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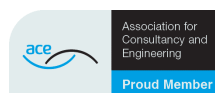
Remedial Strategy Report

For: John Southworth Builders Ltd



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1.0 INTRODUCTION

This *Remedial Strategy Report (4134-01)* has been prepared at the request of John Southworth Builders Ltd. Instructions to proceed with this report were received in February 2024. This report primarily follows the findings and recommendations of the Curtins Phase 2 Ground Investigation (Ref. 081862-CUR-XX-XX-RP-GE-00003, July 2023). Additionally, this report uses findings and recommendations from the following documents:

- **Curtins Phase 1 Preliminary Risk Assessment** (Ref. 077873-CUR-00-XX-RP-GE-031, April 2021);
- **Curtins Phase 2 Ground Investigation** (Ref. 081862-CUR-XX-XX-RP-GE-00003, July 2023);
- **Triangle Architects Proposed Site Plan FINAL (SK11, October 2021).**

This report pertains to a c. 0.147 Ha site located to the north-east of Blackwin Street, Manchester at the approximate post code M12 5LB. The National Ordnance Survey Grid Reference for the centre of the site is 387461E, 396809N. A site location plan is included in Appendix 2 (Drawing ref. *SI-01*).

The site currently comprises a vacant area of land with vegetation along the site boundaries. The site is accessed from Blackwin Street through a gate along the south-western site boundary. The site is bound by residential property to the north and east, Blackwin Street to the west and south-west and the Gorton Health Centre to the south. An aerial photo of the site is included below:



Figure 1: Aerial image of the site dated April 2023.

1.1 Scope

This Remedial Strategy Report has been undertaken to determine the remedial requirements of the site based upon the existing site investigation works, to assess the coal mine gas risk for the site. It is the Client's intention to develop the site into a low-rise residential development comprising 7 No. low rise dwellings with associated private gardens, soft landscaping and access roads.

The proposed development plan is contained in Appendix 2. An extract of the proposed development plan is shown below:



Figure 2: Extract of the proposed development plan (taken from Triangle Architects, Proposed Site Plan FINAL, SK11, dated October 2021).

1.2 Brief

This report has been undertaken following the findings and recommendations of the Curtins *Phase 2 Ground Investigation* (Ref. 081862-CUR-XX-XX-RP-GE-00003, July 2023). Based on the Curtins ground investigation findings, this report will outline the remedial strategy with regard to human health, controlled waters and ground gas risk on site.

The limitations of the report are contained in Appendix 1.

1.3 Summary of Previous Phase 2 Investigation Findings

Curtins have undertaken an intrusive investigation of the site in December 2022, comprising 6 No. trial pits to depths of between 2.39m and 2.80m bgl (57.07m and 57.91m AOD), 5 No. dynamic sample boreholes to a depth of 5.45m bgl (57.28m and 57.84m AOD) and 1 No. cable percussive borehole to a depth of 9.95m bgl (57.94m AOD). 19 No. samples from across site have been submitted for environmental analysis. Elevated concentrations of mercury have been recorded, with 4 No. samples exceeding the human health GAC of 1.0mg/kg. The below table summarises the findings of the chemical analysis of the samples.

Determinand	GAC threshold (mg/kg)	Concentration (mg/kg)			
		TP1 (0.20-0.30m)	TP2 (0.20-0.30m)	TP5 (0.30-0.40m)	WS3 (0.20-0.30m)
Mercury	1	1.34	1.21	2.01	1.32

Elevated concentrations of TPH compounds were recorded across site, however no GAC exceedances were recorded in any samples submitted for environmental laboratory analysis.

Asbestos was recorded within 4 No. samples out of 19 No. submitted for environmental analysis (TP01 at 0.40m bgl and TP03 at 0.20m bgl). It was encountered in the form of chrysotile fibre bundles and Asbestos Insulating Board (AIB). The below table summarises the findings of the chemical analysis of the samples. An Asbestos Management assessment using the CL:AIRE JIWG Decision Support Tool has been undertaken as part of the remedial recommendations and is detailed in Section 2.1.

Location	Depth (m bg)	Stratum	Asbestos Type	Quantification (%w/w)
WS2	0.20 – 0.30	Made Ground	Amosite Loose Fibres	0.002
TP1	0.20 – 0.30		Chrysotile Bitumen Products	0.002
TP2	0.20 – 0.30		Amosite Loose Fibres	0.047
TP5	0.30 – 0.40		Amosite Loose Fibres	0.001

As a result of the Curtins works, remedial measures are required for the proposed soft landscaped areas to negate exposure pathway risks with existing site materials.

The risk of volatile / VOCs is regarded as negligible due to the lack of evidence for the potential sources of VOCs on site, consequently contaminative pathways for vapours are not considered.

2.0 REMEDIAL STRATEGY FOR HUMAN HEALTH

The proposed development is to include private gardens and areas of soft landscaping. The Curtins Phase 2 Ground Investigation report recommended a cover system in these areas to break any pathways between the existing site soils and the end user.

2.1 Asbestos Management – JIWG Decision Support Tool

Asbestos in the form of chrysotile fibre bundles (concentrations between 0.001% and 0.047% wt/wt) was encountered within 4 No. samples of fine grained Made Ground. ACM comprising chrysotile bitumen product was also encountered within TP1 at concentrations of 0.002% wt/wt. Consequently, the Made Ground on-site is considered unsuitable for re-use within 600mm bgl of the proposed rear gardens and 450mm of the proposed soft landscaping.

Based on the findings of the chemical laboratory the chemical laboratory test results, a risk assessment has been using the *JIWG Decision Support Tool for the Categorisation of Work Activities Involving Asbestos in Soil or Construction & Demolition Materials in accordance with CAR 2012* (FINAL Version 2.1, March 2017).

The risk assessment has been undertaken based on the identified 0.047% amosite loose fibres recorded in TP2. The risk assessment has been included below:

Stage 1		Score
Hazard Factors		
Select ACM type (run model for each type to generate 'Worst Case' output)	Loose fibrous asbestos debris	3
Extent of degradation of ACMs at outset of work	Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Fraility and degree of bonding by matrix (ACM matrix, not ground materials)	Frail ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
Distribution of Visible Asbestos Across Affected Area	No visible ACMs/fibre bundles	0
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Very Low quantities <0.001 to 0.01 %wt/wt	1
Sub-total		12
Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs		
Hazard ranking		Medium

Stage 2		Score
Exposure Factors		
Anticipated airborne fibre concentration - Control Limit or SAL?	<0.01 fibres/ml	1
Anticipated duration of exposure to asbestos	> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Activity type and effect on deterioration of ACMs during work	Not low intensity, significant deterioration expected	4
Best description of primary host material matrix (soil/made ground)	Coarse to Fine Sand	2
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Medium	3
Sub-total		14
Exposure ranking		Medium
Combined hazard and exposure ranking		26 Medium

Stage 3	
Risk Assessment Outputs	
Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities
*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.	
**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)	
***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis	

A copy of this JIWG asbestos risk assessment is contained in Appendix 3.

The above JIWG risk assessment concludes that re-use of the Made Ground would be non-notifiable, non-licensed work, but would require the use of EN149 type FFP3 disposable face masks and manual / localised dust suppression and localised and basic personal decontamination facilities.

Therefore, if these protection measures are followed, then the Made Ground can be reused outside of the proposed gardens and soft landscaping, i.e., beneath cover systems or hardstanding.

A post-demolition asbestos assessment is recommended as part of the remedial strategy

2.2 Installation of a Clean Cover System

The following Landscaping Plan details the proposed private rear gardens (red) and POS soft landscaping (Public Open Space / POS_{resi} – yellow).

The below remedial recommendations will refer to the landscaping designations detailed in the below extract.



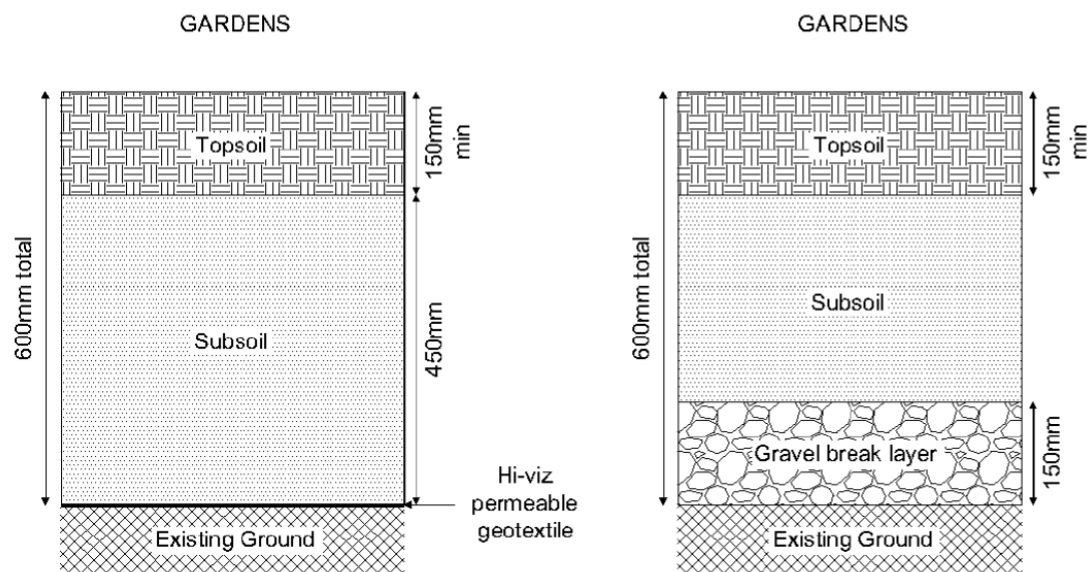
Figure 3: Extract of the landscape plan of the site (SI-02 Landscaping Plan, Feb 2024).

Red = private rear gardens. Yellow = soft landscaping / public open space.

Made Ground containing asbestos is present below finalised garden levels at depths shallower than 600mm (450mm in areas of soft landscaping) across the site. The following procedure is outlined for use in all private gardens and in areas of soft landscaping:

1. Excavate to 600mm bgl in private gardens (450mm in soft landscaping areas).
2. A 600mm clean cover system is recommended to be added to the proposed private gardens (450mm in soft landscaping areas). This is to consist of:
 - No less than 150mm and no more than 300mm suitable topsoil, underlain by;
 - Suitable subsoil to a total (topsoil + subsoil) depth of 600mm (450mm in areas of soft landscaping), underlain by;
 - A high vis geotextile marker;
 - Validate in line with the below strategy.

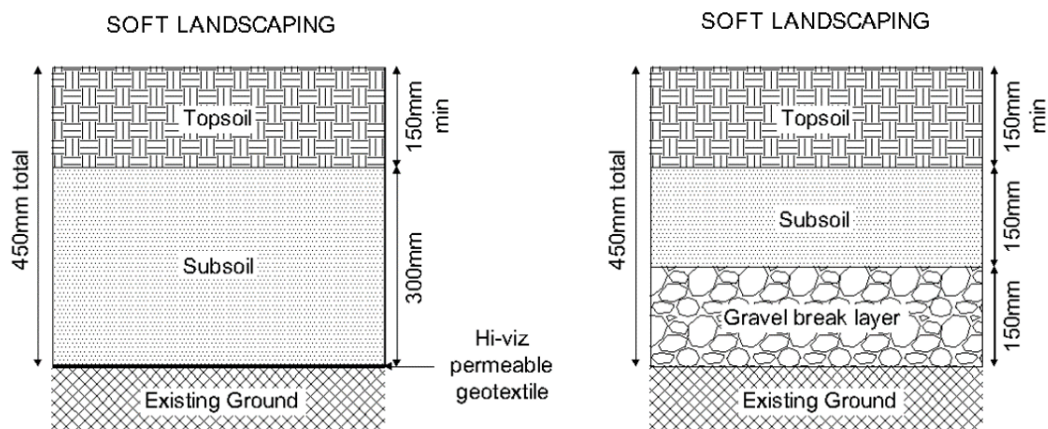
This is shown diagrammatically below:



The cover system for the soft landscaping is to be 450mm thick, due to the presence of asbestos on site, and consist of:

- A minimum of 150mm suitable topsoil, underlain by;
- Suitable subsoil, to a total thickness of 450mm.

This is shown diagrammatically below:



Soils for use in the above recommended cover system must be validated as detailed below to ensure their suitability for use.

2.3 Validation of Clean Cover System

Once the 600mm clean cover system is installed to break contaminative linkages (450mm in areas of soft landscaping), validation requirements include:

- Details of the source of the cover material;
- Chemical test results to demonstrate that the soil is free from contamination and 'suitable for use' in-line with the below chemical testing suites and rates.
- Waste transfer notes to provide evidence of source;
- Confirmation of cover depth by either measurement tape or topographical survey with photographs at a frequency of one pit per three plots.

No topsoil or subsoil is present on-site therefore all topsoil and subsoil will need to be imported and this must be validated as detailed below to ensure its suitability for use (i.e., no glass or plastic is to be included and meets chemical testing acceptability criteria).

Imported topsoil and subsoil is required to be tested at source prior to import to confirm suitability. All topsoil and subsoil, whether site-won or imported is required to be tested at the following frequency:

Source	Material End Use	Sampling Frequency ¹	Testing Suites ³ (see below)
Greenfield Source:	Topsoil	1 per 200m ³	A, B, C, D, F
	Subsoil	1 per 200m ³	A, B, C, D, F
Brownfield Source:	Topsoil	1 per 50m ³	A, B, C, D, F, H
	Subsoil	1 per 100m ³	A, B, C, D, F
	General Fill ²	1 per 1000m ³	A, B, C, E, G

1) Minimum 3 samples regardless of volume.

2) 'General Fill' is material used primarily to raise levels, specifically not within areas of private gardens, public open space, or soft landscaping, e.g. 6F2.

3) In addition to the standard suites given, the laboratory testing suite should include any additional contaminants of concern based on the source of the samples.

Testing Suites:

- A. Asbestos ID, Asbestos quantification.
- B. pH, total and free cyanide, soluble sulfate, organic matter.
- C. Arsenic, Beryllium, Boron, Cadmium, Chromium (III and VI) Copper, Lead, Inorganic Mercury, Nickel, Selenium, Vanadium, Zinc.

- D. Speciated PAHs: Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(ghi)perylene.
- E. Total (non-speciated) PAHs.
- F. Speciated Total Petroleum Hydrocarbons (TPH): Aliphatic >EC5 - EC6, >EC6 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, and > EC35 - EC44, and Aromatic >EC5 - EC7, >EC7 - EC8, >EC8 - EC10, >EC10 - EC12, >EC12 - EC16, >EC16 - EC21, >EC21 - EC35, > EC35 - EC44.
- G. Total Petroleum Hydrocarbons (TPH): TPH EC6 – EC40.
- H. BTEX: Benzene, Toluene, Ethylbenzene, p- & m-xylene, o-xylene. Methyl tertiary butyl ether (MTBE).

Once tested, the results are to be compared against the following Acceptability Criteria:

Suite	Determinand (mg/kg unless stated)	Acceptability Criteria for:			
		Private Gardens	Public Open Space (residential)	Soft Landscaping or Public Open Space (Park)	General Fill
A	Asbestos (%)	ND	ND	ND	<0.001 – 0.01%
B	pH	>6 - <8 ⁽³⁾	>6 - <8 ⁽³⁾	>6 - <8 ⁽³⁾	>5 - <10 ⁽³⁾
	Total Cyanide	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾
	Free Cyanide	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾	0.5 ⁽³⁾
	Soluble Sulfate (mg/l)	500 ⁽³⁾	500 ⁽³⁾	500 ⁽³⁾	500 ⁽³⁾
C	Arsenic	37	79	170	640
	Beryllium	1.7	2.2	63	12
	Boron	290	21000	46000	240000
	Cadmium	11	120	560	190
	Chromium (III)	910	1500	33000	8600
	Chromium (VI)	6	7.7	220	33
	Copper	2400	12000	44000	68000
	Lead	200 ⁽¹⁾	630 ⁽¹⁾	1300	2330 ⁽¹⁾
	Inorganic Mercury	40	120	240	1100
	Nickel	130	230	800	980
	Selenium	250	1100	1800	12000
	Vanadium	410	2000	5000	9000
	Zinc	3700	81000	170000	730000
D	Naphthalene	2.3	4900	1200	
	Acenaphthylene	170	15000	29000	
	Acenaphthene	210	15000	29000	
	Fluorene	170	9900	20000	
	Phenanthrene	95	3100	6200	
	Anthracene	2400	74000	150000	
	Fluoranthene	280	3100	6300	
	Pyrene	620	7400	15000	
	Benzo(a)anthracene	7.2	29	49	
	Chrysene	15	57	93	
	Benzo(b)fluoranthene	2.6	7.1	13	
	Benzo(k)fluoranthene	77	190	370	
	Benzo(a)pyrene	2.2	5.7	11	
	Indeno(1,2,3-cd)pyrene	27	82	150	
	Dibenz(a,h)anthracene	0.24	0.57	1.1	
	Benzo(ghi)perylene	320	640	1400	
E	Total PAHs				1000 ⁽⁴⁾
F	TPH-CWG - Aliphatic >EC5 - EC6	42	570000	95000	
	TPH-CWG - Aliphatic >EC6 - EC8	100	600000	150000	
	TPH-CWG - Aliphatic >EC8 - EC10	27	13000	14000	
	TPH-CWG - Aliphatic >EC10 - EC12	130	13000	21000	
	TPH-CWG - Aliphatic >EC12 - EC16	1100	13000	25000	
	TPH-CWG - Aliphatic >EC16 - EC21	65000	250000	450000	
	TPH-CWG - Aliphatic >EC21 - EC35				
	TPH-CWG - Aliphatic > EC35 - EC44	65000	250000	450000	
	TPH-CWG - Aromatic >EC5 - EC7	70	56000	76000	

	TPH-CWG - Aromatic >EC7 - EC8	130	56000	87000	
	TPH-CWG - Aromatic >EC8 - EC10	34	5000	7200	
	TPH-CWG - Aromatic >EC10 - EC12	74	5000	9200	
	TPH-CWG - Aromatic >EC12 - EC16	140	5100	10000	
	TPH-CWG - Aromatic >EC16 - EC21	260	3800	7600	
	TPH-CWG - Aromatic >EC21 - EC35	1100	3800	7800	
	TPH-CWG - Aromatic > EC35 - EC44	1100	3800	7800	
G	TPH > EC6 - EC40				5000 ⁽⁴⁾
H	Benzene	0.087	72	90	
	Toluene	130	56000	87000*	
	Ethylbenzene	47	24000	17000*	
	p & m-xylene	56	41000	17000*&***	
	o-xylene	60	41000	17000*	
	MTBE (Methyl Tertiary Butyl Ether)	LOD ⁽³⁾	LOD ⁽³⁾	LOD ⁽³⁾	

LQM/CIEH S4ULs for Human Health Risk Assessment (3rd edition, 2015) used unless stated:

- 1) Category 4 Screening Levels (March 2014)
- 2) CL:AIRE Soil GAC for Human Health Assessment (January 2010)
- 3) In-house screening criteria used as no GAC methodology currently exists
- 4) Hazardous waste thresholds. This limit only applies to imported material, not to in-situ soil.

Assumed 1% SOM (most conservative) for those values dependent upon SOM.

ND = Not Detected

LOD = Limit of Detection

*Exceeds vapour saturation limit

**Exceeds solubility saturation limit

The above acceptability criteria for PAHs for imported topsoil and subsoil are based on the published LQM/CIEH S4ULs (2015) for each individual PAH and not based on the Category 4 Screening Level using benzo(a)pyrene as a surrogate marker. This is as the source of the imported material is unknown therefore using the surrogate marker approach may not be suitable as the distribution of PAHs in the imported material may not be similar to those in the Culp et al. (1998)¹ study. Once chemical testing had been undertaken on imported soil and the distribution of PAHs compared to the distribution in the Culp et al. (1998) study, it may be suitable to use the surrogate marker approach / C4SL.

¹ Culp et al. (1998), *A comparison of the tumors induced by coal tar and benzo[a]pyrene in a 2-year bioassay*, **Carcinogenesis**, vol.19, no.1, pp.117–124.

3.0 REMEDIAL STRATEGY FOR GROUND GAS PROTECTION

3.1 Ground Gas Risk Assessment

Previous Ground Gas and Groundwater Monitoring

As part of the Phase 1 and Phase 2 recommendations, Curtins have undertaken ground gas monitoring between 9th January and 27th March 2023. 6 No. boreholes have been installed with a combined ground gas and groundwater monitoring well. The response zones of the installed wells are detailed below.

Location	Depth (m bgl)	Depth (m AOD)	Stratum
WS1	1.00 – 5.00	(56.74 – 52.74)	Glacial Till
WS2	1.00 – 5.00	(56.28 – 52.28)	
WS3	1.00 – 5.00	(56.52 – 52.52)	
WS4	1.00 – 5.00	(56.81 – 52.81)	
WS5	1.00 – 5.00	(56.84 – 52.84)	
CP1	5.00 – 9.95	(52.94 – 47.99)	

The results of a programme of 6 No. ground gas and groundwater monitoring visits undertaken by Curtins over 3 No. months are detailed in the below tables.

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

Concentrations of hydrogen sulfide (H₂S) below instrument detection limit. Carbon monoxide concentrations were recorded between <0.1 and 27ppm during the monitoring visits. The flooded wells are indicated in blue.

Steady state flow of 5l/hr was recorded during the fourth visit undertaken during rising atmospheric pressure conditions.

Location	Response Zone (m bgl, m AOD)	Depth (m bgl, m AOD)	Remarks
WS1	1.00 – 5.00 (56.74 – 52.74)	3.49 – 4.84 (52.90 – 54.25)	Well dry during first visit.
WS2	1.00 – 5.00 (56.28 – 52.28)	0.25 – 0.67 (56.61 – 57.03)	Response zone flooded during all visits.
WS3	1.00 – 5.00 (56.52 – 52.52)	0.48 – 0.74 (56.79 – 57.04)	Response zone flooded during all visits.
WS4	1.00 – 5.00 (56.81 – 52.81)	1.09 – 2.19 (55.62 – 56.72)	-
WS5	1.00 – 5.00 (56.84 – 52.84)	1.15 – 1.22 (56.62 – 56.69)	-
CP1	5.00 – 9.95 (52.94 – 47.99)	3.18 – 5.20 (54.76 – 52.74)	-

The results of the 6 No. ground gas monitoring visits undertaken by Curtins have been assessed in accordance with BS 8485 (2015) + A1 (2019). The characteristic Gas Screening Value (GSV) is calculated by dividing the maximum methane or carbon dioxide concentration by 100 and multiplying by the maximum steady flow rate recorded at the same monitoring point (the instrument detection limit of 0.1 l/hr is utilised when below detection limit flow rates are recorded). If required, the worst case GSV can be calculated by dividing the maximum carbon dioxide and methane concentration by 100 and multiplying by the maximum steady flow rate on-site.

Ground gas monitoring has recorded a maximum peak carbon dioxide concentration of 3.2% v/v and a maximum methane concentration of 0.1% v/v across the site.

It is important to note that the steady flow of 5l/hr was recorded during fourth visit only within the well installed in CP1. This flow rate was measured over a period of 30 seconds, which may not have been sufficient for the flow to reach a steady state, as flow in this borehole was measured over timescales between 5:12 and 13:47 minutes, following which it was noted to reduce to 0.0l/hr during all other visits. Consequently, the 5l/hr 'steady' state value is not included in the GSV calculations. No steady flow rates above detection limits were recorded in any other boreholes across site.

As no steady flow rates were recorded on-site, the GSV and the worst case GSV for carbon dioxide at the site can be calculated as $(3.2/100)*0.1 = 0.0032\text{l/hr}$.

The GSV and the worst case GSV for methane can be calculated as $(0.1/100)*0.1 = 0.0001\text{l/hr}$.

As a result of the Curtins ground gas monitoring results and the Conceptual Site Model (CSM), the site was deemed consistent with the **NHBC Green Traffic Light** with respect to ground gas risk by Curtins. Consequently, no ground gas measures are required for the proposed development. The Conceptual Site Model diagram is contained within Appendix 2. Full ground gas and groundwater monitoring results are contained within the Curtins Phase 2 Report included within Appendix 5.

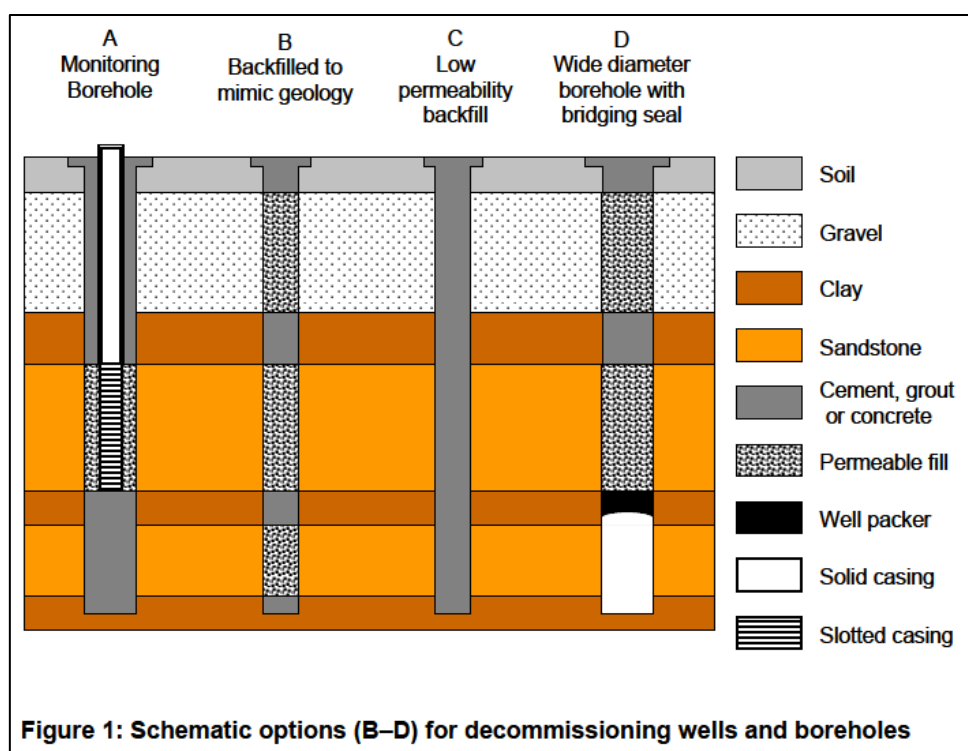
Radon

According to the findings of the Curtins Phase 1 and Phase 2 Reports, the site is located within an area where between 1% - 3% of homes are above the action level. Consequently, no protection measures with respect to radon were deemed necessary.

4.0 OTHER REMEDIAL REQUIREMENTS

4.1 Decommissioning of Boreholes

It is imperative that all boreholes drilled into the site are located and appropriately grouted to negate any possible preferential ground gas pathways. Utilising guidance provided in the Environment Agency's '*Good practice for decommissioning redundant boreholes and wells*' (October 2012), it is prudent to secure redundant borehole to ensure that no groundwater pollution can occur. The Environment Agency (EA) offer advice on the methods of sealing wells to ensure that the preferential pathway is removed. The following diagram taken from the EA guidance shows a monitoring well (A) and 3 No. options for decommissioning (B, C and D):



It is considered prudent to utilise Option C – low permeability backfill, shown in the diagram above, to adequately seal the borehole. The guidance recommends that ‘the backfill materials must be clean, inert and non-polluting’, e.g. bentonite. It is recommended to remove the standpipe and seal with bentonite to ground level. This will be sufficient to prevent contaminant transport.

4.2 Definition of Waste: Code of Practice

Due to the recommended handling and re-use of excavated site-won materials, it is possible to avoid complex waste legislation by utilising the Definition of Waste: Code of Practice (2011, DoW:CoP). This allows assessment of whether or not excavated materials are waste, and when excavated and treated waste can be classified as 'no longer waste'.

It is recommended that in line with DoW:CoP, a robust, site-specific material management plan (MMP) may need to be emplaced and adhered to and verified in an appropriate verification report. This must be reviewed by a 'Qualified Person' who must provide a Declaration to the EA prior to works within the MMP being commenced.

4.3 Material Management

4.3.1 Export of Materials

Any soils to be removed from site must be classified in accordance with WM3 under the definition of waste and chemically tested to determine their destination, i.e. reuse or landfill. Waste ticket records must also be retained as proof of the export of materials from site.

4.3.2 Stockpile Management

During the course of the development there will be areas of stockpiled soils intended for use within the soft landscaping area. These will have been subjected to off-site testing and approved for use on site.

It is imperative that the stockpiles are well managed to avoid inadvertent mixing or depositing of surplus or deleterious materials that would compromise the continued use. We would recommend that the site management reviews the proposed positions for placement of stockpiles and places either fencing or warning signs to ensure compliance.

4.4 Discovery Strategy

In the event of unexpected contamination being discovered, the Discovery Strategy must be followed – this is contained in Appendix 4.

4.5 Design Variation

Following any variation in a finalised proposed development layout and / or detailed design including earthworks design it is recommended that the above conclusions are re-appraised to determine their suitability.

4.6 United Utilities Risk Assessment

A United Utilities Risk Assessment (UURA) has been undertaken for the site, based on the chemical laboratory testing results contained within the Curtins Phase 2 Report included within Appendix 5. The UURA is contained in Appendix 6 and recommends PE (non-barrier) pipework.

APPENDIX 1

LIMITATIONS OF INVESTIGATION WORK AND REPORT

LIMITATIONS OF REPORT

This consultancy report was compiled and carried out by IGE Consulting Limited ('IGE') for the client, as defined in the main report (the 'client'), on the basis of a defined programme and scope of works and the terms of a contract between IGE and the client. IGE undertook this with all reasonable skill and care, taking into account the limits of the scope of works required by the client, the prevailing site conditions, the time scale involved and the resources, including financial and manpower resources, agreed between IGE and the client. IGE cannot accept responsibility to any parties whatsoever, following the issue of this report, for any matters arising which may be considered outwith the agreed scope of works.

Unless otherwise agreed this report has been prepared exclusively for the use and reliance of the client in accordance with generally accepted consulting practices. This report may not be relied upon, or transferred to, by any other party without the written agreement of its author. If a third party relies on this report, it does so wholly at its own and sole risk and IGE disclaims any liability to such parties.

It is IGE's understanding that this report is to be used for the purpose described in the 'Brief' section of this report. That purpose was a significant factor in determining the scope and the services to be provided. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of, or reliance upon the report in those circumstances by the client without IGE's review and advice shall be at the client's sole and own risk.

The information contained in this report is protected by disclosure under Part 3 of the Environmental Information Regulations 2004 pursuant to the provisions of Regulation 12(5) without the consent in writing of a Director of IGE.

This report is a function of the date it was written and should be read in light of any subsequent changes in legislation, statutory requirements and industry practices. Ground conditions can also change over time and further investigations or assessment should be made if there is any significant delay in acting on the findings of this report. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of IGE. In the absence of such written advice of IGE, reliance on the report in the future shall be at the client's own and sole risk. Should IGE be requested to review the report in the future, IGE shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between IGE and the client.

The observations and conclusions described in this report are based solely upon the scope of works agreed between the client and IGE. IGE has not performed any observations, investigations, studies or testing not specifically set out or mentioned within this report. IGE is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the agreed scope of works. For the avoidance of doubt, this report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species (e.g. Japanese Knotweed). It is recommended that the client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the suspected presence asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace full and proper surveys.

Throughout the report the term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A2 2017.

LIMITATIONS OF INVESTIGATION WORK

Desk Study References

This report is based upon IGE's observations of existing physical conditions at the site gained from a walkover survey of the site together with IGE's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. Reliance has been placed on this publicly available data obtained from the sources identified in the main report. When using the information, it has been assumed that it is correct. The findings and recommendations contained in this report are based in part upon information provided by third parties, and whilst IGE have no reason to doubt the accuracy and that it has been provided in full from those it was requested from, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report. IGE did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services. IGE is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to IGE and including the doing of any independent investigation of the information provided to IGE except when otherwise provided in the terms of the contract between the client and IGE.

Historical Mapping

Historical Ordnance Survey maps do not provide a comprehensive description of a site history. They provide details of the site from a date prior to the publication of the map (i.e. a snapshot in time). The period between map editions can be substantial (i.e. several decades). Not all map series are available for every date range in many areas of the UK and therefore there will be gaps in this mapped record for some sites. Potentially contaminative land uses could have been present and removed during such periods and may therefore not form a part of this particular record. In addition, there will be potentially contaminative land uses which are not identified on the map records such as small scale storage / use of hazardous materials, illegal / unlicensed waste disposal activities etc. Different map series identify different features utilising different symbols which can result in features that remain on-site being removed from maps. Some features are also not mapped for security reasons (e.g. airfields and other military installations). These areas are mostly shown as blank areas on historical maps.

Site Walkover

During the site walkover reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

Flooding

Flooding in this report is defined as flooding caused by the sea, ditches, rivers, streams, ponds, lakes, reservoirs and the like. It does not extend to flooding caused by surcharged piped drainage systems and investigations into flooding of this nature are excluded from this report.

Extent of Contamination Studies

Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

The conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the reporting in full. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Intrusive Investigation

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Ground conditions can also be variable and as investigation excavations only allow examination of the ground at discrete locations, the potential exists for ground conditions to be encountered which are different to those considered in this report. The explored extent of the site area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters, based on an understanding of the available operational and historical information, and it should not be inferred that other chemical species are not present.

The groundwater conditions entered on the exploratory hole records are those observed at the time of investigation. The normal speed of investigation usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions and higher groundwater levels may occur at other times of the year than were recorded during this investigation.

Exploratory Holes

Where exploratory holes have been carried out as part of this investigation, the spacing has been determined to provide a reasonable indication of the general ground conditions across the site, but the number has ultimately been limited by commercial constraints. The findings of the exploratory holes relate specifically to the exploratory hole locations and are no absolute guarantee of the ground conditions between such locations. Due allowance should be made for the possibility of variation in conditions between exploratory hole locations.

Extent of Contamination Testing

The extent of contaminated land testing carried out on samples obtained from the site has been determined in accordance with the latest legal guidance issued by the government to provide, with reasonable certainty, the probable general levels of contamination present on site that could pose a significant hazard to human health or waters. The extent of site investigation works including chemical testing has also been limited by reasonable commercial constraints. Although extensive testing of samples has been carried out, the volume of samples taken for testing are a minute fraction of the total volume of soils and groundwater present on site. Therefore, there is a residual risk that undetected pockets of contamination may be present on site, situated between testing locations.

When investigating or developing potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and temporally. The absence of certain ground, ground gas, contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

Extent of Geo-Environmental Studies

This report is strictly limited to the nature of contamination contained within the ground and groundwater at the site. The report does not cover environmental aspects such as air or noise pollution and ground vibrations and the like. In addition, ecological matters relating to wildlife, flora and fauna have not been investigated as part of this report. In particular, the site has not been inspected for the presence or otherwise of invasive species e.g. Japanese Knotweed. It is recommended that the Client appoints a specialist in this subject to carry out a detailed inspection / survey of the site if its presence is suspected. Where mention has been made to the identification asbestos or asbestos-containing materials this is for indicative purposes only and does not constitute or replace a full and proper survey. If an Unexploded Ordnance (UXO) report has been obtained within the report, it has been so on the basis of Health and Safety concerns and no assessment has been made other than transcribing the

recommendations of the sub-contractor contained within the report. In terms of a potential contaminative source, unless ordnance has been manufactured / stored on site, UXOs will only be determined as a contaminative source following a positive identification on site.

PLANNING CONTEXT

The National Planning Policy Framework (NPPF, 2019) states that the purpose of the planning system is to contribute to the achievement of sustainable development. In order to do this the planning system has three overarching objectives, one of which directly relates to the potential for pollution and contaminated land:

- ***'environmental objective - to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy'.***

In accordance with this environmental objective, Paragraph 118 clarifies that 'making effective use of land' includes to:

- *'give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land'.*

In accordance with this environmental objective, Paragraph 170 clarifies that 'conserving and enhancing the natural environment includes:

- *'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability'; and*
- *'remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate'.*

Paragraph 178 of the NPPF states that planning policies and decisions for developments should also ensure that:

- *'a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation)'; and,*
- *'after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990'; and*
- *'adequate site investigation information, prepared by a competent person, is available to inform these assessments'.*

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

APPENDIX 2

FIGURES AND DRAWINGS



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

- 400mm x 400mm concrete paving to front and 1800mm wide patios at rear of dwellings
- Tarmac areas
- Grass areas
- Shrub planting
- Existing tree to be retained
- Existing tree to be removed
- New tree
- Water butt (volume to be a minimum of 200lit)

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 1500mm 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)
- 400mm high low pick wall with 400mm 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

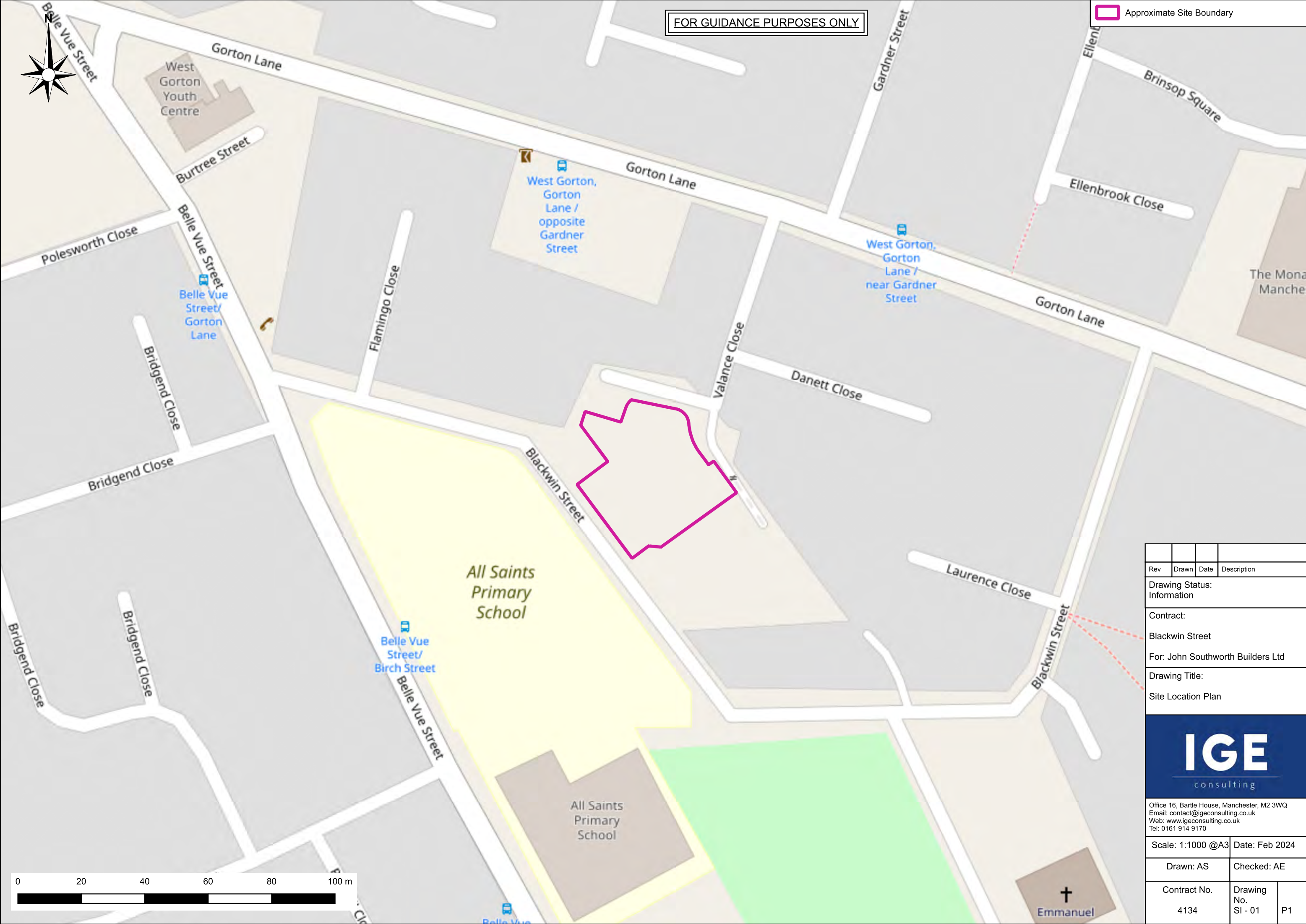
Schedule of Accommodation

Housetype	Description	Awa/m2	Total	Plot Nos.
A	2BSP House	70.9	2	02, 03
B1	3BSP House	88.2	3	01, 05, 06
B2	3BSP House	88.2	1	07
C	4BSP House	155.3	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





FOR GUIDANCE PURPOSES ONLY

Approximate Site Boundary

Rev	Drawn	Date	Description
-----	-------	------	-------------

Drawing Status:
Information

Contract:

Blackwin Street

For: John Southworth Builders Ltd

Drawing Title:

Site Location Plan

IGE

consulting

Office 16, Bartle House, Manchester, M2 3WQ
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk
Tel: 0161 914 9170

Scale: 1:1000 @A3

Date: Feb 2024

Drawn: AS

Checked: AE

Contract No.	Drawing No.	
4134	SI - 01	P1



28

El Sub Sta

Possible maintenance
strip for sub-station (TBC)

396800

BLACKWIN STREET

FOR GUIDANCE PURPOSES ONLY

UCP

LP(R)

UCP

UCP

7

1 to 3

Area added to Highway

Unadopted Highway
(MCC ownership)

LP

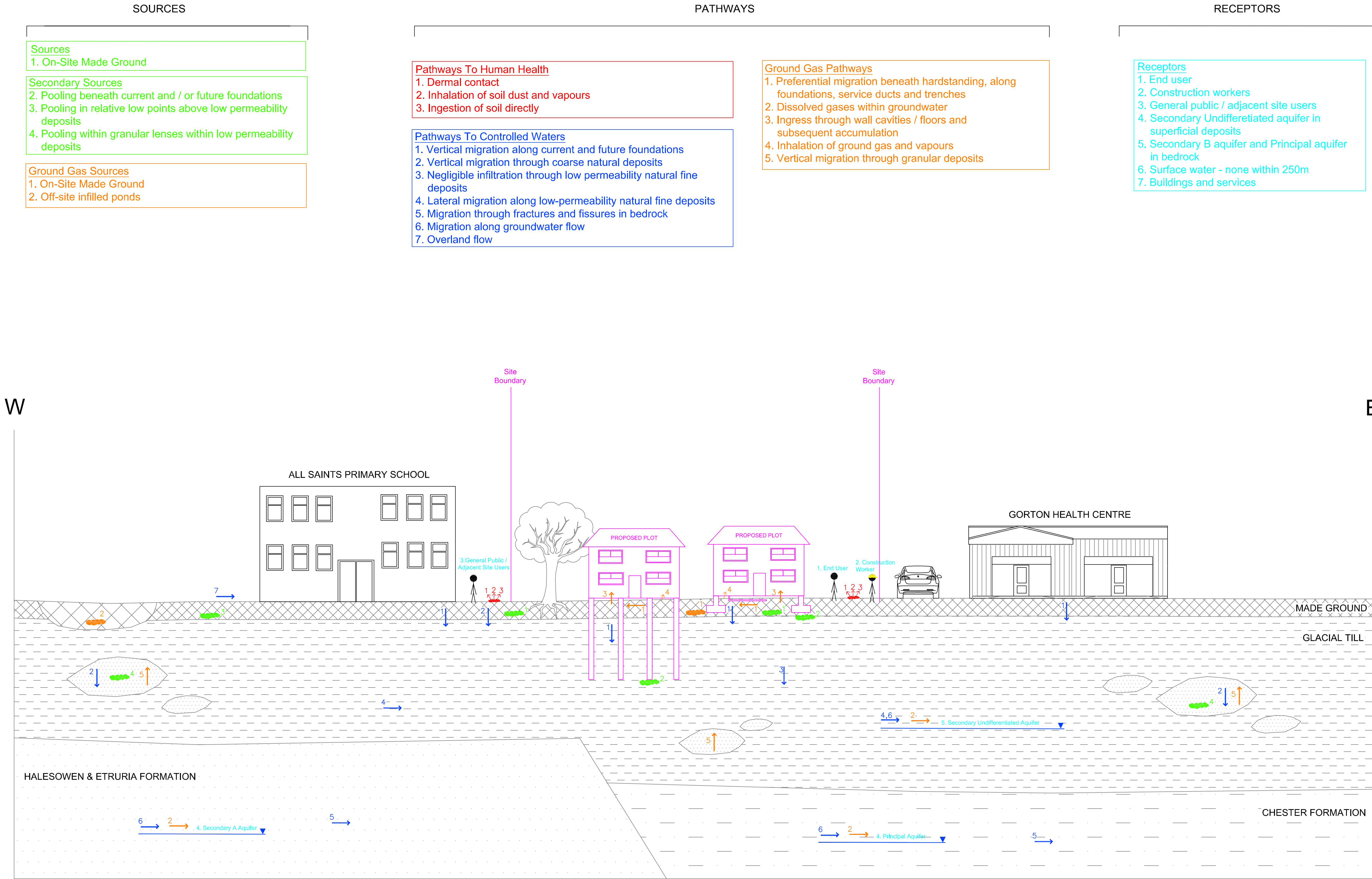
UCP

11343

- Approximate Site Boundary
- Private Garden (Rear)
- Soft Landscaping (Public Open Space)

Rev	Drawn	Date	Description
Drawing Status: Information			
Contract: Blackwin Street For: John Southworth Builders Ltd			
Drawing Title: Landscaping Plan			
IGE consulting			
Office 16, Bartle House, Manchester, M2 3WQ Email: contact@igeconsulting.co.uk Web: www.igeconsulting.co.uk Tel: 0161 914 9170			
Scale: 1:200 @A3		Date: Feb 2024	
Drawn: AS		Checked: AE	
Contract No. 4134		Drawing No. SI - 02	P1





APPENDIX 3

CL:AIRE JIWG DECISION SUPPORT TOOL



Joint Industry Working Group
Asbestos in Soil and Construction & Demolition Materials

Project Reference	4134
Site Name	Blackwin Street
Client	John Southworth Builders Ltd
Run by	AS
Date	26.02.2024
Scenario details	Construction work

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

Score

Select ACM type (run model for each type to generate 'Worst Case' output)
Extent of degradation of ACMs at outset of work
Friability and degree of bonding by matrix (ACM matrix, not ground materials)
Distribution of Visible Asbestos Across Affected Area
Amount of asbestos fibre in selected ACM/fibre type as % of host material

Loose fibrous asbestos debris	3
Disaggregated (dominated by loose fibrous material; extreme degradation in ACM and/or free asbestos fibres/fibre bundles)	4
Friable ACM or ACM with fibres not linked in any matrix (free dispersed fibres/fibre bundles)	4
No visible ACMs/fibre bundles	0
Very Low quantities - <0.001 to 0.01 %wt/wt	1

Sub-total

12

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking

Medium

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.

It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.



Stage 2

Exposure Factors

Anticipated airborne fibre concentration - Control Limit or SALI?
Anticipated duration of exposure to asbestos
Activity type and effect on deterioration of ACMs during work
Best description of primary host material matrix (soil/made ground)
Respirable fibre index for ACM - RIVM report 711701034 (2003)

<0.01 fibres/ml	1
> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Not low intensity, significant deterioration expected	4
Coarse to Fine Sand	2
Medium	3

Sub-total

14

Exposure ranking

Medium

Combined hazard and exposure ranking

26

Medium



Joint Industry Working Group

Asbestos in Soil and Construction & Demolition Materials

Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.

**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)

***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

APPENDIX 4

DISCOVERY STRATEGY



DISCOVERY STRATEGY

Office 16
Bartle House
Oxford Court
Manchester
M2 3WQ

Tel: 0161 914 9171
Email: contact@igeconsulting.co.uk
Web: www.igeconsulting.co.uk

What to Look Out For

Potentially contaminative material can be identified as follows:

- Appears oily / has an iridescent sheen
- Hydrocarbon odour e.g., oily or petroleum odour
- Solvent odour e.g., sharp or sweet odour
- Waste materials e.g., metals, plastic etc.
- Asbestos e.g., fibrous sheeting / roofing / board / lagging etc.
- 'Landfill' odour e.g., rotten / putrefying / leachate odour

Or any other material that looks man-made or does not match its surroundings – if in doubt, check.

Procedure for Discovery of Unexpected Contamination

If any of the above material is discovered, the following procedure must be carried out:

- a) Stop works in the area of the contamination discovery.
- b) Inform the Site Manager.
- c) Record the visual and olfactory evidence of contamination.
- d) Suitably qualified geo-environmental engineer to investigate the contamination; take samples, photographs and in-situ tests and discover the extents of the contamination, and to identify potential contaminants and specify chemical testing, if necessary.
- e) Either dig out the contaminated material and stockpile, on an impermeable membrane if necessary, or leave in-situ whilst awaiting chemical test results, if needed – whichever presents the least risk.



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- f) Suitably qualified geo-environmental engineer to re-visit the site's risk assessment, taking into account the newly discovered contamination and recommend remediation, if necessary, or other next steps.
- g) If the risk assessment and remediation strategy is changed as a result, the Local Authority and/or the Environment Agency should be informed and/or consulted.
- h) Lastly, undertake remediation of the affected area if this has been deemed appropriate.

Procedure for Discovery of an Unexpected Tank

Former industrial sites may contain unrecorded underground storage tanks (USTs).

Follow the below steps if a UST is found:

- a) Stop works in the area of the UST discovery.
- b) Inform the Site Manager.
- c) Suitably qualified geo-environmental engineer to investigate the tank, including measuring the size, contents, condition, and visual and olfactory evidence of contamination. Geo-environmental engineer to record the location of the tank on a site plan, take photographs, and sample the contents to send for chemical testing to determine the contents.
- d) Suitably qualified contractor to empty the tank and dispose of contents at a suitably licensed disposal facility.
- e) Suitably qualified contractor to undertake integrity testing in line with the 'Blue Book' method (APEA / EI '*Design, Construction, Modification, Maintenance and Decommissioning of Petrol Filling Stations*' 4th ed. (April 2018)), to determine whether the tank is intact or has been compromised.
- f) Suitably qualified geo-environmental engineer to undertake a risk assessment based on the contents of the tank and the results of the integrity testing, to determine whether to decommission the tank and leave in-situ or to remove the tank.
- g) Suitably qualified contractor to clean and 'inert' the tank, and provide a gas safe certificate, in line with the 'Blue Book' method.

- h) Suitably qualified contractor to either decommission the tank in-situ in line with the 'Blue Book' method or remove the tank and dispose of at an appropriate facility.
- i) If excavated and removed, suitably qualified geo-environmental engineer to investigate the base and the sides of the resultant excavations and if any contamination is found, undertake the Procedure for Discovery of Unexpected Contamination above.

APPENDIX 5

CURTINS PHASE 2 GROUND INVESTIGATION REPORT

Blackwin Street, Manchester

Phase 2 Ground Investigation

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

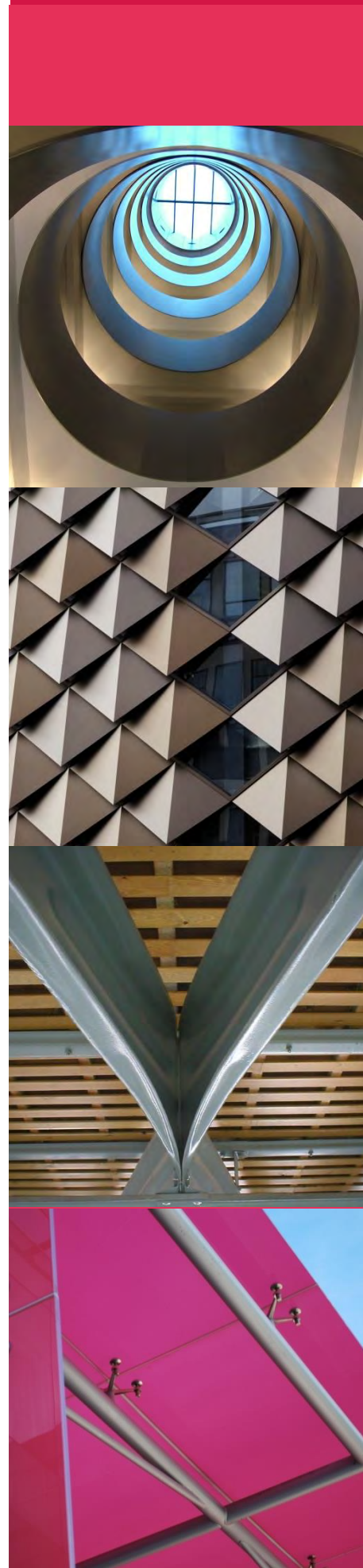
Revision: P02

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.

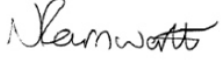


Rev	Description	Issued by	Checked	Date
P01	Report Issue	MH	NF	27/02/2023
P02	Updated following completion of gas monitoring	RT	NF	24/07/2023

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 off 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 Ordnance 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

Phase 2 Ground Investigation

	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 <i>Appendix C</i>. 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.

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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 off 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.

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.

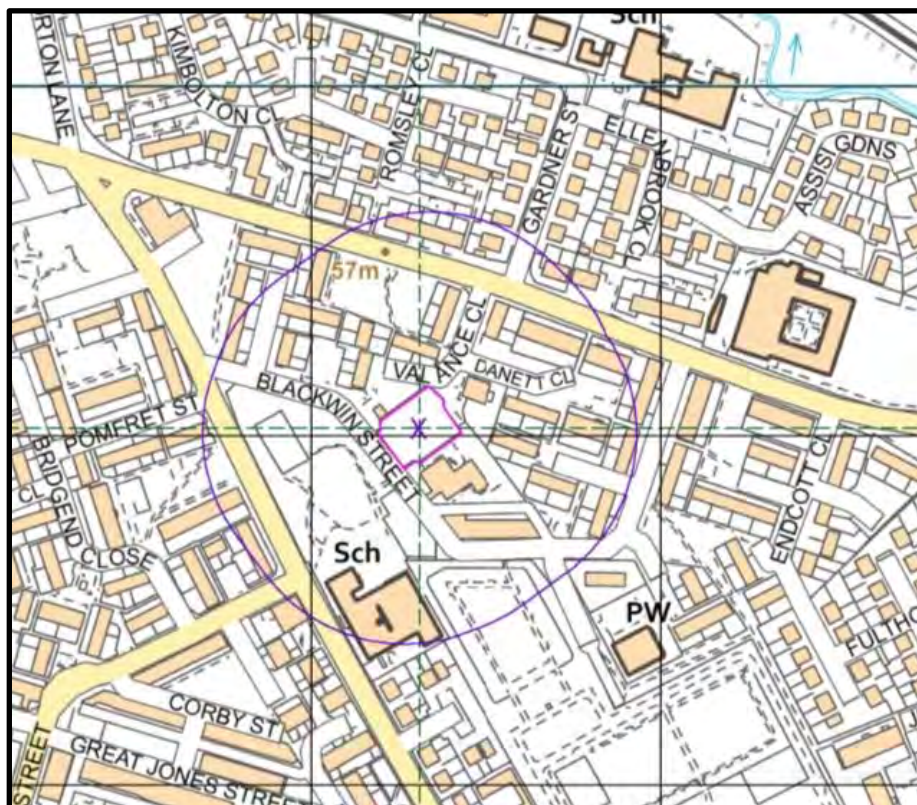


Figure 2.1 – Site Location Plan (Site boundary shown in pink).
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2.2 Surrounding Area Details

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.

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	MADE GROUND – Concrete (0.10m)
		0.10m to 0.30m bgl	MADE GROUND Quarry Waste (0.20m)
		0.30m to 10.00 bgl	Silty gravelly CLAY (9.70m)
		10.00m bgl	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.

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 assess 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

Notes:

1. A heterogeneous 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

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	

Phase 2 Ground Investigation

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.

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	57.74	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.
	WS2	57.28	5.45	
	WS3	57.52	5.45	
	WS4	57.81	5.45	
	WS5	57.84	5.45	
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	57.08	2.40	Confirm shallow ground conditions and record potential buried obstructions in accessible areas of the site. Collect soils samples for chemical analysis.
	TP2	57.45	2.39	
	TP3	57.83	2.80	
	TP4	57.80	2.50	
	TP5	57.91	2.60	
	TP6	57.07	2.50	

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*.

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*.

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

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	ISO 17025 MCERTS
pH Value*	26	ISO 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*.

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)	Ground 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.

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*.

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.

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 (m²/MN)		1	0.13	
Undrained Shear Strength, Cu (kPa)		2	170	254

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

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.

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:

$$C_u = f_1 \times \text{SPT N}$$

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) recording 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/m³ is deemed suitable for the cohesive soils above the groundwater table in accordance with BS8002 (Ref. 13).

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

$$M_v = 1 / (f_2 \times \text{SPT N})$$

Equation 2

Where:

M_v 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%, M_v values range between 0.041 and 0.181 m²/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/m³ was reported. A coefficient of volume compressibility of 0.13 m²/MN was reported, confirming the medium compressibility clay at this depth.

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.

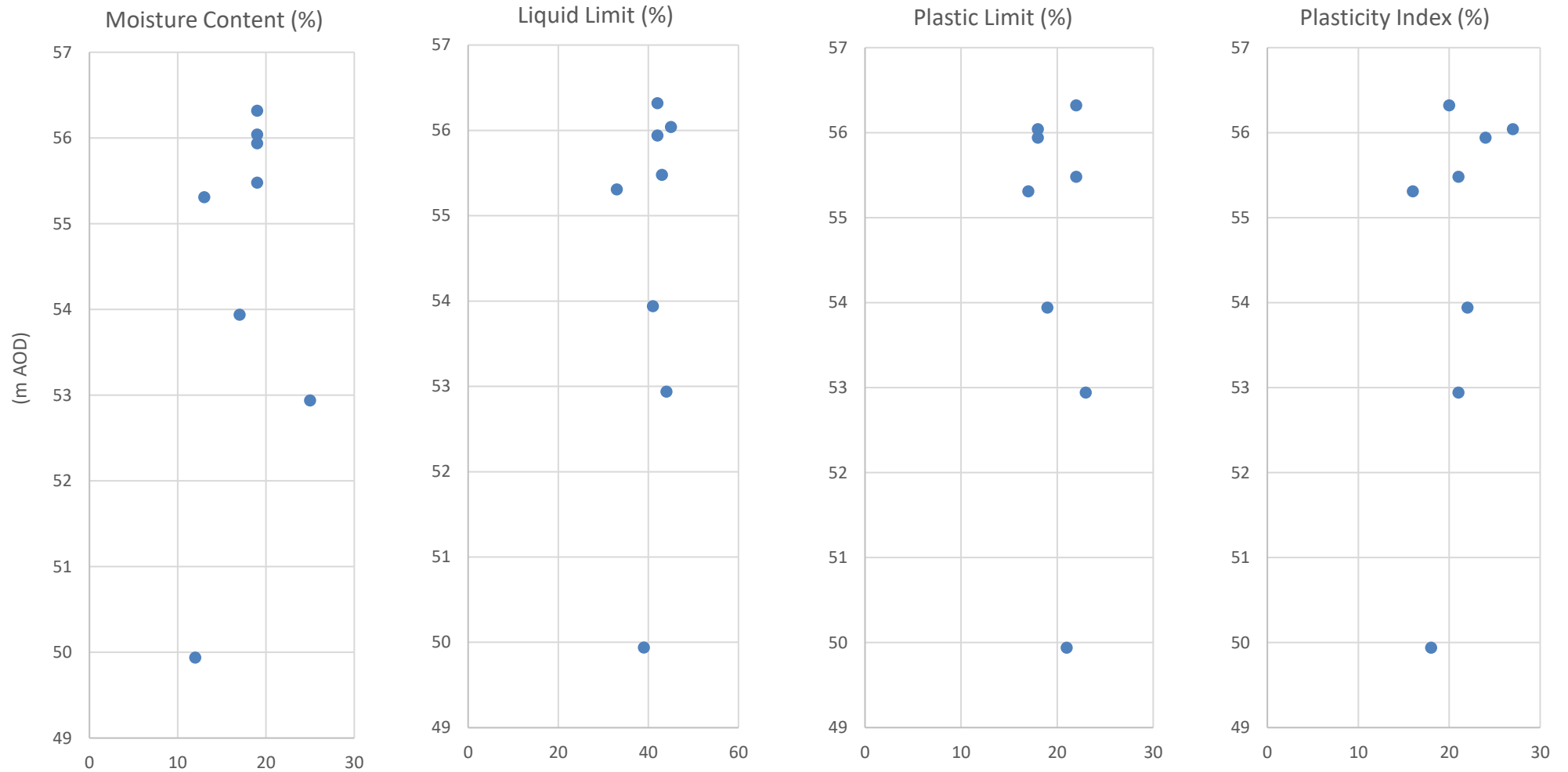


Figure 6.2.1a – Summary of Atterberg Test Results vs. Depth (m AOD)

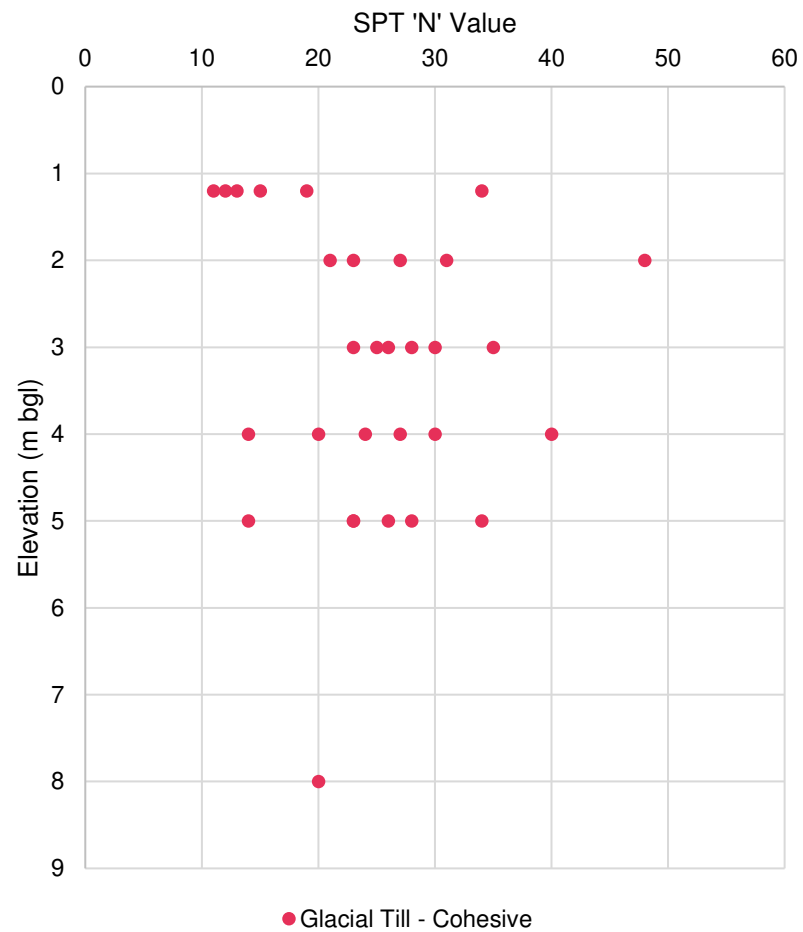


Figure 6.2.1b – Standard Penetration Test vs. Depth (m bgl)

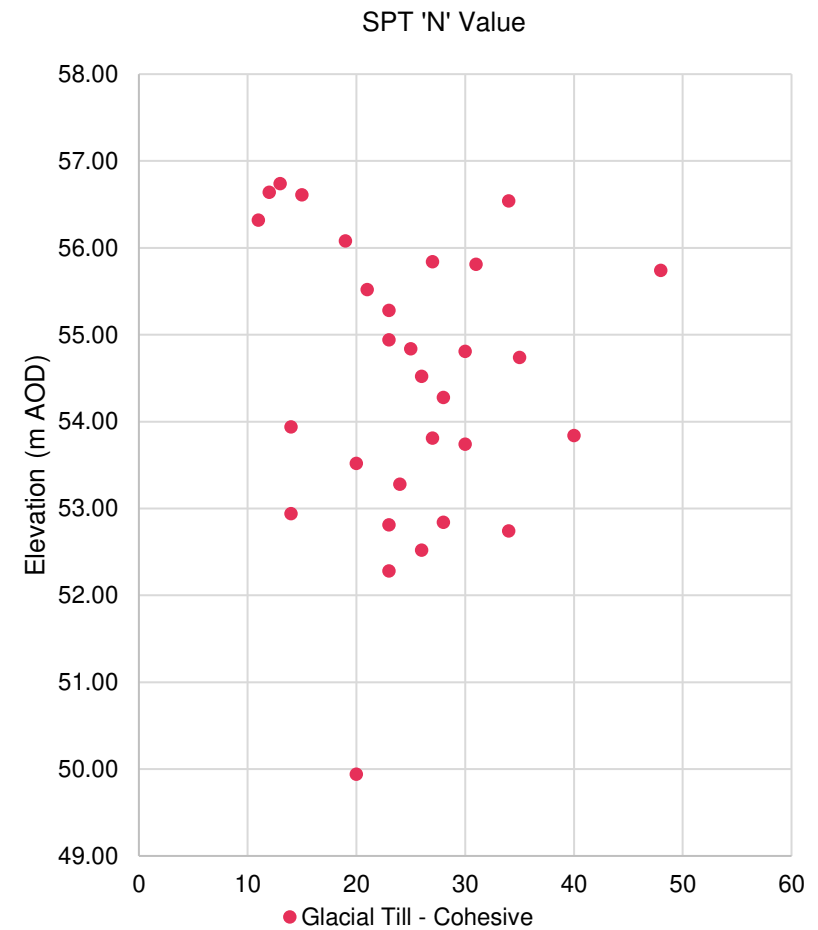
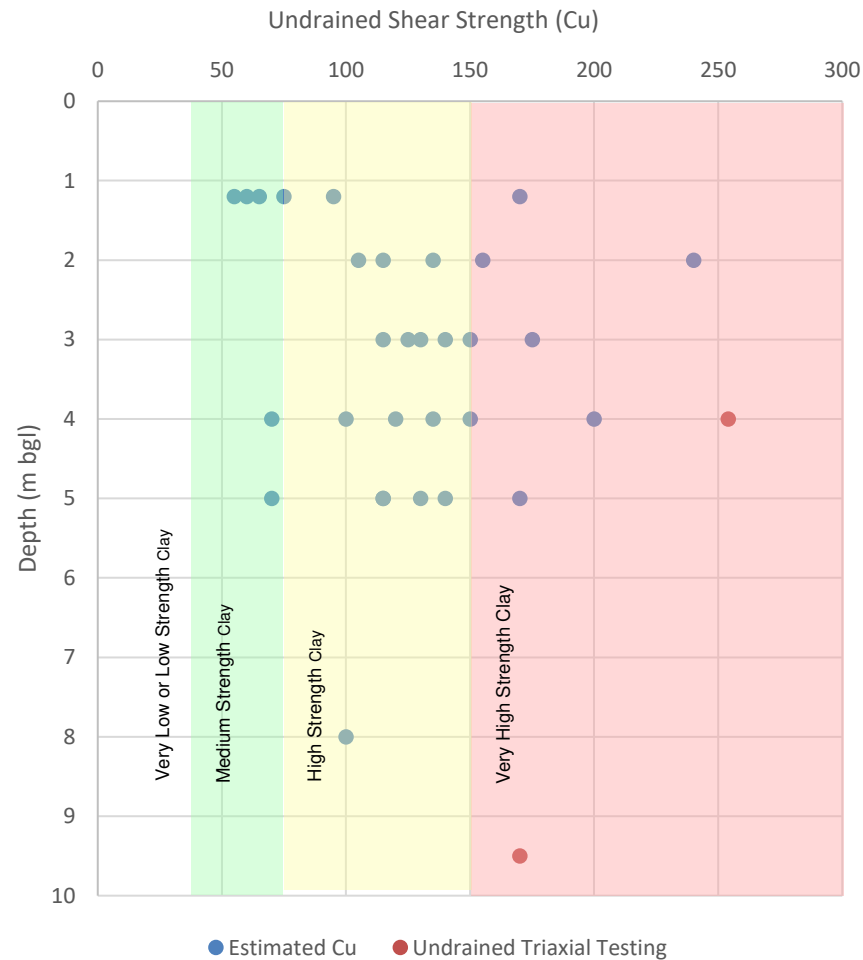
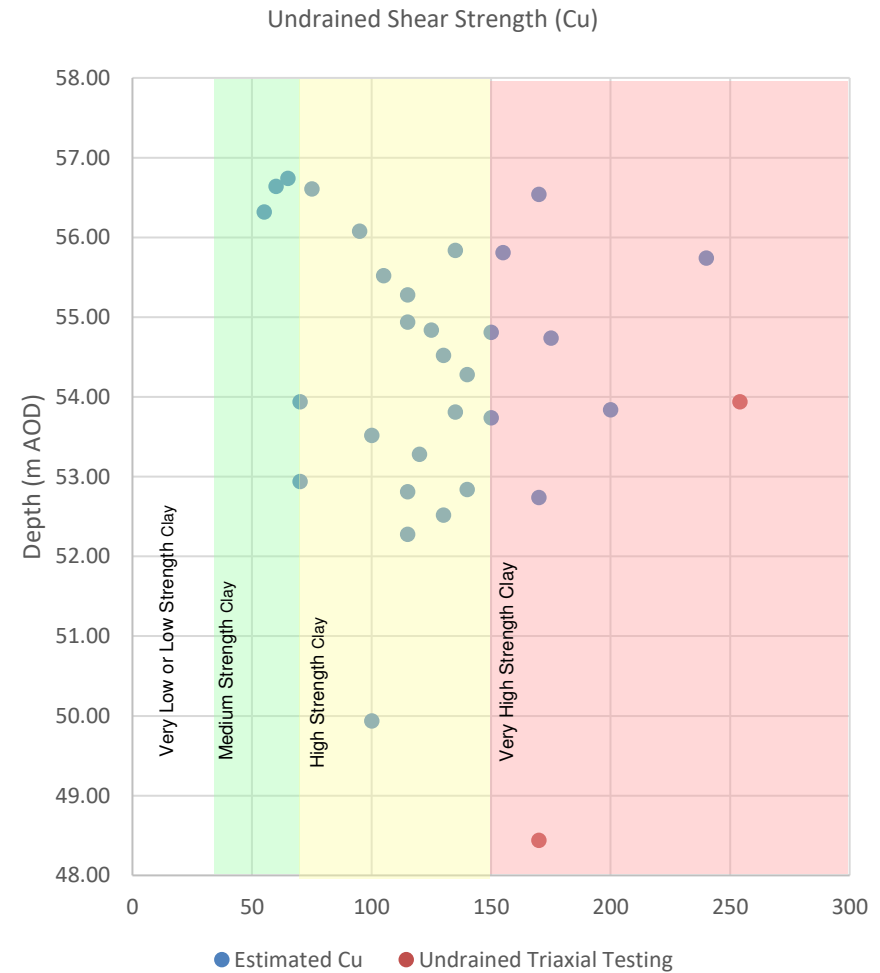


Figure 6.2.1c – Standard Penetration Test vs. Elevation (m AOD)

Phase 2 Ground Investigation

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

Phase 2 Ground Investigation

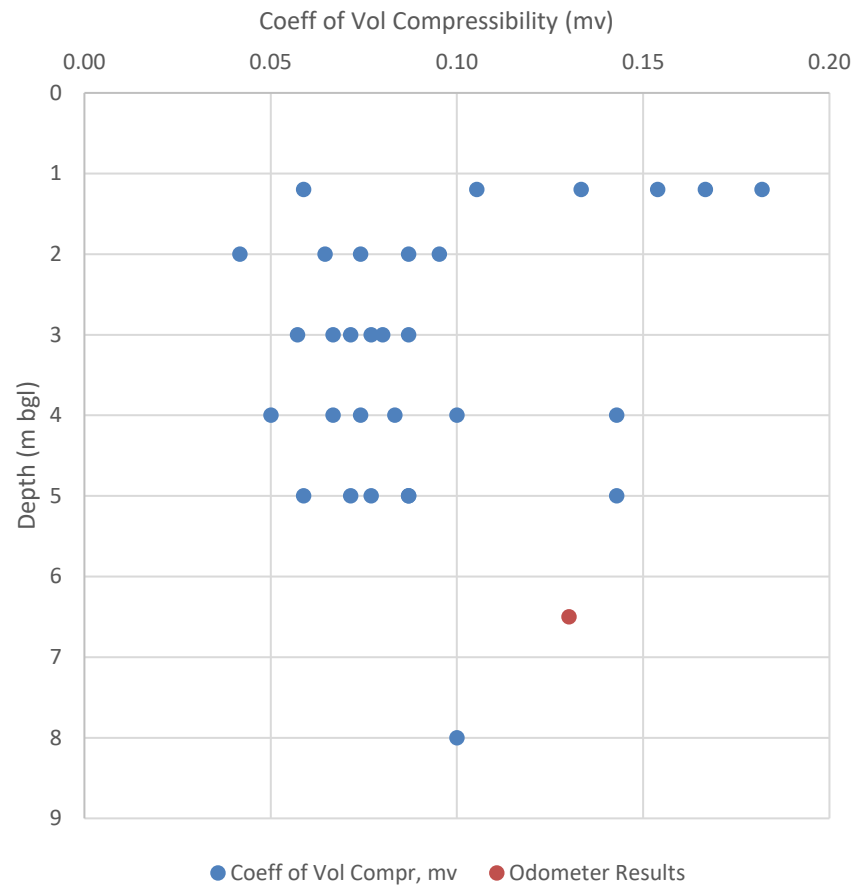
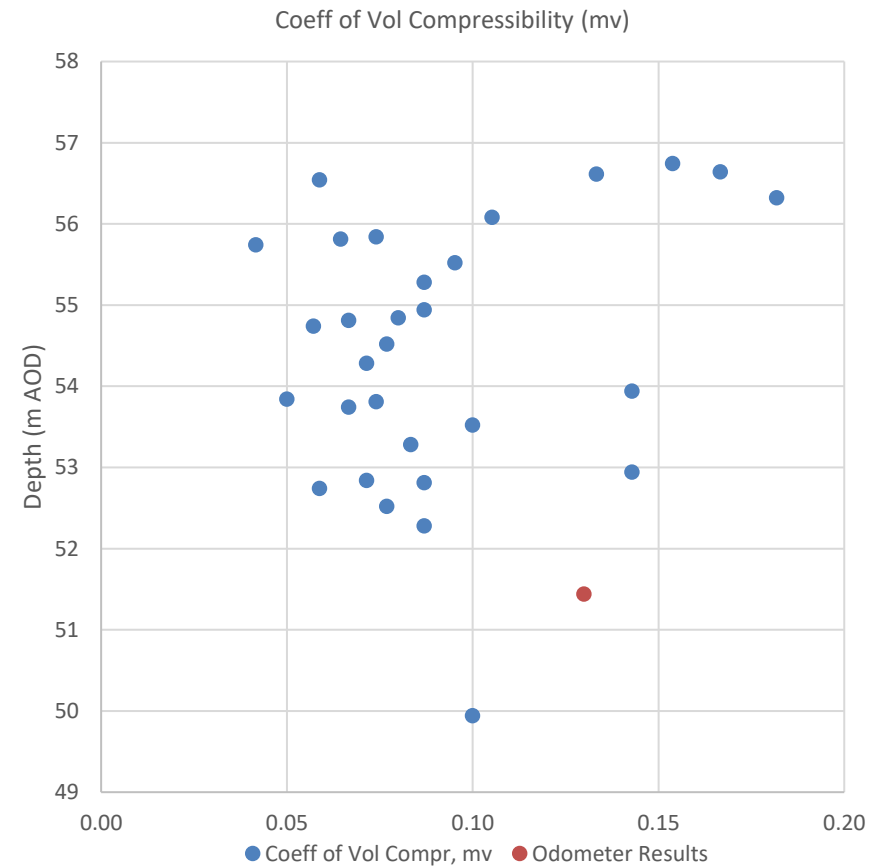


Figure 6.2.1f – Estimated Coefficient of Volume Compressibility (Mv) vs Depth (m bgl)



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 6.3a* 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.

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

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*.

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.

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.

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 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.

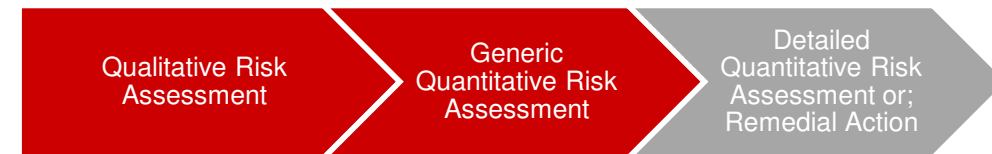
The CSM follows the framework outlined within CIRIA C552.

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.

Phase 2 Ground Investigation



- 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)	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
		There are no surface water features within 250m of the subject site. No surface water abstraction points within 1km					
		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					

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 and 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.

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).

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.

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).

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.

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.

12.0 References

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21. CIRIA (2001) Contaminated Land Risk Assessment. A guide to good practice (report no. C552).
22. CITB (2015) Construction (Design and Management) Regulations.

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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



- 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
 - 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



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



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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

GENERAL NOTES:

--				
Rev:	Description:	Date:	By:	

Appendix B – Exploratory Hole Logs

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

				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)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.40 - 0.50	ES		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. 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. 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). 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. From 4.00m to 4.45m bgl material is stiff to very stiff. End of borehole at 5.45 m
					0.55	57.19		
	1.20	ES	N=34 (4,6/6,9,9,10)	1.20 - 1.30				
				1.50	56.24			
	2.00		N=48 (7,7/11,11,12,14)	2.00	55.74			
	3.00		N=35 (7,7/7,8,10,10)					
	3.80 - 4.00	D	N=30 (5,6/6,7,8,9)	4.00				
				5.00				
				5.45	52.29			

Remarks

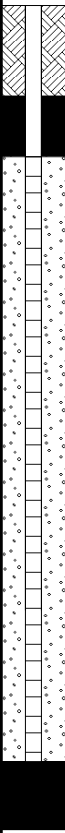
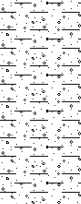
Hand excavated service clearance to 1.20m bgl. No groundwater encountered.

				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)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		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. 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. 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. <i>From 1.20m to 1.65m bgl material is firm to stiff.</i>	
				0.48	56.80				
	1.20								
	1.20 - 1.30	ES	N=19 (3,5/4,5,5,5)						
	1.80 - 2.00	D							
	2.00		N=23 (2,3/5,6,6,6)						
		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	

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

				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)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		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. <i>From 1.20m to 1.65m bgl material is soft to firm.</i>	1
		2.00		N=21 (2,2/3,5,6,7)				<i>From 2.00m to 2.45m bgl material is firm to stiff.</i>	2
		3.00		N=26 (2,4/4,7,7,8)					3
		4.00		N=20 (3,4/4,5,5,6)				<i>From 4.00m to 4.45m bgl material is firm to stiff.</i>	4
		5.00		N=26 (4,5/6,6,7,7)	5.45	52.07		End of borehole at 5.45 m	5
								6	
								7	
								8	
								9	
								10	

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

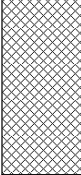
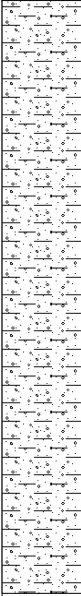
					Borehole Log			Borehole No. WS4 Sheet 1 of 1			
Project Name: Blackwin Street					Project No. 081427-Blackwin		Co-ords: 387461.72 - 396818.34		Hole Type WS		
Location: Blackwin Street, Gorton					Level: 57.81		Scale 1:50		Logged By RT		
Client: One Manchester					Dates: 05/12/2022 - 05/12/2022						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		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.	1		
		2.00		N=31 (4,5/6,7,9,9)				From 1.20m to 2.00m bgl material is firm to stiff.			
		2.50 - 2.70	D					From 2.00m to 2.45m bgl material is very stiff.	2		
		3.00		N=30 (5,5/6,7,8,9)				From 3.00m to 3.45m bgl material is stiff to very stiff.	3		
		4.00		N=27 (5,5/6,7,7,7)					4		
	5.00		N=23 (5,6/6,5,6,6)		5.45	52.36		End of borehole at 5.45 m	5		
									6		
									7		
									8		
									9		
									10		
Remarks Hand excavated service clearance to 1.20m bgl. No groundwater encountered.											
											

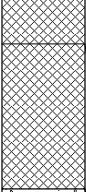
					Borehole Log		Borehole No. WS5 Sheet 1 of 1			
Project Name: Blackwin Street					Project No. 081427-Blackwin		Co-ords: 387443.76 - 396815.78			
Location: Blackwin Street, Gorton					Level: 57.84		Hole Type WS			
Client: One Manchester					Dates: 05/12/2022 - 05/12/2022		Scale 1:50			
Client: One Manchester					Dates: 05/12/2022 - 05/12/2022		Logged By RT			
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.40 - 0.50	ES		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.		
					0.60	57.24				
		1.20	ES	N=12 (1,2/2,3,3,4)						
		1.20 - 1.30								
		1.80 - 2.00	D	N=27 (3,4/5,7,7,8)				From 4.00m to 4.45m bgl material is stiff to very stiff.		
		2.00								
		3.00		N=25 (3,3/5,6,7,7)						
		4.00		N=40 (4,6/10,10,10,10)						
		5.00		N=28 (5,5/6,7,7,8)						
					5.45	52.39	End of borehole at 5.45 m			

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

				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): Depth 2.40		2.47 		Scale 1:25 Logged RT	
Client: One Manchester									
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20 - 0.30	ES		0.31	56.77		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.		
				0.59	56.49		MADE GROUND: Reddish brown moderately gravelly sand. Sand is fine medium to coarse. Gravels are occasional sub-rounded mudstone fragments.		
							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			
Remarks: Trial pit backfilled in arisings. No groundwater encountered.									
Stability: Stable									

				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): Depth 2.39		2.72 0.79		Scale 1:25 Logged RT	
Client: One Manchester									
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20 - 0.30	ES		0.48	56.97		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.		
	1.20 - 1.30	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. (Reworked Glacial Till)		
				2.39	55.06		Relic sewer present from 2.03m to 2.39m bgl running in a north-east to south-west trajectory.		
							End of pit at 2.39 m		
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									

				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): Depth 2.80		2.6 0.77		Scale 1:25 Logged RT	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.50 - 0.60	ES		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.		
							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		
Remarks: Trial pit backfilled in arisings. No groundwater encountered.									
Stability: Stable									

				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): Depth 2.50		2 0.76		Scale 1:25 Logged RT	
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.40 - 0.60	ES		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. 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. 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.		
				0.63	57.17				
				2.50	55.30				
							End of pit at 2.50 m		
Remarks: Trial pit backfilled in arisings. No groundwater encountered.									
Stability: Stable									

				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): Depth 2.50		2.55 0.79		Scale 1:25 Logged RT	
Client: One Manchester									
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
	Depth	Type	Results						
	0.20 - 0.30	ES		0.45	56.62		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.		
	0.60 - 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		
Remarks: Trial pit backfilled in arisings. Perched water encountered at 0.15m bgl.									
Stability: Stable									

				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)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		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
		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.
		2.00 - 2.45	B						
		3.00		N=23 (3,4/5,5,6,7)					
		4.00 4.00 - 4.45	U	N=14 (2,2/5,1,8,0)					
		5.00 5.00 - 5.45	B	N=14 (1,2/3,3,4,4)					
		6.50 - 6.95	U						
		8.00 8.00 - 8.45	B	N=20 (3,4/4,4,6,6)					
	9.50 - 9.95	U							9
					9.95		47.99	End of borehole at 9.95 m	

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

Appendix C – Chemical Laboratory Testing Results

- Envirolab, Environmental Chemistry Analysis Results, Soils

FINAL ANALYTICAL TEST REPORT

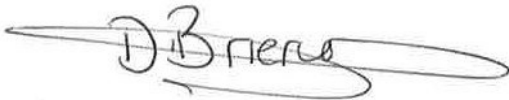
Envirolab Job Number: 22/12136
Issue Number: 1

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

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 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 [#]	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 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 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 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 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 [#]	Amosite	NAD	NAD							A-T-045
Asbestos Matrix (visual) ₀	-	-	-							A-T-045
Asbestos Matrix (microscope) ₀	Loose Fibres	-	-							A-T-045
Asbestos ACM - Suitable for Water Absorption Test? ₀	N/A	N/A	N/A							A-T-045
Asbestos in Soil Quantification % (Hand Picking & Weighing)										
Asbestos in soil % composition (hand picking and weighing) ₀	0.002	-	-					% w/w	0.001	A-T-054

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

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

Envirolab Analysis Dates

Lab Sample ID	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

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

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 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 [#]	NAD	Amosite	Amosite	Chrysotile	NAD	NAD	NAD			A-T-045
Asbestos Matrix (visual) _o	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope) _o	-	Loose Fibres	Loose Fibres	Bitumen Product	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test? _o	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) _o	-	0.047	0.001	0.002	-	-	-	% w/w	0.001	A-T-054

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 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 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 Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/8	22/12229/9								
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 Job Number: 22/12229

Client Project Name: Blackwin St

Client Project Ref: 81427

Lab Sample ID	22/12229/8	22/12229/9								
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 "A" 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.

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 No:	22/12229
Project:	Blackwin St	Date Received:	13/12/2022 (am)
Clients Project No:	81427	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

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

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 29/12/2022
Sampled By: Not Given

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

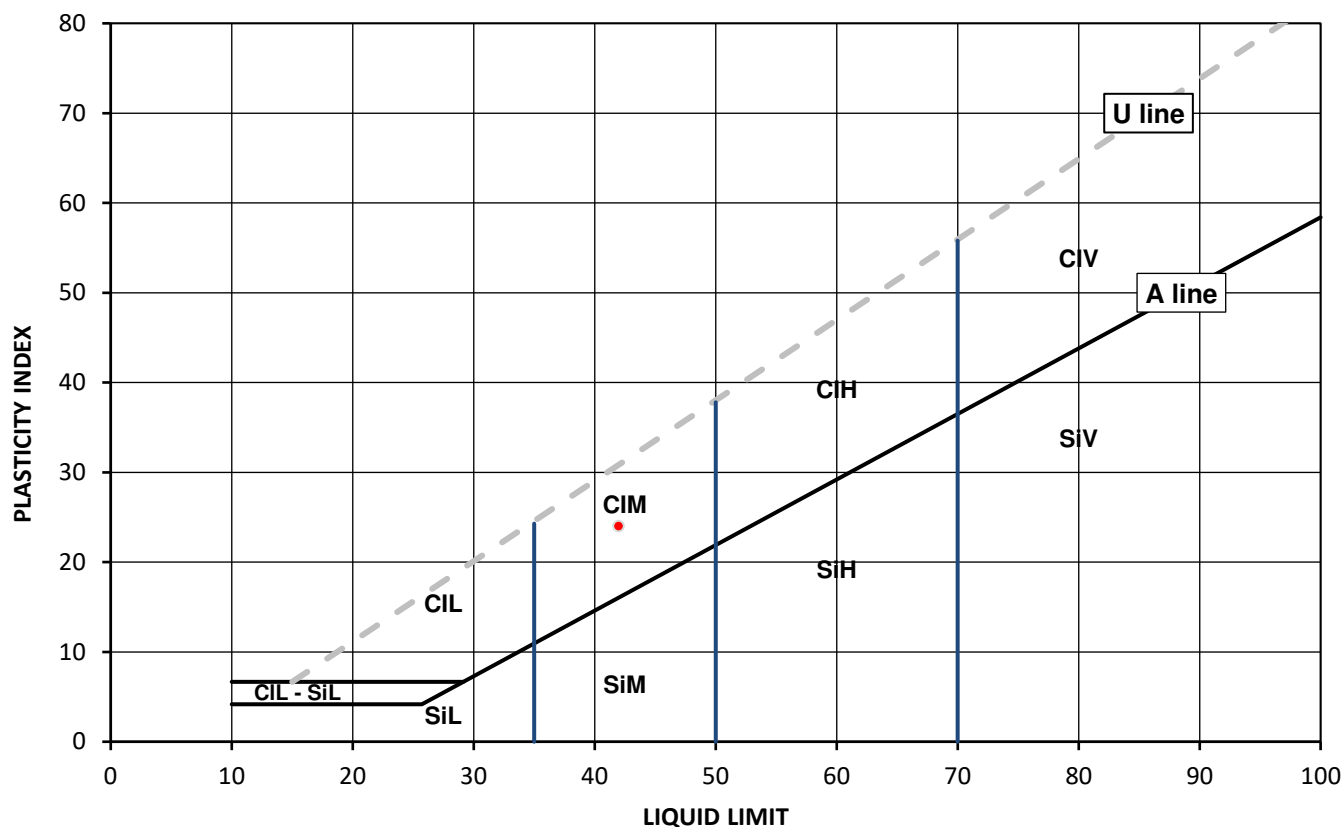
Test Results:

Laboratory Reference: 2535841
Hole No.: CP1 - B1
Sample Reference: Not Given
Sample Description: Dark brown slightly gravelly sandy CLAY

Depth Top [m]: 2.00
Depth Base [m]: 2.45
Sample Type: B

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



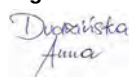
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

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

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

Remarks:

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.

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

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 29/12/2022
Sampled By: Not Given

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

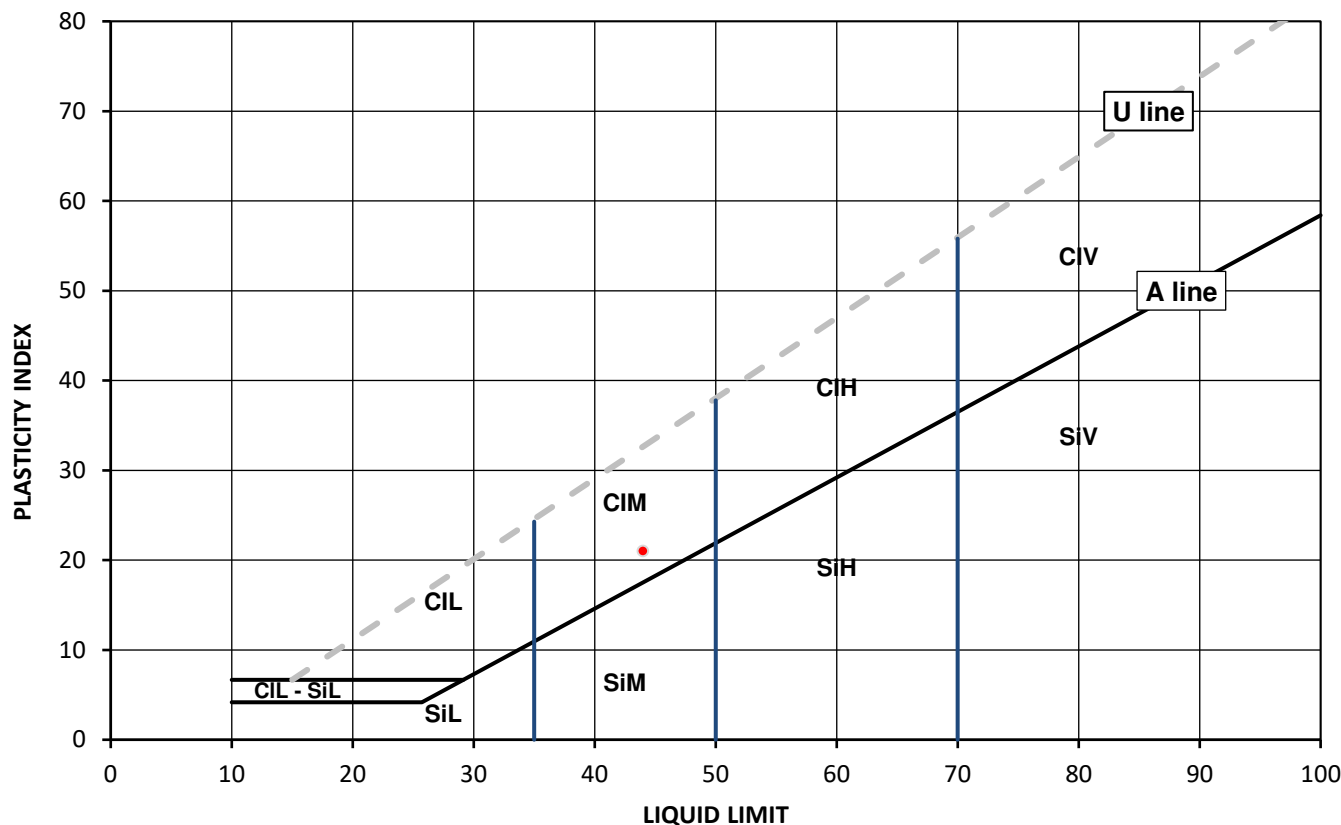
Test Results:

Laboratory Reference: 2535842
Hole No.: CP1 - B2
Sample Reference: Not Given
Sample Description: Greyish brown slightly gravelly sandy CLAY

Depth Top [m]: 5.00
Depth Base [m]: 5.45
Sample Type: B

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



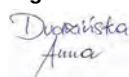
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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 CIHO)

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

Remarks:

Signed:



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

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4041

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 29/12/2022
Sampled By: Not Given

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

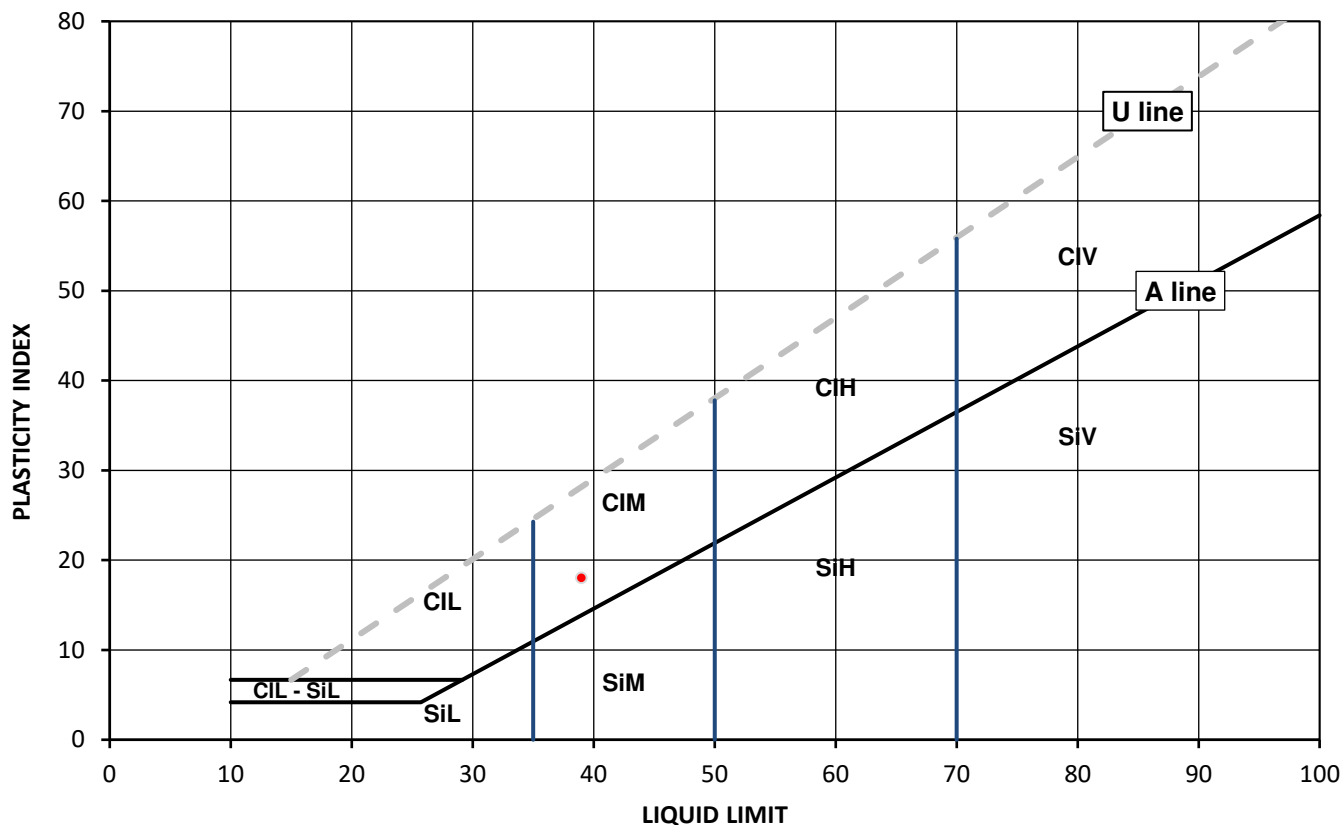
Test Results:

Laboratory Reference: 2535843
Hole No.: CP1 - B3
Sample Reference: Not Given
Sample Description: Orangish brown slightly gravelly sandy CLAY

Depth Top [m]: 8.00
Depth Base [m]: 8.45
Sample Type: B

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



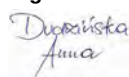
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	Clay	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 CIHO)

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

Remarks:

Signed:



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

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4041

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 28/12/2022
Sampled By: Not Given

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

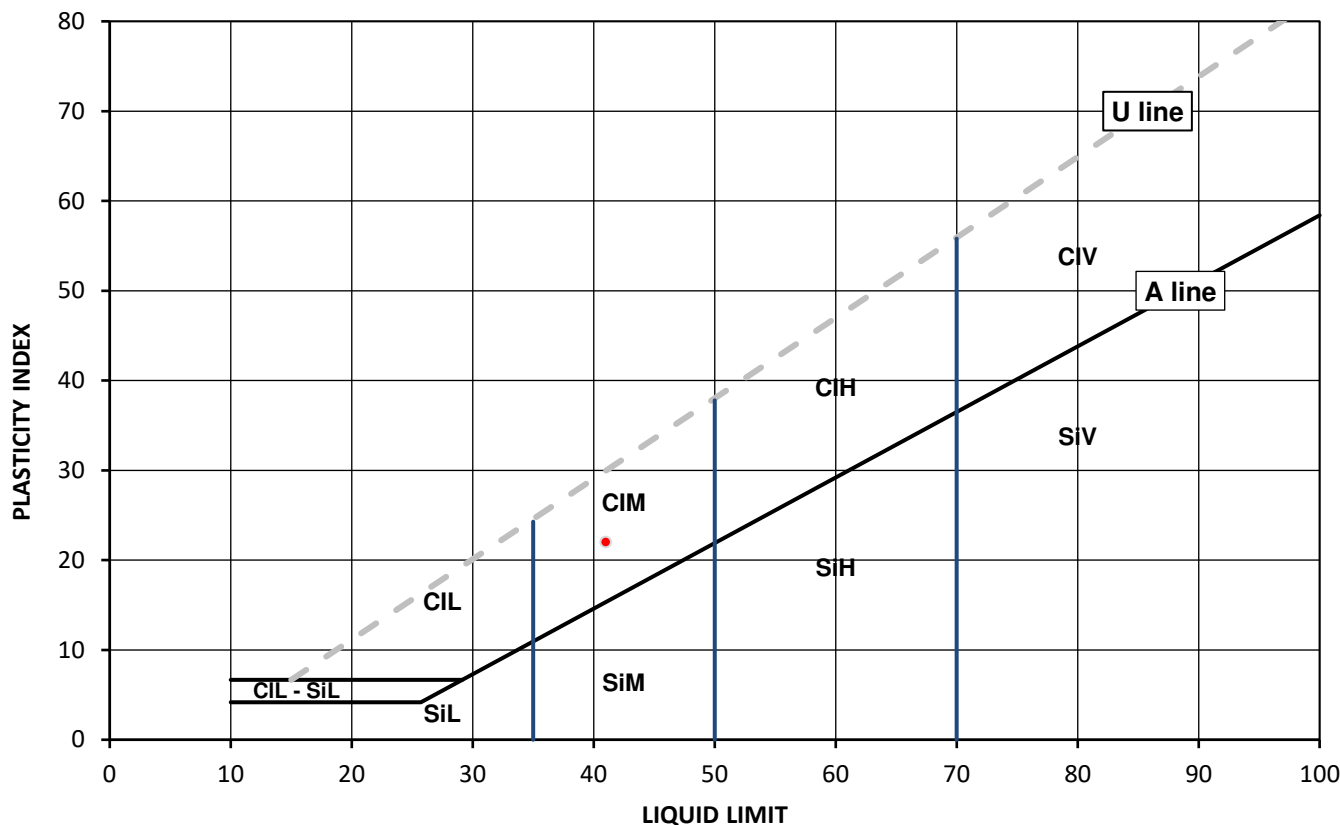
Test Results:

Laboratory Reference: 2535847
Hole No.: WS1 - D1
Sample Reference: Not Given
Sample Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 3.80
Depth Base [m]: 4.00
Sample Type: D

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



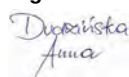
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

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

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

Remarks:

Signed:



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PL Deputy Head of Reporting Team
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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

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 28/12/2022
Sampled By: Not Given

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

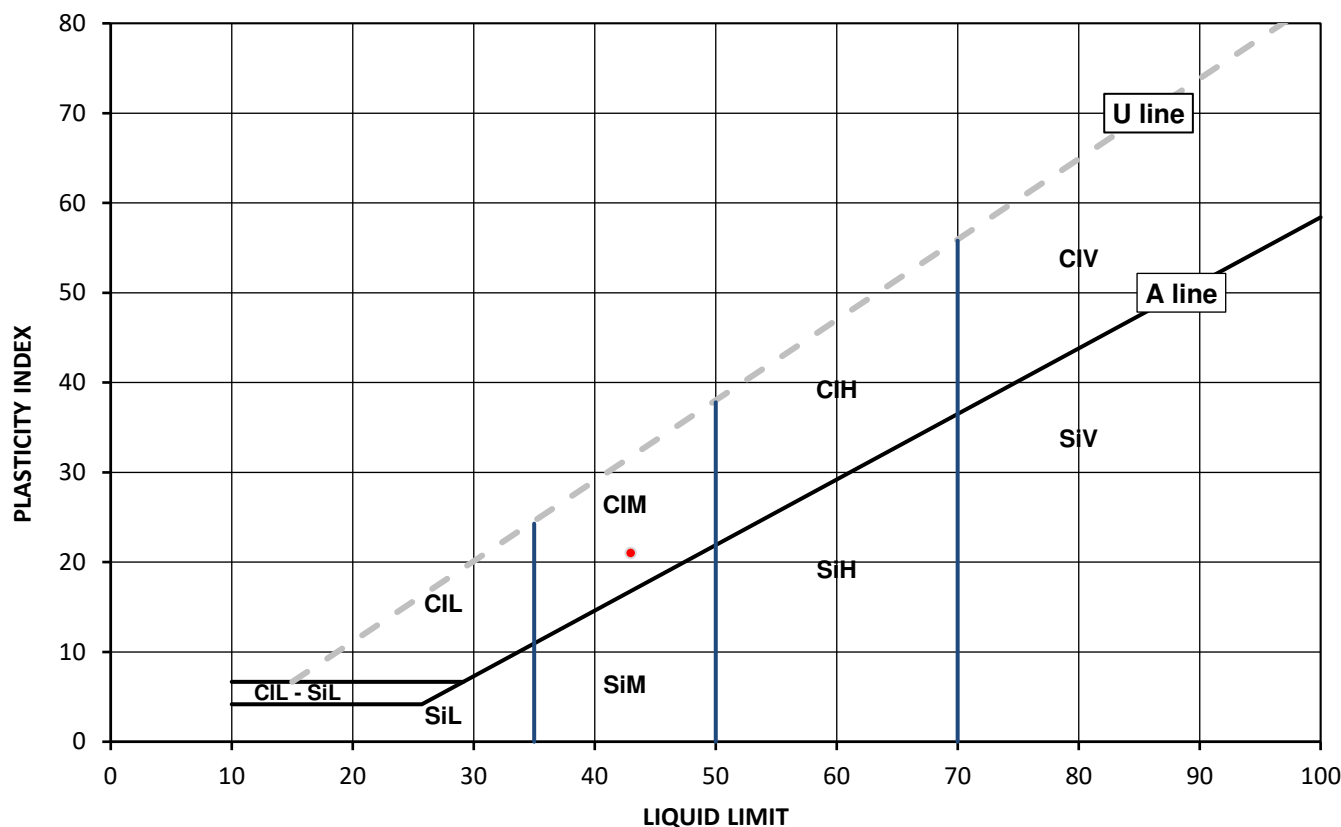
Test Results:

Laboratory Reference: 2535848
Hole No.: WS2 - D1
Sample Reference: Not Given
Sample Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 1.80
Depth Base [m]: 2.00
Sample Type: D

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



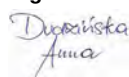
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

	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 CIHO)

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

Remarks:

Signed:



Anna Dudzinska
PL Deputy Head of Reporting Team
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4041

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 28/12/2022
Sampled By: Not Given

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

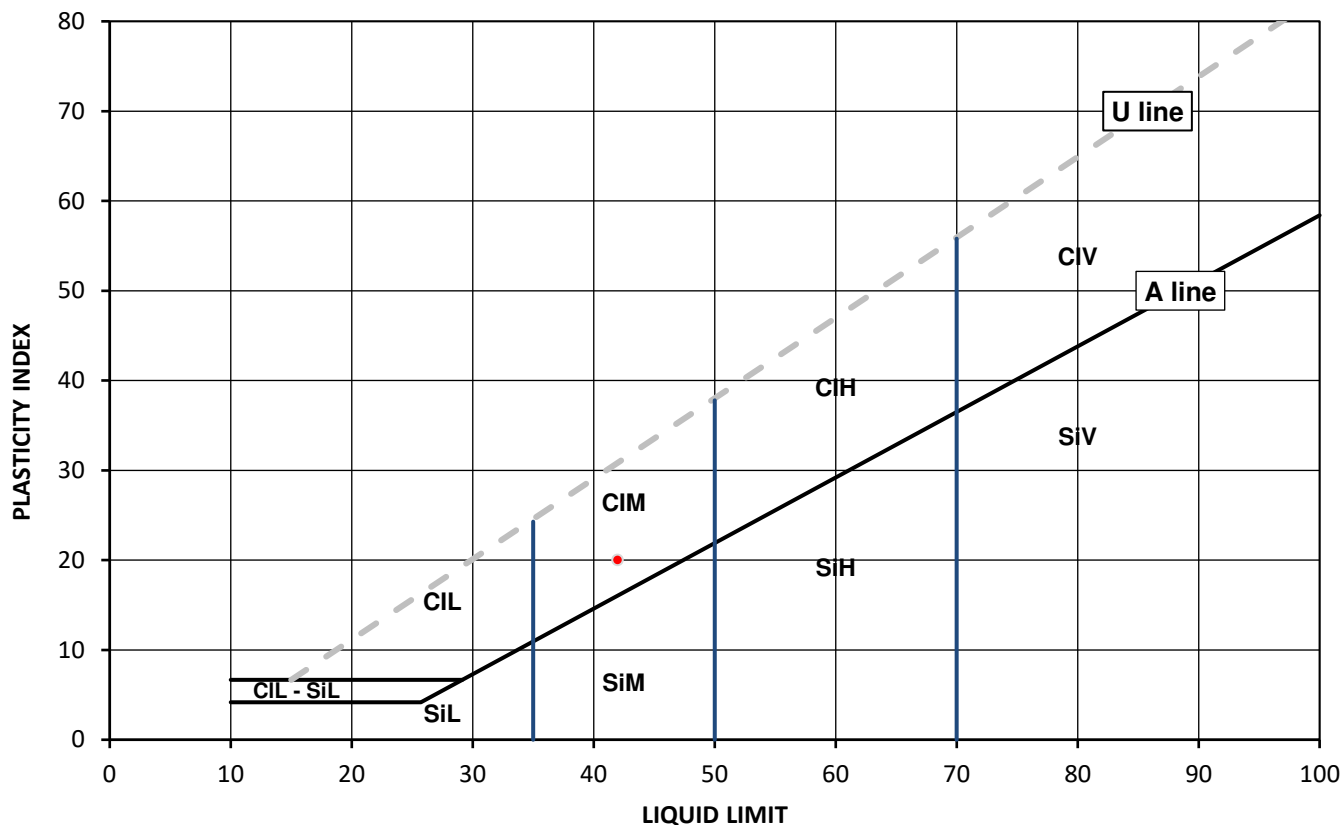
Test Results:

Laboratory Reference: 2535849
Hole No.: WS3 - D1
Sample Reference: Not Given
Sample Description: Brown slightly gravelly sandy CLAY

Depth Top [m]: 1.20
Depth Base [m]: 1.40
Sample Type: D

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



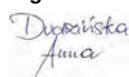
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

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

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

Remarks:

Signed:



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

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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

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: 05/12/2022
Date Received: 15/12/2022
Date Tested: 28/12/2022
Sampled By: Not Given

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

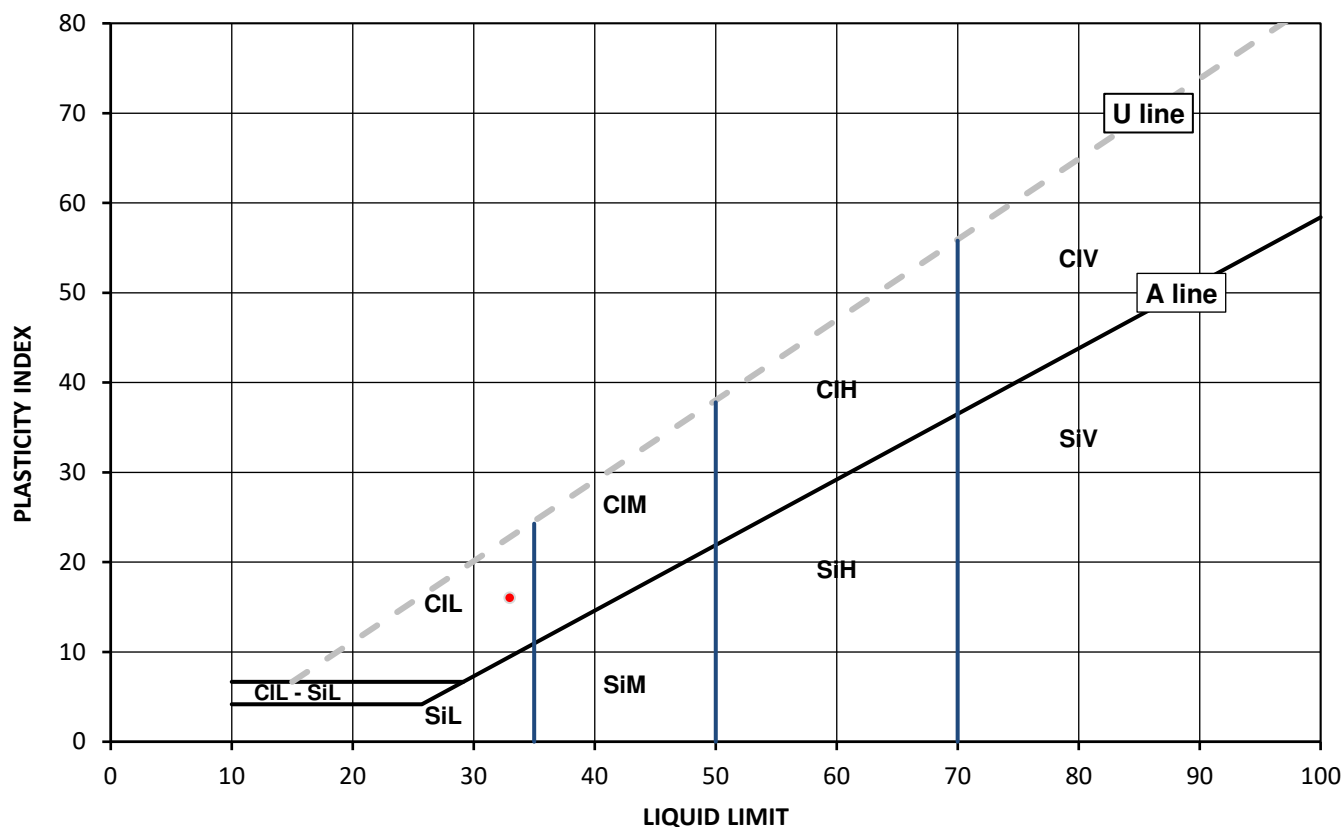
Test Results:

Laboratory Reference: 2535850
Hole No.: WS4 - D1
Sample Reference: Not Given
Sample Description: Brown slightly gravelly very sandy CLAY

Depth Top [m]: 2.50
Depth Base [m]: 2.70
Sample Type: D

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



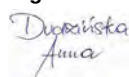
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

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

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

Remarks:

Signed:



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

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4041

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: 05/12/2022
Date Received: 15/12/2022
Date Tested: 28/12/2022
Sampled By: Not Given

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

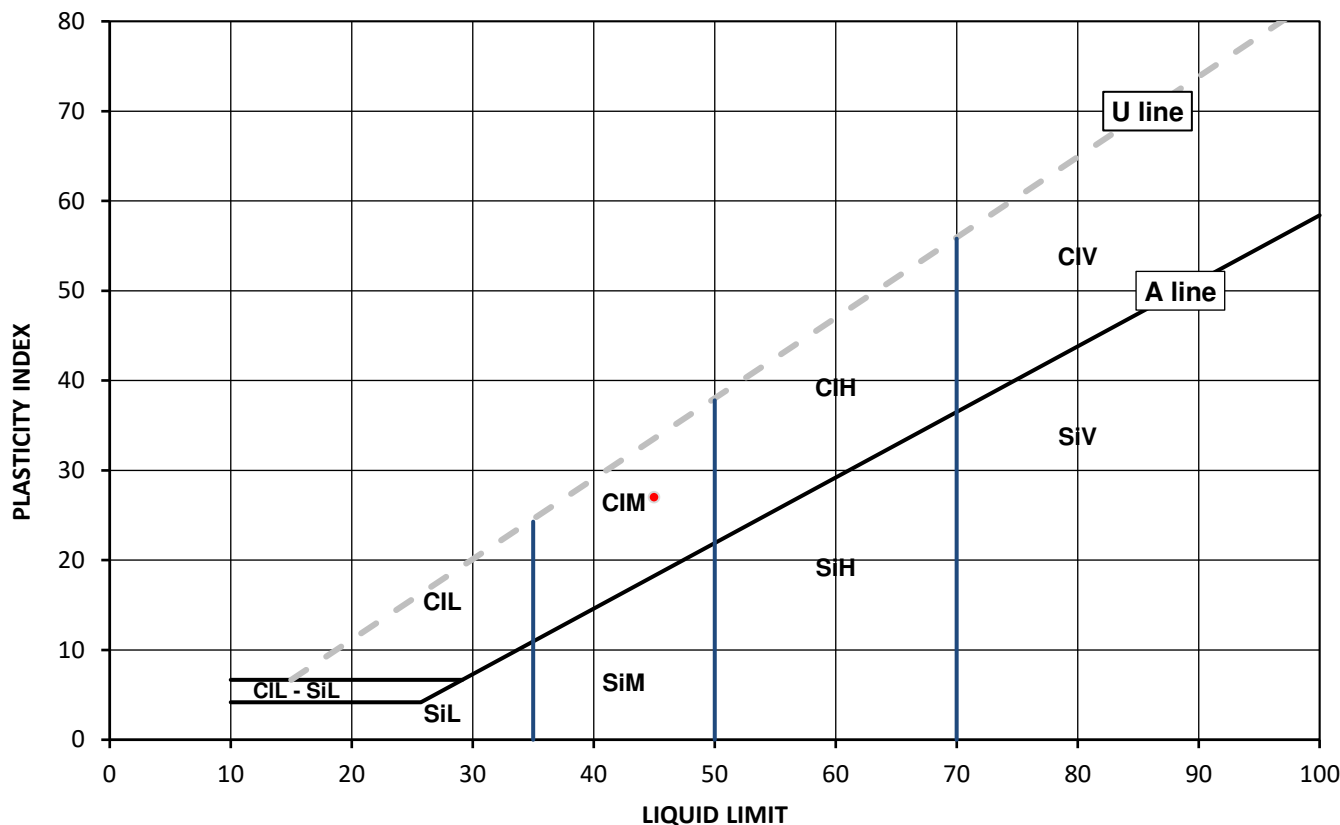
Test Results:

Laboratory Reference: 2535851
Hole No.: WS5 - D1
Sample Reference: Not Given
Sample Description: Brown slightly sandy CLAY

Depth Top [m]: 1.80
Depth Base [m]: 2.00
Sample Type: D

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



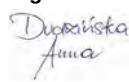
Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

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

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

Remarks:

Signed:



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

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SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

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



Environmental Science

4041

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

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

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

Contact: Russel Taylor
Site Address: Blackwin St

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 m	Depth Base m	Type					% Passing 425um %	WL %	Wp %	Ip %	bulk Mg/m3	dry Mg/m3	PD 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:

Dudzińska Anna

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

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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**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

Environmental Science

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:

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Signed:

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

TEST CERTIFICATE

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

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

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

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 23/12/2022
Sampled By: Not Given

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

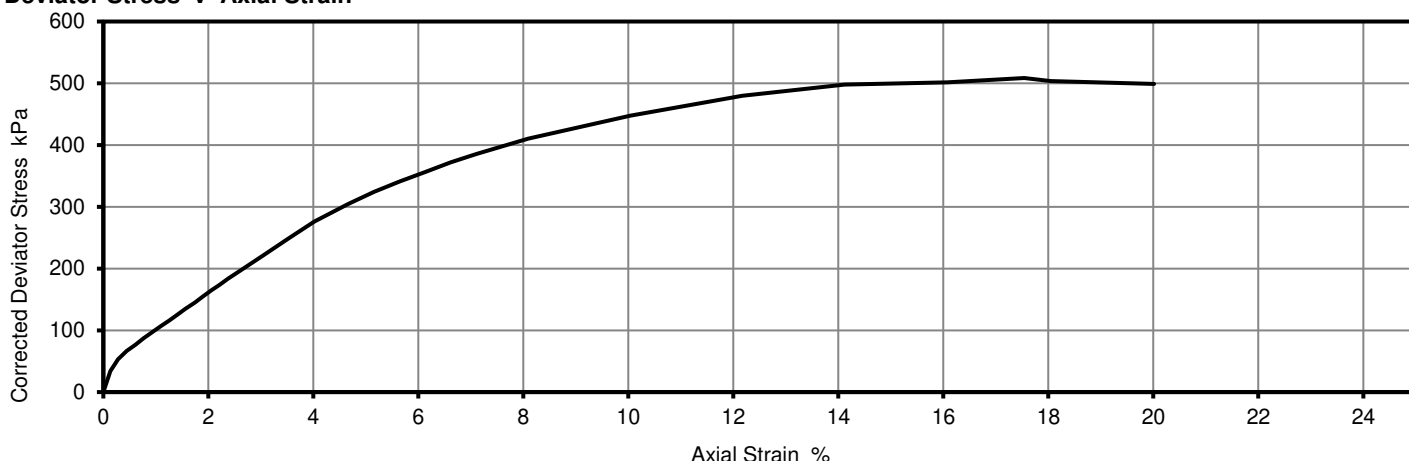
Test Results:

Laboratory Reference: 2535844
Hole No.: CP1 - U100
Sample Reference: Not Given
Sample Description: Brown slightly gravelly CLAY
Sample Preparation: Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.

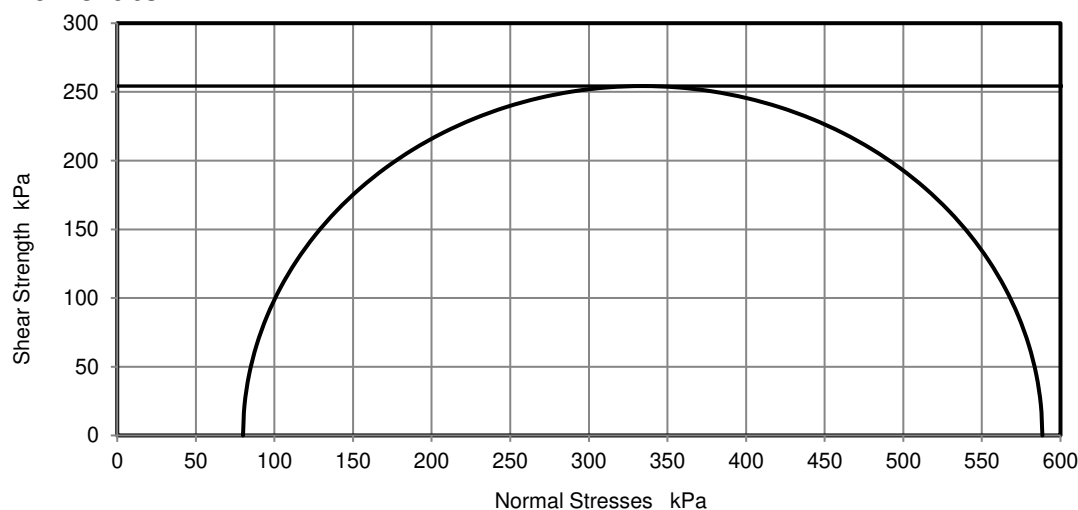
Depth Top [m]: 4.00
Depth Base [m]: 4.45
Sample Type: U

Test Number	1	Rate of Strain	1.98	%/min
Length	201.66	Cell Pressure	80	kPa
Diameter	102.98	Axial Strain at failure	17.5	%
Bulk Density	2.16	Deviator Stress, ($\sigma_1 - \sigma_3$) _f	508	kPa
Moisture Content	19	Undrained Shear Strength, c_u	254	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Dry Density	1.82	Mode of Failure	Compound	
Membrane Correction	0.90	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:

Signed:

Anna Dudzinska

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

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TEST CERTIFICATE

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

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

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

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: 06/12/2022
Date Received: 15/12/2022
Date Tested: 23/12/2022
Sampled By: Not Given

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

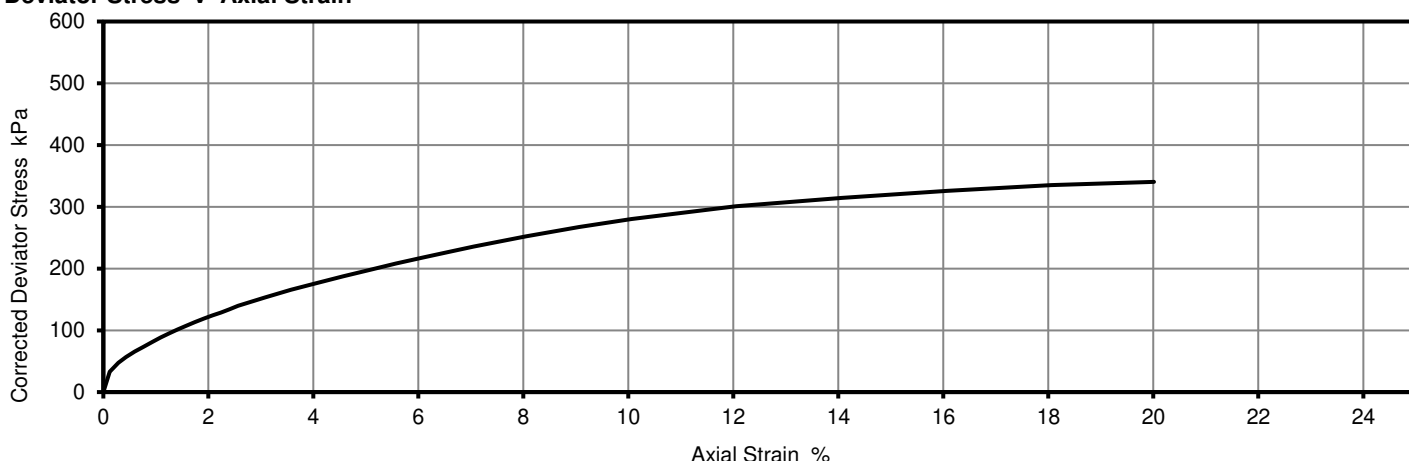
Test Results:

Laboratory Reference: 2535846
Hole No.: CP1 - U100
Sample Reference: Not Given
Sample Description: Brown slightly gravelly CLAY
Sample Preparation: Sample prepared in accordance with BS 1377-1:2016 Clause 9.1.1.

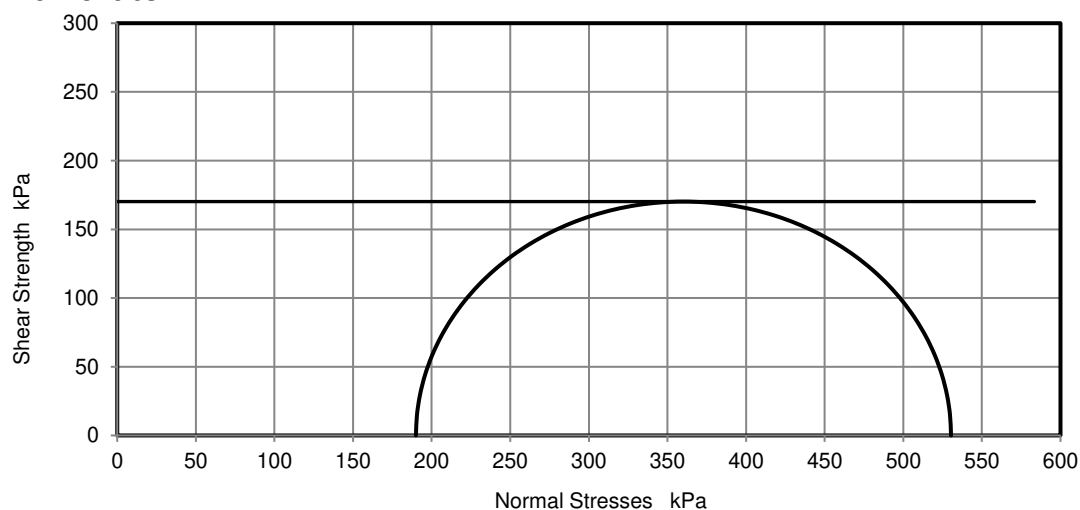
Depth Top [m]: 9.50
Depth Base [m]: 9.95
Sample Type: U

Test Number	1	Rate of Strain	2.00	%/min
Length	199.38	Cell Pressure	190	kPa
Diameter	103.37	Axial Strain at failure	20.0	%
Bulk Density	2.17	Deviator Stress, ($\sigma_1 - \sigma_3$) _f	340	kPa
Moisture Content	15	Undrained Shear Strength, c_u	170	kPa $\frac{1}{2}(\sigma_1 - \sigma_3)_f$
Dry Density	1.88	Mode of Failure	Compound	
Membrane Correction	1.04	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:

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Signed:

Anna Dudzinska

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



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

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



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

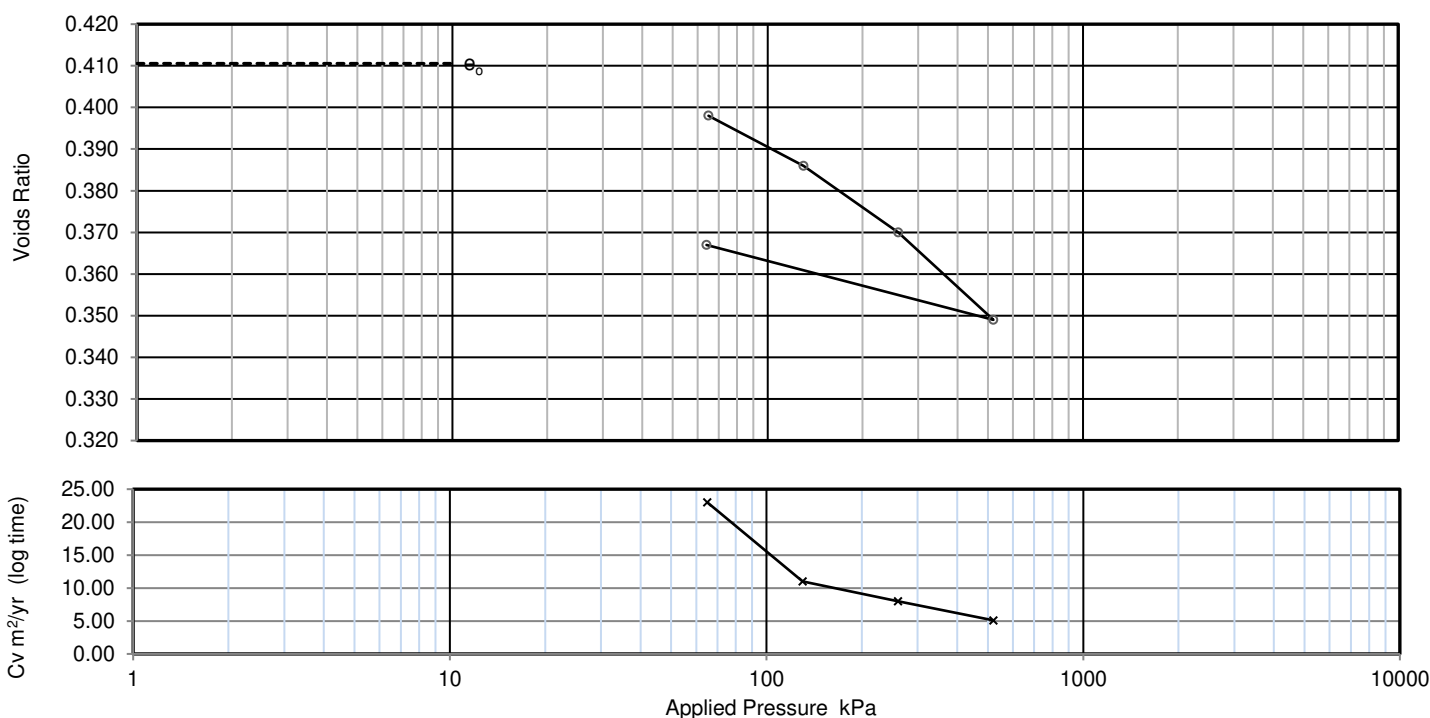
Contact: Russel Taylor
Site Address: Blackwin St

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

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

Laboratory Reference: 2535845
Hole No.: CP1 - U100
Sample Reference: Not Given
Sample Description: Brown gravelly slightly sandy CLAY

Depth Top [m]: 6.50
Depth Base [m]: 9.65
Sample Type: U

[illegible]

Preparation

Carried out on top of U100

Index tests

Orientation of the sample

Particle density

Liquid limit

Plastic limit

Specimen details

Diameter

Height

Moisture Content

Bulk density

Dry density

Voids Ratio

Saturation

Avg. temperature for test

Swelling Pressure

Settlement on saturation

Total test time

Vertical		
assumed	2.65	Mg/m3
N/A		%
N/A		%

Initial	Final	
50.20	-	mm
20.00	19.39	mm
16	16	%
2.19	2.26	Mg/m3
1.88	1.94	Mg/m3
0.411	0.367	
106	118	%
22.0		°C
Not measured		kPa
		%
5		days

Note: Cv corrected to 20°C

Remarks:

Signed:

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

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

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

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e: russell.taylor@curtins.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.

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 SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.048	0.087	0.047	0.072	0.052
Water Soluble SO ₄ 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

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 SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.039	0.07
Water Soluble SO ₄ 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

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

Curtins

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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**Logged by**

- 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

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

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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**Logged by**

- 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

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

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

Logged by

- 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

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

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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

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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

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**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

Appendix G – Detailed UXO Report

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

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.

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 <i>high probability</i> that <i>severe harm</i> could arise to a designated receptor from an identified hazard at the site without appropriate further action.
High Risk	<i>Harm is likely to arise</i> to a designated receptor from an identified hazard at the site without appropriate further action.
Moderate Risk	<i>It is possible</i> that without appropriate further action <i>harm could arise</i> to a designated receptor. It is relatively <i>unlikely</i> that any such harm would be <i>severe</i> , and if any harm were to occur it is <i>more likely</i> that such harm would be <i>relatively mild</i> .
Low Risk	<i>It is possible</i> that <i>harm could arise</i> to a designated receptor from an identified hazard. It is <i>likely</i> that, at worst, if any harm was realised any effects would be <i>mild</i> .
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.

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APPENDIX 6

UNITED UTILITIES RISK ASSESSMENT

Supplementary guidance for the selection of water pipes in land potentially affected by contamination

Introduction

In January 2011, UK Water Industry Research (UKWIR) published “Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites” (Ref 10/WM/03/21; the ‘UKWIR Guidance’). Its aim is to ensure that the correct materials are selected for water pipes and components to be used below ground in brownfield sites to protect the quality of drinking water whilst taking into account the service life of the water distribution system. It supersedes the Water Regulations Advisory Scheme (WRAS) Information and Guidance Note 9-04-03 “Laying Pipes in Contaminated Land” which has been withdrawn.

The UKWIR Guidance is for use by developers, self-lay organisations, water companies and consultants when planning, designing and constructing water mains and/or services in brownfield sites. It defines brownfield sites as “land or premises that have previously been used or developed. They may also be vacant or derelict. However, they are not necessarily contaminated.” The UKWIR Guidance states that it does not apply to greenfield sites; however, we consider this supplementary guidance and the relevant sections of the UKWIR guidance as being equally suitable for application to those greenfield sites considered to be potentially affected by contamination. Where greenfield sites are not affected by contamination a preliminary risk assessment (see below) will suffice.

The UKWIR Guidance also states that there should be no departure from its provisions “*except where formally approved by the Water Company, such departure being technically justifiable or representing advances in knowledge or product development*”.

We have adopted the UKWIR Guidance in principle and produced this company specific supplementary guidance (the ‘UUW Guidance’) which includes the Risk Assessment for Water Pipes (the ‘RA’).

This guidance does not cover operative safety, health exposure modelling or accidental pipe damage.

Risk Assessment for Water Pipes in Land Potentially Affected by Contamination

Any application for new water supplies to a development (construction of new properties, or renovation or conversion of existing buildings) in land potentially affected by contamination shall include a completed RA.

As a minimum a desk study (preliminary risk assessment) shall be provided with the RA in accordance with the framework in Environment Agency publication “Model Procedures for the Management of Land Contamination” (ref: CLR11) that sets out whether the land through

which the pipes are to be laid may be affected by contamination. The application of the source, pathway, receptor concept will be an integral part of any pipeline risk assessment. For each potential source (the contamination) and each potential receptor (the water pipe), consideration shall be given to whether a potential pathway between source and receptor exists, or may exist in the future, linking the two. There are normally only three pathways by which contamination may come into contact with water pipes. These are direct contact with the soil or backfill, an excessive vapour phase or a contaminated groundwater regime. If none of these conditions exist on site (adopting the source, pathway, receptor concept) then it is likely that extended and/or targeted soil testing will not be required and a simple risk assessment will suffice. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. The testing requirements are as described in the following section.

The signatories of the Water Supply Application Form and the RA must ensure that all assessments of land condition have been carried out in accordance with applicable current standards and guidelines by or under the direction of a suitably qualified competent person.

We require the competent person to be a) a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or b) a Specialist in Land Condition (SiLC) with appropriate geo-environmental experience.

How to contact us about the information in this leaflet



DeveloperServicesWater@uuplc.co.uk



0345 072 6067

Opening hours:
8am-5pm Mon to Thurs
8am-4.30pm Fri

Testing Requirements

The soil, rock and if appropriate groundwater tests that are required on all sites where the potential for organic contamination has been identified in the desk study and where water pipes are proposed to be laid must be accredited by United Kingdom Accreditation Service (UKAS) as a minimum and where commercially available the Environment Agency's Monitoring Certification Service (MCERTS). These accredited tests should be undertaken for:

Banded hydrocarbons EC5-EC10, EC10-EC16, EC16-EC40 (Total aliphatic and aromatic hydrocarbons for each banding may be summed). Aliphatic/aromatic fractionation and subsequent banding may be required should a more detailed site specific risk assessment be undertaken. The bandings have been amended to take into account readily available laboratory tests. The equivalent carbon number (EC) is used to assess petroleum hydrocarbon mixtures rather than the actual number of carbon atoms in the molecule in line with guidance issued by the Environment Agency (2005).

Volatile organic compounds (VOCs) (method by head space or purge & trap GCMS) with tentative identification of compounds greater than 20µg/kg. The method used should be capable of detecting a wide range of compounds listed in US EPA Method 8260C or similar. The method should include analysis of naphthalene.

BTEX (Benzene, toluene, ethyl benzene and xylenes) plus MTBE (Methyl-tertiary butyl ether) (by head space GCMS)

Semi-Volatile Organic Compounds (SVOCs) (method by GCMS) with tentative identification of compounds greater than 20µg/kg The method used should be capable of detecting the compounds listed in US EPA Method 8270D or similar. The total concentration of SVOCs excludes polycyclic aromatic hydrocarbons, ethers, nitrobenzene, ketones, aldehydes, phenols, cresols and chlorinated phenols. Phenols, cresols and chlorinated phenols which are detected by the SVOC analysis are given their own assessment criteria.

We do not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in the RA below replaces Table 3.1 of the UKWIR Guidance.

Where previous site uses include the use, storage, treatment, disposal or manufacture of any of the following, appropriate testing for these substances will be required:

- Ethers, nitrobenzene, ketones, aldehydes and amines. Note that the presence of amines on any site at the proposed pipe depth +/- 1.0m precludes the use of polyethylene. The methods of analysis and method of calculation of total concentrations of these compounds will need to be agreed with UUW.

To comply with the testing requirements, the suites of tests that are required on all brownfield sites where wrapped steel, wrapped ductile iron or copper pipes are to be laid as minimum must include:

- pH, Conductivity and redox potential

Sufficiency of Testing

Water pipes are normally laid at between 0.75 and 1.35m from finished ground level to crown of pipe. Samples taken and tested must represent both a) the soil in which the water pipes are to be laid and b) the soil down to at least 500mm below the underside of the proposed pipe. Where the proposed depth of the pipes is unknown at the time of application, soil samples representative of the ground condition between surface level and 1.5m below finished ground level shall be taken as a minimum. Where appropriate (see UKWIR Guidance) groundwater sampling and groundwater monitoring will also be necessary. Photo-ionisation detection (PID) monitoring along the proposed route of the pipeline may be employed, though this does not provide a definitive guide to the suitability of water pipe materials.

Where required a sufficient number of test results should be obtained from the material in which the pipes are to be laid. CLAIRE/CIEH 2008 "Guidance on comparing soil contamination data with a critical concentration" may be used, where appropriate, to justify the number of soil samples tested; however, this statistical model should not be used on heterogeneous materials or used to average test results from different types of materials.

Further guidance on representative sampling is contained within BS10175:2011 Code of Practice for the Investigation of Potentially Contaminated Sites, the Department of the Environment's Contaminated Land Research Report "Sampling strategies for contaminated land" prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4; 1994) and the Environment Agency's "Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination" (ref: R&D Technical Report P5-066/TR; 2000).

Where remediation has been carried out on the site, the test results obtained from validation samples will be used in the assessment. Where a horizontal capping system has been or will be employed using materials spread across a site, sufficient samples will need to be taken to characterise the capping material used and the results presented to UUW. However, the sufficiency of sampling on the horizontal capping system, in which the pipeline will be placed, may be assessed on the basis of the source, quantity and type of materials used.

Detection Limits

Only positive concentrations, ie those above the limit of detection should be used in summation of VOC and SVOC (or other test groups of compounds ie phenols, cresols and chlorinated phenols). Laboratory methods shall provide a minimum limit of detection of 10µg/kg for each individual VOC or SVOC (or other test groups of compounds) quantitatively detected in accordance with the methods described above. For tentatively identified compounds (TICs), only those compounds with a concentration of 20µg/kg or greater shall be used in the summation of VOC and SVOC (or other test groups of compounds).

Protective Measures

Where polyethylene, ductile iron, steel or copper pipes are to be laid on a brownfield site or other land potentially affected by contamination (whether or not it has been remediated) and where the concentrations exceed the generic guideline values set out in Table 1 of the RA, the developer shall provide either:

- a) a robust risk assessment to show how any contaminants will not significantly impact on proposed water supplies or buried assets over the lifetime of the assets; or
- b) more suitable pipe materials; or
- c) an engineering solution to protect the pipe work backed up by an adequate assessment of the risk.

Liquid free phase product (e.g. oil or free solvent layers) shall not remain in the ground or groundwater in the vicinity of water pipes, whether barrier pipe or any other pipe materials are used.

When designing pipe routes on land potentially affected by contamination, new preferential contamination pathways along the route of new water pipes shall not be created. Particular measures may be required to prevent the possible migration of contamination through pipe bedding and into controlled waters.

References

BS10175: 2011

"Investigation of Potentially Contaminated Sites Code of Practice"

CLAIRE/CIEH

"Guidance on comparing soil contamination data with a critical concentration" 2008

Department of the Environment Contaminated Land Research Report

"Sampling strategies for contaminated land"
prepared by The Centre for Research into the Built Environment, Nottingham Trent University (Ref: CLR 4) 1994

Environment Agency

"Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination"
(ref: R&D Technical Report P5-066/TR) 2000

Environment Agency

"Model Procedures for the Management of Land Contamination" (ref: CLR11), 2004

Environment Agency P5-080/TR3

"The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils", 2005

UK Water Industry Research (UKWIR)

"Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21) January 2011

Water Regulations Advisory Scheme (WRAS)

Information and Guidance Note 9-04-03

"Laying Pipes in Contaminated Land" 2002

Frequently asked questions

Why has UUW published supplementary guidance to the 'UKWIR Guidance for the Selection of Water Pipes to be used in Brownfield Sites'?

UUW agrees with the UKWIR Guidance in principle; we have published supplementary guidance to clarify some of the areas in which it will operate.

Does the UKWIR Guidance only apply to 'brownfield sites'?

Yes, the UKWIR Guidance does apply to brownfield sites; in addition United Utilities Water will apply this guidance and the UUW supplementary guidance to any greenfield sites which are potentially affected by contamination.

Who is responsible for completing/ signing the Risk Assessment for Water Pipes (RA)?

This may be the Developer, the Developers representative, or the competent person directing the land assessment. The signatory of the Risk Assessment for Water Pipes (RA) must ensure that all land assessments have been carried out in accordance with current standards and guidelines by or under the direction of a suitably qualified competent person. For water supply applications on land potentially affected by contamination, UUW requires the competent person to be either a chartered member of an appropriate professional body (such as the Institution of Civil Engineers, the Geological Society of London or the Royal Institution of Chartered Surveyors) with relevant experience of investigating contaminated sites or a Specialist in Land Condition (SiLC). This level of competency is intended to promote good practice and high professional standards and is no greater than that required for planning purposes by Local Authorities.

Do we need to agree the number and location of soil samples with the Water Company as indicated by the UKWIR guidance following the Preliminary Risk Assessment (PRA)?

Where a preliminary risk assessment (PRA) highlights the need for a site investigation UUW considers it is a responsibility of the qualified competent person directing the land assessment to determine the location and frequency of sampling. UUW's role would be to confirm that the appropriate

choice of pipe material has been made on the basis of the information provided.

What do we do if the pipe route is not known when the Site Investigation report is commissioned?

Where the route of the pipe is not known at the site investigation stage, then any resultant pipe selection needs to take account of any contamination found on the site. Consideration should be given to identifying the route and depth of the pipeline at the site investigation stage to avoid unnecessary testing.

Is it acceptable not to undertake a site investigation and specify the use of barrier pipe which seems to be suitable for all conditions?

Not all brownfield land is contaminated, and because of that a default to barrier pipe is not an acceptable approach to UUW, due to the possibility of higher installation and future maintenance costs. The approach as to whether a site investigation is needed should be risk based. For those sites where land may be affected by contamination appropriate testing shall be undertaken on the ground materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials.

Examples where defaulting to barrier pipe would not be acceptable:

- Where a capping layer (non-contaminated) is introduced within which the pipes will be installed.
- Sites with a potential low risk for contamination.
- Where liquid free phase product (e.g. oil or free solvent layers) is in the ground or groundwater in the vicinity of water pipes.
- Where the route of the pipe could be diverted to another suitable location free from contamination.

Are UUW employees who will assess the Design Proposals for contaminated sites suitably qualified?

It is the role of the Developer's suitably qualified competent person to deal with or direct the assessment of land. UUW's role is to assess the Risk Assessment for Water

Pipes and supporting Site Assessment Report (SAR) which is provided with any new water supply application (ie. it has been provided in the correct format, proposals for pipe selection are included, the methodology is in line with the UKWIR Guidance and UUW Supplementary Guidance, it has been directed by a suitably qualified competent person etc.). If UUW do need to provide assistance or information in deciding pipe materials then the assessment would be carried out under the direction of a suitably qualified competent person.

What happens to existing PE that is in the ground under the "old" guidelines?

The latest UKWIR guidance and UUW's supplementary guidance are intended to be used to decide what pipe materials will be used for new water mains and services. It will have no effect for developers with regard to any parts of UUW's existing network.

Will the Developer be required to submit a fully completed Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, for both the option of a mains requisition application and the option of a self-lay application?

Yes, UUW expect the 'Developer', as defined in UUW Supplementary Guidance, to submit a Risk Assessment for Water Pipes (RA) and supporting Site Assessment Report (SAR), including pipe material recommendation, in respect of any water pipes being installed on the development irrespective of who is to install them.

Does Table 1 in UUW's Risk Assessment for Water Pipes (RA) replace any of the tables to be completed in the Site Assessment Report (SAR) as required in the UKWIR Guidance?

UUW does not consider Table G1 and Table 3.1 of the UKWIR Guidance to be a definitive guide for assessing total concentrations. Table 1 in UUW's RA replaces Table 3.1 of the UKWIR Guidance.

Have any other Water Companies adopted the UKWIR Guidance yet?

You will need to contact the water company concerned if you are intending to install water pipes outside UUW's licensed area.

About us

United Utilities is the North West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

Risk assessment for water pipes (RA)

The risk assessment for water pipes will help you choose appropriate materials for your development. We are happy to deal with a risk assessment for water pipes in advance of any formal application for a new water supply.

If you need any help completing the form please call us on **0345 072 6067**.

Section 1: Development details	
Development name <i>(if it has one)</i>	Land off Blackwin Street
Development address	Blackwin Street, Manchester, M12 5LB
OS Grid reference <i>(mid point)</i>	387461E, 396809N
Developer's name	John Southworth Builders Limited
UUW reference number <i>(for UU use only)</i>	
Please provide details below of the current and historical use of the site and adjacent sites. <i>If your supporting information has details of the current and historical site use, please reference below the relevant sections of your report.</i> 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.	
Section 2: Preliminary risk assessment	
Has your desk study and site walkover identified any land potentially affected by contamination?	☐ Yes ☒ No
If the site is potentially affected by contamination but you have not completed any intrusive site investigation please provide details below of the rationale behind the intended pipe selection. <i>If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.</i> N/A intrusive works completed.	

Section 3: Intrusive site investigation																																	
Have you completed any intrusive site investigation?						☒ Yes ☐ No																											
Have you completed any none intrusive site investigation?						☐ Yes ☒ No																											
Date(s) when the site investigation(s) undertaken						<table><tr><td>0</td><td>5</td><td>1</td><td>2</td><td>2</td><td>0</td><td>2</td><td>2</td></tr><tr><td>1</td><td>2</td><td>1</td><td>2</td><td>2</td><td>0</td><td>2</td><td>2</td></tr><tr><td>D</td><td>D</td><td>M</td><td>M</td><td>Y</td><td>Y</td><td>Y</td><td>Y</td></tr></table>				0	5	1	2	2	0	2	2	1	2	1	2	2	0	2	2	D	D	M	M	Y	Y	Y	Y
0	5	1	2	2	0	2	2																										
1	2	1	2	2	0	2	2																										
D	D	M	M	Y	Y	Y	Y																										
At what level has groundwater been encountered?						metres below ground level or																											
						☒ Not encountered																											
Table 1 (Pipeline Selection Risk Assessment Summary (PSRAS)) below classifies testing required where the preliminary risk assessment has identified land potentially affected by contamination. Please provide details below of any test groups which have not been tested and the rationale for not testing. <i>If your supporting information has details of the rationale behind not testing any particular test groups, please reference below the relevant sections of your report.</i>																																	
VOCs, SVOCs and Cresols as no sources identified																																	
If the intrusive site investigation has identified concentrations above the PE threshold (see PSRAS) and your intended pipe selection is PE. Please provide details below of the rationale behind the intended pipe selection. <i>If your supporting information has details of the rationale behind the intended pipe selection, please reference below the relevant sections of your report.</i>																																	
The exceedances are not at pipeline depth and the exceedances were within the Made Ground which may be removed for human health purposes.																																	
Section 4: Site remediation																																	
Please provide details below of any site remediation (which may include a change in site levels) already completed. <i>If your supporting information has details of the site remediation already completed, please reference below the relevant sections of your report.</i>																																	
None completed.																																	
Has the PSRAS (Table 1) been completed using appropriate data after remediation?						☐ Yes ☐ No ☒ N/A																											
Please provide details below of any proposed site remediation and an analysis of whether this will affect your intended pipe selection. <i>If your supporting information has details of any proposed site remediation and whether this will affect your intended pipe selection, please reference below the relevant sections of your report.</i>																																	
N/A																																	

Section 5: Final use of site

Please provide details below of any chemicals (including fuel) to be stored on site and any other future contamination risks which may affect your intended pipe selection.

If your supporting information has details of potential contamination risks which may affect your intended pipe selection, please reference below the relevant sections of your report.

None, residential development.

What water pipe materials are intended to be used on site?

☒ PE ☐ PE Barrier Pipe Type A ☐ PE Barrier Pipe Type B
Other (please specify):

Section 6: Additional information

Please use the section below to provide any additional details to support your intended pipe selection.

PE pipe deemed appropriate as samples with elevated TPH are from Made Ground (0.00m - 0.30m bgl) which is located above pipeline depth and therefore is not considered a significant risk.

Section 7: Risk assessor

Name and relevant qualifications of person directing the risk assessment for water pipes

Mr Andrew Edwards (CEnv Institution of Environmental Sciences)

Name and address of risk assessor's company

IGE Consulting Ltd.
Office 16, Bartle House, Oxford Court, Manchester, M2 3WQ

Date risk assessment performed

2 1 0 2 2 0 2 4

Section 8: Declaration

I confirm I have completed this form and provided supporting information in accordance with 'UKWIR Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites' and UUW's Supplementary Guidance. I also confirm that if any further site investigation is needed and carried out, I will be required to submit an additional Risk Assessment for Water Pipes with the relevant supporting information. I understand that failure to supply any of the required information may delay my application being processed.

Name

Mr Andrew Edwards CEnv

Company

IGE Consulting Ltd.

Telephone

0161 914 9170

Date

2 1 0 2 2 0 2 4

Please email the completed form and supporting information to DeveloperServicesWater@uuplc.co.uk or post to us at United Utilities Water, Developer Services, Second floor Grasmere House, Lingley Mere, Warrington WA5 3LP.



About us

United Utilities is the North West's water company. We keep the taps flowing and toilets flushing for seven million customers every day. From Crewe to Carlisle, we work hard behind the scenes to help your life flow smoothly.

United Utilities Water Limited, Haweswater House, Lingley Mere Business Park, Lingley Green Avenue, Warrington WA5 3LP.
Registered in England and Wales. Registered Number 2366678.

Table 1 - Pipe selection risk assessment summary (PSRAS)

1. Testing must be undertaken on the materials within which the pipes are to be laid, whether that be existing ground materials, remediated materials or imported capping materials. Please use the appropriate testing data to complete Table 1 below.

2. If more than one pipe selection is being made, for example, for pipes in different areas of a large site, a completed PSRAS is required for each selection.

What materials have been tested to populate Table 1 below? ☒ Existing ground materials ☐ Remediated materials ☐ Imported capping materials

All concentrations in mg/kg								
Test Group	Testing Required?	PE threshold	Metal Pipes/ Barrier Pipe	Laboratory Detection Limit	Testing UKAS accredited Y/N	Maximum concentration at proposed pipeline depth See Note [2]	Maximum site concentration See Note [3]	Locations and depths where concentrations exceed proposed pipeline threshold
Total VOCs	Where Preliminary Risk Assessment (PRA) has identified land potentially affected by contamination	0.5	Pass	-	N/A	-	-	-
Total BTEX & MTBE		0.1	Pass	0.01	Y	<0.01	<0.01	N/A
Total SVOCs (excluding PAHs and those substances marked with an *)		2	Pass	-	N/A	-	-	-
EC5-EC10 aliphatic and aromatic hydrocarbons		2	Pass	0.01 - 3	Y	<0.1 - <3	4	WS3 at 0.20m - 0.30m
EC10-EC16 aliphatic and aromatic hydrocarbons		10	Pass	1	Y	<1	5	N/A
EC16-EC40 aliphatic and aromatic hydrocarbons		500	Pass	1	Y	5	330	N/A
Phenols* (from SVOC analysis)		2	Pass	0.2	Y	<0.2	<0.2	N/A
Cresols and chlorinated phenols* (from SVOC analysis)		2	Pass	-	N/A	-	-	-
Ethers*	Only where identified	0.5	Pass	-	N/A	-	-	-
Nitrobenzene*		0.5	Pass	-	N/A	-	-	-
Ketones*		0.5	Pass	-	N/A	-	-	-
Aldehydes*		0.5	Pass	-	N/A	-	-	-
Amines		Fail	Pass	-	N/A	-	-	-
Corrosive	Conductivity, Redox and pH	Pass	See Note [1]	-	N/A	-	-	-

Note [1] Threshold: For wrapped steel, corrosive if pH<7 and conductivity > 400µS/cm. For wrapped ductile iron corrosive if pH<5, Eh not neutral and conductivity > 400µS/cm. For copper, corrosive if pH<5 or >8 and Eh positive.

Note [2] Water pipes are normally laid at 0.75-1.35m below finished ground level.

Note [3] Also state if liquid free product is present in soil or groundwater.

IGE

consulting

IGE Consulting Ltd, Office 16, Bartle House, Oxford Court, Manchester, M2 3WQ

Tel: 0161 914 9170

Email: contact@igeconsulting.co.uk