Base [m]:	2.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Dark brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19	42	18	24	98



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

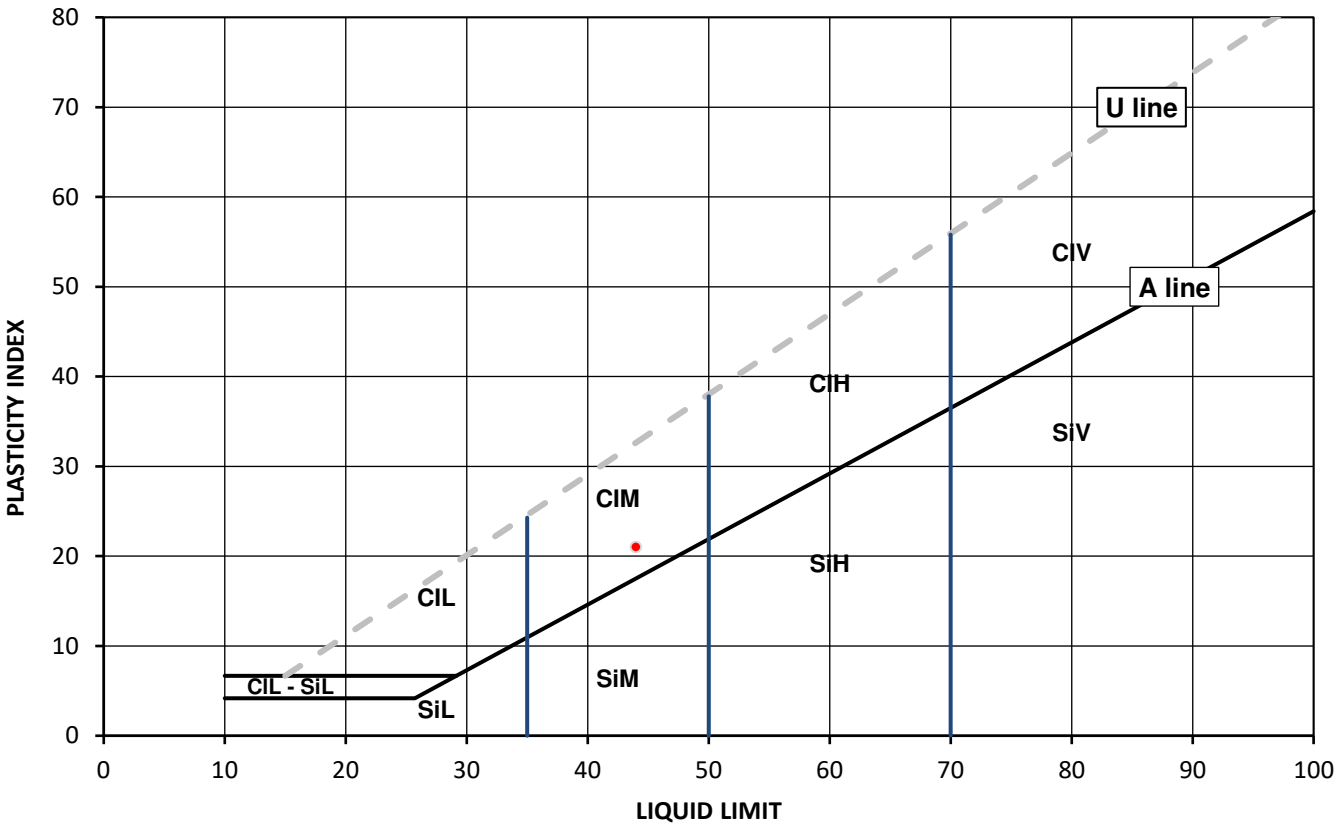
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	29/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535842	Depth Top [m]:	5.00
Hole No.:	CP1 - B2	Depth Base [m]:	5.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Greyish brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
25	44	23	21	93



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

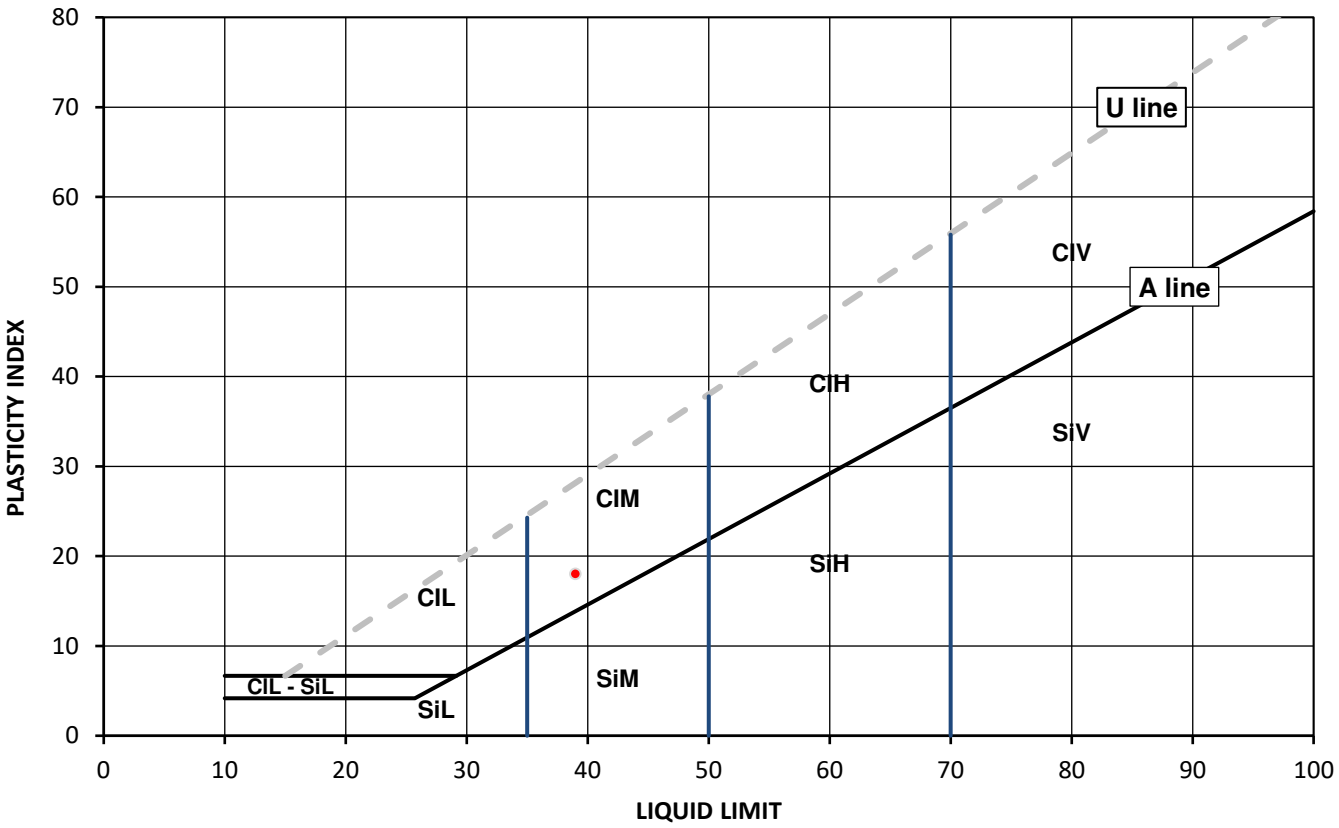
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	29/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535843	Depth Top [m]:	8.00
Hole No.:	CP1 - B3	Depth Base [m]:	8.45
Sample Reference:	Not Given	Sample Type:	B
Sample Description:	Orangish brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
12	39	21	18	96



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

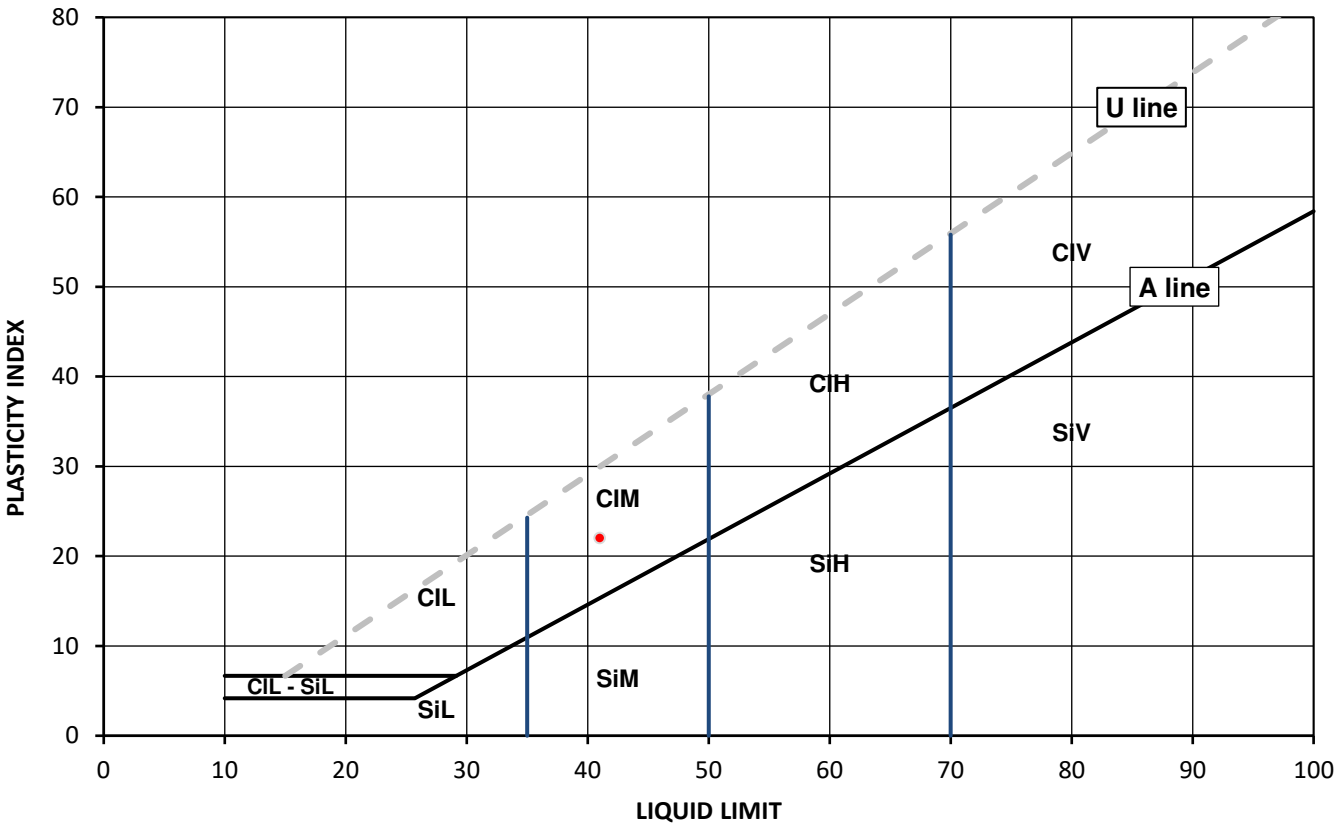
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	28/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535847	Depth Top [m]:	3.80
Hole No.:	WS1 - D1	Depth Base [m]:	4.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
17	41	19	22	90



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

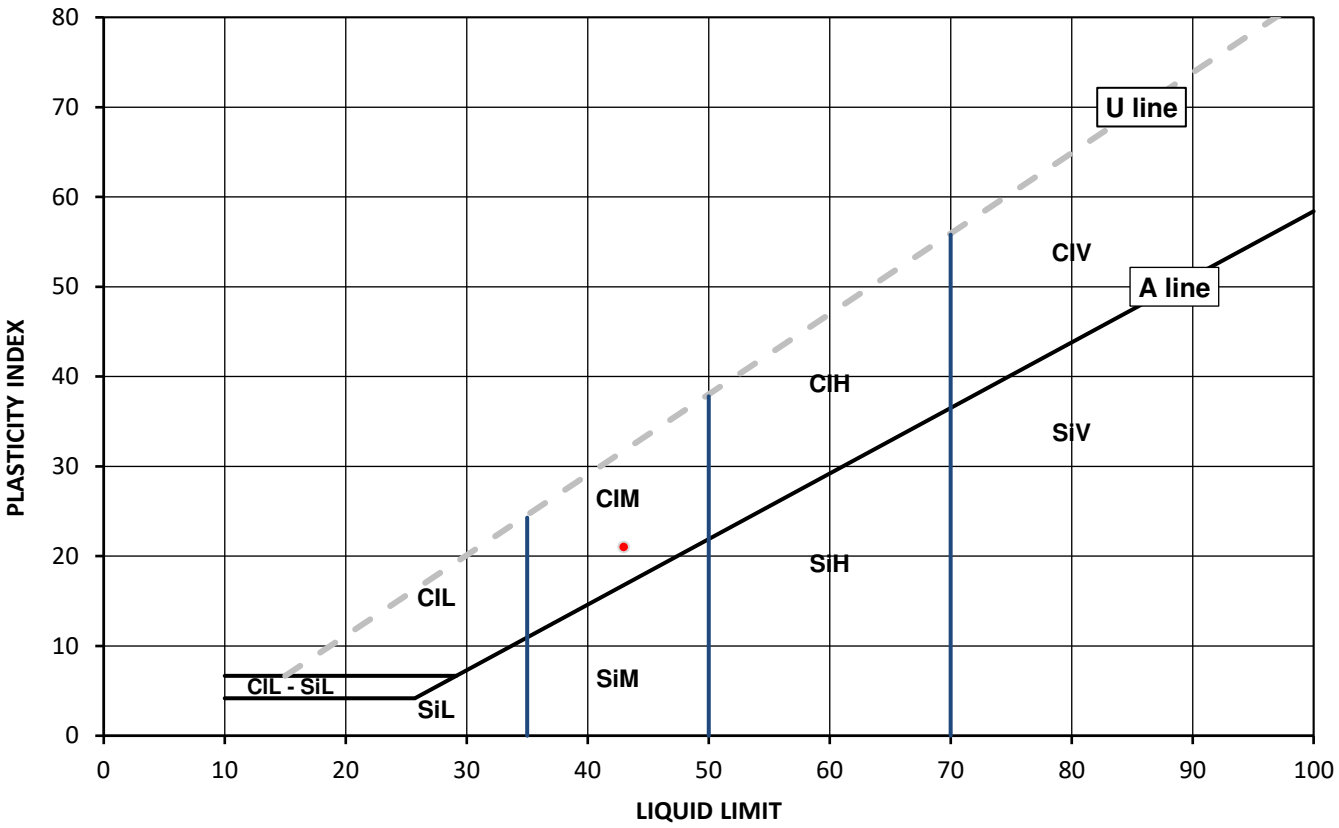
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	28/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535848	Depth Top [m]:	1.80
Hole No.:	WS2 - D1	Depth Base [m]:	2.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19	43	22	21	94



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

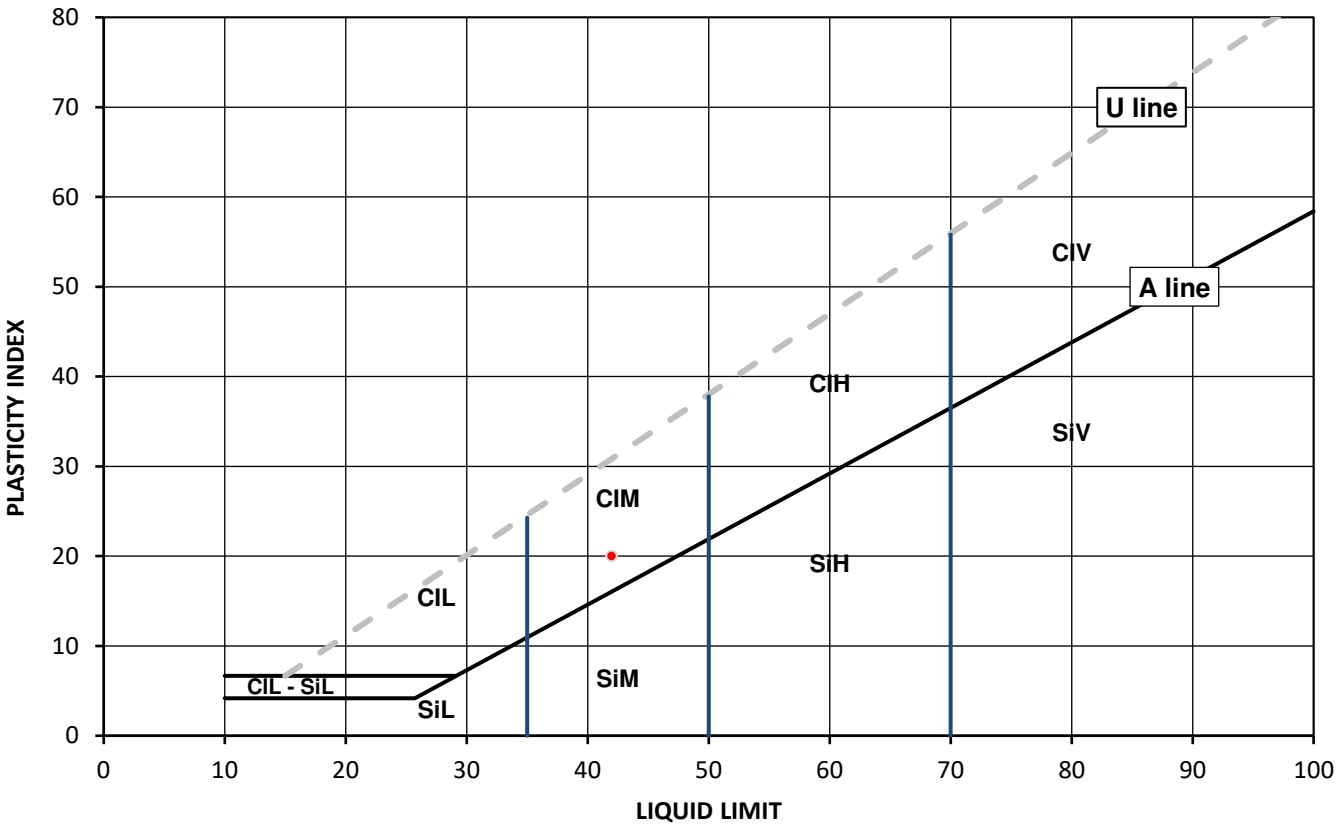
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	28/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535849	Depth Top [m]:	1.20
Hole No.:	WS3 - D1	Depth Base [m]:	1.40
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19	42	22	20	94



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

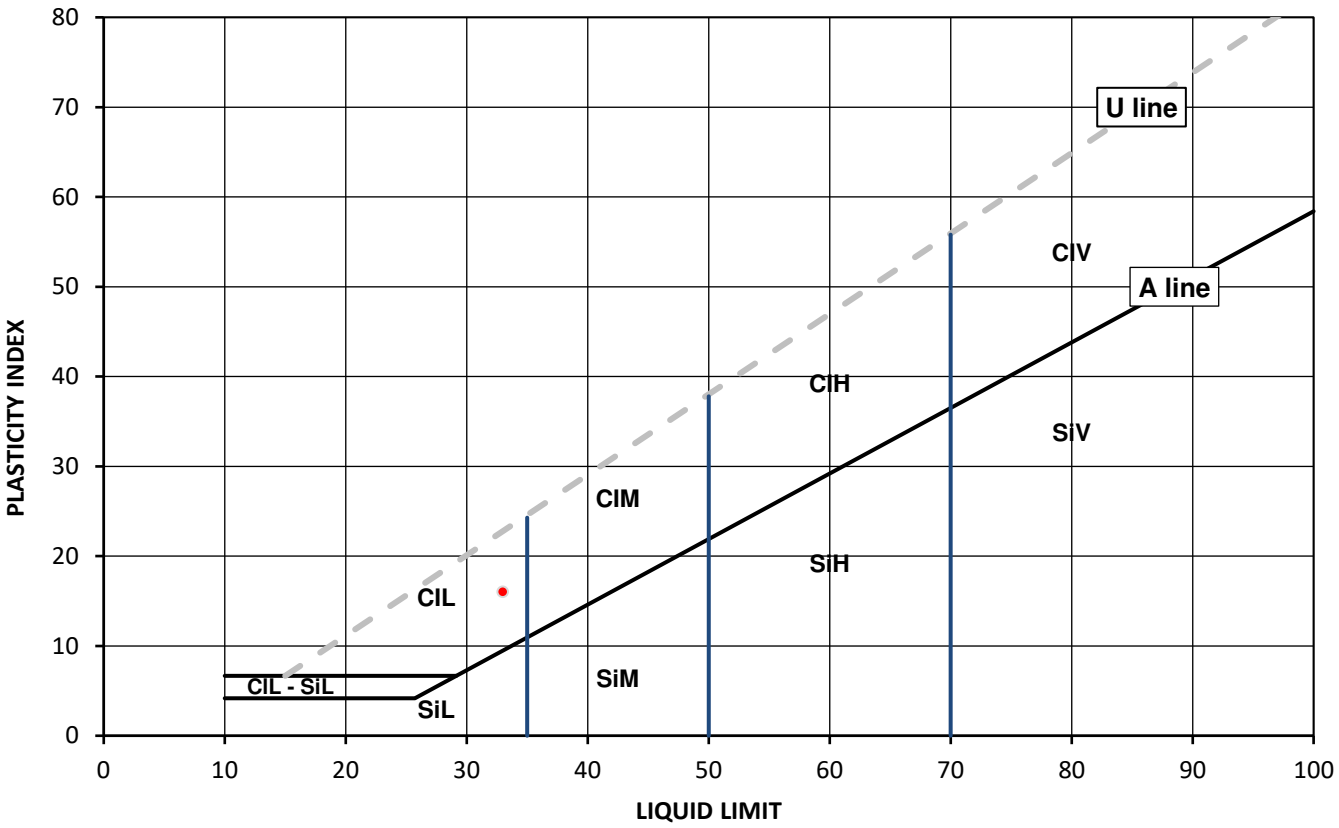
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	05/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	28/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535850	Depth Top [m]:	2.50
Hole No.:	WS4 - D1	Depth Base [m]:	2.70
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly gravelly very sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
13	33	17	16	92



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with:BS 1377-2:1990:Clause 4.3 and 5

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

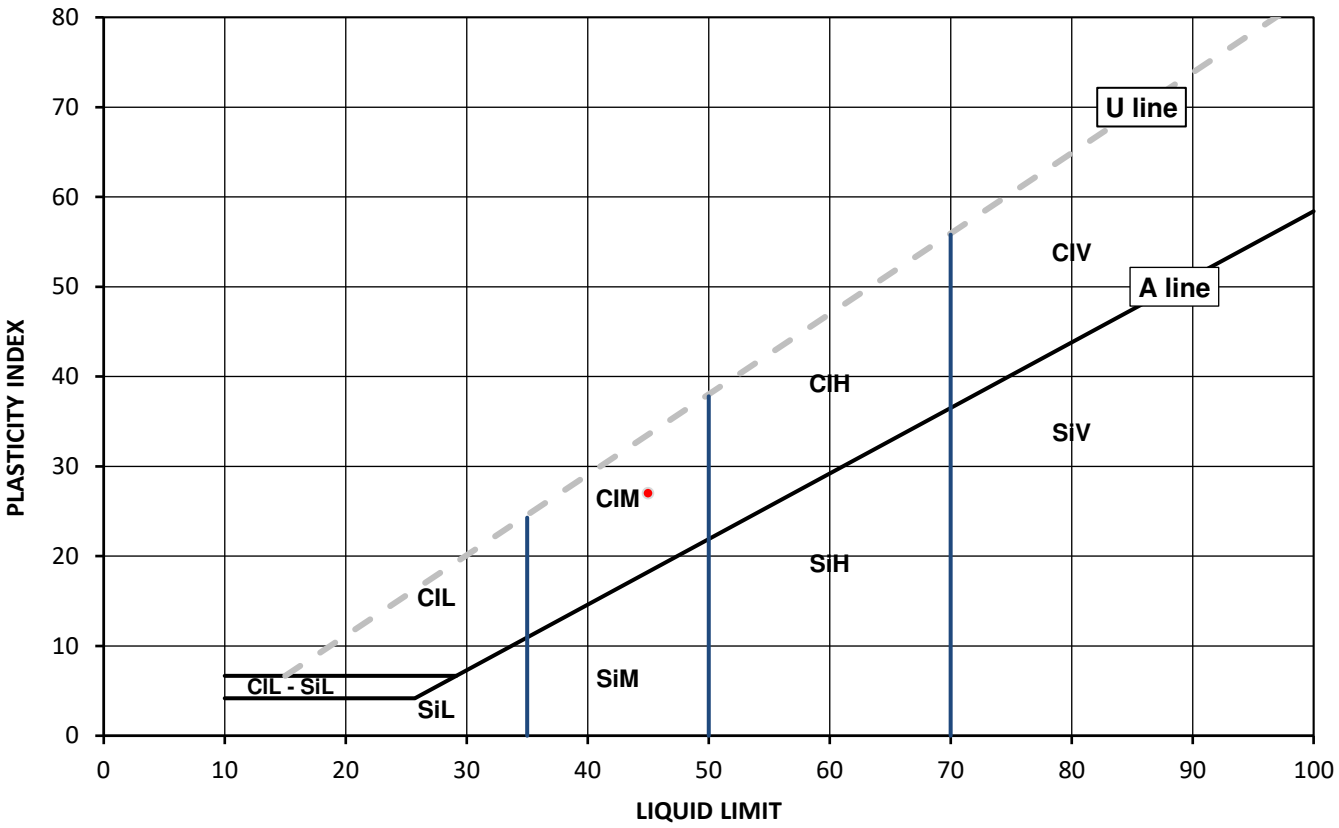
Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	05/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	28/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535851	Depth Top [m]:	1.80
Hole No.:	WS5 - D1	Depth Base [m]:	2.00
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown slightly sandy CLAY		
Sample Preparation:	Tested in natural condition		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19	45	18	27	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 236.12

SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

Water Content by BS 1377-2:1990: Clause 3.2; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

UKAS TESTING 4041

Environmental Science

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Blackwin St

Client Reference: 81427
Job Number: 22-13643
Date Sampled: 05/12 - 06/12/2022
Date Received: 15/12/2022
Date Tested: 28/12 - 29/12/2022
Sampled By: Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Water Content BS 1377-2 [W]	Water Content BS EN ISO 17892-2 [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
2535841	CP1 - B1	Not Given	2.00	2.45	B	Dark brown slightly gravelly sandy CLAY	Atterberg 4 Point	19		98	42	18	24						
2535842	CP1 - B2	Not Given	5.00	5.45	B	Greyish brown slightly gravelly sandy CLAY	Atterberg 4 Point	25		93	44	23	21						
2535843	CP1 - B3	Not Given	8.00	8.45	B	Orangish brown slightly gravelly sandy CLAY	Atterberg 4 Point	12		96	39	21	18						
2535847	WS1 - D1	Not Given	3.80	4.00	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	17		90	41	19	22						
2535848	WS2 - D1	Not Given	1.80	2.00	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	19		94	43	22	21						
2535849	WS3 - D1	Not Given	1.20	1.40	D	Brown slightly gravelly sandy CLAY	Atterberg 4 Point	19		94	42	22	20						
2535850	WS4 - D1	Not Given	2.50	2.70	D	Brown slightly gravelly very sandy CLAY	Atterberg 4 Point	13		92	33	17	16						
2535851	WS5 - D1	Not Given	1.80	2.00	D	Brown slightly sandy CLAY	Atterberg 4 Point	19		100	45	18	27						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Date Reported: 04/01/2023

GF 238.14

SUMMARY REPORT

DETERMINATION OF WATER CONTENT

Tested in Accordance with: BS 1377-2: 1990: Clause 3.2

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Curtins

Client Address: 17-19 Whitworth Street West, Manchester, M1 5WG

Contact: Russel Taylor

Site Address: Blackwin St

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Client Reference: 81427
Job Number: 22-13643
Date Sampled: 05/12 - 06/12/2022
Date Received: 15/12/2022
Date Tested: 28/12 - 29/12/2022
Sampled By: Not Given

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	WC	Sample preparation / Oven temperature at the time of testing			
		Reference	Depth Top m	Depth Base m	Type			%				
2535841	CP1 - B1	Not Given	2.00	2.45	B	Dark brown slightly gravelly sandy CLAY		19	Sample was quartered, oven dried at 106.5 °C			
2535842	CP1 - B2	Not Given	5.00	5.45	B	Greyish brown slightly gravelly sandy CLAY		25	Sample was quartered, oven dried at 106.9 °C			
2535843	CP1 - B3	Not Given	8.00	8.45	B	Orangish brown slightly gravelly sandy CLAY		12	Sample was quartered, oven dried at 106.9 °C			
2535847	WS1 - D1	Not Given	3.80	4.00	D	Brown slightly gravelly sandy CLAY		17	Sample was quartered, oven dried at 106.2 °C			
2535848	WS2 - D1	Not Given	1.80	2.00	D	Brown slightly gravelly sandy CLAY		19	Sample was quartered, oven dried at 106.2 °C			
2535849	WS3 - D1	Not Given	1.20	1.40	D	Brown slightly gravelly sandy CLAY		19	Sample was quartered, oven dried at 106.2 °C			
2535850	WS4 - D1	Not Given	2.50	2.70	D	Brown slightly gravelly very sandy CLAY		13	Sample was quartered, oven dried at 106.2 °C			
2535851	WS5 - D1	Not Given	1.80	2.00	D	Brown slightly sandy CLAY		19	Sample was quartered, oven dried at 106.2 °C			

Comments:

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Date Reported: 04/01/2023

GF 099.16

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

UKAS TESTING 4041

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Tested in Accordance with: BS 1377-7: 1990: Clause 8

Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	23/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

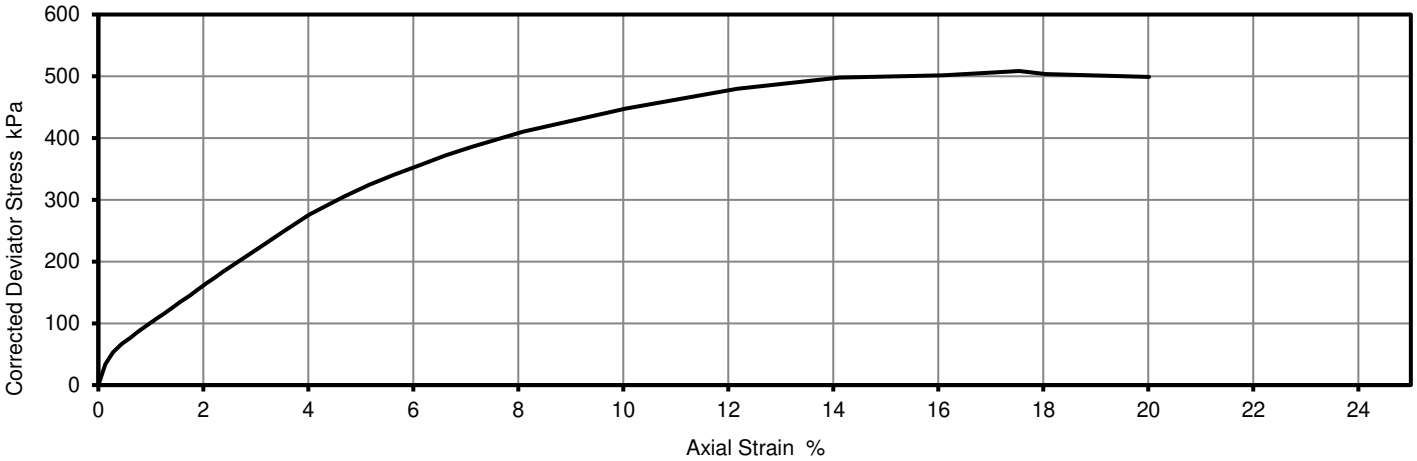
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

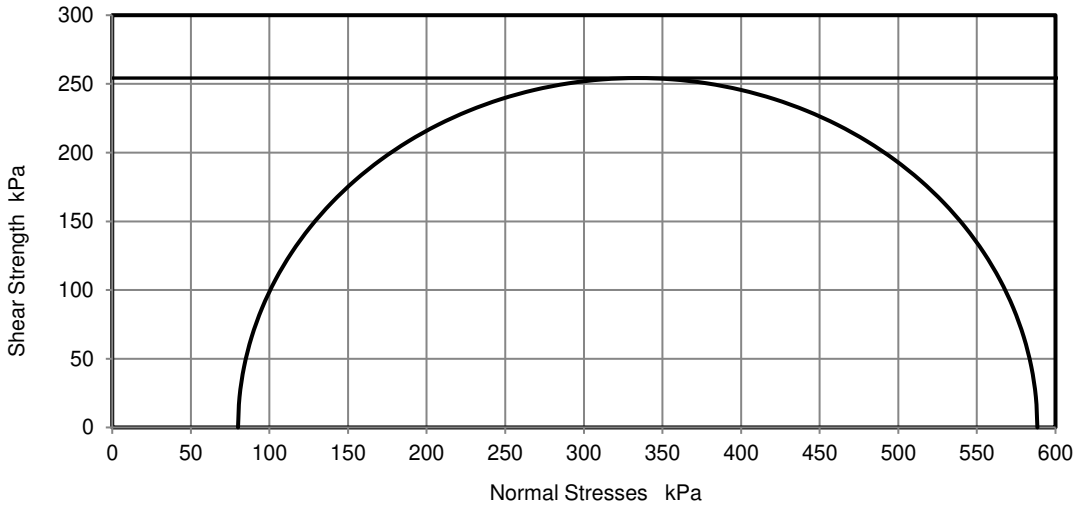
Laboratory Reference:	2535844	Depth Top [m]:	4.00
Hole No.:	CP1 - U100	Depth Base [m]:	4.45
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	1.98	%/min
Length	201.66	mm	Cell Pressure	80	kPa
Diameter	102.98	mm	Axial Strain at failure	17.5	%
Bulk Density	2.16	Mg/m3	Deviator Stress, (σ1 - σ3)f	508	kPa
Moisture Content	19	%	Undrained Shear Strength, cu	254	kPa ½(σ1 - σ3)f
Dry Density	1.82	Mg/m3	Mode of Failure	Compound	
Membrane Correction	0.90	kPa	Membrane thickness	0.27	mm

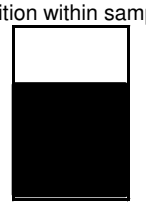
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 184.12

TEST CERTIFICATE

DETERMINATION OF THE UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION WITHOUT MEASUREMENT OF PORE PRESSURE

4041

Tested in Accordance with: BS 1377-7: 1990: Clause 8

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

Environmental Science

Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	23/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

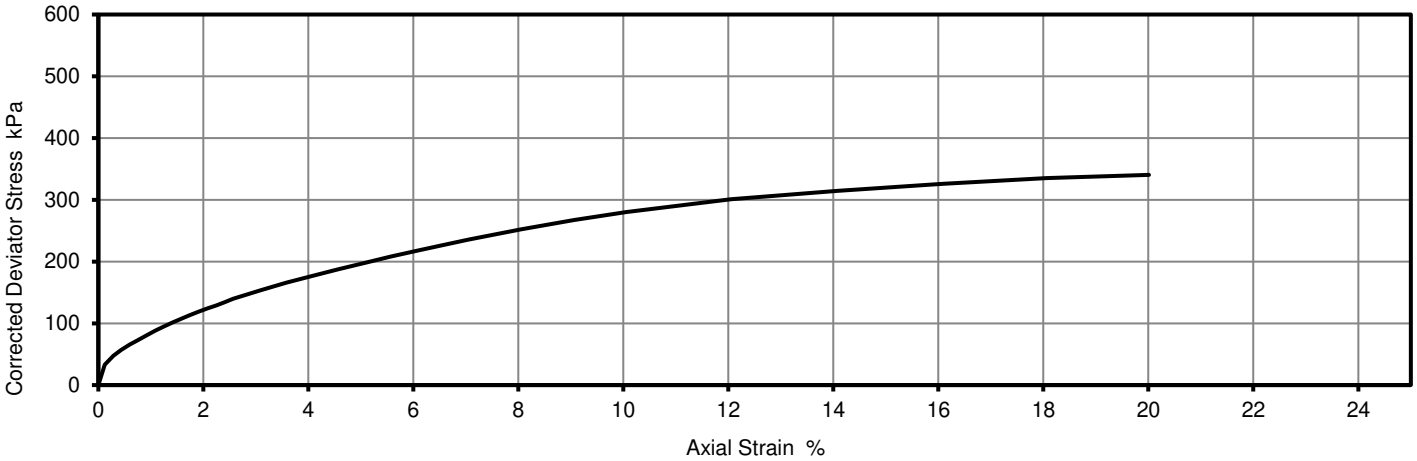
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

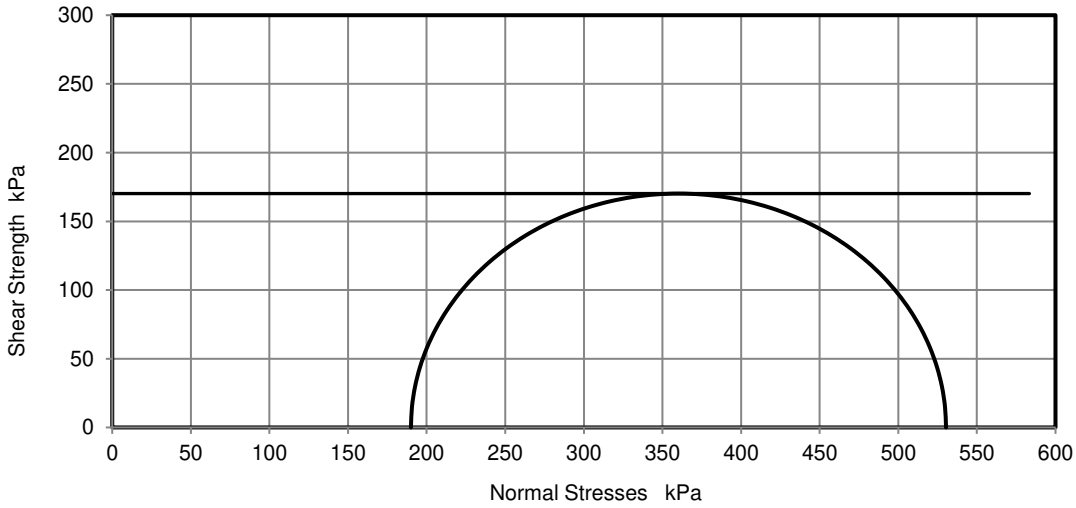
Laboratory Reference:	2535846	Depth Top [m]:	9.50
Hole No.:	CP1 - U100	Depth Base [m]:	9.95
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown slightly gravelly CLAY		
Sample Preparation:	Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.		

Test Number	1		Rate of Strain	2.00	%/min	
Length	199.38	mm	Cell Pressure	190	kPa	
Diameter	103.37	mm	Axial Strain at failure	20.0	%	
Bulk Density	2.17	Mg/m3	Deviator Stress, (σ1 - σ3)f	340	kPa	
Moisture Content	15	%	Undrained Shear Strength, cu	170	kPa	½(σ1 - σ3)f
Dry Density	1.88	Mg/m3	Mode of Failure	Compound		
Membrane Correction	1.04	kPa	Membrane thickness	0.28	mm	

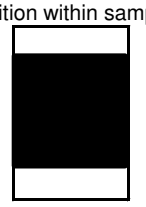
Deviator Stress v Axial Strain



Mohr Circles



Position within sample



Note: Deviator stress corrected for area change and membrane effects. Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 184.12

TEST CERTIFICATE

DETERMINATION OF THE ONE-DIMENSIONAL CONSOLIDATION PROPERTIES

Tested in Accordance with: BS 1377-5:1990: Clause 3

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

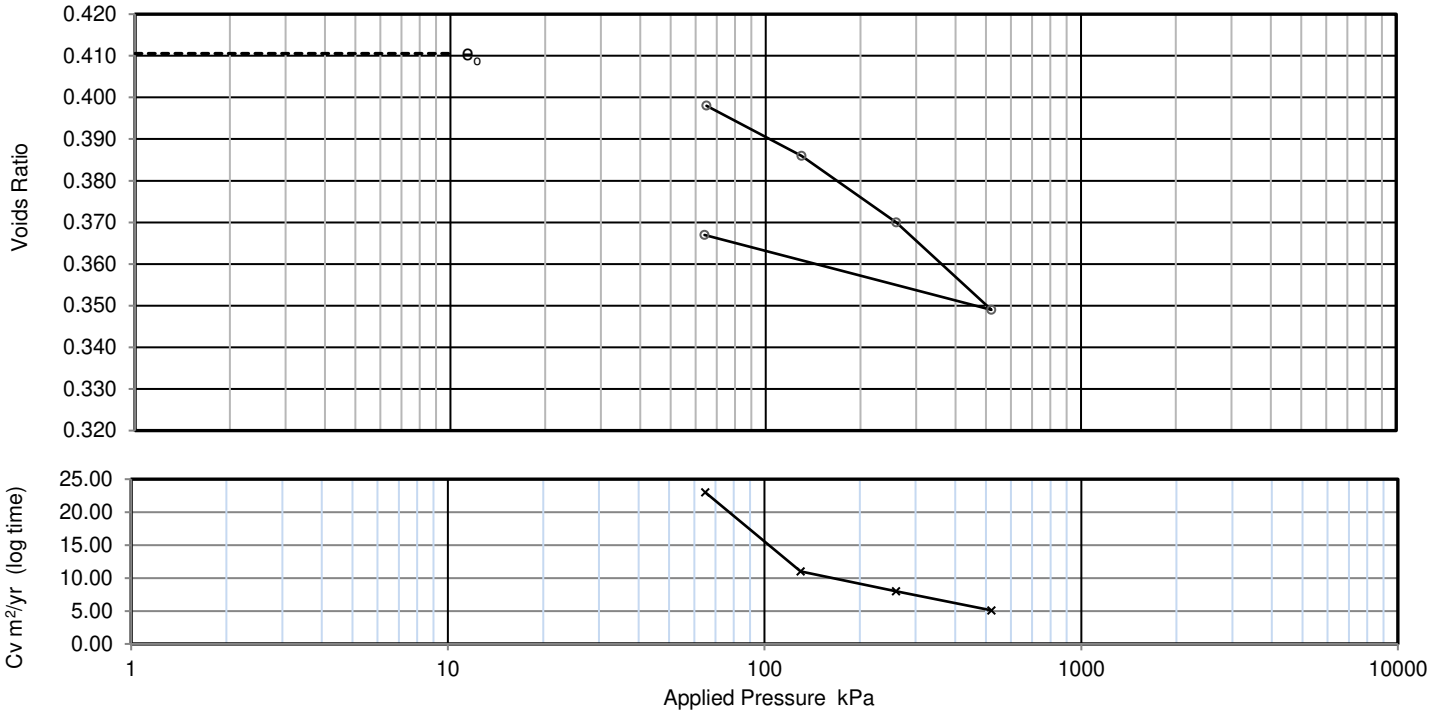
4041

Client:	Curtins	Client Reference:	81427
Client Address:	17-19 Whitworth Street West, Manchester, M1 5WG	Job Number:	22-13643
		Date Sampled:	06/12/2022
		Date Received:	15/12/2022
Contact:	Russel Taylor	Date Tested:	28/12/2022
Site Address:	Blackwin St	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	2535845	Depth Top [m]:	6.50
Hole No.:	CP1 - U100	Depth Base [m]:	9.65
Sample Reference:	Not Given	Sample Type:	U
Sample Description:	Brown gravelly slightly sandy CLAY		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t50, log) m2/yr	Cv (t90, root m2/yr	Csec
0	0.411	-	-	-	-
65	0.398	0.14	23	16	0.00036
130	0.386	0.13	11	11	0.00061
260	0.370	0.091	8	9.6	0.00064
520	0.349	0.06	5.1	8.2	0.00062
64	0.367	0.03			

Preparation

Carried out on top of U100

Index tests

Orientation of the sample	Vertical		
Particle density	assumed	2.65	Mg/m3
Liquid limit	N/A		%
Plastic limit	N/A		%

Specimen details	Initial	Final	
Diameter	50.20	-	mm
Height	20.00	19.39	mm
Moisture Content	16	16	%
Bulk density	2.19	2.26	Mg/m3
Dry density	1.88	1.94	Mg/m3
Voids Ratio	0.411	0.367	
Saturation	106	118	%
Avg. temperature for test	22.0		°C
Swelling Pressure	Not measured		kPa
Settlement on saturation			%
Total test time	5		days

Note: Cv corrected to 20°C

Remarks:

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Signed: Dudzińska Anna

Anna Dudzinska
PL Deputy Head of Reporting Team
for and on behalf of i2 Analytical Ltd

Date Reported: 04/01/2023

GF 172.16

Russel Taylor
Curtins
17-19 Whitworth Street West
Manchester
M1 5WG

e: russell.taylor@curtins.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 22-13644

Project / Site name:	Blackwin St	**Samples received on:**	15/12/2022
Your job number:	81427	**Samples instructed on/ Analysis started on:**	16/12/2022
Your order number:	2615	**Analysis completed by:**	02/01/2023
Report Issue Number:	1	**Report issued on:**	04/01/2023
Samples Analysed:	7 soil samples		

Signed: Izabela Wójcik

Izabela Wójcik
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-13644
Project / Site name: Blackwin St
Your Order No: 2615

Lab Sample Number				2535852	2535853	2535854	2535855	2535856
Sample Reference				CP1 - B2	CP1 - B3	WS1 - D1	WS2 - D1	WS3 - D1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				5.00-5.45	8.00-8.45	3.80-4.00	1.80-2.00	1.20-1.40
Date Sampled				06/12/2022	06/12/2022	06/12/2022	06/12/2022	06/12/2022
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	18	10	13	14	15
Total mass of sample received	kg	0.001	NONE	0.4	0.4	0.6	0.6	0.6

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	8.3	8.3	8.2	8.4
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.048	0.087	0.047	0.072	0.052
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	48.3	86.5	47.3	72.3	52.3

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 22-13644
Project / Site name: Blackwin St
Your Order No: 2615

Lab Sample Number				2535857	2535858
Sample Reference				WS4 - D1	WS5 - D1
Sample Number				None Supplied	None Supplied
Depth (m)				2.50-2.70	1.80-2.00
Date Sampled				06/12/2022	06/12/2022
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	11	14
Total mass of sample received	kg	0.001	NONE	0.6	0.6

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.4	8.3
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.039	0.07
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	38.7	69.9

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

This certificate should not be reproduced, except in full, without the express permission of the laboratory.
The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number : 22-13644
Project / Site name: Blackwin St

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2535852	CP1 - B2	None Supplied	5.00-5.45	Brown clay.
2535853	CP1 - B3	None Supplied	8.00-8.45	Brown clay.
2535854	WS1 - D1	None Supplied	3.80-4.00	Brown clay.
2535855	WS2 - D1	None Supplied	1.80-2.00	Brown clay.
2535856	WS3 - D1	None Supplied	1.20-1.40	Brown clay.
2535857	WS4 - D1	None Supplied	2.50-2.70	Brown clay.
2535858	WS5 - D1	None Supplied	1.80-2.00	Brown clay.

Analytical Report Number : 22-13644
Project / Site name: Blackwin St

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

For method numbers ending in 'UK or A' analysis have been carried out in our laboratory in the United Kingdom (WATFORD).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL or B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

Appendix E – Ground Gas Monitoring Results

- Gas Monitoring Visits 1 – 6

Copyright ©2023 Curtins Consulting Ltd

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Blackwin Street	**Date:**	09/01/2023
Job Number:	81427	**Visit:**	1
Client:	One Manchester	**Weather:**	Rain
Barometric State:	Steady	**Ground Conditions:**	Wet

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
CP1	987	####	0.0	0.0	0.0	1.8	1.8	8.3	0	0	5.20	10.03	**1**
WS1	988	0.0	0.0	0.0	0.0	1.1	0.9	10.0	0	27	Dry	5.00	4
WS2	-	-	-	-	-	-	-	-	-	-	-	-	-
WS3	987	86.5	0.0	0.0	0.0	0.0	0.0	18.9	0	10	0.74	4.82	2
WS4	987	-2.0	0.0	0.0	0.0	1.5	1.5	10.5	0	0	2.19	4.95	3
WS5	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes

1 Steady gas flow reached after 13:47 minutes
2 Steady gas flow reached after 12:32 minutes
3 Steady gas flow reached after 26 seconds
4 Flow rate of 0 was achieved instantly

Logged by

JP

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Blackwin Street	**Date:**	01/02/2023
Job Number:	81427	**Visit:**	2
Client:	One Manchester	**Weather:**	Overcast and rain
Barometric State:	Steady	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
CP1	1012	107.4	0.0	0.0	0.0	2.0	2.0	6.10	0	0	4.4	10.04	**1**
WS1	1012	1.0	0.0	0.0	0.0	1.1	1.1	4.90	0	0	4.84	5.00	2
WS2	1012	0.2	0.0	0.0	0.0	0.7	0.5	19.30	0	0	0.44	4.86	3
WS3	1012	19.4	0.0	0.0	0.0	0.1	0.0	14.50	0	10	0.55	4.61	4
WS4	1012	0.4	0.0	0.0	0.0	1.6	0.8	15.90	0	0	1.69	4.95	5
WS5	1012	-5.5	0.0	0.0	0.0	1.9	1.9	14.7	0	0	1.22	4.85	6

Notes

1 Flow rate of 0 was achieved after 7:14 minutes
2 Flow rate of 0 was achieved after 0:17 minutes
3 Flow rate of 0 was achieved after 0:02 minutes
4 Flow rate of 0 was achieved after 2:42 minutes
5 Flow rate of 0 was achieved instantly
6 Flow rate of 0 was achieved after 0:36 minutes

Logged by

JP

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Blackwin Street	**Date:**	17/02/2023
Job Number:	81427	**Visit:**	3
Client:	One Manchester	**Weather:**	Overcast
Barometric State:	Steady	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
CP1	1010	106.6	0.0	0.0	0.0	2.5	2.5	6.8	0	0	4.14	10.04	**1**
WS1	1010	0.0	0.0	0.0	0.0	1.0	0.9	6.3	0	10	4.39	5.00	
WS2	1010	-4.2	0.0	0.0	0.0	0.8	0.8	18.7	0	0	0.67	4.83	2
WS3	1010	-42.3	0.0	0.0	0.0	0.2	0.0	17.1	0	0	0.67	4.83	3
WS4	1010	0.0	0.0	0.0	0.0	1.4	1.2	16.0	0	0	1.48	4.95	
WS5	1011	14.0	0.0	0.0	0.0	2.0	2.0	15.6	0	0	1.22	4.85	4

Notes

1 Gas flow rate of 0 reached after 5:12 minutes
2 Gas flow rate of 0 reached instantly
3 Gas flow rate of 0 reached after 25 seconds
4 Gas flow rate of 0 reached after 10 seconds

Logged by

JP

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Blackwin Street	**Date:**	24.02.23
Job Number:	81427	**Visit:**	4
Client:	One Manchester	**Weather:**	Overcast
Barometric State:	Rising	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl
		Max	SS	Max	SS	Max	SS					
CP1	1005	48.0	5.0	0.0	0.0	2.7	2.6	7.1	0	0	3.82	10.13
WS1	1005	0.0	0.0	0.0	0.0	2.4	1.3	3.7	0	0	4.17	5.10
WS2	1005	0.0	0.0	0.0	0.0	1.2	0.7	19.0	0	0	0.66	4.87
WS3	1005	3.8	0.4	0.0	0.0	0.6	0.0	17.3	0	0	0.62	4.82
WS4	1005	0.0	0.0	0.0	0.0	1.8	0.7	18.5	0	0	1.41	4.96
WS5	1005	4.5	0.0	0.0	0.0	2.1	1.8	16.3	0	0	1.19	4.84

Notes

1 Gas flow rate reached 5 (steady state) after 30 seconds.
2 Gas flow rate reached 0.4 (steady state) after 10 seconds.
3 Gas flow rate reached 0 after 10 seconds.

Logged by

LW

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Blackwin Street	**Date:**	16.03.23
Job Number:	81427	**Visit:**	5
Client:	One Manchester	**Weather:**	Overcast
Barometric State:	Rising	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl
		Max	SS	Max	SS	Max	SS					
CP1	991	45.4	0.0	0.0	0.0	3.2	3.2	8.6	0	0	3.51	10.13
WS1	992	3.6	0.0	0.0	0.0	1.3	1.0	11.2	0	0	3.71	5.00
WS2	992	0.0	0.0	0.0	0.0	0.2	0.1	20.3	0	0	0.25	4.82
WS3	991	11.2	0.0	0.0	0.0	0.2	0.1	17.5	0	0	0.49	4.82
WS4	991	0.0	0.0	0.0	0.0	1.1	0.9	19.6	0	0	1.22	4.96
WS5	993	0.0	0.0	0.0	0.0	2.0	1.9	17.0	0	0	1.16	4.87

Notes

1 Gas flow rate reached 0 after 4:00 minutes.
2 Gas flow rate reached 0 after 1:00 minute.
3 Gas flow rate reached 0 after 1:00 minute.

Logged by

LW

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Curtins
Merchant Exchange, 17-19 Whitworth Street West, Manchester, M1 5WG
Tel: 0161 236 2394
Fax: 0161 228 7902

GAS MONITORING LOG SHEET

Project:	Blackwin Street	**Date:**	27/03/2023
Job Number:	0	**Visit:**	6
Client:	One Manchester	**Weather:**	Sunny
Barometric State:	Rising	**Ground Conditions:**	Damp

Borehole Reference	Barometric Pressure mb	Flow l/hr		Methane %		Carbon Dioxide %		Oxygen %	Hydrogen Sulphide ppm	Carbon Monoxide ppm	Water Level m bgl	Borehole Base m bgl	Note
		Max	SS	Max	SS	Max	SS						
CP1	1018	0.0	0.0	0.0	0.0	0.1	0.1	19.8	0	0	3.18	10.04	
WS1	1019	0.0	0.0	0.0	0.0	0.1	0.1	19.9	0	0	3.49	5.00	
WS2	1018	0.0	0.0	0.0	0.0	0.2	0.2	19.9	0	0	0.35	4.85	
WS3	1017	0.0	0.0	0.0	0.0	0.1	0.1	19.9	0	0	0.52	4.84	
WS4	1018	0.0	0.0	0.0	0.0	0.1	0.1	19.9	0	0	1.09	4.95	
WS5	1017	0.0	0.0	0.0	0.0	0.2	0.1	19.8	0	0	1.15	4.84	

Notes

Logged by

JP

1% gas volume = 10,000 ppm
Flow rate, methane and carbon dioxide reported as 'maximum' (max) and 'steady state' (SS) readings.
All other gases recorded at 'steady state' unless otherwise stated

Appendix F – GAC Screening Thresholds

Copyright ©2023 Curtins Consulting Ltd

Appendix G – Detailed UXO Report

Copyright ©2023 Curtins Consulting Ltd

Appendix H – Risk Assessment Methodology

The site-specific risk assessment, presented in this report, follows the principle of establishing whether there is a viable linkage between a contaminant source to a potential receptor, via an exposure pathway.

The risk assessment corresponds with the total site area and incorporates both descriptive (qualitative) and, where available, numerical (quantitative) lines of evidence.

Risk assessment is the process of collating known information on a hazard or set of hazards to estimate actual or potential risk to receptors. The receptor may be humans, a water resource, a sensitive local ecosystem or future construction materials. Receptors can be connected to the source by one or several exposure pathways such as direct contact for example. Risks are generally managed by isolating the receptor or intercepting the exposure pathway or by isolating or removing the hazard.

Without the three essential components of a source, pathway and receptor there can be no risk. Therefore, the presence of contaminant source on a site does not necessarily mean there is a risk.

The risk assessment considers the likelihood of an event taking place (accounting for the presence of the source and receptor and the viability of the exposure pathway) in conjunction with the severity of the potential consequence (accounting for the potential severity of the hazard and the sensitivity of the receptor).

In the risk assessment, the consequence of the hazard has been classified as severe or medium or mild or minor and the probability (likelihood) of the circumstances occurring classified as high likelihood or likely or low likelihood or unlikely.

The consequences and probabilities are subsequently cross-correlated to give a qualitative estimation of the risk using Department of the Environment risk classifications as detailed in the table below and as referenced in CIRIA C552.

		Consequence			
		Severe	**Medium**	**Mild**	**Minor**
Probability (Likelihood)	**High Likelihood**	Very High Risk	High Risk	Moderate Risk	Moderate/Low Risk
	Likely	High Risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate/Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate/Low Risk	Low Risk	Very Low Risk	Very Low Risk

Copyright ©2023 Curtins Consulting Ltd

In accordance with DoE guidance, the following categorisation of **consequence** has been developed.

Classification	Definition	Examples
Severe	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resource. Catastrophic damage to buildings/property. A short-term risk to an ecosystem or organisation forming part of such ecosystem.	High concentrations of cyanide on the surface of an informal recreation area. Major spillage of contaminants from site into controlled water. Explosion, causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
Medium	Chronic damage to Human Health. Pollution of sensitive water resources. A significant change in an ecosystem or organism forming part of such ecosystem.	Concentration of a contaminant from site exceeds the generic or site-specific assessment criteria. Leaching of contaminants from a site to a Principal or Secondary A aquifer. Death of a species within a designated nature reserve. Lesser toxic and asphyxiate effects
Mild	Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services. Damage to sensitive buildings/structures/services or the environment.	Pollution of non-classified groundwater (inc. Secondary B aquifers). Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	Harm, although not necessarily significant harm, which may result in a financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc). Easily repairable effects of damage to buildings, structures and services.	The presence of contaminants at such concentrations that protective equipment is required during site works. The loss of plants in a landscaping scheme. Discoloration of concrete.

Copyright ©2023 Curtins Consulting Ltd

In accordance with DoE guidance, the following categorisation of **probability** has been developed.

Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

In accordance with DoE guidance, the following categorisation of **risk** has been developed.

Classification	Definition
Very High Risk	There is a *high probability* that *severe harm* could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	*Harm* is *likely to arise* to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	*It is possible* that without appropriate further action *harm could arise* to a designated receptor. It is relatively *unlikely* that any such harm would be *severe,* and if any harm were to occur it is *more likely* that such harm would be *relatively mild.*
Low Risk	*It is possible* that *harm could arise* to a designated receptor from an identified hazard. It is *likely* that, at worst, if any harm was realised any effects would be *mild.*
Very Low Risk	The presence of an identified hazard does not give rise to the potential to cause harm to a designated receptor.

The term 'risk' in this instance refers to the risk that the source, pathway, receptor linkage for a given source of contamination is complete. It does not refer to immediate risk to individuals or features present on the site from potential contaminants and is intended to be used as a tool to assess the necessity of further investigation.

Copyright ©2023 Curtins Consulting Ltd

Our Locations

Birmingham
2 The Wharf
Bridge Street
Birmingham
B1 2JS
T. 0121 643 4694
birmingham@curtins.com

Bristol
Quayside
40-58 Hotwell Road
Bristol
BS8 4UQ
T. 0117 302 7560
bristol@curtins.com

Cambridge
50 Cambridge Place
Cambridge
CB2 1NS
T. 01223 631 799
cambridge@curtins.com

Cardiff
3 Cwrt-y-Parc
Earlswood Road
Cardiff
CF14 5GH
T. 029 2068 0900
cardiff@curtins.com

Douglas
Varley House
29-31 Duke Street
Douglas
Isle of Man
IM1 2AZ
T. 01624 624 585
douglas@curtins.com

Dublin
11 Pembroke Lane
Dublin 2
D02 CX82
Ireland
T. 00353 1 507 9447
dublin@curtins.com

Edinburgh
1a Belford Road
Edinburgh
EH4 3BL
T. 0131 225 2175
edinburgh@curtins.com

Glasgow
Queens House
29 St Vincent Place
Glasgow
G1 2DT
T. 0141 319 8777
glasgow@curtins.com

Kendal
Units 24-25 Riverside Place
K Village
Lound Road
Kendal
LA9 7FH
T. 01539 724 823
kendal@curtins.com

Leeds
Ground Floor
Rose Wharf
Ground Floor
Leeds
L29 8EE
T. 0113 274 8509
leeds@curtins.com

Liverpool
51-51 Tithebarn Street
Liverpool
L2 2SB
T. 0151 726 2000
liverpool@curtins.com

London
40 Compton Street
London
EC1V 0BD
T. 020 7324 2240
london@curtins.com

Manchester
Merchant Exchange
17-19 Whitworth Street West
Manchester
M1 5WG
T. 0161 236 2394
manchester@curtins.com

Nottingham
56 The Ropewalk
Nottingham
NG1 5DW
T. 0115 941 5551
nottingham@curtins.com

Rev P02 |Copyright ©2023 Curtins Consulting Ltd