

**Environmental
Geotechnical
Specialists**



PHASE 2 GEO-ENVIRONMENTAL REPORT

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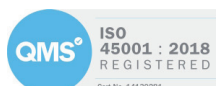
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Report on a Phase 2 Geo-environmental Investigation

Location: **Rushbrook Primary School**
Shillingford Road, Gorton, Manchester M18 7TN

For: Black Cat Building Consultancy Ltd

Consultants: Bell Munro Consulting Limited

Report No. C1742/21/E/2731

Report date: July 2021

For and on behalf of **Rogers Geotechnical Services Ltd**

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Report Summary¹

Item	Comments	Section
Development	Construction of a MUGA play area.	1.
Geology	Superficial geology – Till. Solid geology – Chester Formation.	5.
Strata Conditions	Reworked cohesive made ground present to depths of up to 1.6m. Cohesive and granular till deposits then revealed beneath the made ground.	6.
Groundwater	None encountered during investigation.	6.2
CBR	CBR values in excess of 5% were recorded.	10.
Effect of Sulphates	DC-1 concrete.	10.1
Contamination	Contamination levels did not exceed the appropriate screening values.	11.

¹ This summary should not be relied upon to provide a comprehensive review. All of the information contained in this document should be considered.



1. Introduction

It is understood that an existing playing field is to be developed by the construction of a MUGA. Consequently, a site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of the proposed development. This investigation also takes into consideration the risk of any contamination present. This report describes the work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

The recommendations made and opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of the laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between investigatory positions, these are for guidance only and no liability can be accepted for their accuracy.

This report has been prepared in accordance with our understanding of current best practice. However, new information or legislation, or changes to best practice may necessitate revision of the report after the date of issue.

3. Desk Study

A Phase 1 Desk Study has been undertaken by Rogers Geotechnical Services (RGS) and the results were presented as report number C1742/21/E/2729 in June 2021. This report has been used extensively during the current intrusive investigation.

4. Fieldworks

The fieldworks were undertaken on the 8th of June 2021 and included the following:

- Three windowless sample boreholes.
- Two machine excavated trialpits, utilised for insitu infiltration tests.
- Three TRL DCP tests.

The investigatory locations are shown on the site plan which is presented in Appendix 1 to this report. It should be appreciated that works were supervised by a UXO specialist. At each position, the ground was cleared at regular intervals with a magnetometer and CAT scan.



4.1 Windowless Sample Boreholes

These boreholes were sunk using a drive-in windowless sampler. The cores were undertaken in 1m lengths and reduced in diameter typically from 87mm for the first 1m through 77mm, 67mm for subsequent 1m increments. The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils were described in general accordance with BS5930: 2015 +A1: 2020 and full descriptions are given on the windowless sample records which are presented in Appendix 2. Also included on these records are the core diameters and percentages of core recovered.

4.2 Standard Penetration Tests

Standard penetration tests (SPT) were undertaken at regular depth increments within the windowless sample boreholes. The SPT was conducted in accordance with the procedures given in BS EN ISO 22476: Part 3: 2005 +A1: 2011, and the results are summarised on the borehole record. During this work an automatic trip hammer of 63.5kg falling through 750mm was employed to drive either a cone or split barrel sampler assembly into the ground and the recovered barrel samples were retained in air tight plastic containers.

4.3 Machine Excavated Trialpits

Two trialpits were excavated in order to undertake soakaway testing, the positions of which are shown in Appendix 1. The soakaway tests were undertaken at the base of the pit at depths rational to the construction of soakaways. The soils exposed in the trialpits were logged on site in general accordance with BS5930: 2015 +A1: 2020, and full descriptions are given on the trialpit records which are presented in Appendix 3, in addition to photographs of the trialpits. The results of the soakaway tests are presented in Appendix 4.

Once excavations were completed, the trialpits were carefully re-instated with the arisings. Whilst every care was taken during the infilling process, including compacting of the infill at regular intervals with the back acting arm of the excavator, it should be appreciated that some mounding of the surface may have resulted. Moreover, the infilled soils may be subjected to settlement over time, such that a depression in the surface may also occur. Therefore, the locations of any pits undertaken in this investigation should be conveyed to the current site user, as the mounds or depressions associated with the pits may present a risk to current site operations. Furthermore, it must be realised that the infilled pits represent an area of disturbance within the site soils, thus the soils at the pit locations may vary characteristically compared to the undisturbed ground. As such, foundations placed in this disturbed material may not perform as anticipated.

4.4 TRL Dynamic Concrete Penetrometer Tests

Three TRL Dynamic Cone Penetrometer tests were undertaken. The penetrometer consists of an 8kg slide hammer falling through 575mm onto an anvil, which drives a 20mm diameter 60° cone into the ground. The depth of the cone driven per blow of the hammer is recorded. The results of the dynamic penetration tests are presented as Appendix 5 and include graphs of penetration blows and CBR values versus depth.



5. Geology

The available published geological data for the site has been examined and the following table presents the anticipated geology.

Table 1: Geological Data for the Site

Strata Type	Strata Name ²	Description ³
Superficial Geology	Till	Drift generally over-consolidated and deposited directly by and underneath a glacier without subsequent reworking by glacial water. Consists of a heterogeneous mixture of clay, sand, gravel and boulders varying widely in shape and size.
Solid Geology	Chester Formation	In the Worcester Basin, West Midlands, Staffordshire, Cheshire and Leicestershire, the formation comprises conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone. The conglomerates have a reddish brown sandy matrix and consist mainly of pebbles of brown or purple quartzite, with quartz conglomerate and vein quartz. In these areas the formation generally fines upwards, from dominantly conglomerates at the base, to interbedded conglomerates and sandstones, with sandstone and pebbly sandstone predominant in the upper part, and rare mudstones.

6. Strata Conditions

The succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	Strata Type	Positions Encountered	Groundwater Strikes m below ground level
0.3 – 0.7	MADE GROUND (Cohesive)	TP01, TP02, WS01	None
1.3 – +1.6	MADE GROUND (Reworked cohesive)	TP02, WS01, WS02, WS03	None
1.4 – 1.6	Relict TOPSOIL	WS01, WS02	None
+1.55 – +3.45	Slightly sandy slightly gravelly silty CLAY	TP01, WS01, WS02, WS03	None
2.0 – +3.45	Clayey silty gravelly SAND	WS02, WS03	None

'+' denotes that the strata extended below the termination depth of the investigated positions, thus the extent of the deposit is only proven to the depths indicated

6.1 General Strata

The site was generally found to be capped by cohesive made ground, comprising reworked slightly sandy silty clay with occasional gravel of mudstone, siltstone, sandstone and rare brick, pottery and coal. This made ground was found to be present to depths of between 1.3m and 1.6m. Anecdotal evidence suggests that this material was site won during the construction of the school and associated playing fields. It should be noted that a geotextile membrane was revealed at most positions at a depth of 0.7m.

² Sources: British Geological Survey (NERC) Map Sheet 85; Manchester; Solid and Drift Edition, and Geology of Britain Viewer [*online resource from www.bgs.ac.uk*]



Beneath the made ground, a relict topsoil was observed at WS01 & WS02, before grading into slightly sandy silty clay with occasional gravel of mudstone, siltstone and sandstone. Such cohesive soils were revealed at all locations and were found to extend to the base of the positions with the exception of WS03, whereupon medium dense clayey silty fine and medium-grained sand was observed to the base of the borehole from 2.2m depth. The above mentioned soils are anticipated to represent superficial till deposits. Furthermore, it is anticipated that the site won reworked deposits are also of a similar origin.

6.2 Groundwater

No groundwater strikes were observed during the site investigation. However, it should be appreciated that the normal rate of boring does not permit the recording of an equilibrium water level for any one strike, moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions.

7. Insitu Testing

7.1 Standard Penetration Tests

The standard penetration test results are summarised in the following table:

Table 3: Summary of Standard Penetration Tests

Strata	Depth Range (m)	SPT 'N' (Blows/300mm)		Comments
		Granular soils	Cohesive soils	
MADE GROUND (Reworked cohesive)	1m	-	7 to 8	SPT's indicate a soft to firm in-situ condition.
Slightly sandy slightly gravelly silty CLAY	2m to 3m	-	12 to 31	SPT's indicate a firm to stiff in-situ condition.

7.2 Soakaway Tests

On reaching the elected soakaway test depth, the pit was trimmed and squared as much as practicable. Water was then introduced into the pit at a controlled rate to prevent collapse of the sides and the level monitored at time intervals relative to a reference bar at ground level. The results obtained from the soakaway tests are presented in Appendix 4 and are summarised below:

Table 4: Soakaway Test Results

Location	Soakage Area Dimensions (average) (m)	Depths of soaked strata (m)	Soil Description (of soaked strata)	Infiltration Rate (m/sec)	*Drainage Characteristics
TP01	0.70 x 1.60	1.00 to 1.60	Slightly sandy slightly gravelly silty CLAY.	Not obtained	Poor
TP02	0.60 x 1.50	0.96 to 1.86	Reworked (Slightly sandy slightly gravelly silty CLAY).	Not obtained	Poor



During the soakaway tests the water level did not achieve a fall from 75% to 25% of the effective depth of the storage volume in both trial pits. In both tests, the water level moved by 5mm, before then falling no further. It is considered that the initial movement was observed as water filled any gaps and fissures within the soils at the base and side of the pit. On this basis, the tests could not be completed within the scope of the method provided in BRE Digest 365 due to the poor soakage rates caused by the cohesive nature of the exposed soils. It should be noted that such soils were revealed to 3m depth within the windowless sample boreholes.

7.3 TRL Dynamic Cone Penetrometer Tests

TRL dynamic cone penetrometer tests were undertaken at positions across the area of the proposed MUGA and the results are summarised below:

Table 5: Summary of TRL Dynamic Cone Penetrometer Tests

Position	Depth Range (m)	Range of Average Equivalent CBR (%)	Comments
TRL01	0.3m to 0.5m	+25	Probes indicate an initial zone of variable but high equivalent CBR values. From ≈0.5m depth equivalent CBR notably decreases to the lower average.
	0.5m to 1.1m	+5	
TRL02	0.3m to 0.5m	+25	Probes indicate an initial zone of variable but high equivalent CBR values. From ≈0.5m depth equivalent CBR decreases to the lower average.
	0.5m to 0.9m	+10	
TRL03	0.3m to 0.5m	+25	Probes indicate an initial zone of variable but high equivalent CBR values. From ≈0.5m depth equivalent CBR notably decreases to the lower average.
	0.5m to 1.1m	+6	

8. Laboratory Testing - Geotechnical

The following programme of laboratory testing has been undertaken on samples obtained during this investigation:

- | | |
|--|-------------------------|
| ▪ Moisture content determinations | BS EN ISO 17892 |
| ▪ Index properties (1 point) | BS EN ISO 17892 |
| ▪ Linear shrinkage | BS 1377: 1990: Pt2: 6.3 |
| ▪ Particle size distribution (Dry sieve) | BS EN ISO 17892 |
| ▪ Soluble sulphate content | BS 1377: 1990: Pt3: 5 |
| ▪ pH value | BS 1377: 1990: Pt3: 9 |

The test results are presented in Appendix 6 and are summarised below:

Table 6: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Moisture content determinations	4	17% to 25%		At or close to the plastic limit.
Index properties (1 Point)	3	LL	28% to 47%	Clay of low to intermediate plasticity. Consistency index 0.9 NHBC Class – Low to Medium
		PL	15% to 19%	
		PI	13% to 28%	
		LS	5% to 12%	



Particle size distribution (Dry sieve)	1	Gravel Sand Silt/Clay	9% 87% 4%	Uniformly graded slightly silty gravelly SAND Uniformity coefficient 1.9 Curvature coefficient 0.88
Soluble sulphate & pH	3	SO ₄ pH	78 to 240 mg/l 8.3 to 8.4	ACEC Classification AC-1s.

8.1 Geotechnical Properties

The idealised geotechnical properties employed in design are summarised below.

Table 7: Summary of Geotechnical Properties

Property	Range of values	Comments
Volume change potential (NHBC)	Low to Medium	Silty sandy CLAY
Concrete classification	DC1	Brownfield ground locations (Static water)

9. Laboratory Testing - Environmental

A suite of testing was conducted on samples from across the site and the following regime was undertaken.

- Metals – Cd, Cr^{VI}, Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN⁻ and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO₄²⁻, asbestos screen.

This testing was undertaken by Eurofins Chemtest Ltd and the results of all of the chemical testing are presented in Appendix 6 of this report.

10. Discussion of Ground Conditions - Geotechnical

It is understood that the site is to be developed by the construction of a MUGA. It should be noted that the reworked made ground was noted to be generally present in a firm insitu condition. As such, it is not anticipated that excessive or differential settlement will occur for the proposed development.

It is considered that any hard-standing at the site could be constructed employing traditional pavement design. A design California Bearing Ratio (CBR) of 5% could be employed in the pavement design³. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the

³ Table 11.1, *Reproduction of TRRL Report LR1132 (1984)*, Smith (2006), Smith's Elements of Soil Mechanics, 8th ed.



winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

Should concrete need to be placed, in view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2⁴, which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-1 requirements. Assuming static groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1s. In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1⁵, which can be found in Part D, *Specifying concrete for general cast-in-situ use*, of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

10.1 Surface Water Drainage

An extensive thickness of cohesive made ground has been revealed beneath the site. Whilst isolated pockets of sand have been revealed, these are too sporadic in nature to be relied upon for natural drainage. Indeed, the infiltration testing has revealed that the soils have poor drainage characteristics. Whilst the cohesive soils included a secondary fraction of sand and gravel, these soils cannot be recommended as a soakage stratum due to the poor infiltration rates. Moreover, anecdotal evidence suggests that the school currently has a pumping system during heavy periods of rainfall, further suggesting poor drainage conditions exist at the site. Therefore, soakaways cannot be recommended and an alternative form of drainage should be adopted.

11. Discussion of Ground Conditions - Environmental

11.1 Discussion of Test Results

It is understood that the site is to be developed by the construction of a MUGA. Given the development shall be within the grounds of a school, screening values for a residential with plant uptake have been utilised in analyses.

11.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 1.6% and 2.1%. On this basis, it is considered that the screening values associated with 1% SOM should be adopted. These values have been derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website⁶ and these include many local authorities.

⁴ Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*

⁵ Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

⁶ <http://www.atrisksoil.co.uk/pages/general/subscribers.asp>



A comparison of the results of the testing, together with the data given above, can be found within Appendix 6. These results indicate the following:

Table 8: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
WS01	0.6	PAHs (chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene)
WS02	0.4	PAHs (indeno(1,2,3-cd)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene)
WS03	0.7	None

Concentrations of chromium^{VI}, phenols (total) and total petroleum hydrocarbons were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values. In addition, no asbestos was detected within the soils samples tested.

It should be appreciated that the soil screening values for PAHs and TPHs (where appropriate) represents vapour saturation limits. The inhalation of vapour pathway contributes less than 10% of total exposure, which is unlikely to significantly affect the combined assessment criterion⁷. In view of this, the ATRISK soil SSVs notes that the users may wish to consider using a combined assessment criterion if free product is not observed, the values for which are also provided on the summary of contamination analysis. It is therefore considered that the criteria for no free product should be adopted for the PAHs and TPHs at this site. The results of the contaminants found to exceed these screening values are tabulated below:

Table 9: Summary of Areas Contaminated by PAHs & TPHs

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with Plant Uptake)
WS01	0.6	None
WS02	0.4	None
WS03	0.7	None

On the basis of the above information, the results of the investigation have concluded that the site is generally uncontaminated for the proposed end use.

11.2 Site Specific Risk Assessment

11.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency⁸ advice on the assessment of risks arising from the presence of contamination

⁷ Ref: ATRISK soil, SSVs derived using CLEA v1.071 for 1% SOM, Residential with home grown produce land use, 23.06.17.

⁸ R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.



in soils and using the source-pathway-receptor approach.⁹ This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'¹⁰

11.2.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 10. Sources of contamination include the following:

On-site – Made Ground.

The preliminary risk assessment has been evaluated with reference to the following ratings and definitions:

N/A -	A source-pathway-receptor linkage is not considered to exist and therefore a risk assessment is not required.
Low -	A pollution linkage is unlikely and/or the likelihood of harm occurring is low and of minor consequence.
Moderate -	The linkage exists but the likelihood of harm occurring is not considered to be significant although remedial action may be necessary
High -	The linkage exists and the available data indicates that significant harm may be caused and remedial action could be necessary.

The results of the risk assessment are presented in Table 10.

⁹ The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.

¹⁰ See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.



Table 10: Conceptual Site Model and Site Specific Risk Assessment

Conceptual Site Model			Site Specific Risk Assessment	
Pathways	Receptor	Linkage Present?	Risk Rating	Notes
Direct contact/dermal absorption/soil ingestion	Operative	No – no significant contamination found to be present at the site.	N/A	No further action required.
	End User		N/A	
	Neighbours		N/A	
Inhalation of Dust/Vapours	Operative	No – no significant contamination found to be present at the site.	N/A	No further action required.
	End User		N/A	
	Neighbours		N/A	
Ingestion of fruit/vegetables and/or waters	Operative	No – no significant contamination found to be present at the site.	N/A	No further action required.
	End User		N/A	
	Neighbours		N/A	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	No – no landfill present within 250m of the site. Moreover, development is open-air in nature.	N/A	No further action required.
	End User		N/A	
	Neighbours		N/A	



Spillage/loss/run off direct to receiving water	Controlled Waters	No – whilst known controlled waters are present within 250m, no significant contamination was found to be present at the site.	N/A	No further action required.
Migration via permeable unsaturated strata	Controlled Waters	No – whilst principal and secondary undifferentiated aquifers are present beneath the site, no significant contamination was found to be present at the site.	N/A	
Run off via drainage/sewers etc	Controlled Waters	No – old services may be present on site, however no significant contamination was found to be present at the site.	N/A	
Direct contact with contaminated soils	Plants	No – no significant contamination found to be present at the site.	N/A	No further action required.
Uptake via root system			N/A	
Direct contact with contaminated soils	Building Materials	Yes – the contaminants and pH levels revealed at the site may represent a limited risk to building materials or plastic water pipes. Concrete classification testing indicates that the aggressive chemical environment is AC-1s.	Low (plastic services)	Please see section 11.3 for information on good building practice.
Direct contact with contaminated groundwater			Low (buried concrete)	
Exposure to Radon	Operative End User	No – Not in a radon affected area.	N/A	The publication BR211 states that no protection measures are necessary.
UXO Risk	Operative End User	Yes – the site remains at a moderate risk from UXO.	Moderate	This should be conveyed to site operatives during the construction phase.



11.3 Indicative Remediation Strategy

In view of the site specific risk assessment it is considered that it will not be necessary to undertake any specific remediation at this site. It should be appreciated, however, that careful inspection of the subgrade should be made during the groundworks. Should areas of contamination be detected then further testing may become necessary.

11.3.1 General Approach to Construction

In order to fulfil the objectives defined above it is likely that the following remedial strategy could be utilised. It is recommended that a pragmatic approach be undertaken, with observational techniques being employed at each stage of the work.

Ground-works

During the ground-works phase of the development, protection to the site operatives is required. The risk to site operatives is considered under the Health and Safety at Work Act 1974, together with regulations made under the act, which includes the Control of Substances Hazardous to Health (COSHH) regulations. Therefore, the risks to site personnel must be considered under the Construction Design and Management (CDM) regulations at the planning stage and be included in the contractor's Health and Safety Plan and site specific Method Statements. These documents should include the following main elements.

- Site operatives at all levels should be made aware of the fundamental principles of identifying potentially contaminated soils and the hazards of working with such soils not identified by the ground investigation.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use at all times.
- Where vehicles are transferring soil to landfill site they should be covered to prevent any potential contamination of the surrounding area by dust.
- Any stockpiles of soil should be sheeted over to prevent excessive amounts of airborne dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer any potential contamination to surrounding areas.
- A suitable UXO risk assessment should be undertaken and, where necessary, appropriate supervision should be provided during the groundworks phase.

On completion of the ground-works a careful site inspection of the sub-grade would be required. Should visual or olfactory evidence of contamination be revealed then further testing may become necessary.



Construction

During the construction phase of the development the following items are required to protect the structure from the potential contaminants revealed at this site.

- Beneath, pavements and hard-standings clean inert granular sub-base should be employed.
- For buried concrete the results of the sulphate and pH testing indicate that the design sulphate class for the site should be DS-1.
- New plastic services should be constructed in a surround of clean inert material and selected in accordance with the recommendation given in the United Kingdom Water Industry Research (UKWIR) website under Report Ref. No. 10/WM/03/21 - 'Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites'. The statutory water authority for the area in which site is located may have a risk assessment form to complete which allows these recommendations to be met. It should be noted that further determinand specification contamination testing may be necessary.

11.4 Fill Materials

It should also be appreciated that any fill material, either site-won or imported, to be employed at the site should be subjected to the following assessment to determine its suitability.

Fill materials should be initially screened, by a suitably qualified engineer to establish that:

- It is a suitable growing media if it is to be employed as such, including compliance with BS3883 (2007)
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing
- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG¹¹ documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Table 11: Validation Sampling and Testing

Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone (to confirm the inert nature of the material)	Standard metals/metalloids (As, Cd, Cr, Cr ^{VI} , Cu, Hg, Ni, Pb, Se, Zn)

¹¹ YALPAG *Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V3.3* Appendix 1a, October 2016.



Crushed Hardcore, Stone, Brick	Minimum 1 per 1000m ³	Standard metals/metalloids as above plus PAH (16 USEPA) and Asbestos
Greenfield/ Manufactured Soils	The greater of a minimum of 3 or 1 per 250m ³	Standard metals/metalloids as above plus PAH (16 USEPA) and Asbestos
Brownfield/ Screened Soils	The greater of a minimum of 6 or 1 per 100m ³	Standard metals/metalloids as above plus PAH (16 USEPA), TPH (CWG banded) and Asbestos Any additional analysis dependant on the history of the donor site.

The screening values for the above regime should also be agreed with any regulatory bodies; however, the following is recommended in the first instance.

Table 12: Fill Screening Values			
Contaminant	Screening Value (Residential with Plant Uptake) (mg/kg)		Reference
	1% SOM	6% SOM	
As	37	37	Atrisk ^{SOIL} SSVs
Cd	22.1	22.1	Atrisk ^{SOIL} SSVs
Cr(VI)	3.62	3.63	Atrisk ^{SOIL} SSVs
Cu	4730	4790	Atrisk ^{SOIL} SSVs
Hg	8.81	15.8	Atrisk ^{SOIL} SSVs
Ni	136	136	Atrisk ^{SOIL} SSVs
Pb	200	200	Atrisk ^{SOIL} SSVs
V	136	138	Atrisk ^{SOIL} SSVs
Zn	20000	20300	Atrisk ^{SOIL} SSVs

Please see summary sheet within Appendix 7 for full screening values including PAHs & TPHs.

The above screening values should be considered with respect to the Soil Organic Matter (SOM) of the subject material i.e. 1% SOM would be typical for granular fill and 6% SOM for topsoil. Testing should comply with UKAS and MCERTS, where applicable, and undertaken by an accredited laboratory.

Where the material has been derived from a commercial company, certificates or other industry quality protocol compliance i.e. WRAP should be obtained. However, it will be necessary to ensure that this documentation specifically related to the material being imported, it is no more than two months old and complies with the screening and frequency requirements given above.

Suitable fill materials should be either placed immediately or sufficiently quarantined to prevent cross-contamination. If it is necessary, the quarantined material should be placed on appropriate sheeting and covered to prevent it becoming mixed with contaminated soils or dust, or penetrated by mobile contaminants.



12. Recommendations for Further Work

- This report should be forwarded to the relevant authorities as soon as practicable to ensure they have sufficient time to review and discuss any issues.
- Discussions with ground work contractors in relation to the requirement for testing of materials to be disposed off-site (Waste Acceptance Criteria) and the suitability of imported materials.
- Discussions with service providers regarding suitable materials for pipe work given the nature of chemical determinands found within the soils on site.
- Detailed design of the sub-structure.

Clearly Rogers Geotechnical Services Ltd would be happy to offer advice with respect to the above and assist where necessary.



13. References

- British Geological Survey (NERC) (2021), BGS, Keyworth.
 - Geology of Britain Viewer:
(http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)
 - Lexicon of Named Rock Units:
(<http://www.bgs.ac.uk/lexicon/>)
- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes*, B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-3: *Geotechnical investigation and testing – Field testing, Part 3: Standard penetration test*, B.S.I., London.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations*, B.S.I., London.
- British Standards Institution (2011), BS 10175: *Investigation of potentially contaminated sites – Code of Practice*, British Standards Institute.
- British Standards Institution (2017) BS EN ISO 14688: *Geotechnical investigation and testing – Identification and classification of soil*, B.S.I., London.
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground, BRE Press, Garston.
 - Part C: *Assessing the aggressive chemical environment*.
 - Part D: *Specifying concrete for general cast-in-situ use*.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs (2014) SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*.



Appendix 1

Site Plan



Notes:
Investigation positions approximated from site operative's notes.



Rogers Geotechnical Services Ltd
Offices 1 & 2, Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU
Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:
AHR

Job Number:
C138/19/E/246

Project Details:
Oak C E Primary School,
Dryclough Road, Huddersfield.

Scale: Not to scale - reference only

ground investigation

drilling & excavation

insitu testing

laboratory testing & gas monitoring

engineering consultancy

surveying & flood risk assessments

training, CPD & expert witness

... delivered using our own drilling rigs / crews / soils lab / engineers

Constructionline

CHAS

ISO 9001:2015

ISO 14001:2015

CHAS

ISO 9001:2015

CHAS

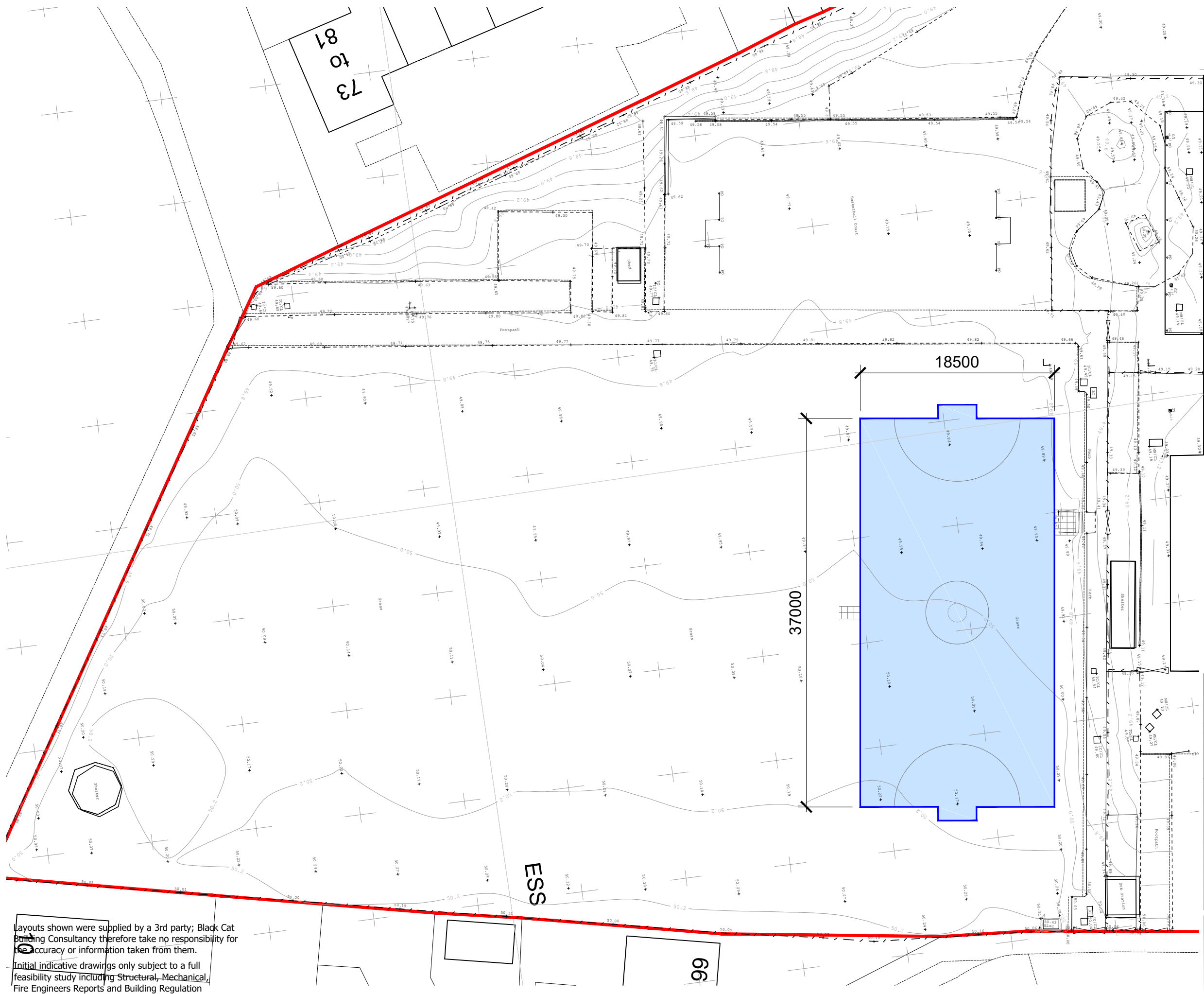
ISO 9001:2015

CHAS

ISO 9001:2015

CHAS

ISO 9001:2015



Rushbrook Prima Academy

Client	
Contract RUSHBROOK PRIMARY SCHOOL GORTON	
Drawing PROPOSED PLAYING AREA TOPOGRAPHICAL SURVEY	
Drawing No BCC-RBS-D02-003	Scales 1:350@A3
Revision	Drawn
Date APR '21	Checked



Layouts shown were supplied by a 3rd party; Black Cat Building Consultancy therefore take no responsibility for the accuracy or information taken from them.

Initial indicative drawings only subject to a full feasibility study including Structural, Mechanical, Fire Engineers Reports and Building Regulation / Warrant Legislation.



Appendix 2

Borehole Records



Borehole Log

Borehole No.

WS01

Sheet 1 of 1

Project Name: Rushbrook Primary School

Project No.
C1742/21/E/2731

Co-ords:

Hole Type
WLS

Location: Shillingford Road, Gorton, Manchester M18 7TN

Level:

Scale
1:50

Client: Black Cat Building Consultancy Ltd

Dates: 08/06/2021

Logged By
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.10					0.10			MADE GROUND (Loose brown fine SAND).	
		0.30					0.30			MADE GROUND (Firm brown gravelly CLAY. Gravel is sub-angular fine to coarse of brick).	
		1.00	SPT	87	100	N=7 (1,1/1,2,2,2)				REWORKED (Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is sub-rounded sub-angular fine and medium of mudstone, siltstone, sandstone and rare brick).	1
				77	40		1.30			0.3m: Brick cobble. 0.7m: Geotextile membrane.	
		2.00	SPT			N=15 (2,2/3,3,4,5)	2.00			RELICT TOPSOIL (Soft dark brown organic slightly sandy silty CLAY). No recovery.	2
				67	100					Stiff brown slightly sandy slightly gravelly silty CLAY. Sand is fine and medium. Gravel is sub-rounded to sub-angular fine and medium of mudstone, siltstone, sandstone and rare coal.	3
		3.00	SPT			N=29 (3,4/6,8,7,8)					
							3.45			End of Borehole at 3.45m	

Remarks

Borehole supervised by UXO engineer. Stainless steel casing utilised.





Borehole Log

Borehole No.

WS02

Sheet 1 of 1

Project Name: Rushbrook Primary School

Project No.
C1742/21/E/2731

Co-ords:

Hole Type
WLS

Location: Shillingford Road, Gorton, Manchester M18 7TN

Level:

Scale
1:50

Client: Black Cat Building Consultancy Ltd

Dates: 08/06/2021

Logged By
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.05					0.05			TOPSOIL (Loose slightly organic silty fine SAND).	
		0.60	D	87	100					REWORKED (Firm brown slightly sandy slightly gravelly silty CLAY. Locally organic with rare rootlets. Gravel is sub-rounded sub-angular fine and medium of mudstone, siltstone, sandstone and rare brick and pottery).	1
		1.00	SPT			N=8 (1,2/2,2,2,2)					
				77	85		1.40			Soft brown brownish grey organic silty CLAY. Rare rootlets.	
		1.75	D				1.60				
		2.00	SPT			N=14 (2,2/3,3,4,4)	2.00			Loose to medium dense brown slightly silty gravelly fine and medium SAND.	2
				57	100					Stiff brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine and medium of mudstone, siltstone, sandstone and rare coal.	3
		3.00	SPT			N=31 (3,5/7,7,8,9)					
							3.45			End of Borehole at 3.45m	4
											5
											6
											7
											8
											9
											10

Remarks

Borehole supervised by UXO engineer. Stainless steel casing utilised.





Borehole Log

Borehole No.

WS03

Sheet 1 of 1

Project Name: Rushbrook Primary School

Project No.
C1742/21/E/2731

Co-ords:

Hole Type
WLS

Location: Shillingford Road, Gorton, Manchester M18 7TN

Level:

Scale
1:50

Client: Black Cat Building Consultancy Ltd

Dates: 08/06/2021

Logged By
RAP

Well	Water Strikes	Samples and In Situ Testing					Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Dia. (mm)	TCR (%)	Results					
		0.80	D	87	100	N=7 (1,1/1,2,2,2)	0.70			REWORKED (Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is sub-rounded sub-angular fine and medium of mudstone, siltstone, sandstone and rare brick).	1
		1.00	SPT							REWORKED (Soft to firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine and medium. Gravel is sub-rounded to sub-angular fine and medium of mudstone, siltstone, sandstone and rare coal).	
		1.50	D	77	85	N=21 (2,3/5,5,5,6)	1.40			0.7m: Geotextile membrane.	2
		2.00	SPT				2.20			Firm brown mottled greyish brown slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is sub-rounded to sub-angular fine and medium of mudstone, siltstone, sandstone and coal.	
		3.00	SPT	57	80	N=12 (2,2/3,4,3,2)	3.45			Medium dense greyish brown clayey silty fine and medium SAND.	3
										End of Borehole at 3.45m	4
											5
											6
											7
											8
											9
											10

Remarks

Borehole supervised by UXO engineer. Stainless steel casing utilised.





Appendix 3

Trialpit Records



Trial Pit Log

Trialpit No

TP01

Sheet 1 of 1

Project Name: Rushbrook Primary School

Project No.
C1742/21/E/2731

Co-ords: -

Level:

Date

08/06/2021

Location: Shillingford Road, Gorton, Manchester M18 7TN

Dimensions
(m):

1.6

Depth
1.55

0.7

Scale

1:50

Logged
RAP

Client: Black Cat Building Consultancy Ltd

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.70			MADE GROUND (Firm to stiff brown slightly gravelly silty CLAY. Gravel is sub-angular fine to coarse of brick sandstone mudstone and rare coal. Broken corrugated pipe also revealed at 0.5m (waste)).	
				1.55			Firm brown slightly sandy slightly gravelly silty CLAY. Sand is fine and medium. Gravel is sub-rounded to sub-angular fine and medium of mudstone, siltstone, sandstone and rare coal. <u>0.7m: Membrane.</u>	1
							End of pit at 1.55 m	2
								3
								4
								5
								6
								7
								8
								9
								10

Remarks: Trialpit supervised by UXO engineer. Excavation took 45mins due to firm ground.

Stability: Good







Trial Pit Log

Trialpit No

TP02

Sheet 1 of 1

Project Name: Rushbrook Primary School

Project No.
C1742/21/E/2731Co-ords: -
Level:Date
08/06/2021

Location: Shillingford Road, Gorton, Manchester M18 7TN

Dimensions
(m):

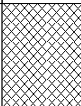
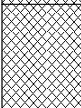
1.5

Client: Black Cat Building Consultancy Ltd

Depth
1.86

0.6

Scale
1:50Logged
RAP

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.70			MADE GROUND (Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is subrounded and sub-angular fine and medium of mudstone, siltstone, sandstone and rare brick).	
							REWORKED (Firm to stiff slightly sandy slightly gravelly silty CLAY. Sand is fine to coarse. Gravel is sub-rounded fine and medium of mudstone siltstone sandstone and rare coal).	1
							<i>0.7m: Membrane.</i>	
				1.86			<i>1.6m: Possibly natural.</i>	
							End of pit at 1.86 m	2
								3
								4
								5
								6
								7
								8
								9
								10

Remarks: Trialpit supervised by UXO engineer. Excavation took 45mins due to firm ground.

Stability:







Appendix 4

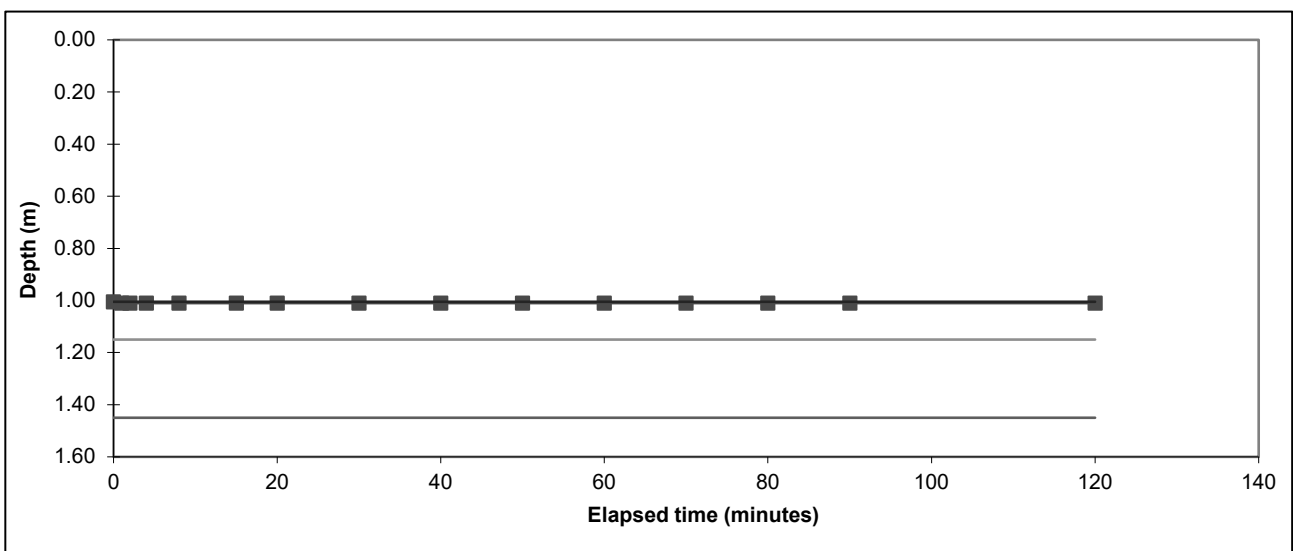
Soakaway Records

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	TP01	Test No:	1	Date:	08.06.21
Length (m):	1.600	Datum Height:			0.00 m agl
Width (m):	0.70	Granular infill:	None		
Depth (m):	1.60	Porosity of infill:	1	(assumed)	

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.005	120	1.010
1	1.010		
2	1.010		
4	1.010		
8	1.010		
15	1.010		
20	1.010		
30	1.010		
40	1.010		
50	1.010		
60	1.010		
70	1.010		
80	1.010		
90	1.010		



Start water depth for analysis (mbgl):	1.01		
75% effective depth (mbgl):	1.15	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.30		
25% effective depth (mbgl):	1.45	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.60		
Volume outflow between 75% and 25% effective depth (m ³):			
Mean surface area of outflow (m ²):			2.50
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
--------------------------------------	--

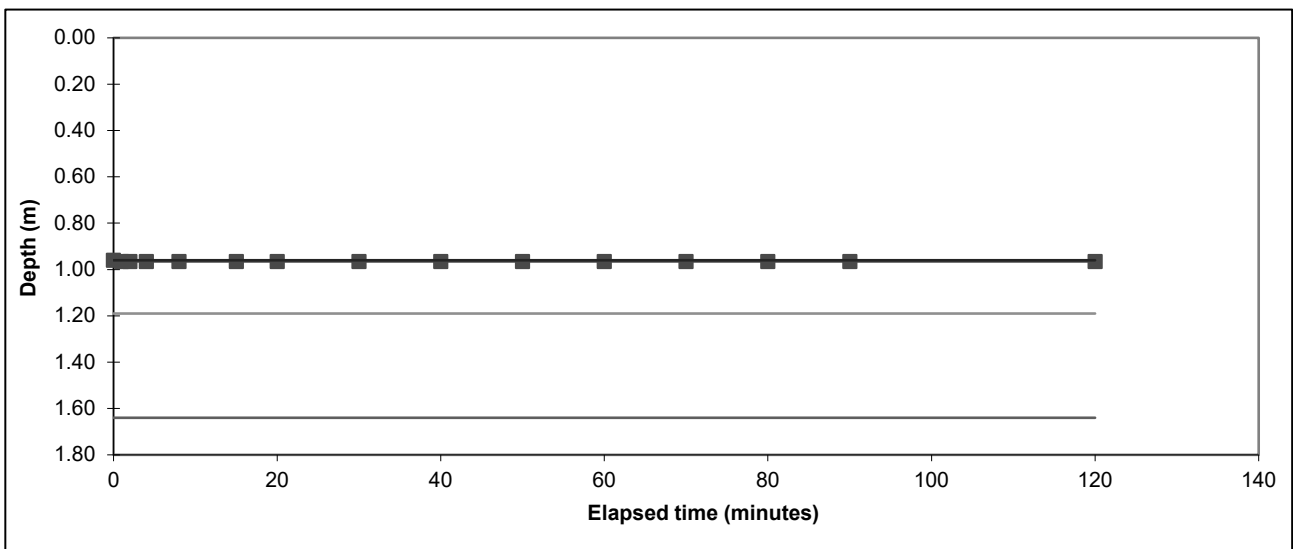
Remarks	Results processed following BRE 365 (2007).
----------------	---

Client:	Black Cat Consultancy	Job No:	
Site:	Rushbrook Primary School		C1742/21/E

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	TP02	Test No:	1	Date:	08.06.21
Length (m):	1.500	Datum Height:		0.00 m agl	
Width (m):	0.60	Granular infill:	None		
Depth (m):	1.86	Porosity of infill:	1	(assumed)	
		Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
		0	0.960	120	0.965
		1	0.965		
		2	0.965		
		4	0.965		
		8	0.965		
		15	0.965		
		20	0.965		
		30	0.965		
		40	0.965		
		50	0.965		
		60	0.965		
		70	0.965		
		80	0.965		
		90	0.965		



Start water depth for analysis (mbgl):	0.96		
75% effective depth (mbgl):	1.19	Elapsed time (mins):	#N/A
50% effective depth (mbgl):	1.41		
25% effective depth (mbgl):	1.64	Elapsed time (mins):	#N/A
Base of soakage zone (mbgl):	1.86		
Volume outflow between 75% and 25% effective depth (m ³):			
Mean surface area of outflow (m ²):		2.79	
(side area at 50% effective depth + base area)			
Time for outflow between 75% and 25% effective depth (mins):			

Soil infiltration rate (m/s):	Test incomplete as 25% effective depth not achieved. Unable to reliably determine soil infiltration rate.
--------------------------------------	--

Remarks	Results processed following BRE 365 (2007).
----------------	---

Client:	Black Cat Consultancy	Job No:	
Site:	Rushbrook Primary School		C1742/21/E



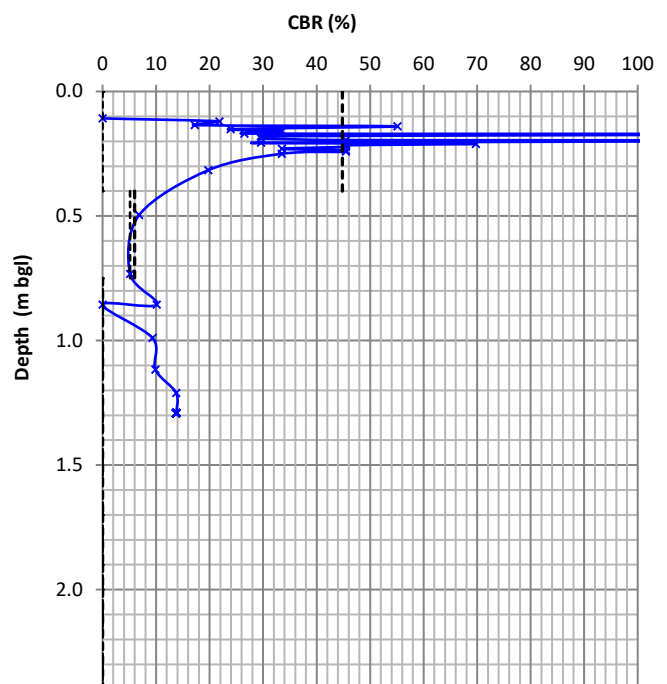
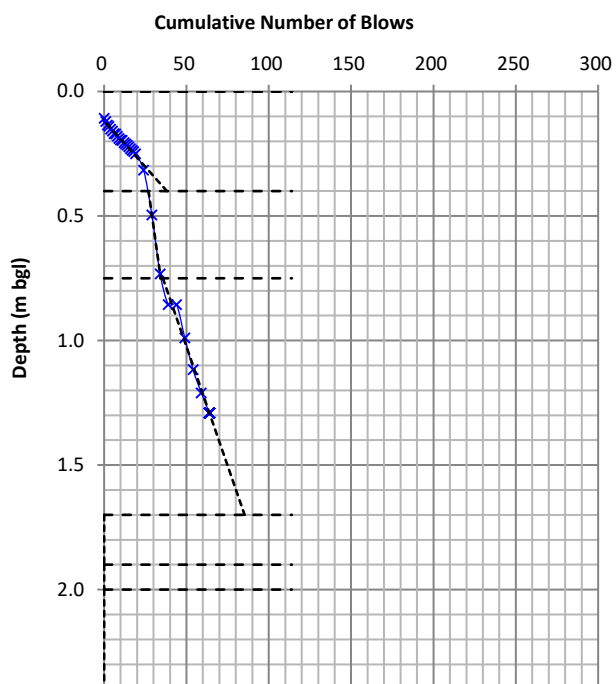
Appendix 5

TRL DCP Records

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	108	-	5	24	316	20				
1	1	120	22	5	29	496	7				
1	2	135	17	5	34	732	5				
1	3	140	55	5	39	856	10				
1	4	151	24	5	44	856	-				
1	5	159	34	5	49	990	9				
1	6	169	26	5	54	1117	10				
1	7	171	145	5	59	1210	14				
1	8	180	30	5	64	1292	14				
1	9	189	30								
1	10	195	45								
1	11	197	145								
1	12	206	30								
1	13	210	70								
1	14	216	45								
1	15	222	45								
1	16	230	34								
1	17	236	45								
1	18	242	45								
1	19	250	34								

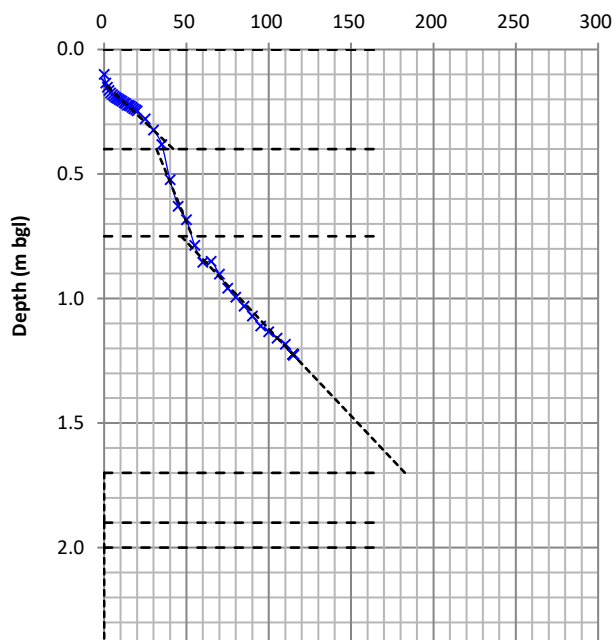


IMPACT (TRL) Dynamic Cone Penetrometer

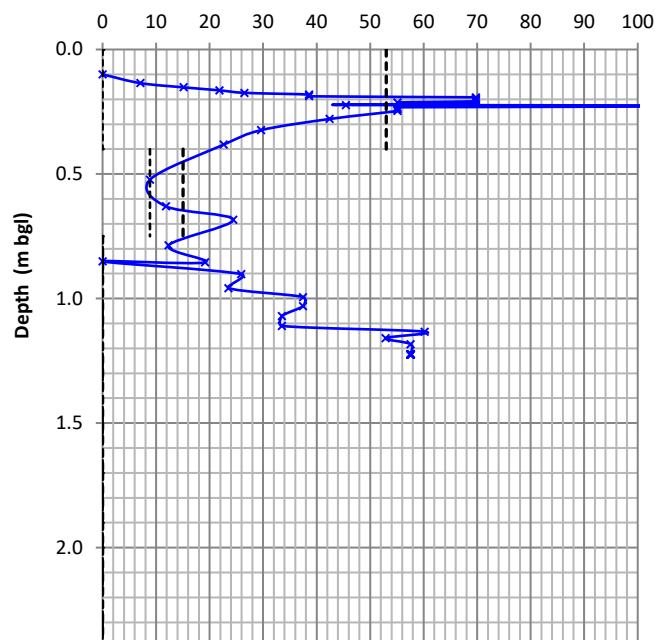
SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	100	-	1	20	247	55				
1	1	135	7	5	25	279	42				
1	2	152	15	5	30	324	30				
1	3	164	22	5	35	382	23				
1	4	174	26	5	40	523	9				
1	5	181	39	5	45	630	12				
1	6	188	39	5	50	684	24				
1	7	192	70	5	55	787	12				
1	8	196	70	5	60	855	19				
1	9	200	70	5	65	851	-				
1	10	204	70	5	70	902	26				
1	11	208	70	5	75	958	23				
1	12	213	55	5	80	994	37				
1	13	217	70	5	85	1030	37				
1	14	223	45	5	90	1070	34				
1	15	225	145	5	95	1110	34				
1	16	227	145	5	100	1133	60				
1	17	232	55	5	105	1159	53				
1	18	237	55	5	110	1183	58				
1	19	242	55	5	115	1225	58				

Cumulative Number of Blows



CBR (%)

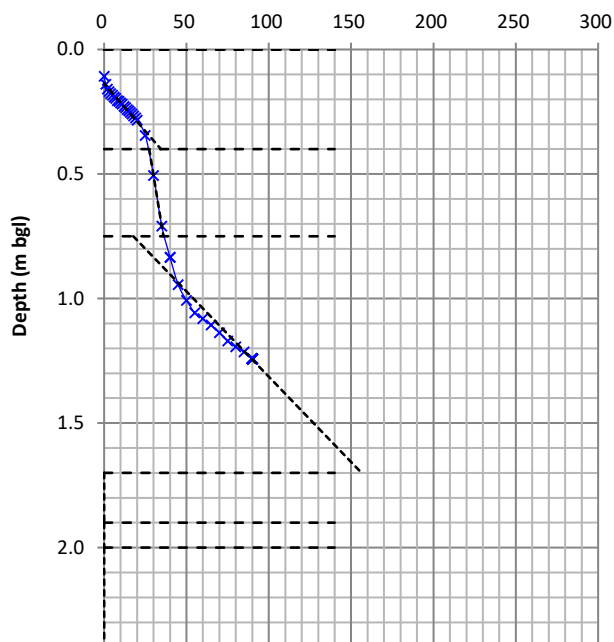


IMPACT (TRL) Dynamic Cone Penetrometer

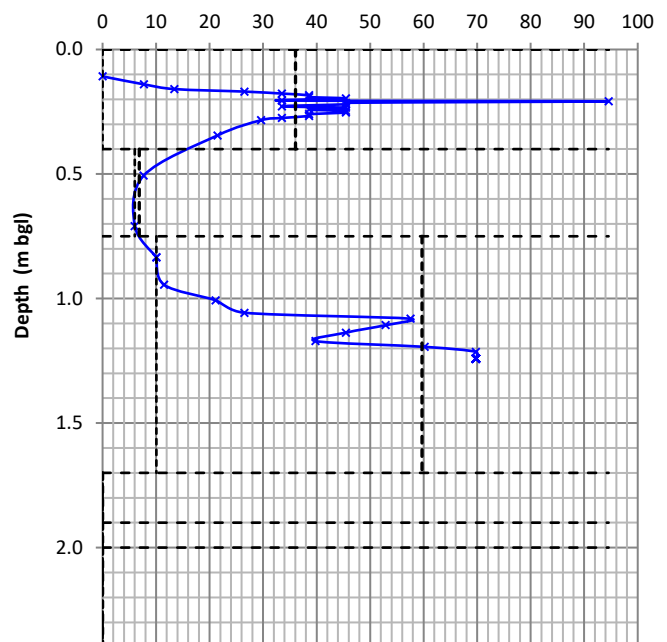
SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	108	-	1	20	284	30				
1	1	140	8	5	25	345	21				
1	2	159	13	5	30	506	8				
1	3	169	26	5	35	709	6				
1	4	177	34	5	40	834	10				
1	5	184	39	0	40	835	-				
1	6	191	39	5	45	945	12				
1	7	197	45	5	50	1007	21				
1	8	205	34	5	55	1057	26				
1	9	208	95	5	60	1081	58				
1	10	214	45	5	65	1107	53				
1	11	220	45	5	70	1137	45				
1	12	228	34	5	75	1171	40				
1	13	234	45	5	80	1194	60				
1	14	241	39	5	85	1214	70				
1	15	247	45	5	90	1241	70				
1	16	253	45								
1	17	260	39								
1	18	267	39								
1	19	275	34								

Cumulative Number of Blows



CBR (%)





Appendix 6

Laboratory Testing

**Environmental
Geotechnical
Specialists**



LABORATORY REPORT

GEO TECHNICAL
ENVIRONMENTAL

job number C/1742/21/E/2731	client ref
site address Rushbrook Primary School 101 Shillingford Road, Gorton, Manchester, M18 7TN	client address Black Cat Building Ltd The Lightwell, 61-63 Brown Street, Manchester, M2 2JG
consultant	
date scheduled 17/06/2021	date issued 24/06/2021
issued by H J Letch	job title Asst. Lab Manager

Rogers Geotechnical Services Ltd Telephone 01484 607 977
Email jude.norcliffe@rogersgeotech.co.uk www.rogersgeotech.co.uk
 Unit 4, Barncliffe Business Park, Near Bank, Shelley,
 Huddersfield, West Yorkshire HD8 8LU.





8948

Environmental
Geotechnical
Specialists



Schedule of UKAS Accredited Laboratory Tests

1. CLASSIFICATION OF SOIL	BS 1377-2:1990	BS EN 150 17892	Accredited (A)	Unaccredited (U)
1.1 Moisture / Water content determination				
i. Oven drying	Pt 2 : 3.2	Pt 1 : 2014	A	
ii. Saturation m/c of chalk	Pt 2 : 3.3			U
1.2 Index Properties				
i. Liquid limit – cone penetrometer	Pt 2 : 4.3	Pt 12 : 2018 : 5.3 / 5.5	A	
ii. Plastic limit	Pt 2 : 5.3		A	
iii. Shrinkage limit	Pt 2 : 6.3			U
iv. Linear shrinkage	Pt 2 : 6.5		A	
1.3 Particle Density				
i. Gas jar	Pt 2 : 8.2			U
ii. Large pycnometer	Pt 2 : 8.3			U
iii. Small pycnometer	Pt 2 : 8.4	Pt 3 : 2015 : 5.1		U
1.4 Density Tests				
i. Linear measurement	Pt 2 : 7.2	Pt 2 : 2014 : 5.1	A	
ii. Immersion in water	Pt 2 : 7.3	Pt 2 : 2014 : 5.2		U
iii. Fluid / Water displacement	Pt 2 : 7.4	Pt 2 : 2014 : 5.3		U
iv. Sand replacement	Pt 9 : 2.1, 2.2			U
v. Core cutter	Pt 9 : 2.4			U
1.5 Particle Size Distribution				
i. Dry Sieve	Pt 2 : 9.2	Pt 4 : 2016 : 5.2	A	
ii. Wet Sieve	Pt 2 : 9.3	Pt 4 : 2016 : 5.2	A	
iii. Sedimentation by pipette	Pt 2 : 9.4	Pt 4 : 2016 : 5.3 / 5.4	A	
iv. Sedimentation by hydrometer	Pt 2 : 9.5			U
2. CHEMICAL TESTS	BS 1377-3:2018			
ii. Mass loss on ignition	Pt 3 : 4			U
3. COMPACTION RELATED TESTS	BS 1377-4:1990			
3.1 Dry density/moisture relationship				
i. 2.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
ii. 4.5kg rammer – 1 litre mould	Pt 4 : 3			U
- CBR mould	Pt 4 : 3			U
3.2 Moisture Condition Value				
i. Single point test	Pt 4 : 5.4			U
ii. MCV/moisture content relationship	Pt 4 : 5.5			U
3.3 California Bearing Ratio				
i. Undisturbed sample	Pt 5 : 7			U
ii. Recompacted sample	Pt 5 : 7			U
iii. Soaked, inc measurement of swell	Pt 5 : 7			U
4. COMPRESSIBILITY OF SOIL	BS 1377-5:1990			
i. One dimensional consolidation	Pt 5 : 3			U
ii. Swelling pressure test	Pt 5 : 3			U
5. SHEAR STRENGTH OF SOIL	BS 1377-7:1990			
i. Hand shear vane	Makers instructions			U
ii. Shear box (100mm square sample)	BS 1377 : Pt 7 : 4			U
iii. Triaxial – quick undrained	BS 1377 : Pt 7 : 8, 9			U
6. PERMEABILITY				
i. Falling head	K. H. Head Vol 2			U
ii. Constant head	BS 1377 : Pt 6 : 6			U
iii Triaxial cell	BS 1377 : Pt 6 : 6			U
7. ROCK TESTS				
7.1 Classification Tests				
i. Natural moisture content	-			U
ii. Saturated moisture content	-			U
iii. Natural density	-			U
iv. Porosity	-			U
7.2 Strength Tests				
i. Point load index	ISRM '85			U
ii. Uniaxial compression test	ISRM '81			U



GEOTECHNICAL LAB RESULTS

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Rushbrook Primary School

[illegible]

Key			Date Printed	Approved By	Table
Density test	Liquid Limit	Particle density	17/06/2021	Harry	1
Linear measurement unless :	4pt cone unless :	sp - small pyknometer			sheet
wd - water displacement	cas - Casagrande method	gj - gas jar			1
wi - immersion in water	1pt - single point test				

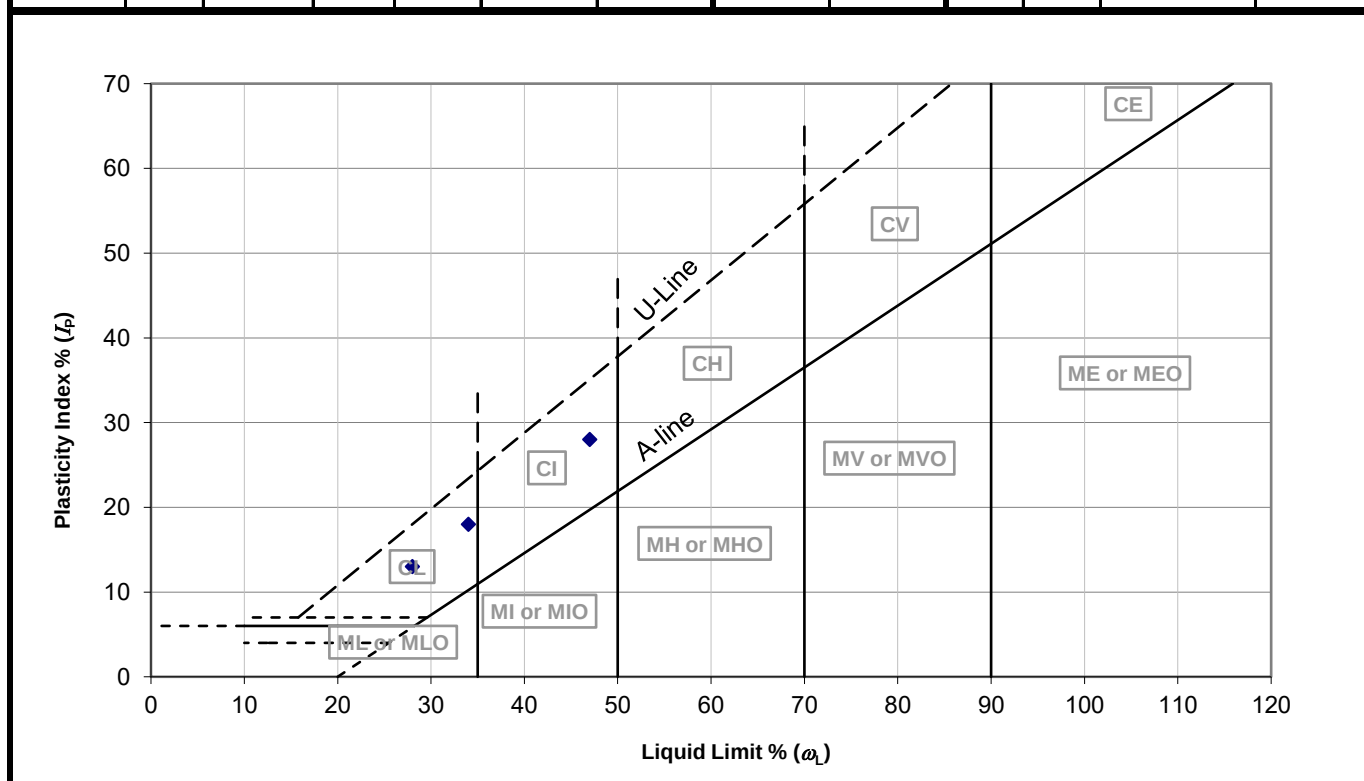


Project Name	Rushbrook Primary School
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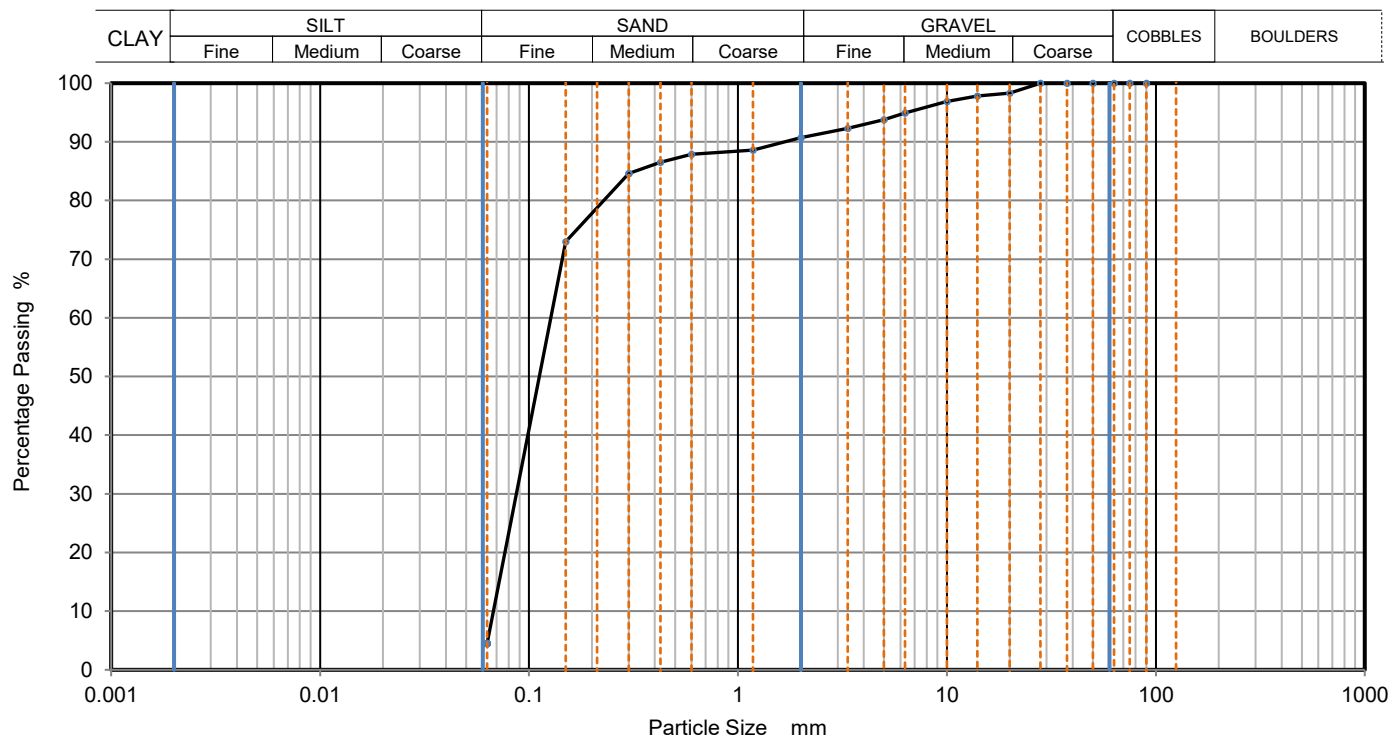
Remarks:

Table	2
Sheet	1

 Rogers Geotechnical Services Ltd. Offices 1&2, Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU					Classification of Index Properties					C1742/21/E/2731			
Project Name: Rushbrook Primary School					BS EN ISO: 17892: Parts 1, 12					Fig. 3		Sheet. 1	
Location:										Input By: Harry			
Client: Black Cat Building Consultancy Ltd										Check By: Harry			
Location	Depth (m)	Moisture Content (w) (%)	Liquid Limit (wL) (%)	Plastic Limit (wP) (%)	Plasticity Index (IP) (%)	Retained by 0.425mm (%)	Modified (w) (w') (%)	Modified (IP) (IP') (%)	Liquidity/ Consistency		Casagrande Class	N.H.B.C Class (%)	
									(IL) (%)	(IC) (%)			
WS01	0.50	17.1	34	16	18	7	18	17	0.1	0.9	C L	LOW	
WS03	0.80	15.8	28	15	13	13	18	11	0.1	0.9	C L	LOW	
WS03	1.50	22.2	47	19	28	1	22	28	0.1	0.9	C I	MEDIUM	



	PARTICLE SIZE DISTRIBUTION			Job Ref	C1742/21/E/2731
				Borehole/Pit No.	WS02
Site Name	Rushbrook Primary School			Sample No.	2
Soil Description	Greyish brown slightly gravelly fine and medium SAND.			Depth, m	1.75
Specimen Reference	d2	Specimen Depth	1.75 m	Sample Type	D
Test Method	ISO 17892 -4, by sieving on pre-dried or dry sample			KeyLAB ID	RGS_202106172



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	98		
14	98		
10	97		
6.3	95		
5	94		
3.35	92		
2	91		
1.18	89		
0.6	88		
0.425	87		
0.3	85		
0.15	73		
0.063	5		

Dry Mass of sample, g

783

Sample Proportions	% dry mass
Very coarse	0
Gravel	9
Sand	87
Fines <0.063mm	4

Grading Analysis	
D100 mm	28
D60 mm	0.127
D30 mm	0.0871
D10 mm	0.0676
Uniformity Coefficient	1.9
Curvature Coefficient	0.88

Remarks

Preparation and testing in accordance with BS EN ISO 17892 - 4, unless noted below

Operator	Checked	Approved	Sheet printed 17/06/2021	Fig 4 Sheet 1
Val	Harry	Harry		



ENVIRONMENTAL LAB RESULTS

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Final Report

Report No.: 21-20553-1

Initial Date of Issue: 24-Jun-2021

Client Rogers Geotechnical Services Ltd

Client Address: Unit 4, Barncliffe Business Park
Near Bank
Shelley
Huddersfield
West Yorkshire
HD8 8LU

Contact(s): Rob Palmer

Project C1742/21/E Rushbrook Primary School

Quotation No.: Q20-21584 **Date Received:** 17-Jun-2021

Order No.: PO-1610 **Date Instructed:** 17-Jun-2021

No. of Samples: 3

Turnaround (Wkdays): 5 **Results Due:** 23-Jun-2021

Date Approved: 24-Jun-2021

Approved By:


Details: Glynn Harvey, Technical Manager

Results - Soil

Project: C1742/21/E Rushbrook Primary School

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				21-20553	21-20553	21-20553
Quotation No.: Q20-21584	Chemtest Sample ID.:				1222858	1222859	1222860
	Sample Location:				WS01	WS02	WS03
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.60	0.40	0.70
	Date Sampled:				14-Jun-2021	14-Jun-2021	14-Jun-2021
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
Cadmium	M	2450	mg/kg	0.10	0.17	0.18	0.11
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
Copper	M	2450	mg/kg	0.50	28	22	20
Mercury	M	2450	mg/kg	0.10	0.11	< 0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	22	24	26
Lead	M	2450	mg/kg	0.50	40	21	15
Zinc	M	2450	mg/kg	0.50	60	47	46
Vanadium	U	2450	mg/kg	5.0	20	18	19
Arsenic	M	2450	mg/kg	1.0	9.6	6.8	7.0
Selenium	M	2450	mg/kg	0.20	0.29	0.25	0.22
Cyanide (Free)	M	2300	mg/kg	0.50	4.6	4.6	3.5
Total Phenols	M	2920	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Naphthalene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2700	mg/kg	0.10	1.6	0.59	< 0.10
Anthracene	M	2700	mg/kg	0.10	0.46	0.13	< 0.10
Fluoranthene	M	2700	mg/kg	0.10	2.4	0.77	0.28
Pyrene	M	2700	mg/kg	0.10	2.7	0.81	0.24
Benzo[a]anthracene	M	2700	mg/kg	0.10	1.1	0.32	< 0.10
Chrysene	M	2700	mg/kg	0.10	1.2	0.54	< 0.10
Benzo[b]fluoranthene	M	2700	mg/kg	0.10	1.4	0.45	< 0.10
Benzo[k]fluoranthene	M	2700	mg/kg	0.10	0.80	0.30	< 0.10
Benzo[a]pyrene	M	2700	mg/kg	0.10	1.1	0.50	< 0.10
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.10	0.67	0.24	< 0.10
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.10	0.33	0.17	< 0.10
Benzo[g,h,i]perylene	M	2700	mg/kg	0.10	0.76	0.32	< 0.10
Total Of 16 PAH's	M	2700	mg/kg	2.0	15	5.1	< 2.0
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0

Results - Soil

Project: C1742/21/E Rushbrook Primary School

Client: Rogers Geotechnical Services Ltd	Chemtest Job No.:				21-20553	21-20553	21-20553
Quotation No.: Q20-21584	Chemtest Sample ID.:				1222858	1222859	1222860
	Sample Location:				WS01	WS02	WS03
	Sample Type:				SOIL	SOIL	SOIL
	Top Depth (m):				0.60	0.40	0.70
	Date Sampled:				14-Jun-2021	14-Jun-2021	14-Jun-2021
	Asbestos Lab:				DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD			
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10
pH	M	2010		4.0	8.3	8.3	8.4
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.078	0.24	0.11
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	13	12	14
Soil Colour	N	2040		N/A	Grey	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Clay	Clay	Clay
Sulphate (Total)	M	2430	%	0.010	0.091	0.11	0.076
Organic Matter	M	2625	%	0.40	2.1	1.7	1.6

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet							
Job Number	C1742/21/E			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)							
Job Name	Rushbrook Primary										
Date	15.07.2021			Sample Location	WS01	WS02	WS03				
Client	Black Cat Consultancy			Depth Top	0.6	0.4	0.7				
				Depth Base							
Determinand	Units	Ref	LOD	Residential With Plant Uptake 1%							
				Atrisk 2015 (No Free Product)	Atrisk 2017						
Cadmium	mg/kg	C	0.10		22.1	0.17	0.18	0.11			
Chromium (Hexavalent)	mg/kg	B/C	0.5	20.5	3.62	< 0.50	< 0.50	< 0.50			
Copper	mg/kg	A+	0.50		4730	28	22	20			
Mercury	mg/kg	A/D	0.10		8.81	0.11	< 0.10	< 0.10			
Nickel	mg/kg	A+	0.50		136	22	24	26			
Lead	mg/kg	C	0.50		200	40	21	15			
Zinc	mg/kg	A+	0.50		20000	60	47	46			
Vanadium	mg/kg	A+	5.0		136	20	18	19			
Arsenic	mg/kg	C	1.0		37	9.6	6.8	7.0			
Selenium	mg/kg	A	0.20		375	0.29	0.25	0.22			
Cyanide (Free)	mg/kg	A	0.50		34	4.6	4.6	3.5			
Total Phenols	mg/kg	A	0.30		267	<0.1	<0.1	<0.1			
Naphthalene	mg/kg	A+	0.10	0	0.829	< 0.10	< 0.10	< 0.10			
Acenaphthylene	mg/kg		0.10			< 0.10	< 0.10	< 0.10			
Acenaphthene	mg/kg	A+	0.10	608	157	< 0.10	< 0.10	< 0.10			
Fluorene	mg/kg	A+	0.10	0	735	< 0.10	< 0.10	< 0.10			
Phenanthrene	mg/kg		0.10			1.6	0.59	< 0.10			
Anthracene	mg/kg	A+	0.10	0	10200	0.46	0.13	< 0.10			
Fluoranthene	mg/kg	A+	0.10		983	2.4	0.77	0.28			
Pyrene	mg/kg	A+	0.10		668	2.7	0.81	0.24			
Benzo[a]anthracene	mg/kg	A	0.10	4.52	1.71	1.1	0.32	< 0.10			
Chrysene	mg/kg	A	0.10	585	0.44	1.2	0.54	< 0.10			
Benzo[b]fluoranthene	mg/kg	A	0.10	7.72	1.22	1.4	0.45	< 0.10			
Benzo[k]fluoranthene	mg/kg	A	0.10	84.4	0.686	0.80	0.30	< 0.10			
Benzo[a]pyrene	mg/kg	B/C	0.10	4.95	1.51	1.1	0.50	< 0.10			
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.10	7.31	0.0614	0.67	0.24	< 0.10			
Dibenz(a,h)Anthracene	mg/kg	A	0.10	0.838	0.00393	0.33	0.17	< 0.10			
Benzo[g,h,i]perylene	mg/kg	A	0.10	96.2	0.0187	0.76	0.32	< 0.10			
Total Of 16 PAH's	mg/kg		2.0			15	5.1	< 2.0			
Aliphatic TPH >C5-C6	mg/kg	A+	1.0	0	42.7	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C6-C8	mg/kg	A+	1.0	0	99.3	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C8-C10	mg/kg	A+	1.0	0	13.9	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	81.7	49.9	< 1.0	< 1.0	< 1.0			

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet							
Job Number	C1742/21/E			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)							
Job Name	Rushbrook Primary										
Date	15.07.2021			Sample Location		WS01	WS02	WS03			
Client	Black Cat Consultancy			Depth Top		0.6	0.4	0.7			
				Depth Base							
Determinand	Units	Ref	LOD	Residential With Plant Uptake 1%							
Aliphatic TPH >C12-C16	mg/kg	A+	1.0	385	20.9	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C16-C21	mg/kg	A+	1.0		210000	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C21-C35	mg/kg	A+	1.0		210000	< 1.0	< 1.0	< 1.0			
Aliphatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0			
Total Aliphatic Hydrocarbons	mg/kg		5.0			< 5.0	< 5.0	< 5.0			
Aromatic TPH >C5-C7	mg/kg	A+	1.0		0.137	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C7-C8	mg/kg	A+	1.0	0	113	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C8-C10	mg/kg	A+	1.0	0	20.5	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C10-C12	mg/kg	A+	1.0	0	70	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C12-C16	mg/kg	A+	1.0	165	155	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C16-C21	mg/kg	A+	1.0		319	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C21-C35	mg/kg	A+	1.0		1120	< 1.0	< 1.0	< 1.0			
Aromatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0			
Total Aromatic Hydrocarbons	mg/kg		5.0			< 5.0	< 5.0	< 5.0			
Total Petroleum Hydrocarbons	mg/kg		10.0			< 10	< 10	< 10			
pH			N/A			8.3	8.3	8.4			
Sulphate (2:1 Water Soluble) as SO4	g/l		0.010			0.078	0.24	0.11			
ACM Type			N/A								
Asbestos Identification	%		0.001			No Asbestos Detected	No Asbestos Detected	No Asbestos Detected			
Moisture	%		0.020			13	12	14			
Soil Colour			N/A			Grey	Brown	Brown			
Other Material			N/A			Stones	Stones	Stones			
Soil Texture			N/A			Clay	Clay	Clay			
Sulphate (Total)	%		0.010			0.091	0.11	0.076			
Organic Matter	%		0.40			2.1	1.7	1.6			



End of Report

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Appendix 7

Fill Screening Values

Rogers Geotechnical Services Ltd.

Atkins ATRISK Soil Screening Values (SSVs) - Residential With Plant Uptake Landuse

Tox Data Report No.	Compound	Residential with Homegrown Produce Landuse (mg/kg)				Reference
	<i>Metals</i>	SOM: 1%		SOM: 6%		
3	Cadmium	22.1		22.1		C
4	Chromium VI	3.62	20.5	3.62	20.5	B/C
	Copper	4730		4790		A+
7	Mercury	8.81		15.80		A/D
8	Nickel	136		136		A+
	Lead	200		200		C
	Zinc	20000		20300		A+
	Vanadium	136		138		A+
	<i>Semi and Non Metals</i>					
1	Arsenic	37		37		C
10	Selenium	375		375		A
	Free Cyanide	34		34		A
9	Phenols (total)	267		1200		A
	<i>Poly Aromatic Hydrocarbons</i>	Free product	No free product	Free product	No free product	
20	Napthalene	0.829		12.2		A+
	Acenaphthene	157	608	2760		A+
	Fluorene	735		2610		A+
	Anthracene	10200		26200		A+
	Fluoranthene	983		2980		A+
	Pyrene	668		2120		A+
	Benzo(a)anthracene	1.71	4.52	8.54		A
2	Chrysene	0.44	585	2.64	927	A
2	Benzo(b)fluoranthene	1.22	7.72	7.29	9.86	A
2	Benzo(k)fluoranthene	0.686	84.4	4.12	100	A
2	Benzo(a)pyrene	1.51	4.95	0.998	5	B/C
2	Dibenzo(a,h)anthracene	0.00393	0.838	2.05	4.95	A*
2	Indeno(1,2,3-cd)pyrene	0.0614	7.31	0.368	9.75	A
2	Benzo(g,h,i)perylene	0.0187	96.2	0.112	103	A
	<i>Petroleum Hydrocarbons</i>					
	Aliphatic C5-C6	42.7		369		A+
	Aliphatic C6-C8	99.3		768	1240	A+
	Aliphatic C8-C10	13.9		204		A+
	Aliphatic C10-C12	49.9	81.7	297	1180	A+
	Aliphatic C12-C16	20.9	385	125	4130	A+
	Aliphatic C16-C21	210000		210100		A+
	Aliphatic C21-C35	210000		210100		A+
	Aromatic C5-C7 (Benzene)	0.137		0.871		A+
	Aromatic C7-C8 (Toluene)	113		780		A+
	Aromatic C8-C10	20.5		232		A+
	Aromatic C10-C12	70		468		A+
	Aromatic C12-C16	155	165	830		A+
	Aromatic C16-C21	319		1040		A+
	Aromatic C21-C35	1120		1710		A+
A+ = Values update June 2017.						
A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.						
B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).						
C = Category 4 Screening Levels (C4SLs).						
D = SSV provided is for Methyl Mercury.						