EAL



PHASE II SITE INVESTIGATION INCLUDING COAL MINING RISK ASSESSMENT

AT

YSGOL I D HOOSON, HEOL CARADOC, RHOSLLANERCHRUGOG, WREXHAM LL14 2DS

27TH NOVEMBER 2024

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CONTENTS

1.1. Background 5
1.2. Proposed Development 5
1.3. Objectives 6
1.4. Previous Reports 6
1.5. Confidentiality 6
1.6. Limitations 6
1.0 SITE SETTING 7
2.1 Site Details 7
2.2 Site History 8
2.3 Geology 10
2.4 Mining 10
2.4.1 Shafts 10
2.4.2 Underground Mining 13
2.4.3 Unrecorded Mining 13
2.5 Geoenvironmental Information 14
3.0 CONCEPTUAL SITE MODEL 14
4.0 SITE INVESTIGATION 15
4.1 Site Investigation Rationale 15
4.2 Fieldwork 16
4.3 In Situ Testing 16
4.4 Geotechnical Testing 17
4.5 Geoenvironmental Testing 17
5.0 GROUND CONDITIONS 18
5.1 Anthropogenic Material 18
5.2 Natural Superficial Material 18
5.3 Bedrock and Mining 18
5.4 Groundwater 19
5.5 Contamination 19
5.6 In Situ Testing 20
5.7 Geotechnical Laboratory Testing 24
6.0 MINING RISK ASSESSMENT 26
7.0 GEOTECHNICAL COMMENTS 27
7.1 Geotechnical Considerations 27
7.2 Desiccation and Trees 27
7.3 Geotechnical Design Values 28
7.4 Foundations 28
7.5 Floor Slabs 29
8.0 GEOENVIRONMENTAL ASSESSMENT 30
8.1 Assessment 30
8.2 Assessment for the Protection of Human Health 30
8.3 Assessment for the Risk to Plant Life 31
8.4 Assessment for the Protection of Controlled Waters 31
8.5 Assessment for Water Supply Pipes 32
8.6 Chemical Attack on Below Ground Concrete 32
8.7 Ground Gases 33
8.8 Waste Assessment 33
9.0 CONCLUSION 36
9.4 Environmental Risk Assessment 36
9.2 Mining Risk Assessment 37
9.3 Geotechnical Risk Assessment 37
9.4 Recommendations for Further Works 38
APPENDIX I – LIMITATIONS 39
APPENDIX II – EXPLORATORY HOLE RECORDS 41

APPENDIX III – INSITU TESTING 45
APPENDIX IV – GEOTECHNICAL LABORATORY TESTING 48
APPENDIX V – GEOENVIRONMENTAL LABORATORY TESTING 49
APPENDIX VI – SUMMARY OF CONTAMINATION TEST RESULTS & THRESHOLD VALUES 50
APPENDIX VII – UNFORESEEN GROUND CONTAMINATION & ASBESTOS MANAGEMENT PLAN 53
APPENDIX VIII – CHEMICAL ACCEPTABILITY CRITERIA FOR SUBSOIL AND TOPSOIL 57
APPENDIX IX– GAS AND GROUNDWATER MONITORING 60

INTRODUCTION

1.1. Background

Eccles Associates Limited (EAL) has been commissioned by Read Construction, who are acting as Project Manager/Design and Build Contractors on behalf of Wrexham County Borough Council, hereafter referred to as "the Client", to undertake a Phase I study to be followed by a Phase II ground investigation to determine the shallow ground conditions for both geotechnical and geoenvironmental purposes, and to undertake both coal mining and geoenvironmental risk assessments. This report presents a summary of the Phase 1 study and the results of the Phase II investigation.

1.2. Proposed Development

It is understood that the proposed development comprises two small single storey extensions to the existing school building, and a new single-story block of eight classrooms, as shown in Figure 1:

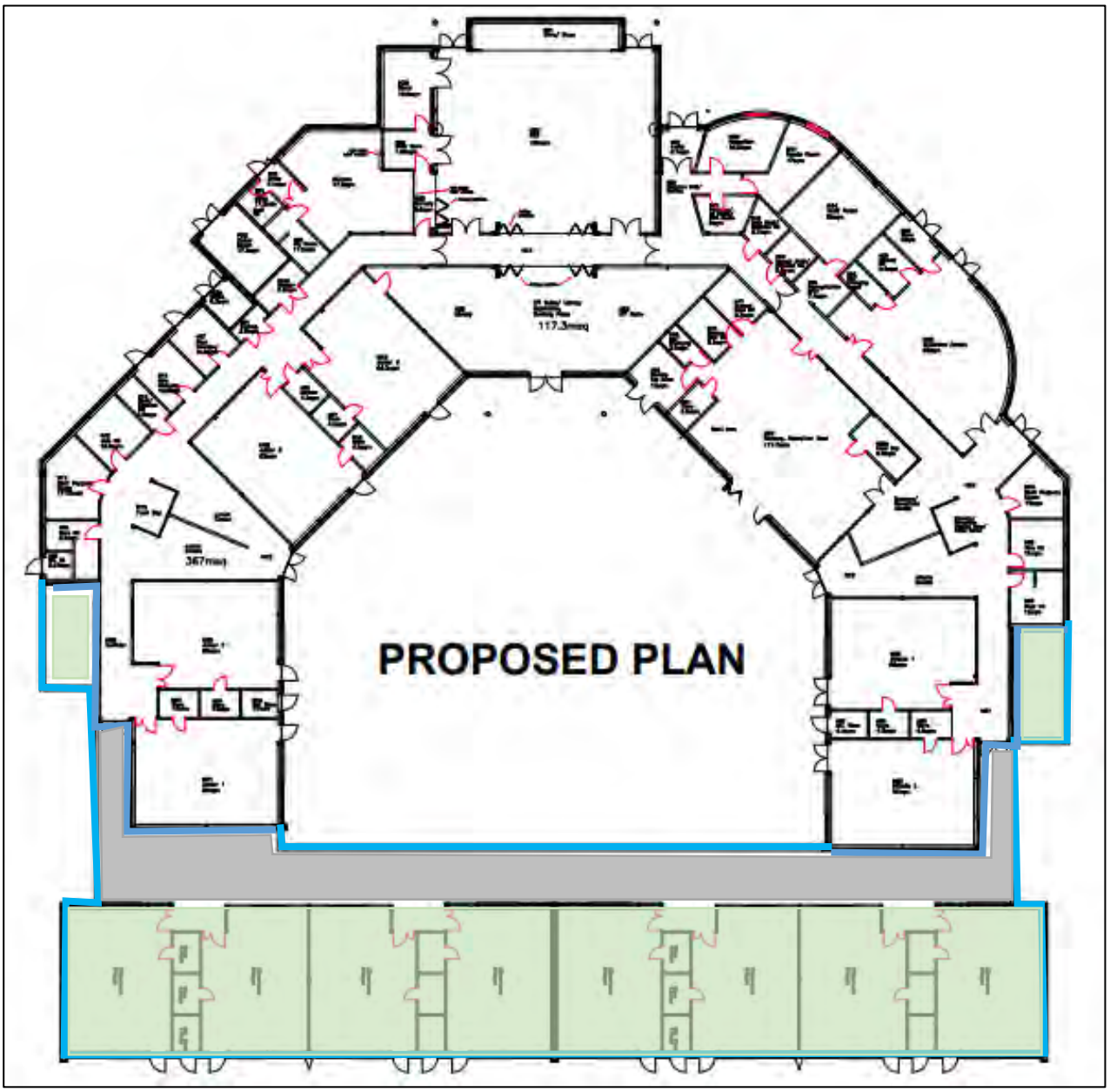


Figure 1: Proposed Development (Blue outline) (Based on drawing provided by Read Construction)
Grey area is hard standing, green areas are new buildings/extensions

In addition to this there are new all-weather sports pitches to be constructed on existing playing fields to the southeast of the new buildings but their locations have yet to be finalised.

1.3. Objectives

The purpose of this report is to provide an assessment of geoenvironmental and coal mining risk to the proposed project and to provide geotechnical information for the design of foundations.

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including but not limited to:

- The Welsh Government: Planning Policy for Wales (Ed 12, July 2024).
- BS 10175:2011+A2:2017: "*Investigation of potentially contaminated sites. Code of practice - Code of practice.*"
- BS5930:2015+A1 2020: "*Code of practice for site investigations.*"
- NHBC Standards, 2024.
- The Building Regulations 2010. Part C (HM Government 2013).
- BS8004: 2015: "Code of Practice for Foundations."
- Environment Agency (2023) Guidance "Land contamination risk management (LCRM) - How to assess and manage the risks from land contamination."
- CIRIA Report C758 (2019) "Abandoned Mine Workings Manual."

1.4. Previous Reports

This report should be read in conjunction with the phase 1 assessment report:

- EAL Report: Phase I Geoenvironmental Assessment Including Phase 1 Coal Mining Risk Assessment at Ysgol I D Hooson, Heol Caradoc, Rhosllanerchrugog, Wrexham LL14 2DS. Dated 16th October 2024

1.5. Confidentiality

Eccles Associates Ltd has prepared this report solely for the use of Reeds and the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from Eccles Associates Ltd. A charge may be levied against such approval.

1.6. Limitations

The full limitations of this report are presented in Appendix I.

The findings and conclusions of this report have been set out and recommendations given for the proposed construction. If there is a subsequent change in the proposed use, the assessments and conclusions should be reviewed to determine whether they are still applicable for the revised end use.

1.0 SITE SETTING

2.1 Site Details

A Site Location Plan is presented below. The site is located on the west side of the village of Rhosllanerchrugog approximately 6km south west of Wrexham, within the historic county of Denbighshire.

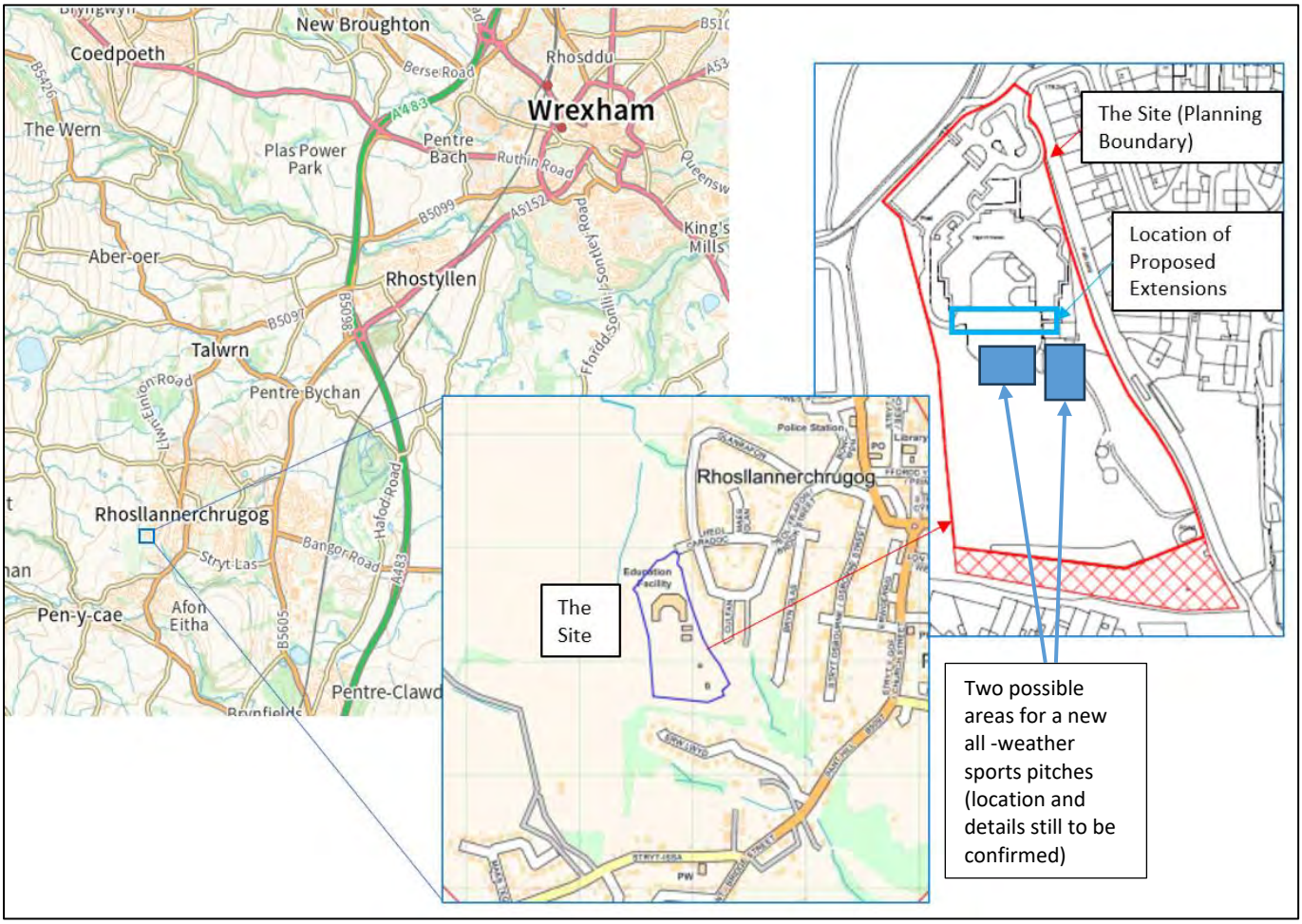


Figure 2 Site Location

Table 1: Site Summary	
Site Address	Ysgol I D Hooson, Heol Caradoc, Rhosllanerchrugog, Wrexham LL14 2DS
National Grid Reference	E: 328779, N: 346061
Site Area	The Planning Boundary is 2.43 Ha, with the proposed area of the extensions comprising approximately 70m x 15 m (0.1ha)

The site was visited by EAL on 11th October 2024, with photographs provided within the Phase 1 report.

At the time of the visit, the single storey school building occupied a generally level area surrounded by asphalted car parking to the northern elevation. To the south, the location of the proposed extensions was mainly occupied by an asphalted playground area. At the south east end of the existing building two temporary classroom units were present with small fenced garden areas. South of the asphalted playground, grassed playing fields are connected to the site by a gentle grassed slope of approximately 1m-1.5m height. Patches of poor grass growth were noted just below the slope crest, it is understood that playground equipment has been recently removed from here.

There are several inspection covers for drainage, including a large rainwater attenuation tank. Electric lighting is also present.

The field boundaries are vegetated with various shrubs and trees. A small willow is noted in the eastern side of the site in the garden area, and various trees are present on the site boundaries. To the eastern limit of the proposed extension, the trees are at the base of a short slope of around 2m height, beyond which are the rear gardens of houses fronting on to Glanafron. To the west, the trees are on a slope of around 7-8m maximum height which leads up to a footpath running along the crest, with playing fields beyond.

There was some patchy waterlogging in the grass, after recent heavy rain. There was no evidence of any depressions, surface disruption to the asphalt or other indications of surface instability.

There were no sources of contamination such as fuel tanks, suspected asbestos, ground stains or odours.

2.2 Site History

A brief review of the site's history from historical maps provided by Groundsure and other historical sources was undertaken and is presented in the Phase 1 report. A summary of the findings is presented below and in Figure 3:

Mining and Mineshafts

- The area has a long history of mining (1563), with substantial growth from the 1840s onwards.
- By 1873 mining was already old and abandoned in the area: "Old shaft (coal)" is indicated within a spoil heap at the south west corner of the site. The northern sector also includes two spoil heaps and a possible small pond.
- The Coal board visited the site in 1968 and visible depressions at the mine shaft locations were present
- More recent aerial photography from 2001 shows the site as agricultural land with crops. There is no evidence for the mine shafts or spoil heaps, although the northern sector of the site appears to have a variation on the crop growth.

Brick Works

- "Pant Brick Works" is shown adjacent to the site to the west in 1873, together with pits and spoil heaps. Other similar works are present in the surrounding area. Pant brick works is no longer indicated by 1909

Railways

- By 1898, a mineral railway from Pant Brick Works is adjacent to the NW boundary of the site and along the eastern boundary.
- By 1909, an additional mineral railway line on an embankment is shown through the NW sector of the site. By 1974, the mineral railways are shown as dismantled

Recent development

- Between the maps of 1982 and 1988, the housing along Fford Mynydd Isa / Erw Lwyd to the south of the site is constructed.
- Information provided by the Client indicates the school was built in September 2007.

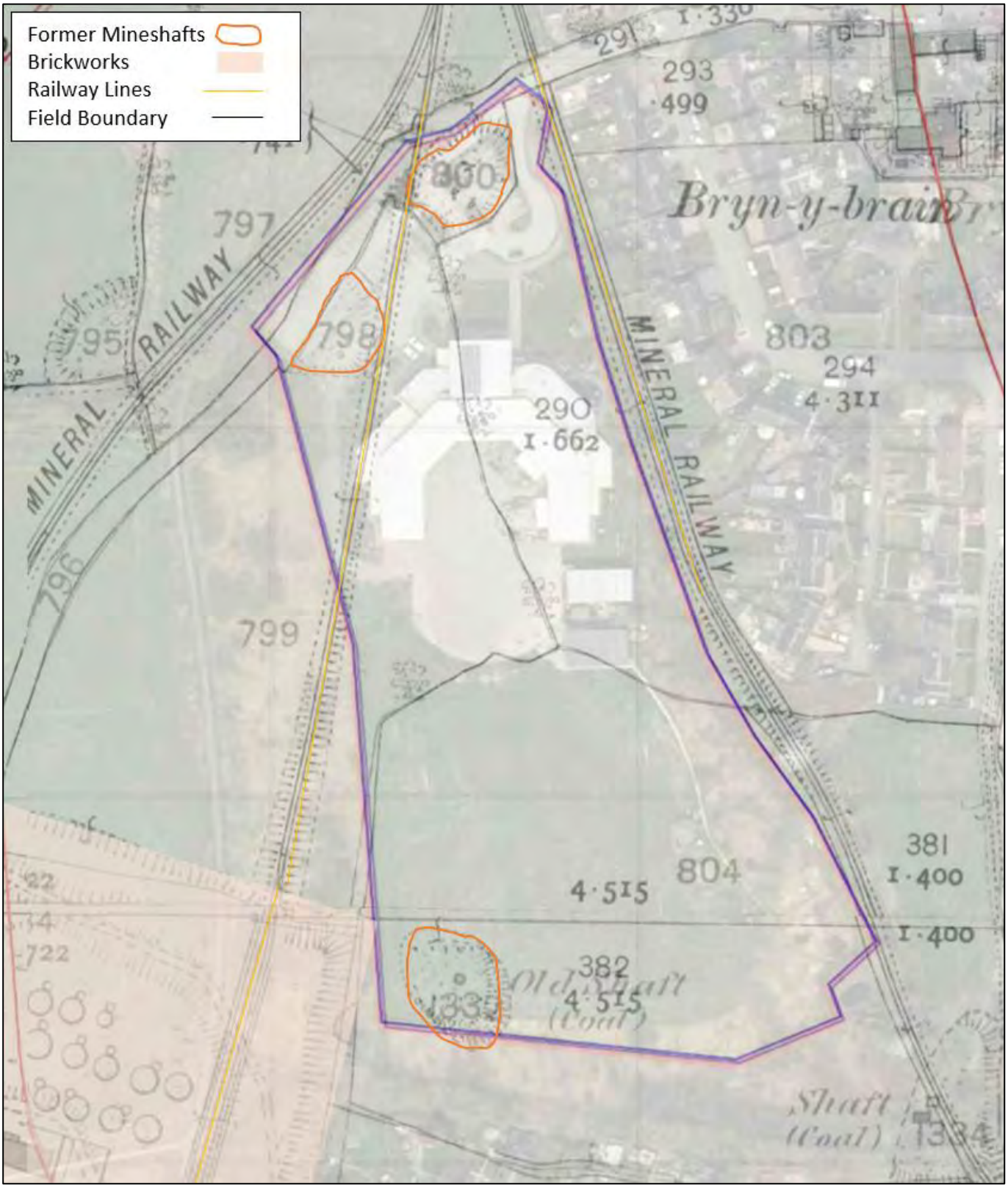


Figure 3: Summary of Historical Features

2.3 Geology

Information about the geology of the site has been taken from Groundsure, and from the British Geological Survey (BGS) maps. memoirs and databases available online and is presented in the Phase 1 report. A summary of the findings is presented below.

The expected sequence comprises:

- Made ground: Topsoil, brickworks wastes, ashes/railway embankments
- Glacial till : sandy clay, sand, and gravel: BGS boreholes in the area indicate this to be:
  - Immediately South of Site (Pen y Cae): Up to between 13.7 to 22.5m depth
  - 0.2km SE of site: Up to 1.2m depth
- Carboniferous Pennine Lower Coal Measures Formation.
  - Shale with ironstone bands, fireclay and coal
  - Nant Coal indicated at outcrop along the NE sector of the site, dipping E and SE
  - 0.2km S: Traces of coal at 19.6m
  - 0.2km SE, coal at 9.6m bgl, suspected to be Firedamp Seam
  -

Coal Seams below the site and in the immediate surroundings are expected to comprise:

Table 2: Summary of Coal Seams

Seam	Depth below Nant Seam (m)*	Thickness (m)
Fireclay Group **Stone Coal** **Half Yard** **Firedamp**	Subcropping to SE of site	Variable
Nant / Soft 5 Quarters	Subcrop at N end of site	1.5
Ruabon Yard / Yard / Soft 5 Quarters	10	0.9
Premier	26	1.0
Llwyneinbon Half Yard	50	0.45

**Scaled from stratigraphic column*

2.4 Mining

A consultant's mining report was presented in the Phase 1 Assessment. There is a high density of mining features around the site. Groundsure list 17 records of mainly coal shafts and brick pits, within 500m.

2.4.1 Shafts

The desk study information about the shafts within the site is detailed in the table below and Figure 4 with slight differences reported regarding the locations of these shafts in different documents being indicated. Note that the Coal Authority indicate that the location of shafts is typically presented on their plans to a accuracy of 8 m (they term this the potential departure of the shafts):

Table 3: Summary Mine Entries (Shafts)				
Shaft	**Coordinates**	**CA Plans**	**BGS and CA Information**	**OS and Other Information**
328346-056	328714 346127	-	Pant Colliery (Rhos Farm) NCB site visit 1968: "No trace, presumed filled 5/68" Supposed to have been filled 1975: No records	Anecdotal evidence : located by Carillion after construction of school in 2007 but sometime before 2013 when one of the visiting engineers fell into it. It is understood that he was unharmed, and that the shaft was infilled. Present on the 1873 OS sheet as spoil mound
328346-057	328754 346169	-		present on the 1873 OS sheet as spoil mound
328346-059	328773 346025	On Rhos Farm Abandonment Plan Plan 14896		-
328345-085	328750 345953	On Rhos Farm Abandonment Plan 14896 and Plan 14889 as a "pit".	Depression visible, presumed filled 5/68	"old shaft" and spoil mound present on the 1873 OS sheet
Unmarked on CA Records	328809 , 345997 (ESTIMATED +/- 20-50m)	Plan 14889 as an unlabelled white dot	-	-
Unmarked on CA Records	328835 , 346024 (ESTIMATED +/- 20-50m)	Plan 14889 as an unlabelled white dot	-	-

Shafts immediately south of the site at Pen y Cae were grouted and plugged in 1981 by NKC Geotech to an unknown specification.

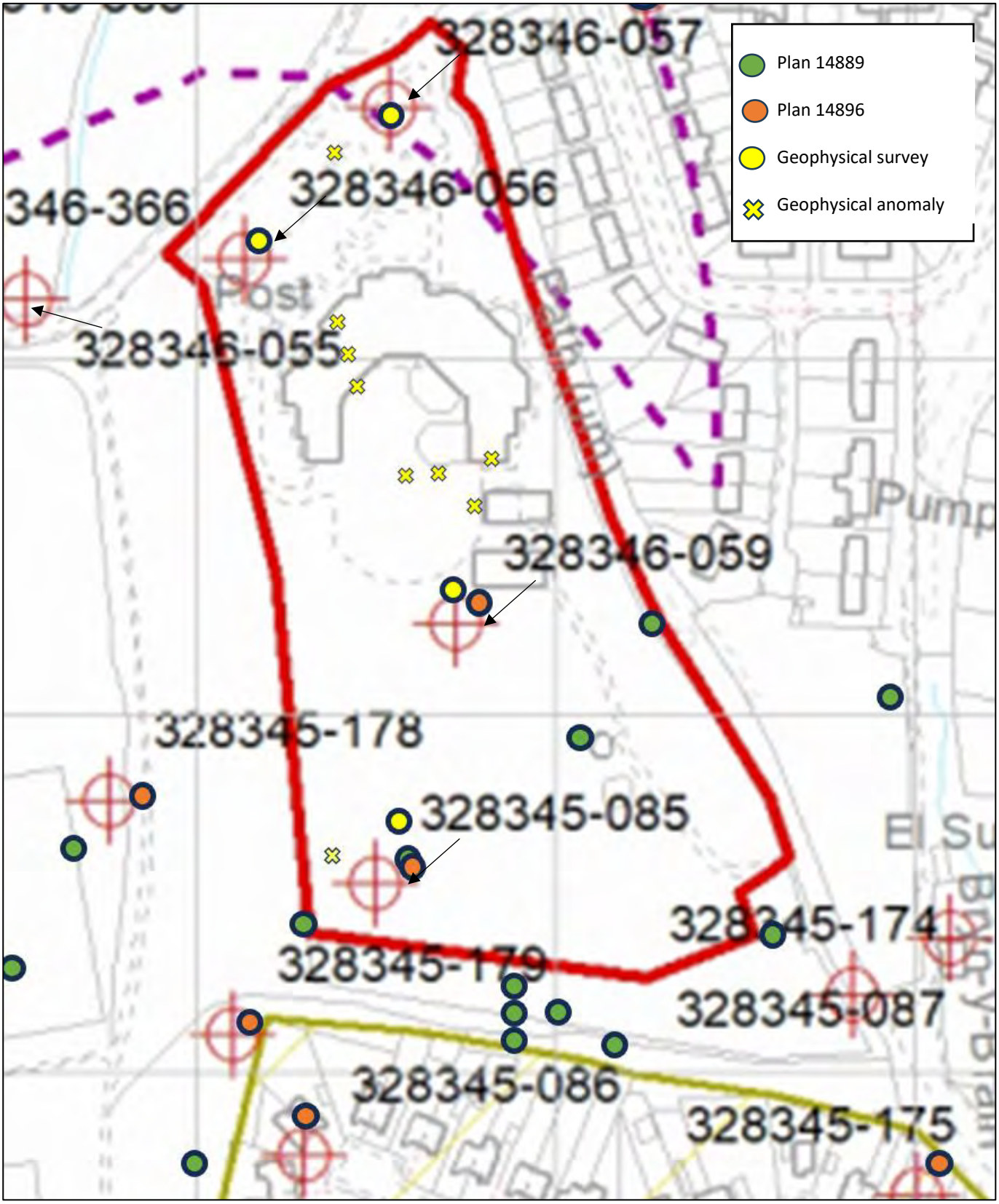


Figure 4: Abandonment Plan Shafts and geophysical survey plotted against Coal Authority Information: Note uncertainty in shaft locations, and two additional possible shafts within school field

2.4.2 Underground Mining

A summary of the desk study records is presented below:

Records suggest that drilling and grouting was carried out at Pen-Y-Cae to the south of the site. Treatment details (if any) below the existing school are unknown.

Within the site, mining is recorded up to between 1850 and 1868 at three depths between 56m and 71m below the site by the Coal Authority. The depth of mining is based on algorithms related to the mining plans. However, the recorded mining here is very old, and the plans are of very poor quality, so the depths of mining cannot be fully relied upon. Similarly, the seam names are old, and do not correlate with modern terminology.

There is a stratigraphic column on mine abandonment plan 14896 which described the old names for the seams, from top to base of sequence as:

- "New Coal – stone coals"
- "Dirty Coal" (36.5m deep)
- "Yard Coal" (map is damaged here – 73+m deep)
- "Wall and Bench Coal" (91m deep) in between beds of shale, sandstone, "rock", "Clunch" (seatearth), and fireclay.

Abandonment plan 14896 shows patchy workings below the southern edge of the site area at the end of the school field from the early 1850s, and possibly much older. These ancient records are not necessarily surveys of mines completed prior to abandonment, so the workings may be much more extensive. It is believed that they are at about 56m depth, but the depth could be anywhere from around 45m to 65m in reality. it is likely that these recorded workings are too deep to affect the proposed development.

A summary from the Coal Authority report is as follows:

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	WALL AND BENCH	Coal	7H2Q	56	Beneath Property	6.0	East	110	1860
unnamed	HALF YARD / QUEEN	Coal	381B	69	Beneath Property	7.0	East	50	1868
unnamed	WALL AND BENCH	Coal	7H24	71	Beneath Property	6.0	East	110	1850

2.4.3 Unrecorded Mining

Coal seams are of a mineable thickness and at shallow depth. There is a long history of mining in the area. There is a possibility for unrecorded shallow mining and unrecorded shafts to be present.

- Mining records are often incomplete because there was no statutory requirement to keep and deposit plans of mines upon abandonment until the Mining Act of 1872. Much of the mining in the area was already historic by the time of the first edition Ordnance Survey mapping.
- Where coal is present at outcrop, there is a potential for ancient drift working to exist, this method dates back to pre-roman times and remained a common form of mining. By the 13th and 14th century, bell pits were also a common form of shallow mining.
- Bell pits are more common where gently dipping strata are present with a thin or absent cover of drift.

It is likely that investigations for mine workings and possibly shaft treatment were undertaken for the construction of the new school in 2007. Records of this investigation were not available at the time of this report.

2.5 Geoenvironmental Information

The Phase 1 desk study indicated a generally low environmental risk, with the main identified possible sources of contamination being possible made ground present associated with mine waste heaps, an historic railway embankment, and an adjacent brick and tile works, together with possible ground gas associated with the underlying mines.

3.0 CONCEPTUAL SITE MODEL

In accordance with BS 10175, a schematic section has been developed for the site based on the previously presented data and contaminant linkage assessment:

The model shows the predicted geology and topography, the major on-site potential contamination sources and vulnerable receptors, based on data previously presented in the report. The information presented above represents the preliminary conceptual ground model for use in the design of the intrusive investigation, and may need to be revised based on information obtained as part of the intrusive investigation.

The ground model and proposed end use described above should be considered broadly representative of residential end use as defined in SR3 “Updated Technical Model to the CLEA Model” (SC050021/SR3, 2011) for the purpose of this report.

The model is presented in Figure 5.

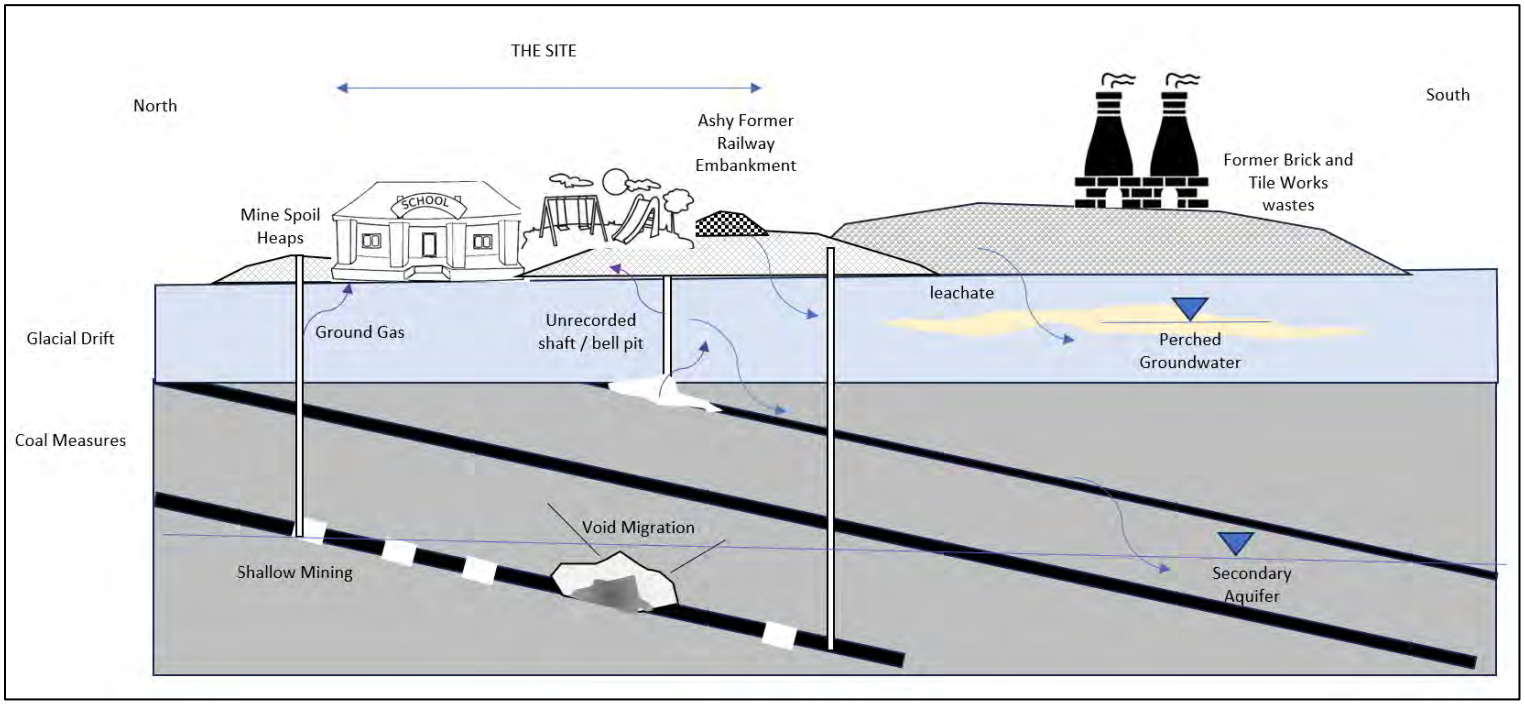


Figure 5: Conceptual Model (not to scale)

4.0 SITE INVESTIGATION

4.1 Site Investigation Rationale

Exploratory holes were positioned to provide information in a spread across the site for geotechnical design and to obtain samples for geoenvironmental purposes, to assess evidence for the presence of any voided, worked or broken ground below the site within influencing distance of the proposed buildings, and to install wells for gas and groundwater monitoring.

Investigation of the potential mine shaft 328346-059 was not proposed at this time as the shaft (+/- 8m departure) is just over 30m from the proposed buildings. The mine shaft and uncertainty in its location is indicated by the red circle in Figure 6.

Note: Should the sports pitch locations be finalised and be within around 10m of the anticipated locations of the mine shaft, then further investigation would be required to assess if the shaft has been suitably backfilled. It is recommended that this would be carried out as part of a later stage of investigation if this is required.

The approximate as drilled hole locations are shown in Figure 6, and in Appendix II.

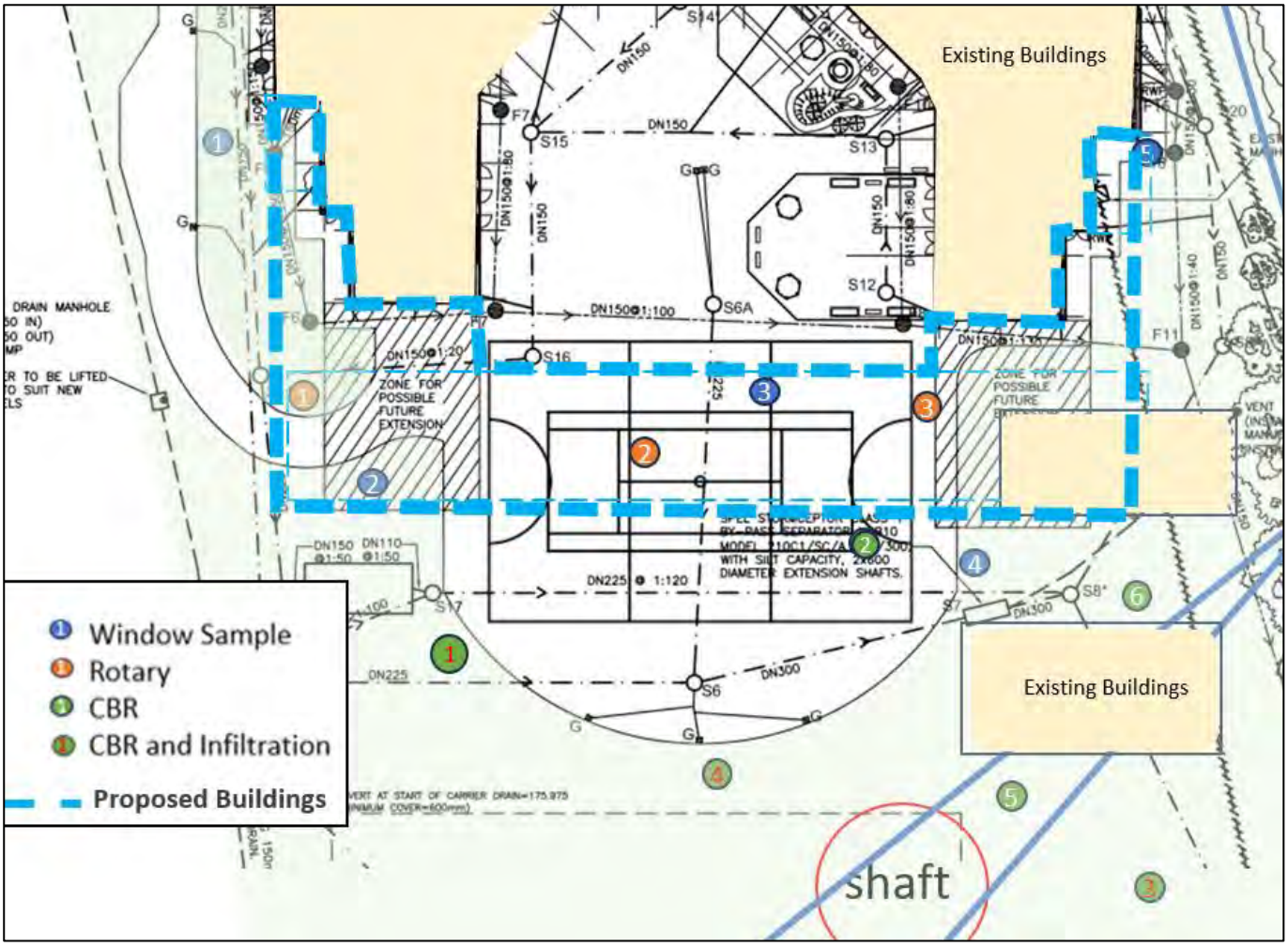


Figure 6: Approximate Exploratory Hole Locations

4.2 Fieldwork

Fieldworks were conducted on the 28th to 30th October 2024. An experienced engineer supervised the works, described the ground encountered, undertook the in situ testing and took samples.

Fieldwork procedures were undertaken in accordance with the relevant sections of: BS5930:2015 + A1:2020 "Code of Practice for Site Investigations" and BS10175.

The depths of exploratory holes, descriptions of strata encountered and comments on groundwater conditions are given on the records in Appendix II and a summary is presented below.

Table 4: Summary of Exploratory Hole Locations and Depths

Exploratory Hole ID:	Type*:	Start:	End:	Depth (m):	Termination reason:	Easting (mE):	Northing (mN):	Level; (mOD):
BH01	BH	28/10/2024	28/10/2024	39.50	Target depth	328729.50	346064.28	176.11
BH02	BH	30/10/2024	30/10/2024	43.00	Target depth	328754.42	346057.97	175.77
BH03	BH	29/10/2024	29/10/2024	45.00	Target depth	328776.51	346062.23	175.84
DCP01	DCP	28/10/2024	28/10/2024	0.91	Refusal	328739.51	346046.98	
DCP02	DCP	29/10/2024	29/10/2024	0.94	Refusal	328768.80	346055.70	
DCP03	DCP	28/10/2024	28/10/2024	0.92	Refusal	328793.90	346024.62	
DCP04	DCP	28/10/2024	28/10/2024	0.93	Refusal	328761.28	346034.44	
DCP05	DCP	28/10/2024	28/10/2024	0.92	Refusal	328783.63	346036.09	
DCP06	DCP	28/10/2024	28/10/2024	0.94	Refusal	328790.34	346051.97	
PT01	IP	28/10/2024	28/10/2024	0.40	Target depth			
PT03	IP	28/10/2024	28/10/2024	0.40	Target depth			
PT04	IP	30/10/2024	30/10/2024	0.40	Target depth			
WS01	WLS	29/10/2024	29/10/2024	2.42	Refusal	328721.03	346087.48	
WS02	WLS	29/10/2024	29/10/2024	5.45	Target depth	328733.88	346055.68	
WS03	WLS	29/10/2024	29/10/2024	2.00	Borehole collapsed	328763.26	346070.87	
WS04	WLS	29/10/2024	29/10/2024	3.60	Refusal	328780.48	346054.27	
WS05	WLS	29/10/2024	29/10/2024	4.43	Refusal	328791.35	346083.74	

**BH: Rotary Borehole*
DCP: Dynamic Cone Penetrometer (TRRL Method)
IP: In situ Permeability (infiltration) test, undertaken adjacent to CBR positions of the same number
WLS: Windowless (dynamic) sampling

Levels and grid co-ordinates for the rotary boreholes were provided by a third party conducting a topographic survey at the time of the investigation. Eastings and Northings for the other positions have been estimated using field data.

Monitoring wells were installed in WS1, WS4 and WS5.

4.3 In Situ Testing

CBR values were determined on site using a hand held DCP (TRRL method).

Infiltration tests were undertaken to assess the feasibility of permeable paving with reference to BS 297:2007+A1:2008 Code of practice for the design and installation of drainage fields for use in wastewater treatment.

The in situ test records are presented in Appendix III.

4.4 Geotechnical Testing

Representative samples of the materials present on the site were analysed by PSL in Doncaster who are UKAS accredited in accordance with ISO17025. Details of the accreditations are presented on the test reports in Appendix IV. Testing comprised:

- 10 samples for moisture content and Atterberg limits
- 1 sample for particle size analysis
- 2 samples for triaxial shear strength

4.5 Geoenvironmental Testing

In order to provide an assessment of the geoenvironmental risk, representative samples of the materials present on the site at shallow depths were assessed for a range of contaminants based on the desk study and site history. Samples for chemical analysis were stored on site in a cool box and submitted under chain of custody procedures to CTS who are UKAS accredited in accordance with ISO17025. Details of the accreditations are presented on the test reports in Appendix V. Testing comprised:

- 6 samples for pH, TOC, a suite of 9 metals, sulphate, PAHs, TPHs.
- 3 of the above samples for additional asbestos screen, and Extractable TPH with a basic carbon banding.
- 1 sample for Waste Acceptance Criteria (WAC) suite.
- 5 samples for concrete classification testing in accordance with BRE Digest SD-1.

Table 4: Summary of Samples & Testing

Hole	Depth	Strata	Testing
WS1	0.10 - 0.20	Topsoil	Full Suite
WS2	0.10 - 0.25	Topsoil	Full Suite plus TPH with banding
WS2	0.60	Hardcore	Not tested
WS3	1.80 - 2.00	ashy clay	Full Suite, WAC, asbestos screen
WS4	1.30 - 1.50	Ashy clay	TPH with banding
WS4	2.60 – 2.80	Ashy clay	Full Suite, asbestos screen
WS5	3.90 - 4.00	Natural clay (reworked)	Full suite
WS5	1.50 - 1.70	Ashy clay with mudstone	Full Suite plus TPH with banding
PT4	0.25 - 0.40	Ashy clay school field fill	asbestos screen
WS1	0.70	Made ground above a membrane	BRE Digest SD-1
WS2	4.60 - 4.75	Natural clay (reworked)	BRE Digest SD-1
WS3	1.40	Ashy clay	BRE Digest SD-1
WS4	1.75	Ashy clay	BRE Digest SD-1
WS5	2.40 - 2.50	Ashy clay	BRE Digest SD-1

5.0 GROUND CONDITIONS

5.1 Anthropogenic Material

Made Ground was encountered in all holes and comprised:

- Hardstanding or Topsoil
- "ashy clay": Clay with rock gravel and anthropogenic material including ash, burnt shale, tiles, engineering bricks: This material was not present in WS1 and WS2. Elsewhere, the base was at 3.6m (WS5) and unproven beyond 3.6m (WS4). In BH3, clay with brick and boulders was noted to 6.7m bgl.
- Reworked natural material comprising clay and rock gravel in varying proportions: This was present below the surface materials or anthropogenic fill in WS1, WS2 and WS5 from between 1.1m and 3.6m depth, Brown clay fill was noted in BH1 to 2.7m and BH02 to 7.3m bgl

In WS01, a geotextile membrane was noted at 0.8m bgl, between made ground and suspected reworked material.

The made ground is suspected to originate from the levelling of the site to create a level development platform for the school. The fill generally increases in depth eastwards, towards the downslope side and generally stiff and very stiff material is present. This may be engineered material, possibly with some cement/line stabilisation added.

The supervising engineer for EAL logging the soil conditions thought that some of the clays soils in the Made Ground had been lime or cement stabilised. This is difficult to discern when describing soils but lime or cement stabilisation does change the texture of soils and this would account for much of the Made Ground being relatively dry and of higher strength. These clays were of higher strength than would be expected for typical recompacted soils of this origin.

5.2 Natural Superficial Material

The rotary boreholes noted glacial clay below the made ground to 9.4m and 12.8m (BH1 and BH2, respectively). In BH2, SPT N-values in excess of 50 were recorded in this material. In BH3, the glacial clay was absent, with rock present immediately below the made ground at 6.7m depth. However, it should be noted that it is usually difficult to discern the difference between reworked and natural clay using rotary open-hole techniques, particularly if no anthropogenic fragments are present in the reworked material.

5.3 Bedrock and Mining

Coal Measures bedrock was encountered at depths in the three deep boreholes in order from west to east of 9.40m (BH1), 12.80m (BH2) and 6.70m (BH3). In BH3, the rock was recorded by the driller as a clay from 6.7m to 20.8m depth, with SPT N- values in excess of 50. Strata predominantly comprised mudstone, with subordinate siltstone and sandstone beds.

A thin coal seam was found in one hole only. Traces of coal were noted within other rocks. The coal seam evidence is summarised below. It is to be noted that the rotary open-hole drilling technique used, primarily to look for any voids, is not able to accurately describe strata in the same way as a cored hole, and strata are estimated only from examination of flush returns and drilling conditions, so thin coal seams can be missed. However, seams of a mineable thickness would typically be noticeable using this technique.

Table 5: Summary of Evidence of Coal Seams			
Borehole	**Depth (m bgl)**	**Coal Seam Evidence**	**Base of Hole (m)**
BH1	13.4 to 18.2	sandstone beds and traces of coal	39.50
BH1	32.6 to 34.1	traces of coal	39.50
BH2	30.8 to >43.0	Lost flush. Hard drilling, no voids	43.00
BH3	28.2 to 31.0	traces of coal	45.00
BH3	38.2 to 38.4	Coal Seam (0.2m thick)	45.00

It was not possible to estimate strata in BH2 beyond 30.8m as the hole lost all flush from 30.8m to beyond the base of the hole at 43.0m depth, however, there were no voids and hard drilling was noted, so this may indicate loss of the water flush to fractures in the rock.

5.4 Groundwater

Groundwater was not noted in the rotary holes, however, as these were drilled using water flush, groundwater entries are often masked.

A water entry was noted in WS4 at 3.50m as the hole hit an obstruction in the made ground, water rose to 2.75m depth in 20 minutes of monitoring. Water was noted in WS3 at the base of the hole at 2.00m. This hole collapsed at this point and no further progress could be made.

Subsequent monitoring of shallow wells installed into the window sample holes initially indicated dry conditions, or water collected in the base of the well only in WS1 and WS4, with groundwater present in all 3 holes on 21/11/24 after a period of rain and snow.

5.5 Contamination

There was no visual or olfactory evidence of contamination noted during the fieldwork other than anthropogenic material in the Made Ground

The results of the laboratory analysis are presented in Appendix VII.

5.6 In Situ Testing

5.6.1 In Situ CBR Values

The upper metre of ground was tested for CBR values for pavement design purposes.

DCP01 and DCP02, which are located in the school playground and close to the attenuation tank, indicated much higher CBR values than the tests below the playing fields down to a depth of 0.70 to 0.80m which corresponds to the gravel layer encountered below the hardstanding. These tests indicate a CBR value of about 18% (the lower bound) in DCP01 and 30% in DCP 02 (with the higher 'spiky data' values exceeding this indicating testing likely to be affected by coarse gravel).

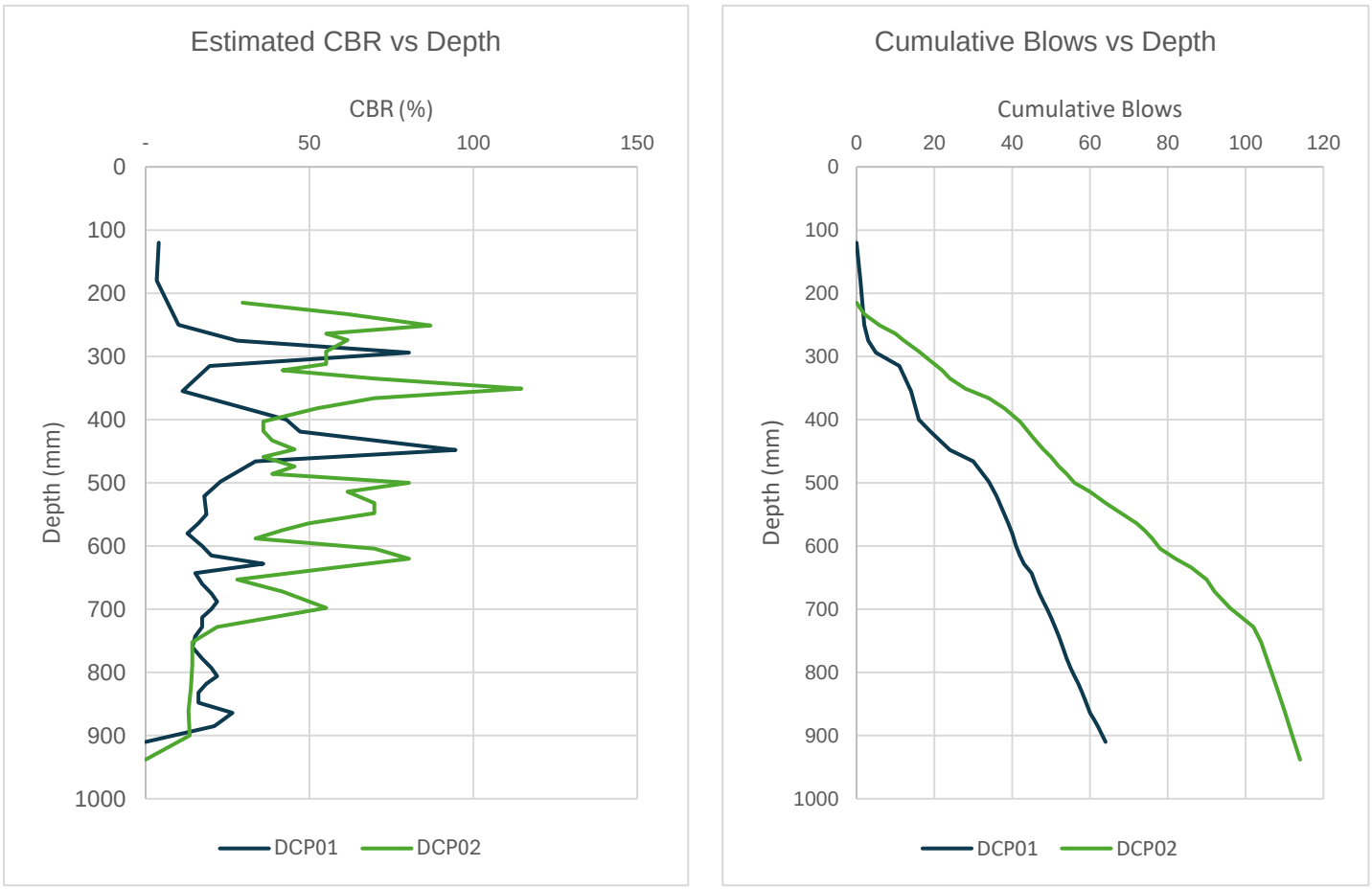


Figure 7: Summary Graphs of DCP01 & DCP02

Lower CBR values were recorded in the made ground below the school field and in a garden area between the mobile classrooms (locations DCP03 to DCP06). These tests were in the clay made ground were generally between 4 and 10-% (again ignoring the higher values likely to be results affected by coarse gravel). A lower bound CBR value appropriate for design of the sports pitches is 4% but this could be lower if the ground is heavily saturated and softens.

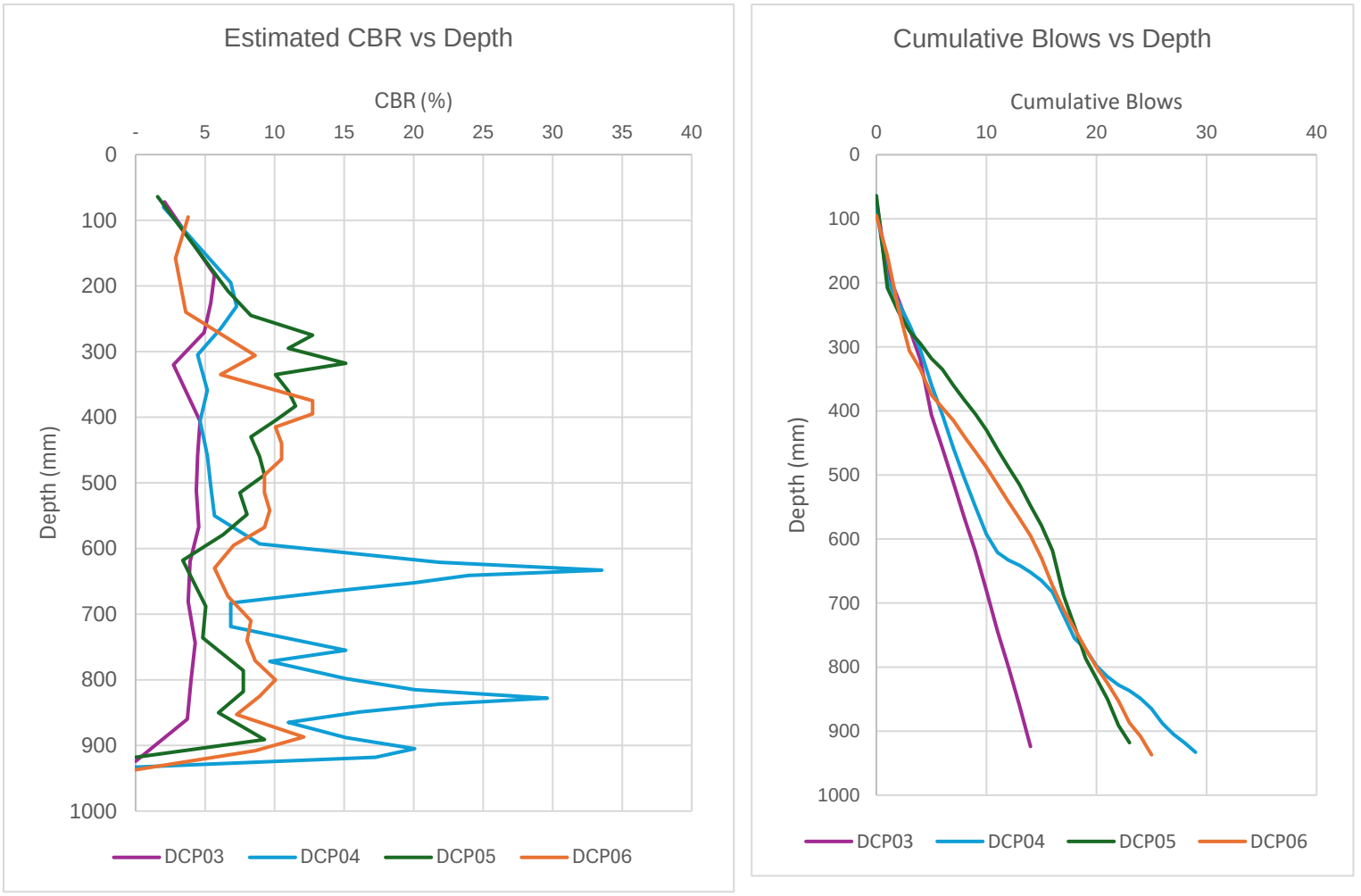


Figure 8: Summary Graphs of DCP03 to DCP06

5.6.2 SPTs and Shear Vanes

SPT values, corrected for hammer energy are presented in Figure 9. A general increase with depth was noted, reflecting an increase in shear strength. All SPT tests in bedrock had N-values >50.

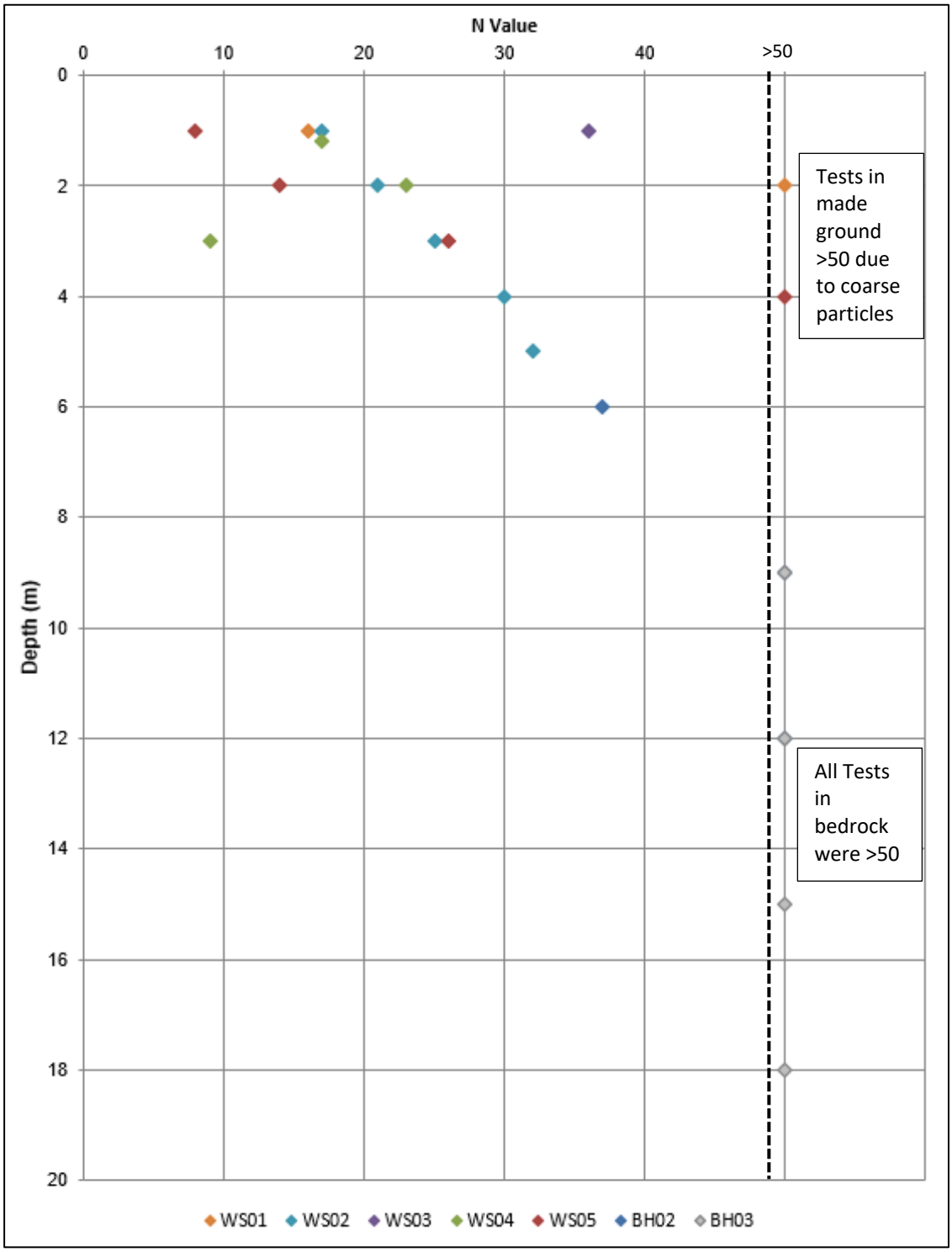


Figure 9: SPT N_{60} v Depth (Note where N values ≥ 50, N value is plotted as 50 for purposes of this graph)

Shear vanes were taken where possible and indicated stiff material and very stiff material sometimes beyond the maximum reading of the vane (441kPa) in the reworked clay.

Two samples were obtained from the window sample cores for triaxial testing. These generally correlate with the lower end of the strengths obtained using the SPT N values. The results can only be taken as approximate, due to the sampling methods used.

Plots comparing the hand vane readings with shear strengths obtained from Stroud's correlation with SPT N values and the triaxial testing are presented in Figure 10:

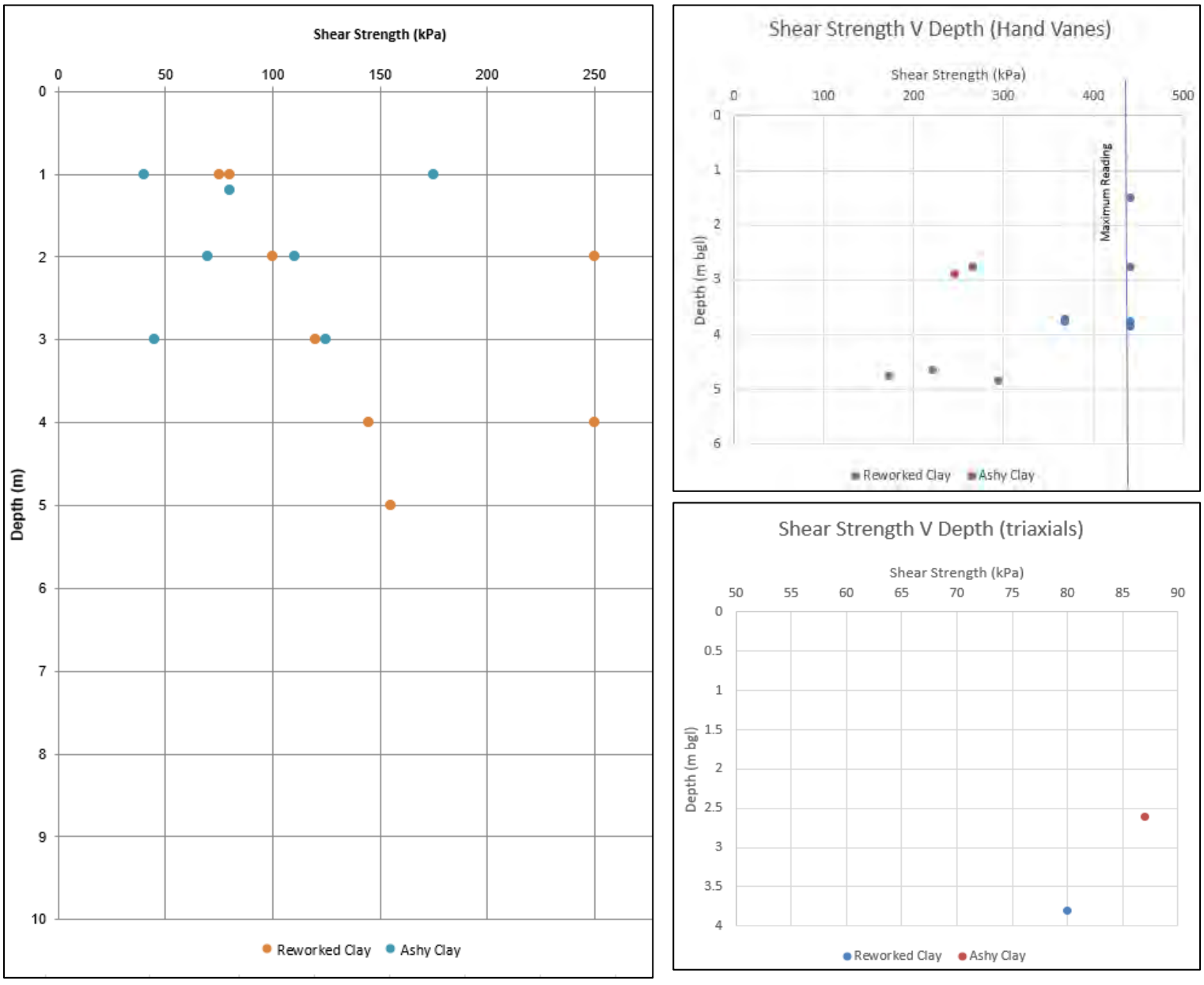


Figure 10: Shear Strength v Depth from Hand Vanes and SPT N correlation (5N) and Triaxial Tests

5.6.3 Infiltration Testing

Tests were undertaken in made ground in 3 locations in the school field. Natural strata were too deep for testing. The ground at the testing depth (300mm bgl) was described as a gravelly clay, which is typically relatively impermeable or of very low permeability.

Note BS 6297:2007 states that: "*a drainage field for disposal should only be used when percolation tests indicate average values of Vp between 15 and 100*". This indicates that only location PT03 (CBR03) is suitable.

Table 6: Summary of Infiltration/Percolation Testing		
Location	**Percolation Value Vp (s/mm)**	
PT01 (CBR01)	Could not be calculated due to slow infiltration	
PT03 (CBR03)	44.4	
PT04 – test 1 (CBR04)	6.8	Average for PT04:
PT04 – test 2 (CBR04)	12.0	11.8 s/mm but note successively
PT04 – test 3 (CBR04)	16.8	increasing values

5.7 Geotechnical Laboratory Testing

Clay soils within the site are assessed to be of low and medium plasticity (with one sample of ashy clay on the boundary between medium and high).

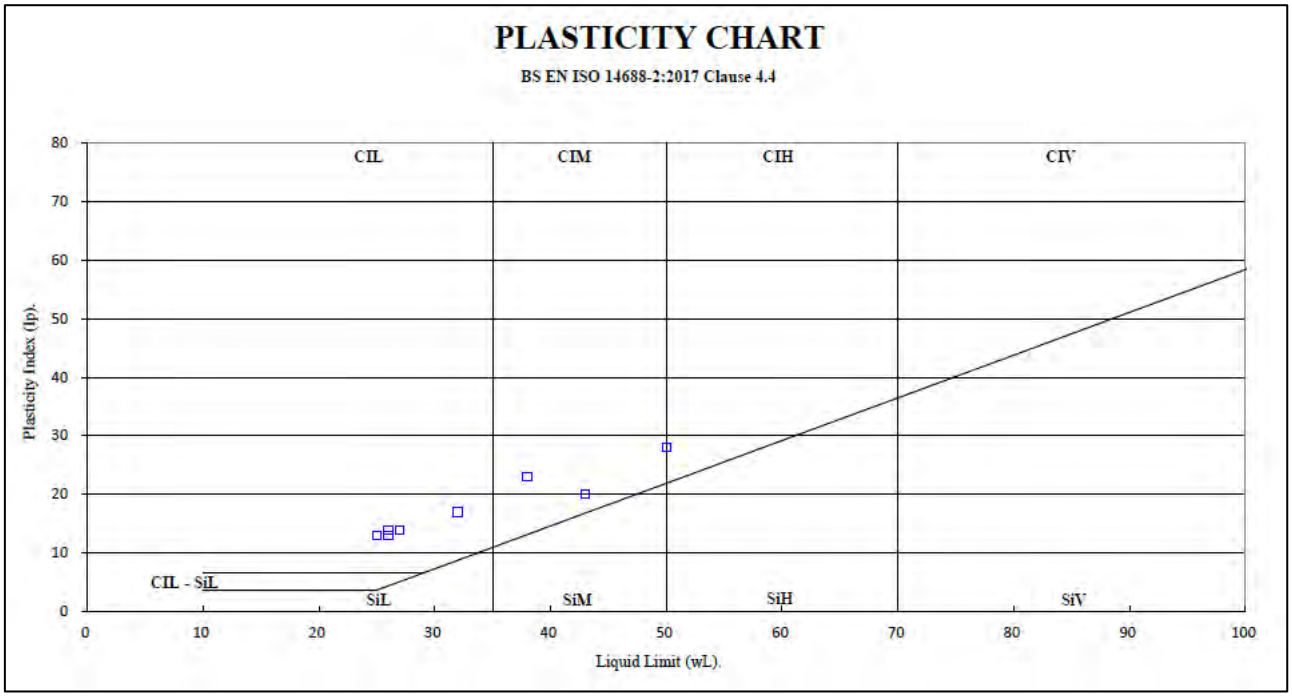


Figure 11: PSL Plasticity Chart

When corrected in accordance with NHBC Chapter 4.2, the Atterberg limits of the natural clays correspond to a generally low volume change potential. In the Made Ground the ashy clays are of low and medium volume change. A low volume change is considered appropriate for the site overall.

The natural glacial clays are the clays with lower plasticity but the deepest sample of Made Ground tested is probably reworked glacial clays based on this classification testing

The natural moisture content of the glacial clays was below the plastic limit in all the samples, indicating generally stiff material to be present (Figure 12). The ashy clays have notably higher moisture contents and higher liquid and plastic limits compared to the other materials. The glacial clays and reworked materials are very similar.

Natural moisture at dry of the plastic limit is often an indication onset of general desiccation. In accordance with BRE Digest 412 Desiccation in Clay Soils (1996), if the moisture content is <0.4 times the liquid limit this can indicate desiccation. Two of the ten samples are classed as desiccated using this formula, with a further two samples marginally desiccated. Both shallow and deep samples are desiccated, and of all clay types.

Whilst desiccation can occur due to vegetation, typically trees, it is thought that the desiccation in the Made Ground is due to lime or cement stabilisation of these materials when the earthworks were carried out for the construction platform for the school. The desiccation in lime or cement stabilised soil is of lower concern than in non-stabilised soils because these materials have a lower risk of swelling and heaving due to the chemical bonding in these materials.

The moisture content in the glacial clay is assessed as being due to over consolidation due to high stresses from overlying ice when these deposits were being created during the last ice age.

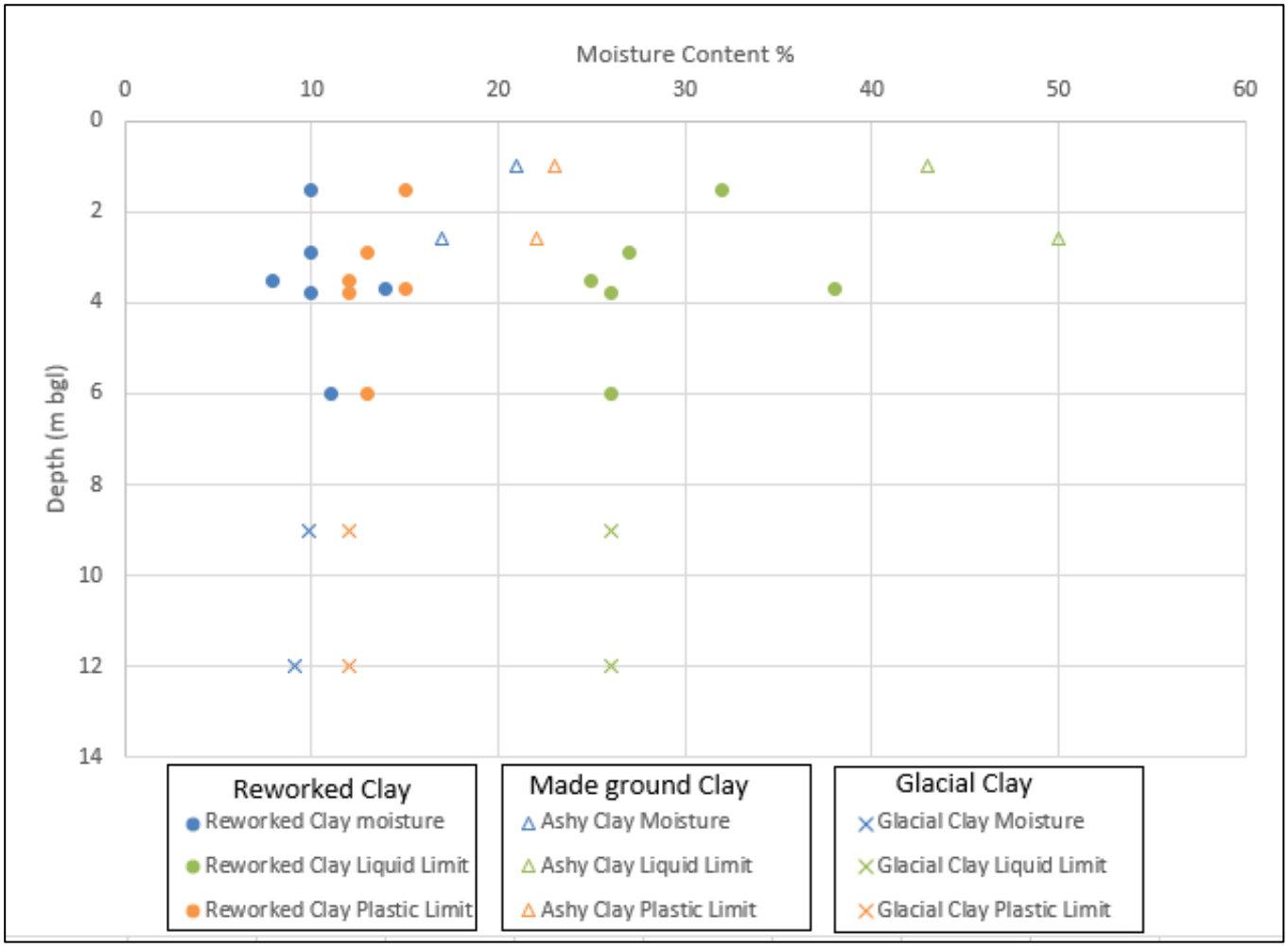


Figure 12: Atterberg Limits and Moisture Contents of Clays v Depth

Particle size distribution testing has confirmed the engineering descriptions, with the reworked clay deposits presenting a typical profile exhibited by glacial clays, with an evenly distributed range of sand sizes and gravel sizes.

Table 7: Summary of Particle Size Distribution Tests

Location	Soil	Cobbles %	Gravel %	Sand %	Silt/Clay %
WS1 1.5m	Reworked Clay	0	26	26	48

6.0 MINING RISK ASSESSMENT

There was no evidence for mined seams and voided ground within 39.5 to 45m of the surface. There was some evidence for thin coal seams which did not appear to be of mineable thickness. One hole suffered loss of flush, but no voids were identified, and drilling remained hard. There is a possibility that this represents broken ground due to collapse above deeper mined seams, but there is no other evidence to support this, and it is thought more likely to represent natural fractures in the rock. There are geological faults present, shown on the geological maps and also on the abandonment plans, and fractures could be associated with these. The recorded workings were not encountered and are considered to be too deep to affect the proposed development.

There is no evidence for recorded shafts below the area of the proposed buildings. There is a possibility that unrecorded shafts are present, however, shallow bell pits appear unlikely due to the expected depth of the mineable coal seams. There is a shaft present relatively close to the two possible locations of the sports pitch.

The risk of spontaneous combustion is assessed to be low due to the lack of shallow seams and pathways to the surface. Similarly, the risk of mine gas is assessed to be low, and gas monitoring has demonstrated relatively low methane and carbon dioxide concentrations although the oxygen concentrations in the ground were relatively low in one well. The gas monitoring is further discussed in Section 8.

The risk to the project from coal mining related risks is summarised below based on the desk study and the results of the intrusive investigation works:

Table 8: Summary of Coal Mining Issues and Assessed Risk

Coal Mining Issue	Present Below the Site ?		Risk Assessment	Overall Assessed Risk
	Yes	No		
Underground coal mining recorded at shallow depths	Yes		Records may be incomplete, but recorded workings are below the southern part of the school field only and at 56m depth.	Low
Underground coal mining probable at shallow depths	Yes		Potentially present but no evidence has been found of shallow workings within a depth of 39.5 to 45m.	Low
Mine entries (shafts & adits)	Yes		No recorded shafts below the footprint of the proposed building. There is a very low possibility of unrecorded shafts based on the history of excavations and filling at the site. There is a shaft present relatively close to the two possible locations of the sports pitch.	Low
Coal mining geology (fissures)	Yes		Fractured ground is likely	Low
Record of past mine gas emissions or potential		No	-	Low
Recorded coal mining surface hazard		No	-	Low
Surface mining (opencast workings)		No	-	Low

It is concluded that the risk to the project from mining related risks are low and no specific mitigation is required as part of the development. However, a watching brief will be required during the site clearance and development stage and should any suspect features, such as unrecorded shafts, which could appear as, for example, circular areas of a different type of made ground of around 1.8 to 2.5m diameter be encountered, then works should stop until specialist advice has been sought.

7.0 GEOTECHNICAL COMMENTS

7.1 Geotechnical Considerations

Geotechnical considerations at this site comprise:

- Deep made ground.
- Clay soils and trees.
- Sloping ground to east of site
- Loading conditions are not full known at this stage. The loads for the primary school structures are anticipated to be relatively light.

The ashy clay made ground is a poor founding stratum. The reworked glacial clay, however, is generally uniform and stiff, and could be used for the proposed structures if bearing pressures were distributed to allow homogenisation of any differential movement, via a raft footing, for example or reinforced strip footings. Alternatively, some form of ground improvement such as Controlled Modulus Columns (CMCs) could be used, or piles.

7.2 Desiccation and Trees

Clay soils can exhibit movement in response to seasonal moisture content change within the influence of existing or removed trees and hedgerows, or if trees are planted close to the building upon completion (which is not anticipated and is unlikely for this development). The amount of movement due to moisture content changes is a function of the mineralogy of the clay (which is related to its plasticity characteristics), the species of tree and the distance of trees to the foundations. The influence of the tree lessens with depth, hence near surface soils are more prone to the effects of desiccation. Desiccation can also be caused by grass and shrubs but only to very limited depths compared to trees. In the longer term, the site is situated in an area where there will be a net annual increase in rainfall due to climate change, so no specific precautions are required due to anticipated longer term climatic effects and trees.

Guidance for the required depth of shallow foundations with regard to clay desiccation is limited for commercial buildings. Clay soils near surface are assessed as low volume change potential in accordance with NHBC Chapter 4.2, building near trees (2024). The guidance published by the NHBC is for low rise residential development but the proposed school buildings are not too dissimilar in loading characteristics to domestic properties so the NHBC guidance will be utilised. Based on this, the minimum foundation depths for low volume change potential clay soils is 0.75m bgl, deepened where there is influence from trees.

Soils at these depths of 0.75m to 1.25m are anticipated to comprise principally reworked glacial clays.

The trees present on the eastern site boundary are assessed as low and medium water demand and are 2-3m below the level of the existing school, and around 5m from the proposed footings in plan. As such, the proposed buildings will not be affected by soils dried by these trees.

A willow tree (high water demand) present below the proposed footprint on the eastern side of the site is a sapling, and in a planter, although it is not known if the roots extend into the soil below. Any soil drying from this tree is anticipated to be limited. Another sapling around 5m in height suspected to be a birch (low water demand) is also present in this location and it is assumed this will need to be relocated. As it is a sapling, minimum foundation depths apply for these soils.

There are semi mature low and medium broad-leafed trees approximately 8 to 10m from the proposed buildings on the western side of the site. These are anticipated to be too far away to affect the proposed footings.

One small (approx. 2.5m height) medium water demand tree is present on the western side of the site below the footprint. It is assumed this tree will be removed. As it is a sapling, minimum foundation depths apply for these soils.

A suspected hawthorn (high water demand) is present approximately 8m from the proposed footprint on the western side. Foundations would need to be deepened to 1.25m at 8m distant from the tree, shallowing to the minimum

depths of 0.75m at 12m distance. Foundations can be gradually stepped, with no step exceeding 0.5m. Soils at these depths (0.75m and 1.25m) are anticipated to comprise reworked glacial clays.

7.3 Geotechnical Design Values

Design values for the reworked glacial clay to a depth of about 2.0m have been selected based on the previous sections of this report and published values:

Table 9: Geotechnical Design Values	
Parameter	**Design Values**
Undrained Shear Strength	75 kPa
Coefficient of Volume Compressibility (m_v)	0.2 m^2/MN
Bulk Unit Weight	20 kN/m^3

Note that the undrained shear strength and stiffness in the underlying deeper reworked glacial clay and the in situ glacial clay is much higher than indicated above. Below a depth of about 4 m, the undrained shear strength is greater than 150 kPa.

7.4 Foundations

For these soils, at the depths proposed, and for the anticipated lightly loaded structures, it is suggested that either reinforced strip footings or a reinforced raft foundation could be utilised. NHBC Chapter 4.2 recommend that for rafts these should:

- be suitably stiff to resist differential movement,
- be founded on granular infill placed and fully compacted in layers
- be generally rectangular with a side ratio of not more than 2:1.

These recommendations are for residential buildings; hence they can be taken as guidelines only for the school building. Note that the proposed row of new classrooms has a much higher ratio length to width ratio than 2:1 indicating that there is a greater risk from differential settlement. Therefore a raft for this project would require increased reinforcement compared to a raft for a typical domestic property.

It is calculated that allowable bearing pressures of 150 kN/m^2 are available at the minimum depth of 0.75 m in the reworked clay for strip footings up to 1.0m wide or for a reinforced raft, with expected settlements less than 20 mm. Foundations should be taken to the minimum depths, 0.2m below the ashy clay/capping, or the foundation depth calculated for tree influence, whichever is deeper.

Granular infill should be placed below raft foundations to at least 50% of the foundation depth (and not more than 1.25m deep) and should extend beyond the edge of the foundation by a distance equal to its natural angle of repose, plus 0.5m, as illustrated in Figure 13. A typical angle of repose for MOT type 1 material would be 38-40 degrees.

Where trees have been removed, heave precautions may be required in accordance with NHBC Chapter 4.2.

It should be noted that in the vicinity of the proposed buildings there is generally relatively thick capping/sub-base which is 0.80 to 1.30 m thick. This is suitable for reuse at the site as part of the development. The exception to this was location WS04 which had no gravel present but was located outside the building footprint.

The monitoring and the groundwater levels in the wells indicate that the water levels at the site are variable and some groundwater is present, probably within granular layers, lenses and beds. After rainfall, water is expected to be

present in the near-surface granular strata. If any shallow water enters excavations, it is likely that this can readily be controlled by sump pumping.

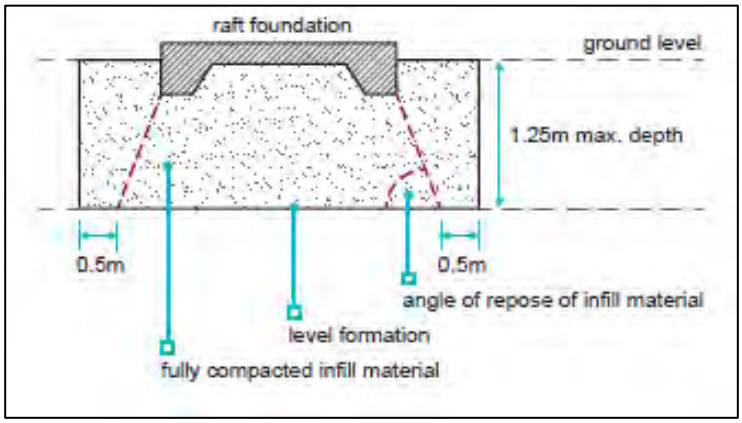


Figure 13: Raft Foundations (NHBC Chapter 4.2)

7.5 Floor Slabs

For reinforced raft foundations, the floor slabs can be incorporated into the raft.

For reinforced strip footings, lightly loaded ground bearing floor slabs could be considered outside the area of tree influence if the formation horizon is proof rolled to remove any soft or loose spots and a well compacted granular layer is installed below the slab to help reduce differential movements.

In the area within the influence of the (hawthorn) tree on the western side of the site, a suspended floor slab could be utilised for this small area with void dimensions as per NHBC Chapter 4.2 (50mm for suspended in situ and 200mm for suspended precast), or alternatively, a ground bearing floor slab can be used if it is placed on granular material , compacted in layers, in the same manner as for below a raft footing, illustrated in Figure 13, in Section 7.4.

8.0 GEOENVIRONMENTAL ASSESSMENT

8.1 Assessment

The assessment of contamination has been carried out in accordance with the overall guidance presented in Environment Agency "Land Contamination Risk Management (LCRM, 2021, updated 2023). Generic risk assessment is a two-stage process. Firstly, in the Risk Estimation stage, the measured contaminant concentrations are compared to the relevant first tier assessment criteria where they have been published. Where there is a suitable dataset, this is done after carrying out statistical analysis to determine the upper confidence limit on the true mean. Otherwise, maximum or specific data points are compared directly. The second stage, Risk Evaluation, comprises an authoritative review of the findings with other pertinent information, in cases where the first stage assessment criteria are exceeded, in order to consider if exceedance may be acceptable in the particular circumstances.

The aspects of risk from substances in the ground considered below are as follows:

- human health;
- plant life;
- pollution of Controlled Waters;
- water supply pipes
- below ground concrete; and
- ground gases.

8.2 Assessment for the Protection of Human Health

The Generic Qualitative Risk Assessment (GQRA) has been carried out assessing the risk based on the landscaped areas being Public Open Space (POS) Parks land use and the area of the buildings as commercial end use for volatile compounds line with current regulations and guidance. A summary of the chemical test results is presented in Appendix VIII (including the source of the assessment criteria) with a comparison against assessment criteria for the above land use criteria and for the more conservative residential end use.

The results of the risk assessments indicate

- No asbestos in any samples.
- Low levels of hydrocarbons and PAH in all samples.
- The following strata have low contaminant.
    - Topsoil
    - Granular capping/sub-base
    - natural reworked clay
    - the glacial clay
- The ashy clay Made Ground (see Table 10) contains:
    - Elevated concentrations higher than the residential criteria for arsenic, lead and zinc.
    - The POS Park criteria are exceeded for two out of the three samples tested and on average exceed the criteria.
    - The ashy fill is assessed to comprise local mining waste (coal and metalliferous) and possibly brickworks wastes. It may also have some burnt oil shale from the extraction of hydrocarbons from coal Measures mudstones.
    - The principal contaminant source is assessed to be elevated concentrations of the metals indicative of waste from smelting metal ore from the North Wales limestone ore body.

Table 10: Summary of Metals with Elevated Concentrations (in mg/kg)									
Sample Location	Sample Depth (m)	Soil Type	Laboratory Test Results mg/kg			Average By Soil Type (mg/kg)		
			Arsenic	Lead	Zinc	Arsenic	Lead	Zinc
WS1	0.1-0.2	Topsoil	12	74	120	<11	87	280
WS2	0.1-0.25		<10	190	440			
WS3	1.8-2.0	Ashy clay	42	370	850	37	2257	13150
WS4	2.7-2.8		58	4300	34000			
WS5	1.5-1.7		11	2100	4600			
WS5	3.9-4.0	Reworked glacial clay	11	160	180	11	160	180

Note:
1 Numbers in red are values in excess of residential land use criteria
2 The threshold criteria for POS Park are indicated below with a comment on the exceedances:
Arsenic 170 mg/kg – Not exceeded
Lead 1,300 mg/kg – Exceeded for two out of three samples of the ashy clay
Zinc 170,000 mg/kg – Not exceeded

Overall, there is no risk currently due to human health risks because there is an adequate clean cover over the ashy clay so there is no pathway. As part of the development there is no requirement to remediate these materials as long as they remain under a cover of clean capping, and there is no reason for them to be near-surface as part of the development because there are limited landscaping changes and the development will principally be buildings, hard standing and an all-weather sports pitch which all provide hard clean cover breaking pathways to metals.

Notwithstanding the above, during groundworks phase of the contract the contractor needs to prevent dust from these materials and any spread of these materials from temporary stockpiling or disposal off site. All personnel carrying out groundworks will need a good level of hygiene.

8.3 Assessment for the Risk to Plant Life

The concentrations of the phytotoxic metals copper, chromium, nickel and zinc have the potential to be harmful to plants and so does lead to a lesser extent. At this site the concentrations of arsenic, lead and zinc (particularly zinc) may cause reduced growth of some types of plants, but many other plant types will not be affected. Because there is a suitable clean cover present at the site and the grass grows well at the site, no further assessment of the risk to plant life will be carried out.

8.4 Assessment for the Protection of Controlled Waters

The following controlled waters receptors are present:

- Secondary A Aquifer natural superficial strata
- Principal Aquifer bedrock

There are no Surface Waters or Source Protection Zones in the vicinity of the site soi the site is in a relatively low controlled waters risk environment.

It is assessed that the elevated metals concentrations this site are from smelting of metalliferous ores. These are principally low solubility materials which is confirmed by the Landfill WAC Suite test results on the ashy clays. These

results have metal concentrations lower than the inert WAC limits (but the antimony concentrations equals the inert WAC limit although note that there are no water quality standards for antimony).

In terms of assessing the risk to groundwater, the following should also be noted:

- Concentrations of organic contaminants were very low so there is negligible risk to controlled waters from these contaminants.
- The elevated concentrations are in clay fill over reworked glacial clay over intact glacial clay. These are all low permeability materials reducing the mobility of any leachate with elevated metal concentrations
- The upper strata of the bedrock is Coal Measures mudstones again being of low permeability and will further reduce the mobility of any leachate with elevated metal concentrations.
- The development will reduce the risk from leaching of the metals because the area of impermeable hard standing at the site will be increased relative to current conditions hence decreasing the risk to controlled waters.

Therefore, the Made Ground does not pose a significant risk to controlled waters and no remediation is required at this site due to the concentration of contaminants at the site.

8.5 Assessment for Water Supply Pipes

Plastic pipe materials are potentially vulnerable to attack from elevated levels of hydrocarbons, which can potentially lead to contamination of potable water supplies and water supply companies also require the risk to their workers from other contaminants in the ground to be assessed. The assessment has been completed in accordance with the current UK Guidance for the Specification of Water Supply Pipes, from United Utilities. This guidance provides threshold concentrations for different pipe material for various chemical groups. The pipeline materials considered by the guidance are PE, PVC, wrapped steel, wrapped ductile iron or copper pipe and barrier pipe. PE are assessed using threshold concentrations for various chemical groups including volatile organic compounds (VOC) with tentatively identified compounds (TICs), semi-volatile organic compounds (SVOC) with TICs, and mineral oils. Wrapped steel, wrapped ductile iron and copper pipe are assessed using corrosive properties.

The default recommendation for water supply pipes is to use PE with other types of pipework only used if the limits for PE pipes are exceeded. The available data indicates no exceedances of the limits for the use of PE pipework so it is deemed permissible for PE pipe to be used at this site. Welsh Water will require a formal Water Supply Pipe Material Assessment to be carried out on their own proforma and submitted with the application for any new connection but this is unlikely to be required for this development as the existing supply is likely to be used for the new buildings.

8.6 Chemical Attack on Below Ground Concrete

Below ground concrete structures are potentially at risk in areas of elevated sulphates and where there is low pH. An assessment of the soil and groundwater data (following the protocol established in BRE Special Digest 1, 2005) indicates high sulphates in the ashy clay fill at WS4. Some sulphates can arise from bricks in rick rubble, or from demolition of old chimneys, such as the ones that were located on the adjacent brickworks site.

In addition, assessment in accordance with BRE Special Digest 1, 2005 indicates that pyrite may be present. Pyrite can be naturally present in coal measures rock and in spoil arising from coal mines. When pyrite is disturbed, such as when excavated for spread footings, it can oxidise to form additional sulphates.

Design sulphate class DS-2 and ACEC AC-2 conditions therefore apply for all buried concrete, assuming mobile groundwater conditions.

8.7 Ground Gases

Radon protection measures are not required.

The Made Ground on site does not contain material which would be considered a viable source of permanent ground gases (e.g. methane and carbon dioxide).

A possible source of ground gas is the underlying coal seams, and bedrock is suspected to be fractured, providing pathways for gas, however, rockhead is below a significant cover of generally impervious clay material.

Only three visits were scheduled as the principal reason for installing the monitoring wells was to confirm the anticipated ground water levels for geotechnical purposes with the measurement of ground gas just to confirm that there is a low ground gas risk at this site as expected from the desk study and that the third round of monitoring was carried out under adverse atmospheric conditions.

The monitoring and barometric pressure trends associated with the monitoring periods is detailed in Appendix IX.

Monitoring has included low and falling atmospheric pressure conditions, and on the third visit in particularly low and falling low pressure conditions (974-976 mbar with more than 16 mBar in the proceeding 12 hours) with a significant layer of snow and ice present on the ground surface. This is likely to represent a worst-case condition for ground gas concentrations, hence no further monitoring is proposed.

Monitoring to date (3 visits) has indicated the following levels of ground gas to be present:

- No methane was recorded
- Carbon dioxide concentrations were between 0.1 and 2.6% v/v
- Oxygen concentrations were between 5.9% and 20.4% v/v
- No hydrogen sulphide or carbon monoxide was detected.
- All PID concentrations were lower that the detection limit.

Note that the potential source of ground gases at the site is low in terms of the nature of the materials and their age/time since deposition. Additionally, whilst the ashy clay does have elevated TOC and LOI, the Dissolved Organic Carbon (DOC) in the leachate is low and therefore generation of ground gases is expected to be very low from materials of this nature.

The ground gas monitoring indicates that ground gas Characteristic Situation 1 (CS1) conditions apply and no mitigation measures will be required for ground gases.

8.8 Waste Assessment

8.8.1 Summary

EAL has undertaken a preliminary assessment of potential excavation waste to arise from the site during redevelopment to:

- Classify the excavation waste to arise as either hazardous or non-hazardous.
- Identify the most sustainable options for the wastes to arise in accordance with the waste hierarchy.
- Provide information to waste producers.
- Be able to provide a basic classification report to a landfill operator (where waste is destined for landfill disposal).

8.8.2 Waste Classification Procedure

As described in the 'Waste Duty of Care Code of Practice (2016)' any substance or object that the holder discards, intends to discard or is required to discard is a waste. It is the responsibility of the waste producer to classify this waste. The classification process is described in the 'Guidance on the classification and assessment of waste' (WM3 UK) and aims to determine whether the waste is Hazardous or Non-Hazardous to human health and the environment.

Hazardous wastes are signified by entries where the code is followed by an asterisk, where some wastes are deemed hazardous without further assessment, which are termed "Absolute Entries" e.g. most waste oils. Alternatively, waste entries are termed "Mirror" entries that require further assessment of hazardous properties, in order to determine whether they are hazardous waste or not (e.g. soil and stones). The EWC codes relevant to excavation wastes are:

- 17 05 03* - soil and stones containing dangerous substances.
- 17 05 04 – soil and stones other than those mentioned in 17 05 03.

The Landfill Directive (Directive 1999/31/EC on the landfilling of waste, Decision 2003/33/EC and Landfill Regulations 2005) led to the establishment of a methodology for classifying wastes.

Wastes first need to be classified based on their total concentrations and classified as either hazardous or non-hazardous waste. WAC testing is only required if the end disposal route is a landfill and WAC analysis must not be used for waste classification.

Wastes can only be accepted at a landfill if they meet the relevant Waste Acceptance Criteria (WAC) for that type of landfill. A waste must comply with the WAC limits for the relevant landfill, otherwise the soil will need to be pre-treated. There are three different WAC criteria, these are:

- Inert waste (this is a sub-set of non-hazardous waste).
- Stable Non-Reactive Hazardous Waste (SNRHW) – this is a minor subset only used for limited types of waste such as asbestos.
- Hazardous waste.

There are no standard set of WAC limits for non-hazardous landfill sites and each non-hazardous landfill will have its own set of criteria under which it is licenced to accept non-hazardous waste. These will need to be determined through the selected waste receiver prior to disposal.

A non-hazardous waste should not be compared with WAC limits for hazardous or SNRHW waste sites and the WAC test should only be used to determine if the waste is suitable for disposal at an inert waste landfill site. Likewise, wastes classified as hazardous based on their total concentrations should not be compared with WAC limits for inert waste landfill sites, as these will not be accepted.

8.8.3 Waste Classification

An assessment of the soils encountered and tested as part of this investigation has been made in accordance with the likely waste classification if this material is sent to landfill for disposal although it should be noted that there are other potential sites which may be able to take wastes such as sites with a recovery permit or a treatment permit.

Table 11: Waste Assessment Summary

Stratum	Waste Classification	WAC Analysis	Likely Landfill Classification	Remarks
Topsoil	Non-hazardous	-	Inert	Reuse or send for recycling-
Made Ground -Sub-base	Non-hazardous	-	Inert	Reuse on site or send off site for recycling
Ashy clay	**Hazardous**	LOI & TOC Too High for Hazardous Landfill	Hazardous (due to lead & zinc)	Would require pre-treatment before sending to a Hazardous landfill
Made Ground - reworked clay	Non-hazardous	-	Inert	Inert
Natural Glacial clay	Non-hazardous		Inert	Inert

8.8.4 Reuse of Soils on Site - U1 Exemption

There will be limited soils requiring to be reused on the site, probably limited to some topsoil and the capping/sub-base.

A U1 exemption application can be made for the re-use/import of soils and stones, but only up to 1000 tonnes or for brick and concrete up to 5000 tonnes. This is usually an efficient way to re-use small volumes of waste materials. However, only one U1 can be filed in per site in any 3-year period. The application is quick and free via online registration.

9.0 CONCLUSION

9.4 Environmental Risk Assessment

The Phase 1 desk study has shown that this site is in an area where there has been historic coal mining below and around the site. Historic railway embankments were also potentially present, and an historic brickworks is adjacent to the site.

The site investigation encountered ashy clay Made Ground and reworked natural clays.

In relation to the risk from contaminants to human health, the results of the risk assessments indicate:

- No asbestos in any samples.
- Low levels of hydrocarbons and PAH in all samples.
- The following strata have low contaminant.
    - Topsoil
    - Granular capping/sub-base
    - natural reworked clay
    - the glacial clay
- The ashy clay Made Ground (see Table 10) contains:
    - Elevated concentrations higher than the residential criteria for arsenic, lead and zinc.
    - The POS Park criteria are exceeded for two out of the three samples tested and on average exceed the criteria.
    - The ashy fill is assessed to comprise local mining waste (coal and metalliferous) and possibly brickworks wastes. It may also have some burnt oil shale from the extraction of hydrocarbons from coal Measures mudstones.
    - The principal contaminant source is assessed to be elevated concentrations of the metals indicative of waste from smelting metal ore from the North Wales limestone ore body.

Whilst there are elevated concentrations of metals locally in the Made Ground, this does not pose a significant risk to controlled waters.

For water supply pipes, PE pipework can be used.

Radon protection measures are not required at this site and there is a low risk from permanent ground gases (e.g. methane and carbon dioxide) and Characteristic Situation CS1 conditions apply.

Overall, no remediation is required at this site due to the concentration of contaminants or from ground gas. However, the following items should be noted:

- There is no risk currently due to human health risks because there is an adequate clean cover over the ashy clay so there is no pathway.
- As part of the development there is no requirement to remediate these materials as long as they remain under a cover of clean capping and there is no reason for them to be near-surface as part of the development because there are limited landscaping changes and the development will principally be buildings, hard standing and an all-weather sports pitch which all provide hard clean cover breaking pathways to metals.
- During groundworks phase of the contract the contractor needs to:
    - Prevent dust from these materials and any spread of these materials from temporary stockpiling or disposal off site.
    - All personnel carrying out groundworks will need a good level of hygiene.
- As with any site, there is the potential for areas of previously unexpected contamination to be present, as is the case with any “brownfield” site and this issue needs to be considered. If encountered then the procedures in Appendix VII should be implemented.

If for any reason that soil is required to be imported to the site then the import threshold criteria set out in Appendix VIII should be used for acceptability criteria.

In terms of waste disposal, the ashy soils on site will be classified as being hazardous in terms of waste disposal and the high costs for disposal of this soil should be noted. All the other soils encountered are assessed as likely to be inert wastes.

9.2 Mining Risk Assessment

It is concluded that the risk to the project from shallow mining is low and no mitigation measures are required. However, a watching brief will be required during the site clearance and development stage and should any suspect features be encountered then works should stop until specialist advice has been sought.

9.3 Geotechnical Risk Assessment

Geotechnical considerations at this site comprise:

- Relatively deep made ground
- Clay soils and trees.
- Sloping ground to east of site
- Loading conditions are not fully known at this stage. The loads for the primary school structures are anticipated to be relatively light.

Suitable foundations solutions are assessed to comprise:

- Raft footings
- Reinforced strips
- Ground improvement such as CMCs,
- Piles.

Assessment of soil shrinkage characteristics in the presence of trees has indicated minimum foundation depths of 0.75m bgl to be appropriate, deepened where trees are present. A suspected high water demand tree is present approximately 8m from the proposed footprint on the western side. Foundations would need to be deepened to 1.25m at 8m distant from the tree, shallowing to the minimum depths of 0.75m at 12m distance. Foundations can be gradually stepped, with no step exceeding 0.5m. These guidelines are for residential properties, so should be taken as general guidance only.

Soils at these depths (0.75m and 1.25m) are anticipated to comprise principally reworked glacial clays.

It is calculated that allowable bearing pressures of 150kN/m^2 are available at the minimum depths of 0.75m in the reworked clay for strip footings up to 1.0m wide as a reinforced raft, with expected settlements less than 20mm.

The length to width ration of the main new building is relatively high for a raft so additional reinforcement will be required to prevent the risk of differential settlement.

Where trees have been removed, heave precautions may be required in accordance with NHBC Chapter 4.2.

Design sulphate class DS-2 and ACEC AC-2 conditions therefore apply for all buried concrete, assuming mobile groundwater conditions.

CBR Values in the existing relatively thick existing capping/sub-base are between 18% and 30%. Below this the clays have a design CBR value of 2%. A CBR Value of 4% is recommended below the area of the proposes all weather sports pitches. It is recommended that confirmation VBR testing is carried out on the proposed formation once the site clearance and levelling has been undertaken.

The monitoring and the groundwater levels in the wells indicate that the water levels at the site are variable and some groundwater is present, probably within granular layers, lenses and beds. If any shallow water enters excavations, it is likely that this can readily be controlled by sump pumping.

Infiltration tests were undertaken in made ground in three locations in the school field. Natural strata were too deep for testing. The ground at the testing depth (300mm bgl) was described as a gravelly clay, which is typically relatively impermeable or of very low permeability. Note BS 6297:2007 states that: "*a drainage field for disposal should only be used when percolation tests indicate average values of Vp between 15 and 100*". This indicates that only location PT03 (CBR03) is suitable for infiltration.

9.4 Recommendations for Further Works

The gas monitoring wells should be fully decommissioned and infilled with suitable impervious material such as bentonite or a bentonite cement grout prior to the construction of the proposed buildings. This could be done during the construction phase.

END OF REPORT

EAL

APPENDIX I - LIMITATIONS

APPENDIX I – LIMITATIONS

LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between Eccles Associates Ltd and the Client as indicated in Section 1.0.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information, it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency/Natural Resources Wales. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. 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 be made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. In addition to the above Eccles Associates Ltd note that when investigating, or developing, potentially contaminated land it is important to recognise that sub-surface conditions may vary spatially and also with time. The absence of certain ground, ground gas, and contamination or groundwater conditions at the positions tested is not a guarantee that such conditions do not exist anywhere across the site. Due to the presence of existing buildings and structures access could not be obtained to all areas. Additional contamination may be identified following the removal of the buildings or hard standing.

7. 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.

8. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials this is for indicative purposes only and do not constitute or replace full and proper surveys.

9. The executive summary, 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 report in full.

10. This report presents an interpretation of the geotechnical information established by excavation, observation, and testing. Whilst every effort is made in interpretative reporting to assess the soil conditions over the Site it should be noted that natural strata vary from point to point and that man-made deposits are subject to an even greater diversity. Groundwater conditions are dependent on seasonal and other factors. Consequently, there may be conditions present not revealed by this investigation.

11. Eccles Associates Ltd cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by Eccles Associates Ltd is owned by them and no such plans or documents may be reproduced, published, or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by Eccles Associates Ltd in this connection without their explicit written agreement there to by Eccles Associates Ltd.

12. Rather, this investigation has been undertaken to provide a preliminary characterisation of the existing sub-surface geotechnical characteristics and make up and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

13. This investigation has been undertaken to reasonably characterise existing sub-surface conditions and the findings of this study are our best interpretation of the data collected, within the scope of work and agreed budget. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

EAL

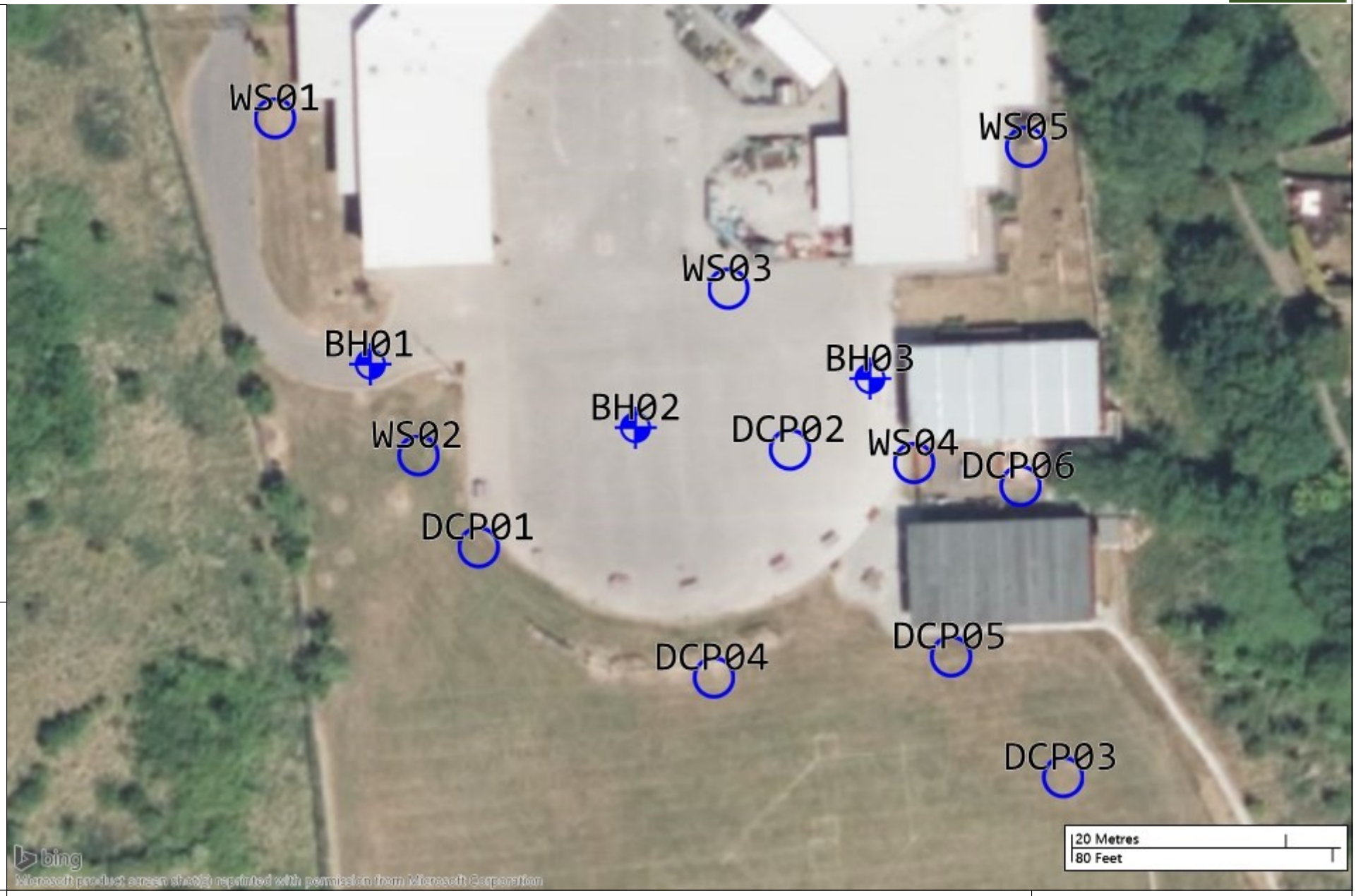
APPENDIX II – EXPLORATORY HOLE RECORDS

APPENDIX II EXPLORATORY HOLE RECORDS

Exploratory Hole Location Plan

EAL

N



Legend Key

- Locations By Type - BH
- Locations By Type - DCP
- Locations By Type - IP
- Locations By Type - WLS

Notes:

1. WS and DCP locations are approximate

Date:	04-11-2024	Project:	Ysgol I.D. Hoosan	Drawing No:
Issue:	DRAFT	Project No:	24-074	Ref
Scale:	1:500	Client:	Reed Construction Holdings Ltd	

Exploratory Hole Key Sheet

SAMPLES:

Undisturbed:	
U	Driven tube sample
UT	Thin wall driven tube sample
TW	Pushed thin wall tube sample
P	Pushed piston sample
L	Liner sample (from windowless or similar sampler), full recovery unless otherwise stated
CBR	CBR mould sample
BLK	Block sample
C	Core sample (from rotary core) taken for laboratory testing
Disturbed:	
D	Small sample
B	Bulk sample
AMAL	Amalgamated sample
Environmental:	
ES	Environmental soil sample
EW	Environmental water sample
Comments:	Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that an attempt was made to take a tube sample; however, there was no recovery. Sample recovery is given as a percentage.

TESTS:

SPT S or SPT C	Standard Penetration Test, open shoe (S) or solid cone (C)
	The Standard Penetration Test is defined in BS EN ISO 22476-3 (2005). The incremental blow counts are given in the Field Records column; each increment is 75mm unless stated otherwise and any penetration under self weight in mm (SW) is noted. Where the full 300mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach 50 (either in total or for a single increment) the total blow count beyond the seating drive is given (without the N = prefix).
ICBR	In situ CBR
IV	In situ vane shear strength, peak (p) and remoulded (r), kPa
HV	Hand vane shear strength, peak (p) and remoulded (r), kPa
PP	Pocket penetrometer test, converted to shear strength, kPa
KFH, KRH, KPI	Variable head permeability tests (KFH = falling head test, KRH = rising head test, KPI = packer test), permeability value
PID/FID	Photo-ionisation detector/Flame-ionisation detector
	Test results provided in Field Records column

DRILLING RECORDS:

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930: 2015 and BS EN ISO 22575-1 (2006)

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacings are presented.
NI	Non intact is used where the core is fragmented.
CRF	Core recovered (length in m) in the following run
AZCL	Assessed zone of core loss
NR	Not recovered

FLUSH TYPE:

a - air
a/m - air/mist
f - foam
p - polymer
s - saline
w - water

GROUNDWATER:

▽ Groundwater strike

▼ Groundwater level after standing period

DEPTH REMARKS:

EoS	End of Shift
SoS	Start of Shift
EoBH	End of Borehole

INSTRUMENTATION:

Details of installations are given on the Record. Legend column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill. The type of instrument installed is indicated by a code adjacent to the Legend column at the base of the instrument.

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer
AP	Access pipe
GMP	Gas monitoring standpipe
(xx)	Internal diameter (mm)
ICE	Biaxial inclinometer
ICM	Inclinometer tubing for use with probe
SLIP	Slip indicator
ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point
ETR	Rod extensometer

EXPLORATORY HOLE TYPE:

CP	Cable percussion
DP	Dynamic probe
DCP	Dynamic cone penetrometer
HA	Hand auger
IP	Inspection pit
OP	Observation pit/trench
PC	Pavement core
RC	Rotary core
RO	Rotary open hole
SH	Shaft
SNC	Sonic (resonance)
TP	Trial pit/trench
TRAV	Traverse
WLS	Windowless (dynamic) sample
WS	Window (dynamic) sample

AGS

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Reference

KEY SHEET

Dynamic Sample Log

Exploratory position reference: **WS01**

Sheet 1 of 1

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
WLS	0.00	2.42	29-10-24	29-10-24	GP	DART	CW	29-10-24	Hammer ID: DART334 Er(%) 62 Coordinates are approximate

Location details:

mE: 328721.03
mN: 346087.48
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results
				(0.35)	Dark brown slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium. Occasional rootlets.			0.10 - 0.20	ES	
				0.35	(TOPSOIL)					
				(0.45)	Very dense dark grey and light grey slightly sandy slightly silty subangular fine to coarse GRAVEL of limestone and mudstone.			0.70	D	
				0.80	(MADE GROUND)					
	(52)			(0.40)	Stiff brown gravelly CLAY. Gravel is subangular fine to coarse. (MADE GROUND)	Dry		1.00 - 1.45	S	N=15 (3,4/4,3,4,4)
				1.20	*0.80 m: Geotextile membrane*					
					Very stiff brown gravelly CLAY. Gravel is subangular fine to coarse. (REWORKED GLACIAL TILL)			1.50 - 2.00	B	
								1.50	PP	441
				(1.22)	*1.75 m: Becomes very gravelly*			1.70	PP	441
								1.90	PP	441
	(52)					Dry		2.00 - 2.42	S	N=50 (16,9/50 for 265mm)
				2.42	Dynamic sample ends at 2.42 m (Refusal)					

Inst (Ø)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Casing:

Cased to:	Diameter (mm):

Depth related remarks:

From	to:	Remarks

Run details:

From:	to:	Ø	Duration:	Recovery:

Log issue: DRAFT
Scale: 1:50
Checked/approved by: DD/CK
Printed: 18/11/2024 09:43

Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Dynamic Sample Log

Exploratory position reference: **WS02**

Sheet 1 of 1

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
WLS	0.00	5.45	29-10-24	29-10-24	GP	DART	CW	29-10-24	Hammer ID: DART334 Er(%) 62 Coordinates are approximate

Location details:

mE: 328733.88
mN: 346055.68
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results
				(0.40)	Brown gravelly CLAY. Gravel is subangular to subrounded fine to medium. Occasional rootlets. (MADE GROUND)			0.10 - 0.25	ES	
				0.40						
				0.50	Cream and light grey subangular fine to coarse limestone GRAVEL. (MADE GROUND)			0.60	ES	
				(0.60)	Dense light brownish grey sandy clayey GRAVEL. Gravel is subangular to subrounded fine to coarse. (MADE GROUND)	Dry		1.00 - 1.45	S	N=16 (4,6/5,4,3,4)
				1.10	Very stiff brown gravelly CLAY. Gravel is subangular to subrounded fine to coarse. Occasional specs of black carbonaceous material. (REWORKED GLACIAL TILL)					
						Dry		2.00 - 2.45	S	N=20 (5,4/5,4,5,6)
								2.75	PP	441
								2.90 - 3.00	D	
						Dry		3.00 - 3.45	S	N=24 (4,5/5,6,7,6)
				(4.35)						
								3.50 - 3.65	D	
								3.75	PP	441
								3.80 - 4.00	UT	
					3.90 m: Becomes stiff	Dry		3.85	PP	441
								4.00 - 4.45	S	N=29 (5,8/12,6,5,6)
								4.60 - 4.75	D	
								4.65	PP	221
								4.75	PP	172
						Dry		4.85	PP	294
								5.00 - 5.45	S	N=31 (5,6/7,8,8,8)
				5.45	Dynamic sample ends at 5.45 m (Target depth)					
	Inst (Ø)					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Casing:

Cased to:	Diameter (mm):

Depth related remarks:

From	to:	Remarks

Run details:

From:	to:	Ø	Duration:	Recovery:

Log issue: DRAFT
Scale: 1:50
Checked/approved by: DD/CK
Printed: 18/11/2024 09:43

Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Dynamic Sample Log

Exploratory position reference: **WS03**

Sheet 1 of 1

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
WLS	0.00	1.45	29-10-24	29-10-24	GP	DART	CW	29-10-24	Hammer ID: DART334 Er(%) 62 Coordinates are approximate

Location details:

mE: 328763.26
mN: 346070.87
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description
				0.10	Grey TARMAC.
				0.20	(MADE GROUND)
					Light greyish cream subangular fine to medium GRAVEL.
				(0.80)	(MADE GROUND)
					Cream and whitish grey subangular medium to coarse limestone GRAVEL.
	▼			1.00	(MADE GROUND)
				1.20	Firm grey gravelly CLAY. Gravel is subangular to subrounded fine to medium. Rare fine gravel of broken red tile.
					(MADE GROUND)
				(0.80)	Medium dense dark grey, brown and purple ashy very clayey cinder GRAVEL. Occasional burnt shale and carbonaceous material.
					(MADE GROUND)
				2.00	Dynamic sample ends at 2.00 m (Borehole collapsed)

Samples & In Situ Testing

Water	Casing	Depth	Type & No	Results
1.00		1.00 - 1.45	S	N=35 (3,3/4,11,11,9)
		1.00 - 1.20	D	
		1.40	D	
		1.80 - 2.00	ES	

Inst (Ø)	Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
1.00	1.00		

Casing:

Cased to:	Diameter (mm):

Depth related remarks:

From	to:	Remarks
1.20	2.00	Very difficult to excavate: hole collapsing, unable to case through the gravel
2.00	2.00	Water standing at base of hole

Run details:

From:	to:	Ø	Duration:	Recovery:

Log issue: DRAFT
Scale: 1:50
Checked/approved by: DD/CK
Printed: 18/11/2024 09:43

Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Dynamic Sample Log

EAL

Exploratory position reference: **WS04**

Sheet 1 of 1

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
WLS	0.00	3.45	29-10-24	29-10-24	GP	DART	CW	29-10-24	Hammer ID: DART334 Er(%) 62 Coordinates are approximate

Location details:

mE: 328780.48
mN: 346054.27
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results
				(0.40)	Brown gravelly CLAY. Gravel is subangular to subrounded fine to medium of mixed lithologies. Occasional rootlets. (MADE GROUND)					
				0.40						
				(0.30)	Brown slightly clayey subrounded fine to medium GRAVEL. One whole engineering brick, glazed cream and brown, makers stamp "Dennis, Ruabon". (MADE GROUND)					
	(52)			0.70						
				(0.50)						
				1.20	Brown and grey sandy gravelly CLAY. Gravel is subangular to subrounded fine to medium. Occasional carbonaceous material and cinders. (MADE GROUND)	Dry		1.20 - 1.65 1.30 - 1.50	S ES	N=16 (0,0/2,4,4,6)
					Brown, grey and cream mottled gravelly CLAY. Gravel is subangular to subrounded fine to coarse of cinders, engineering brick, mudstone, shale, coal and other carbonaceous material. (MADE GROUND)			1.75	D	
						Dry		2.00 - 2.45	S	N=22 (4,3/6,5,5,6)
				(2.40)						
								2.70 - 2.80	ES	
	(52)					Dry		3.00 - 3.45	S	N=9 (7,4/2,1,2,4)
				3.60	*3.50 m: Cream engineering brick and 10 mm red floor tile in sampler*					
					Dynamic sample ends at 3.60 m (Refusal)					
	Inst (Ø)					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:
3.60	2.75		

Casing:

Cased to:	Diameter (mm):

Depth related remarks:

From	to:	Remarks

Run details:

From:	to:	Ø	Duration:	Recovery:

Log issue: DRAFT
Scale: 1:50
Checked/approved by: DD/CK
Printed: 18/11/2024 09:43

Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Dynamic Sample Log

EAL

Exploratory position reference: **WS05**

Sheet 1 of 1

Borehole formation details:

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
WLS	0.00	4.43	29-10-24	29-10-24	GP	DART	CW	29-10-24	Hammer ID: DART334 Er(%) 62 Coordinates are approximate

Location details:

mE: 328791.35
mN: 346083.74
Grid: OSGB

Backfill/ Instal'n	Water-strike	Legend	Level	Depth (thick-ness)	Stratum Description	Samples & In Situ Testing: Water	Casing	Depth	Type & No	Results
				0.10	Grey TARMAC.					
				(0.35)	(MADE GROUND)					
				0.45	Cream and light brown subangular fine to medium GRAVEL.					
				(0.55)	(MADE GROUND)					
					Light grey and grey silty subangular medium to coarse limestone GRAVEL.					
	(52)			1.00	(MADE GROUND)	Dry		1.00 - 1.45	S	N=8 (3,2/2,2,2,2)
					Dark greyish brown ashy gravelly CLAY. Gravel is subangular fine to medium of mixed lithologies including cinders. Occasional black carbonaceous material. Rare gravel of burnt shale and red tile.			1.50 - 1.70	ES	
					(MADE GROUND)	Dry		2.00 - 2.45	S	N=14 (1,4/4,3,4,3)
				(2.60)						
								2.60 - 2.80	UT	
								2.75	PP	265
								2.90	PP	245
						Dry		3.00 - 3.45	S	N=25 (3,4/5,4,8,8)
				3.60	Firm to stiff light brown and grey mottled slightly sandy gravelly CLAY. Gravel is subangular fine to coarse of mixed lithologies.			3.70 - 3.80	D	
					(MADE GROUND)			3.70	PP	368
						Dry		3.75	PP	368
	(52)			(0.82)				3.90 - 4.00	ES	
								4.00 - 4.42	S	N=50 (8,10/50 for 275mm)
				4.43	Dynamic sample ends at 4.42 m (Refusal)					

	Inst (Ø)					Water	Casing	Depth	Type & No	Results

Groundwater entries:

Struck:	Rose to:	Casing:	Sealed:

Casing:

Cased to:	Diameter (mm):

Depth related remarks:

From	to:	Remarks

Run details:

From:	to:	Ø	Duration:	Recovery:

Log issue: DRAFT
Scale: 1:50
Checked/approved by: DD/CK
Printed: 18/11/2024 09:43

Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths and reduced levels are in metres.

Borehole Log

Exploratory Hole: **BH01**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
RO	0.00	39.50	28-10-24	28-10-24	RP	MI2	RP	28-10-24	1. Stratum descriptions based on driller's descriptions.

Location details:

m E: 328729.50
m N: 346064.28
m OD: 176.10
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Install'n
Water	Casing	Depth	Type & No	Results/Remarks								
							TOPSOIL. (TOPSOIL)	(0.30) 0.30	175.80			
							Round GRAVEL. (MADE GROUND)	(0.50) 0.80	175.30			
							Brown sandy, gravelly CLAY. (REWORKED GLACIAL TILL)	(1.40)				
							Light grey sandstone BOULDER. (REWORKED GLACIAL TILL)	2.20 (0.50)	173.90			
							Light greyish brown gravelly CLAY. (GLACIAL TILL)	2.70 (6.70)	173.40			
							Light grey MUDSTONE. (PENNINE LOWER & MIDDLE COAL MEASURES)	9.40 (4.00)	166.70			
							Light grey MUDSTONE. Occasional sandstone beds. Occasional traces of coal. (PENNINE LOWER & MIDDLE COAL MEASURES)	13.40 (4.80)	162.71			
							Light grey MUDSTONE interbedded with strong sandstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)	18.20	157.90			
Water	Casing	Depth	Type & No	Results	Core	If						Inst (Ø)

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:
0.00	39.50	Water		100/100

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	39.50		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

EAL

Borehole Log

Exploratory Hole: **BH01**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:

Location details:

m E: 328729.50
m N: 346064.28
m OD: 176.10
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Instal'n
Water	Casing	Depth	Type & No	Results/Remarks								
							Light grey MUDSTONE interbedded with strong sandstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)	(14.40)				
							Light grey MUDSTONE. Occasional traces of coal. (PENNINE LOWER & MIDDLE COAL MEASURES)	32.60 (1.50)	143.50			
							Light grey MUDSTONE. (PENNINE LOWER & MIDDLE COAL MEASURES)	34.10 (5.40)	142.00			
							Borehole ends at 39.50 m (Target depth)	39.50	136.60			
Water	Casing	Depth	Type & No	Results	Core	If						Inst (Ø)

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	39.50		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Borehole Log

Exploratory Hole: **BH02**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
RO	0.00	43.00	30-10-24	30-10-24	RP	MI2	RP	30-10-24	1. Stratum descriptions based on driller's descriptions. 2. Hammer ID: AR1943 Er(%) 71

Location details:

m E: 328754.42
m N: 346057.96
m OD: 175.77
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Install'n
Water	Casing	Depth	Type & No	Results/Remarks								
							TARMAC (MADE GROUND)	0.10 (0.80)	175.67			
							Round GRAVEL. (MADE GROUND)	0.90	174.87			
							Brown CLAY. (MADE GROUND)	(6.40)				
Dry	3.00	6.00 - 6.45	C	N=31 (5,5/7,7,8,9)								
							Stiff brown CLAY. (GLACIAL TILL)	7.30	168.47			
Dry	3.00	9.00 - 9.34	C	50 (4,7/50 for 185mm)				(5.50)				
Dry	3.00	12.00 - 12.16	C	50 (25 for 125mm/50 for 30mm)								
							Light grey MUDSTONE. (PENNINE LOWER & MIDDLE COAL MEASURES)	12.80	162.97			
								(5.20)				
							Light grey MUDSTONE. Occasional strong siltstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)	18.00	157.77			
Water	Casing	Depth	Type & No	Results	Core	If						Inst (Ø)

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:
0.00	30.80	Water		100/100

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	43.00		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

EAL

Borehole Log

Exploratory Hole: **BH02**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:

Location details:

m E: 328754.42
m N: 346057.96
m OD: 175.77
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Instal'n
Water	Casing	Depth	Type & No	Results/Remarks								
							Light grey MUDSTONE. Occasional strong siltstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)	(5.60)				
							Light grey MUDSTONE with darker bands. (PENNINE LOWER & MIDDLE COAL MEASURES)	23.60	152.17			
								(7.20)				
							No flush returns. Hard drilling, no voids. (PENNINE LOWER & MIDDLE COAL MEASURES)	30.80	144.97			
								(12.20)				
Water	Casing	Depth	Type & No	Results	Core	If					Inst (Ø)	

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:
30.80	43.00	Water		0/0

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	43.00		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

EAL

Borehole Log

Exploratory Hole: **BH02**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:

Location details:

m E: 328754.42
m N: 346057.96
m OD: 175.77
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Instal'n
Water	Casing	Depth	Type & No	Results/Remarks								
							No flush returns. Hard drilling, no voids. (PENNINE LOWER & MIDDLE COAL MEASURES)					
							Borehole ends at 43.00 m (Target depth)	43.00	132.77			
Water	Casing	Depth	Type & No	Results	Core	If					Inst (Ø)	

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	43.00		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Borehole Log

Exploratory Hole: **BH03**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:
RO	0.00	45.00	29-10-24	29-10-24	RP	MI2	RP	29-10-24	1. Stratum descriptions based on driller's descriptions. 2. Hammer ID: AR1943 Er(%) 71

Location details:

m E: 328776.51
m N: 346062.23
m OD: 175.84
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Install'n
Water	Casing	Depth	Type & No	Results/Remarks								
							TARMAC (MADE GROUND)	0.10	175.74			
							Round GRAVEL. (MADE GROUND)	(1.20)				
							Brown CLAY with brick and strong boulders. (MADE GROUND)	1.30	174.54			
								(5.40)				
							Brown sandy, gravelly CLAY. (PENNINE LOWER & MIDDLE COAL MEASURES)	6.70	169.14			
Dry		9.00 - 9.30	C	50 (5,10/50 for 155mm)								
Dry		12.00 - 12.16	C	50 (25 for 95mm/50 for 65mm)								
								(14.10)				
Dry		15.00 - 15.10	C	50 (25 for 60mm/50 for 35mm)								
Dry		18.00 - 18.14	C	50 (25 for 80mm/50 for 55mm)								
Water	Casing	Depth	Type & No	Results	Core	If					Inst (Ø)	

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:
0.00	45.00	Water		100/100

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	45.00		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

EAL

Borehole Log

Exploratory Hole: **BH03**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:

Location details:

m E: 328776.51
m N: 346062.23
m OD: 175.84
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Instal'n
Water	Casing	Depth	Type & No	Results/Remarks								
							Brown sandy, gravelly CLAY. (PENNINE LOWER & MIDDLE COAL MEASURES)					
							Light grey MUDSTONE. Occasional siltstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)	20.80	155.04			
								(7.40)				
							Light grey MUDSTONE. Occasional traces of coal. (PENNINE LOWER & MIDDLE COAL MEASURES)	28.20	147.64			
								(2.80)				
							Light grey MUDSTONE. Occasional dark siltstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)	31.00	144.84			
								(1.70)				
							Strong light grey SILTSTONE. (PENNINE LOWER & MIDDLE COAL MEASURES)	32.70	143.14			
								(0.90)				
							Light grey MUDSTONE. (PENNINE LOWER & MIDDLE COAL MEASURES)	33.60	142.24			
								(4.60)				
							COAL. (PENNINE LOWER & MIDDLE COAL MEASURES)	38.20 38.40	137.64 137.44			
							Light grey MUDSTONE. Occasional siltstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)					
Water	Casing	Depth	Type & No	Results	Core	If					Inst (Ø)	

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	45.00		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

EAL

Borehole Log

Exploratory Hole: **BH03**

Exploratory Hole Formation Details

Type:	From:	To:	Start date:	End date:	Crew:	Plant:	Logger:	Logged:	Remarks:

Location details:

m E: 328776.51
m N: 346062.23
m OD: 175.84
Grid: OSGB

Samples & In Situ Testing					TCR SCR RQD	min If avg max	Stratum Description	Depth (thick-ness)	Level	Legend	Water-strike	Backfill/ Instal'n
Water	Casing	Depth	Type & No	Results/Remarks								
							Light grey MUDSTONE. Occasional siltstone beds. (PENNINE LOWER & MIDDLE COAL MEASURES)	(6.60)				
							Borehole ends at 45.00 m (Target depth)	45.00	130.84			
Water	Casing	Depth	Type & No	Results	Core	If					Inst (Ø)	

Groundwater entries:

Struck:	Rose to:	After (mins):	Casing:	Sealed:	Remarks:

Flush details:

From:	To:	Type:	Colour:	Min/max %:

Diameter & depth:

Dia. (mm):	To:	Casing:	Remarks:
150	3.00	3.00	
92	45.00		

General remarks:

Log issue: DRAFT
Checked/approved by: DD/CK
Scale: 1:100
Printed: 18/11/2024 09:43:03

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in metres.

Infiltration Test Report

Exploratory/Test Location: **PT04**

Test no:	Date:	Method:	Weather:	Dimensions:	Start:	End:	Location:	
2	28/10/24	BS6297:2007+A1:2008	Overcast, showers	Length (m):	0.30	0.30	mE:	328761.28
Method of pit construction:				Width (m):	0.30	0.30	mN:	346034.44
Hand excavated				Depth (m):	0.40	0.40	GL:	N/A
							Grid:	OSGB

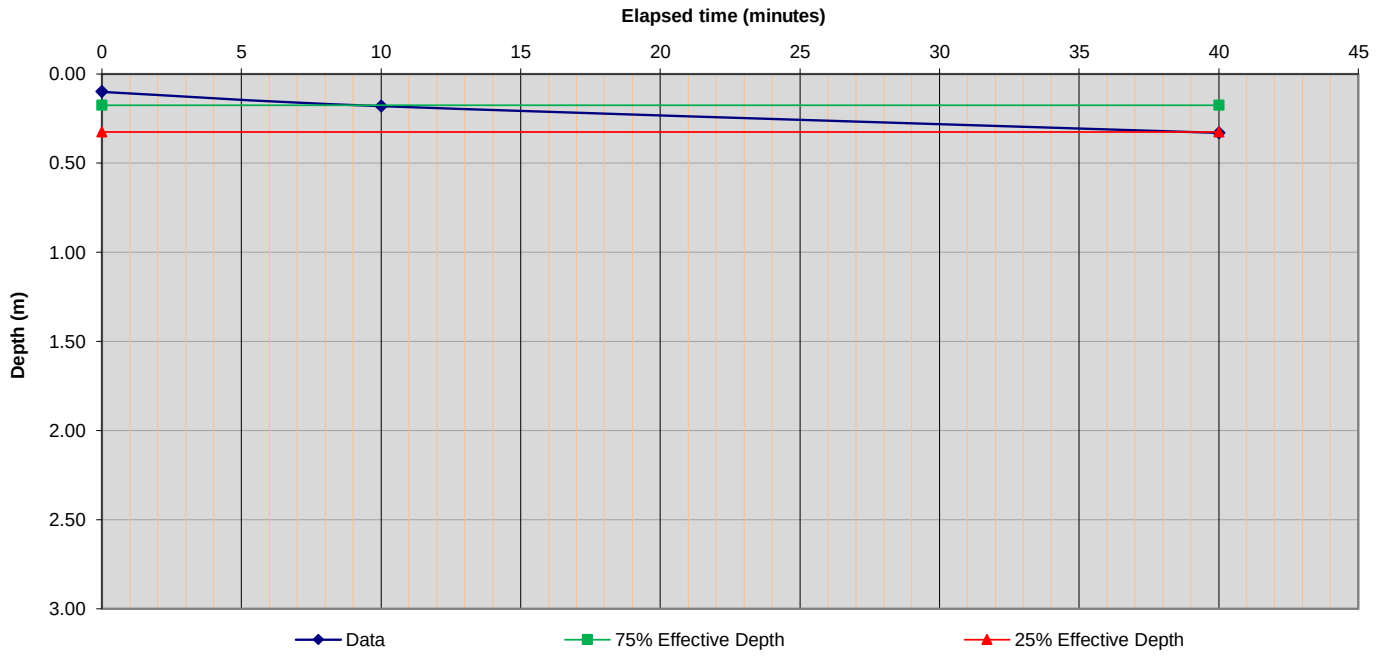
Elapsed time (mins):	Water depth (m below GL):	Remarks:
0	0.10	
10	0.18	
40	0.33	

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Invert level source:
75%	0.18	75%	10.00	0.10	Assumed
50%	0.25				
25%	0.33	25%	40.00		

Base area of pit	0.09	m^2
Mean surface area through which outflow occurs	0.27	m^2
Volume outflow between 75 and 25% effective depth	0.01	m^3

Soil infiltration rate, f	N/A	$m^3/m^2/s$
Soil infiltration rate, f	N/A	m/hr
Percolation Value, vp	1.20E+01	s/mm

Notes:
Stratum:
0.00 - 0.20: Brown slightly gravelly CLAY (MG).
0.20 - 0.40: Brown very gravelly CLAY (MG).



Issue:	DRAFT	Project:	Ysgol I.D. Hoosan
Operator:	CW	Proj. No:	
Checked by:	DD	Client:	Reed Construction Holdings Ltd

Infiltration Test Report

Exploratory/Test Location: **PT04**

Test no:	Date:	Method:	Weather:	Dimensions:	Start:	End:	Location:	
3	28/10/24	BS6297:2007+A1:2008	Overcast, showers	Length (m):	0.30	0.30	mE:	328761.28
Method of pit construction:				Width (m):	0.30	0.30	mN:	346034.44
Hand excavated				Depth (m):	0.40	0.40	GL:	N/A
							Grid:	OSGB

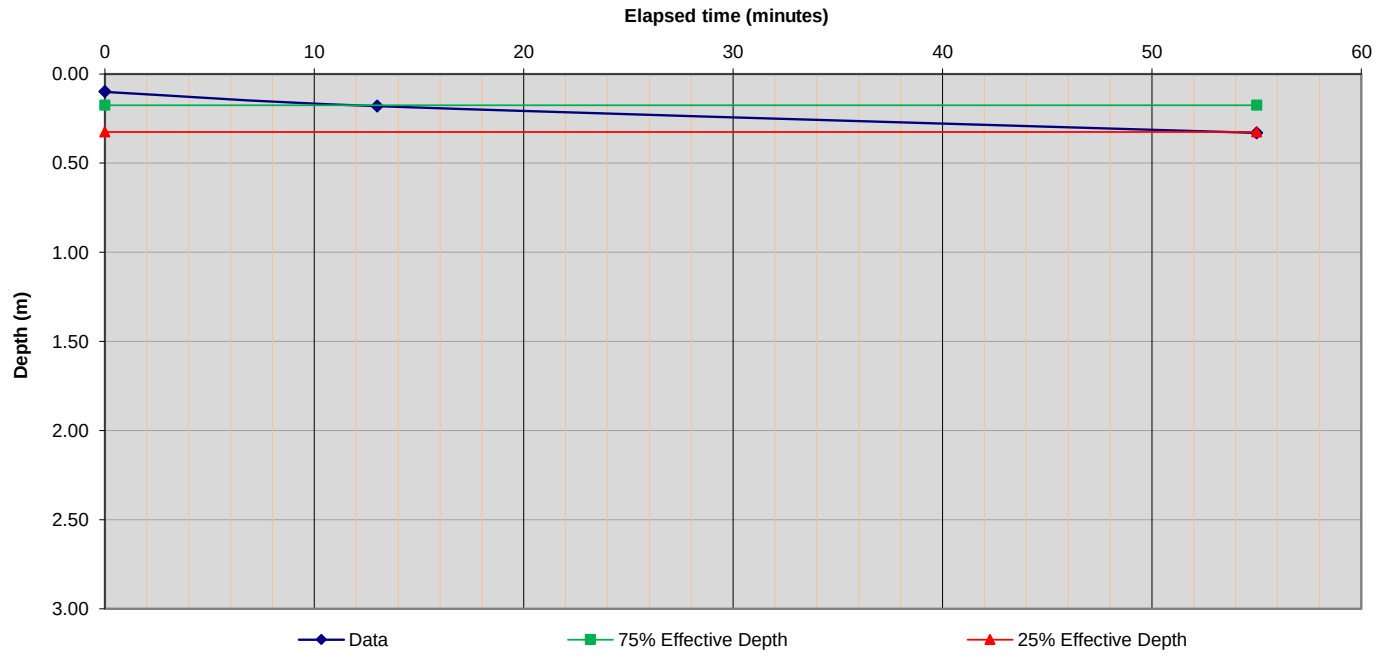
Elapsed time (mins):	Water depth (m below GL):	Remarks:
0	0.10	
13	0.18	
55	0.33	

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Invert level source:
75%	0.18	75%	13.00	0.10	Assumed
50%	0.25				
25%	0.33	25%	55.00		

Base area of pit	0.09	m^2
Mean surface area through which outflow occurs	0.27	m^2
Volume outflow between 75 and 25% effective depth	0.01	m^3

Soil infiltration rate, f	N/A	$m^3/m^2/s$
Soil infiltration rate, f	N/A	m/hr
Percolation Value, vp	1.68E+01	s/mm

Notes:
Stratum:
0.00 - 0.20: Brown slightly gravelly CLAY (MG).
0.20 - 0.40: Brown very gravelly CLAY (MG).



Issue:	DRAFT	Project:	Ysgol I.D. Hoosan
Operator:	CW	Proj. No:	
Checked by:	DD	Client:	Reed Construction Holdings Ltd


YSGOL I D
HOOSON
WS 1
29.10.24


YSGOL I D
HOOSON
WS 2
29.10.24


YSGOL I.D
HOOSON
WS 3
29.10.24


YSGOL I.D
HOOSON
WS 4
29.10.24


YSGOL I.D
HOOSON
WS 5
29.10.24

EAL

APPENDIX III INSITU TESTING

APPENDIX III – INSITU TESTING

Exploratory Hole Key Sheet

SAMPLES:

Undisturbed:	
U	Driven tube sample
UT	Thin wall driven tube sample
TW	Pushed thin wall tube sample
P	Pushed piston sample
L	Liner sample (from windowless or similar sampler), full recovery unless otherwise stated
CBR	CBR mould sample
BLK	Block sample
C	Core sample (from rotary core) taken for laboratory testing
Disturbed:	
D	Small sample
B	Bulk sample
AMAL	Amalgamated sample
Environmental:	
ES	Environmental soil sample
EW	Environmental water sample
Comments:	Sample reference numbers are assigned to every sample taken. A sample reference of 'NR' indicates that an attempt was made to take a tube sample; however, there was no recovery. Sample recovery is given as a percentage.

TESTS:

SPT S or SPT C	Standard Penetration Test, open shoe (S) or solid cone (C)
	The Standard Penetration Test is defined in BS EN ISO 22476-3 (2005). The incremental blow counts are given in the Field Records column; each increment is 75mm unless stated otherwise and any penetration under self weight in mm (SW) is noted. Where the full 300mm test drive is achieved the total number of blows for the test drive is presented as N = ** in the Test column. Where the test drive blows reach 50 (either in total or for a single increment) the total blow count beyond the seating drive is given (without the N = prefix).
ICBR	In situ CBR
IV	In situ vane shear strength, peak (p) and remoulded (r), kPa
HV	Hand vane shear strength, peak (p) and remoulded (r), kPa
PP	Pocket penetrometer test, converted to shear strength, kPa
KFH, KRH, KPI	Variable head permeability tests (KFH = falling head test, KRH = rising head test, KPI = packer test), permeability value
PID/FID	Photo-ionisation detector/Flame-ionisation detector
	Test results provided in Field Records column

DRILLING RECORDS:

The mechanical indices (TCR/SCR/RQD & If) are defined in BS 5930: 2015 and BS EN ISO 22575-1 (2006)

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
If	Fracture spacing, mm. Minimum, typical and maximum spacings are presented.
NI	Non intact is used where the core is fragmented.
CRF	Core recovered (length in m) in the following run
AZCL	Assessed zone of core loss
NR	Not recovered

FLUSH TYPE:

a - air
a/m - air/mist
f - foam
p - polymer
s - saline
w - water

GROUNDWATER:

▽ Groundwater strike

▼ Groundwater level after standing period

DEPTH REMARKS:

EoS	End of Shift
SoS	Start of Shift
EoBH	End of Borehole

INSTRUMENTATION:

Details of installations are given on the Record. Legend column shows installed instrument depths including slotted pipe section or tip depth, response zone filter material type and layers of backfill. The type of instrument installed is indicated by a code adjacent to the Legend column at the base of the instrument.

SP	Standpipe
SPIE	Standpipe piezometer
PPIE	Pneumatic piezometer
EPIE	Electronic piezometer
AP	Access pipe
GMP	Gas monitoring standpipe
(xx)	Internal diameter (mm)
ICE	Biaxial inclinometer
ICM	Inclinometer tubing for use with probe
SLIP	Slip indicator
ESET	Electronic settlement cell/gauge
ETM	Magnetic extensometer settlement point
ETR	Rod extensometer

EXPLORATORY HOLE TYPE:

CP	Cable percussion
DP	Dynamic probe
DCP	Dynamic cone penetrometer
HA	Hand auger
IP	Inspection pit
OP	Observation pit/trench
PC	Pavement core
RC	Rotary core
RO	Rotary open hole
SH	Shaft
SNC	Sonic (resonance)
TP	Trial pit/trench
TRAV	Traverse
WLS	Windowless (dynamic) sample
WS	Window (dynamic) sample

AGS

Project: **Ysgol I.D. Hoosan**
Project No: **24-074**
Client: **Reed Construction Holdings Ltd**

Reference

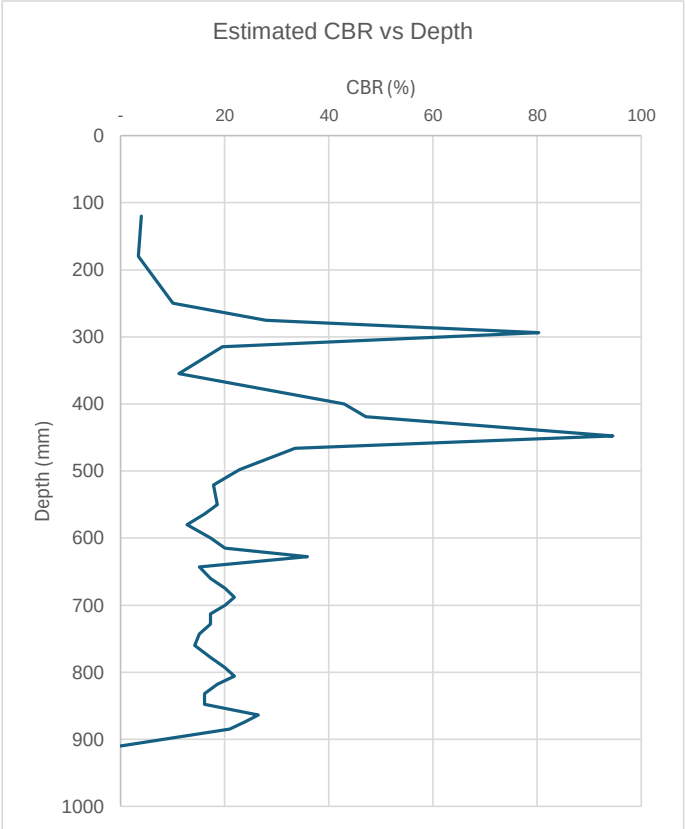
KEY SHEET

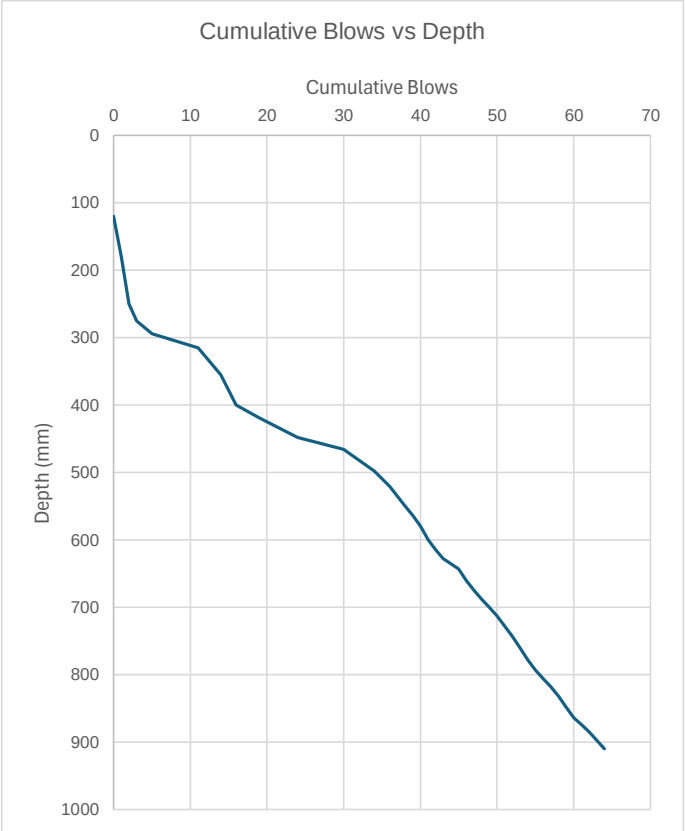
IN SITU CBR (TRRL DCP)

DCP01

Operator:	Date:	Weather:	Remarks:	Location:
CW	28/10/2024	Overcast, showers		mE: 328739.51
				mN: 346046.98
Chkd by:	Start depth:	Surface layer:	Zero reading (mm):	Termination reason:	mOD:
DD	0.12	Grass	0	Refusal	Grid: OSGB

Cumulative blows:	Cumulative pen (mm):	Increment blows:	Increment pen (mm):	mm per blow:	Layer CBR (%)
0	120	0			
1	180	1	60	60.0	4
2	250	1	70	70.0	3
3	275	1	25	25.0	10
5	294	2	19	9.5	28
11	315	6	21	3.5	80
14	355	3	40	13.3	20
16	400	2	45	22.5	11
19	419	3	19	6.3	43
24	448	5	29	5.8	47
30	466	6	18	3.0	95
34	498	4	32	8.0	
36	521	2	23	11.5	
38	550	2	29	14.5	
39	564	1	14	14.0	
40	580	1	16	16.0	
41	600	1	20	20.0	
42	615	1	15	15.0	
43	628	1	13	13.0	21
45	643	2	15	7.5	
46	660	1	17	17.0	
47	675	1	15	15.0	
48	688	1	13	13.0	
49	700	1	12	12.0	
50	713	1	13	13.0	
51	728	1	15	15.0	
52	743	1	15	15.0	
53	760	1	17	17.0	16
54	778	1	18	18.0	
55	793	1	15	15.0	
56	806	1	13	13.0	
57	818	1	12	12.0	
58	832	1	14	14.0	
59	848	1	16	16.0	
60	864	1	16	16.0	21
61	874	1	10	10.0	
62	885	1	11	11.0	
64	910	2	25	12.5	





Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: DRAFT

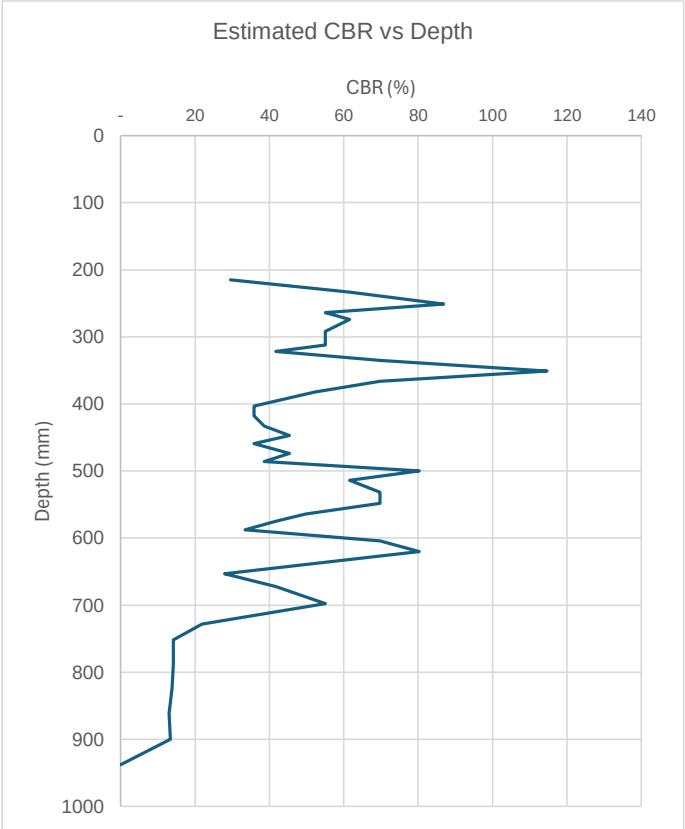
Project:	Ysgol I.D. Hoosan
Project No:	24-074
Client:	Reed Construction Holdings Ltd

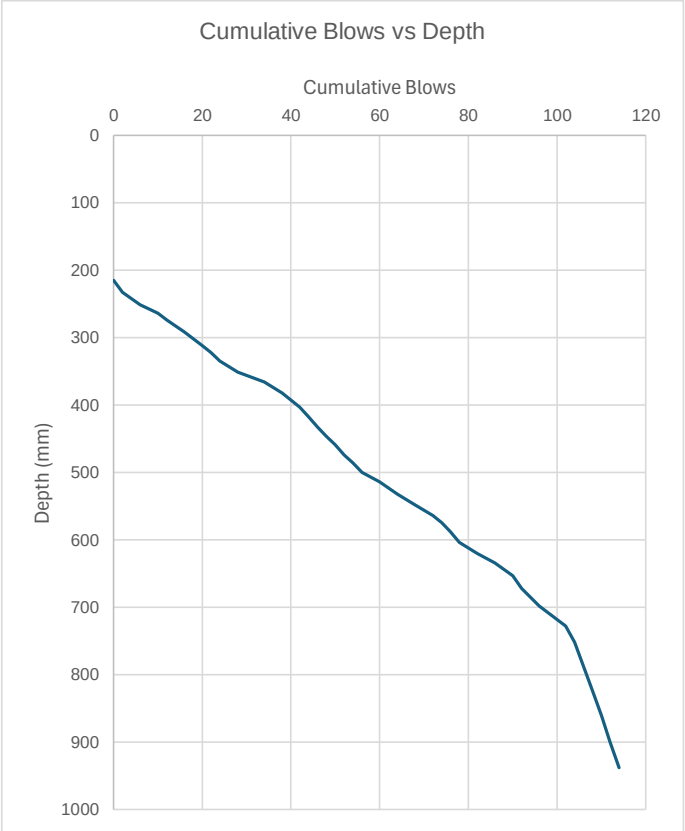
IN SITU CBR (TRRL DCP)

DCP02

Operator:	Date:	Weather:	Remarks:	Location:
CW	29/10/2024	Overcast, showers		mE: 328768.80
				mN: 346055.70
Chkd by:	Start depth:	Surface layer:	Zero reading (mm):	Termination reason:	mOD:
DD	0.215	Grass	0	Refusal	Grid: OSGB

Cumulative blows:	Cumulative pen (mm):	Increment blows:	Increment pen (mm):	mm per blow:	Layer CBR (%)
0	215	0			
2	233	2	18	9.0	30
6	251	4	18	4.5	62
10	264	4	13	3.3	87
12	274	2	10	5.0	
16	292	4	18	4.5	
18	302	2	10	5.0	56
20	312	2	10	5.0	
22	322	2	10	5.0	
24	335	2	13	6.5	42
28	351	4	16	4.0	70
34	366	6	15	2.5	>100
38	382	4	16	4.0	70
42	403	4	21	5.3	52
44	418	2	15	7.5	
46	433	2	15	7.5	
48	447	2	14	7.0	
50	459	2	12	6.0	39
52	474	2	15	7.5	
54	486	2	12	6.0	
56	500	2	14	7.0	
60	514	4	14	3.5	
64	532	4	18	4.5	70
68	548	4	16	4.0	
72	564	4	16	4.0	
74	575	2	11	5.5	
76	588	2	13	6.5	42
78	604	2	16	8.0	
82	620	4	16	4.0	70
86	634	4	14	3.5	80
90	653	4	19	4.8	
92	672	2	19	9.5	
96	698	4	26	6.5	41
102	728	6	30	5.0	
104	752	2	24	12.0	
106	788	2	36	18.0	
108	824	2	36	18.0	
110	861	2	37	18.5	14
112	900	2	39	19.5	
114	938	2	38	19.0	





Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: DRAFT

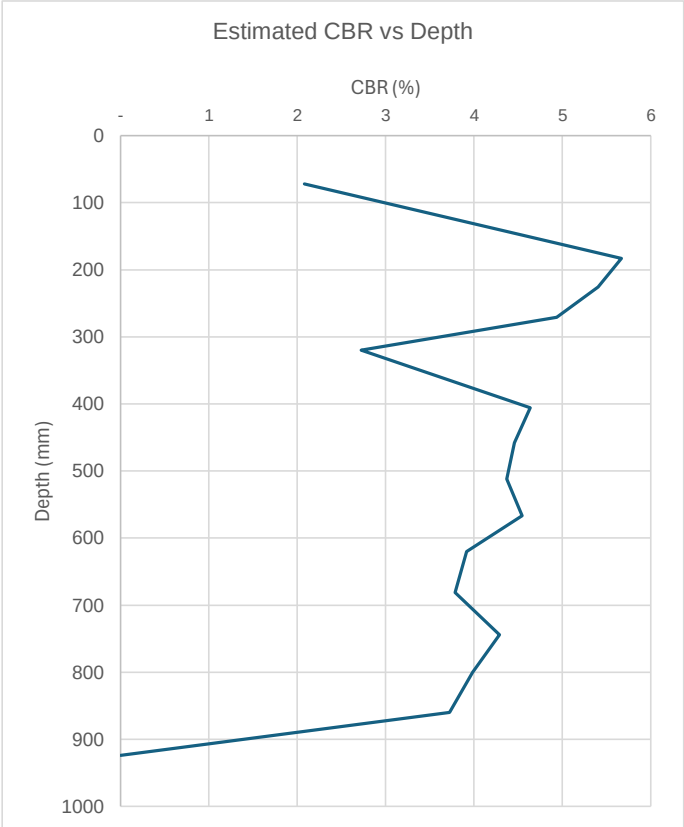
Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

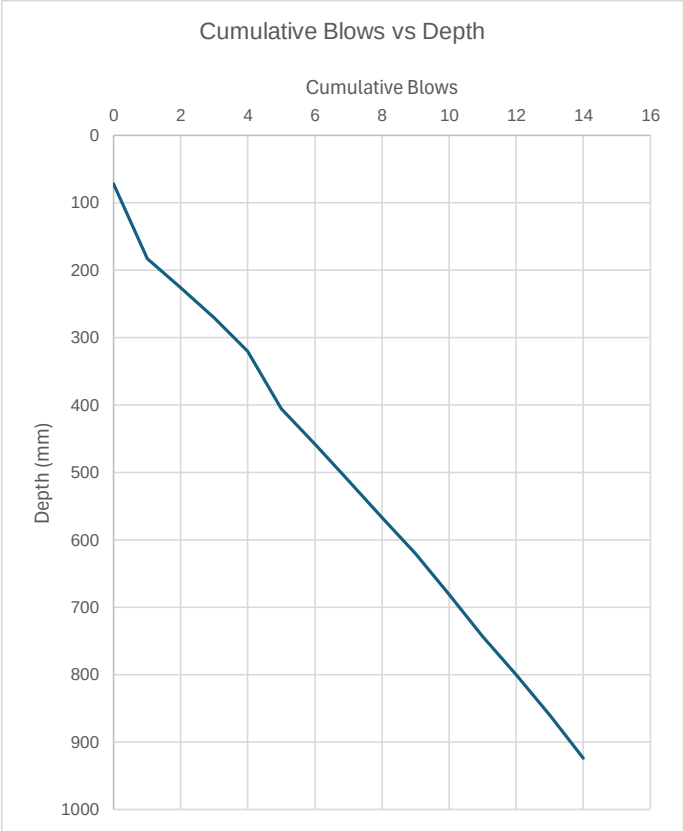
IN SITU CBR (TRRL DCP)

DCP03

Operator:	Date:	Weather:	Remarks:	Location:
CW	29/10/2024	Overcast, showers		mE: 328793.90
				mN: 346024.62
Chkd by:	Start depth:	Surface layer:	Zero reading (mm):	Termination reason:	mOD:
DD	0.72	Grass	0	Refusal	Grid: OSGB

Cumulative blows:	Cumulative pen (mm):	Increment blows:	Increment pen (mm):	mm per blow:	Layer CBR (%)
0	72	0			
1	183	1	111	111.0	2
2	226	1	43	43.0	6
3	271	1	45	45.0	5
4	320	1	49	49.0	5
5	406	1	86	86.0	3
6	458	1	52	52.0	5
7	512	1	54	54.0	4
8	567	1	55	55.0	4
9	620	1	53	53.0	5
10	681	1	61	61.0	4
11	744	1	63	63.0	4
12	800	1	56	56.0	4
13	860	1	60	60.0	4
14	924	1	64	64.0	4





Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: DRAFT

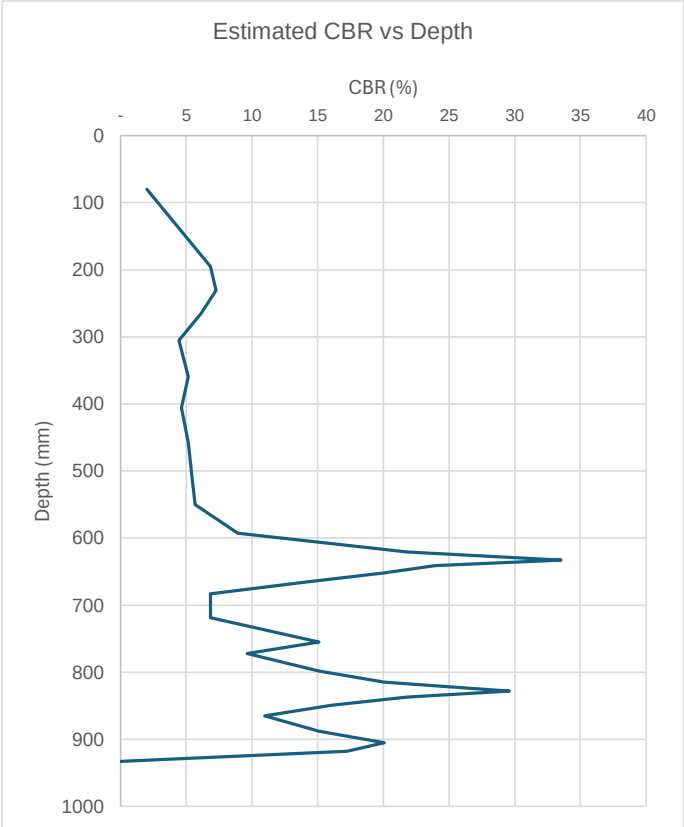
Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

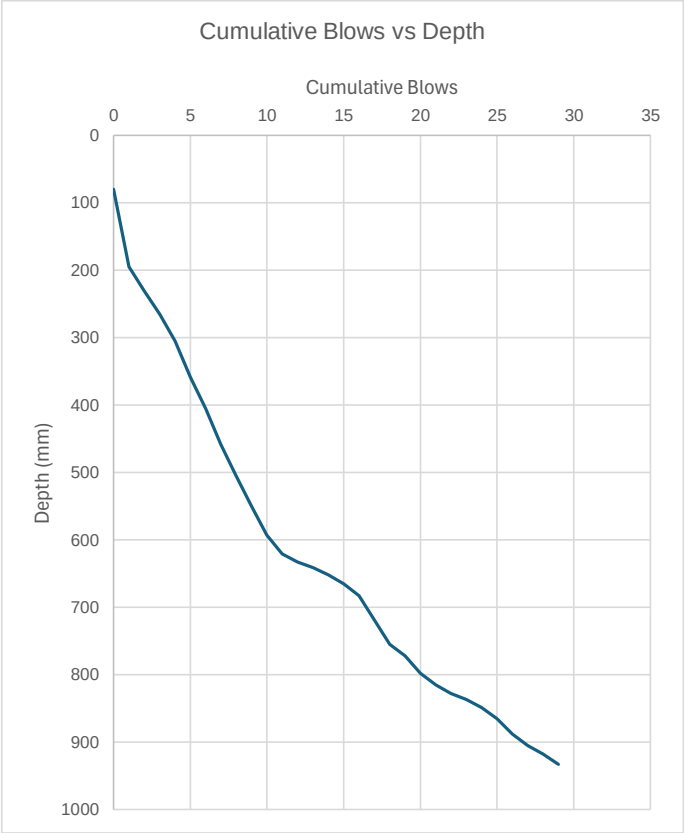
IN SITU CBR (TRRL DCP)

DCP04

Operator:	Date:	Weather:	Remarks:	Location:
CW	29/10/2024	Overcast, showers		mE: 328761.28
				mN: 346034.44
Chkd by:	Start depth:	Surface layer:	Zero reading (mm):	Termination reason:	mOD:
DD	0.8	Grass	0	Refusal	Grid: OSGB

Cumulative blows:	Cumulative pen (mm):	Increment blows:	Increment pen (mm):	mm per blow:	Layer CBR (%)
0	80	0			
1	195	1	115	115.0	
2	231	1	36	36.0	
3	265	1	34	34.0	
4	305	1	40	40.0	
5	359	1	54	54.0	
6	406	1	47	47.0	6
7	458	1	52	52.0	
8	505	1	47	47.0	
9	550	1	45	45.0	
10	593	1	43	43.0	
11	621	1	28	28.0	
12	633	1	12	12.0	
13	641	1	8	8.0	
14	652	1	11	11.0	23
15	665	1	13	13.0	
16	683	1	18	18.0	
17	719	1	36	36.0	7
18	755	1	36	36.0	
19	772	1	17	17.0	
20	798	1	26	26.0	13
21	815	1	17	17.0	
22	828	1	13	13.0	
23	837	1	9	9.0	24
24	849	1	12	12.0	
25	865	1	16	16.0	
26	888	1	23	23.0	
27	905	1	17	17.0	16
28	918	1	13	13.0	
29	933	1	15	15.0	





Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: DRAFT

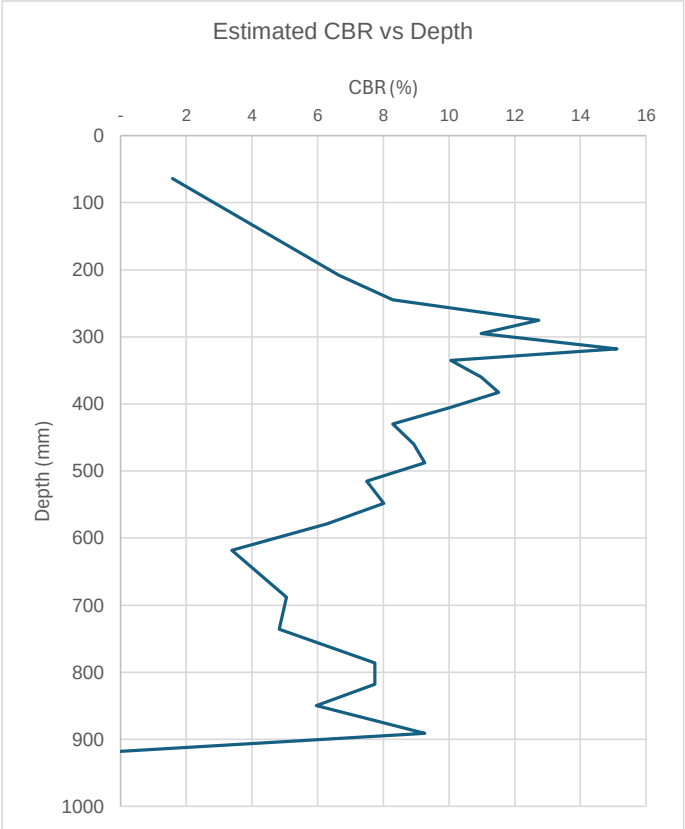
Project:	Ysgol I.D. Hoosan
Project No:	24-074
Client:	Reed Construction Holdings Ltd

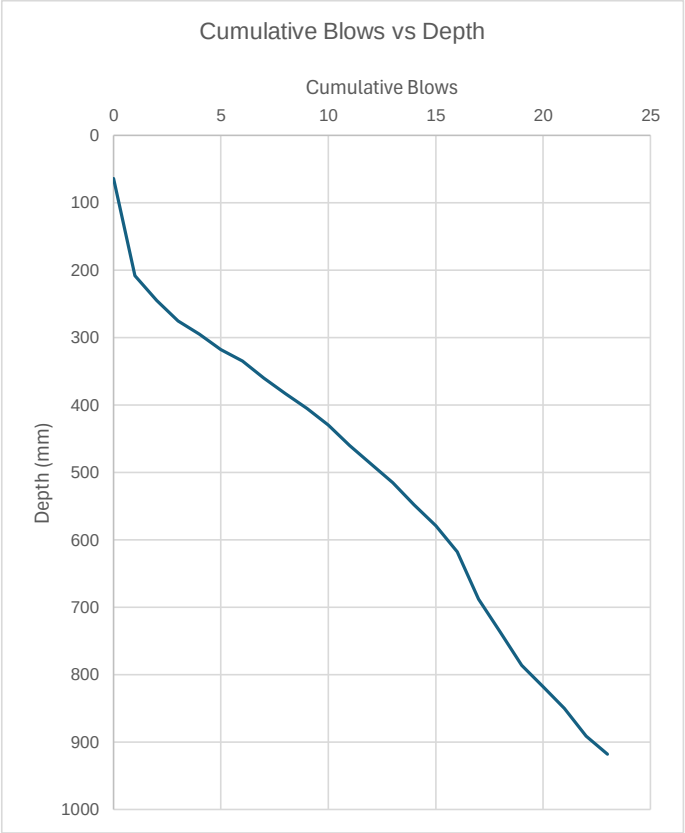
IN SITU CBR (TRRL DCP)

DCP05

Operator:	Date:	Weather:	Remarks:	Location:
CW	29/10/2024	Overcast, showers		mE: 328783.63
				mN: 346036.09
Chkd by:	Start depth:	Surface layer:	Zero reading (mm):	Termination reason:	mOD:
DD	0.64	Grass	0	Refusal	Grid: OSGB

Cumulative blows:	Cumulative pen (mm):	Increment blows:	Increment pen (mm):	mm per blow:	Layer CBR (%)
0	64	0			
1	208	1	144	144.0	2
2	245	1	37	37.0	7
3	275	1	30	30.0	
4	295	1	20	20.0	
5	318	1	23	23.0	
6	335	1	17	17.0	
7	360	1	25	25.0	12
8	383	1	23	23.0	
9	405	1	22	22.0	
10	430	1	25	25.0	
11	460	1	30	30.0	
12	488	1	28	28.0	
13	515	1	27	27.0	
14	548	1	33	33.0	
15	579	1	31	31.0	
16	618	1	39	39.0	
17	688	1	70	70.0	7
18	736	1	48	48.0	
19	786	1	50	50.0	
20	818	1	32	32.0	
21	850	1	32	32.0	
22	891	1	41	41.0	
23	918	1	27	27.0	





Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: DRAFT

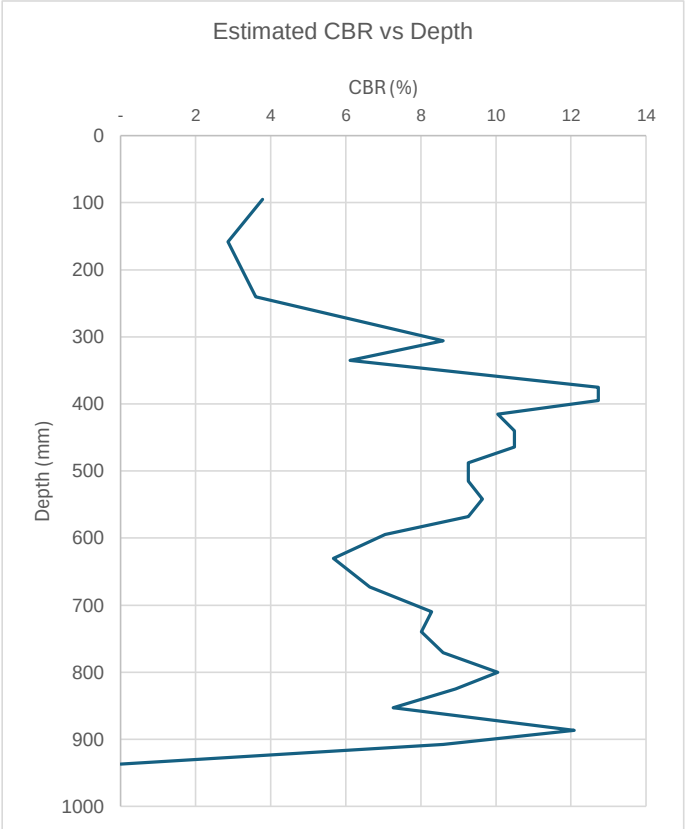
Project: Ysgol I.D. Hoosan
Project No: 24-074
Client: Reed Construction Holdings Ltd

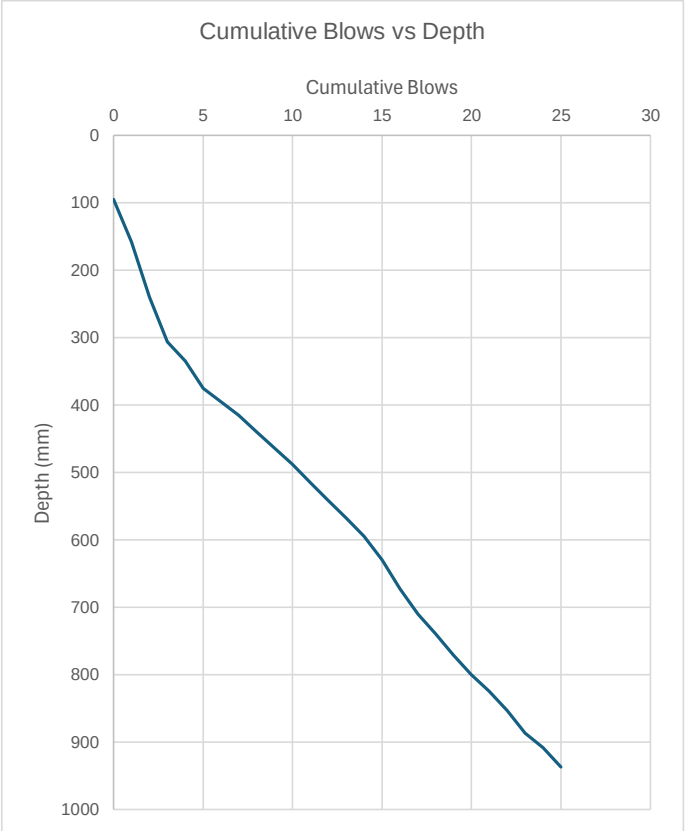
IN SITU CBR (TRRL DCP)

DCP06

Operator:	Date:	Weather:	Remarks:	Location:
CW	29/10/2024	Overcast, showers		mE: 328790.34
				mN: 346051.97
Chkd by:	Start depth:	Surface layer:	Zero reading (mm):	Termination reason:	mOD:
DD	0.94	Grass	0	Refusal	Grid: OSGB

Cumulative blows:	Cumulative pen (mm):	Increment blows:	Increment pen (mm):	mm per blow:	Layer CBR (%)
0	95	0			
1	158	1	63	63.0	
2	240	1	82	82.0	3
3	306	1	66	66.0	
4	335	1	29	29.0	
5	375	1	40	40.0	
6	395	1	20	20.0	
7	415	1	20	20.0	11
8	440	1	25	25.0	
9	464	1	24	24.0	
10	488	1	24	24.0	
11	515	1	27	27.0	
12	542	1	27	27.0	
13	568	1	26	26.0	
14	595	1	27	27.0	
15	630	1	35	35.0	
16	673	1	43	43.0	
17	710	1	37	37.0	
18	740	1	30	30.0	9
19	771	1	31	31.0	
20	800	1	29	29.0	
21	825	1	25	25.0	
22	853	1	28	28.0	
23	887	1	34	34.0	
24	908	1	21	21.0	
25	937	1	29	29.0	





Notes: For explanation of symbols and abbreviations see Key Sheet.
All depths in meters.

Issue: DRAFT

Project:	Ysgol I.D. Hoosan
Project No:	24-074
Client:	Reed Construction Holdings Ltd

Infiltration Test Report

Exploratory/Test Location: **PT01**

Test no:	Date:	Method:	Weather:	Dimensions:	Start:	End:	Location:	
1	30/10/24	BS6297:2007+A1:2008	Overcast, showers	Length (m):	0.30	0.30	mE:	328739.51
Method of pit construction:				Width (m):	0.30	0.30	mN:	346046.98
Hand excavated				Depth (m):	0.40	0.40	GL:	N/A
							Grid:	OSGB

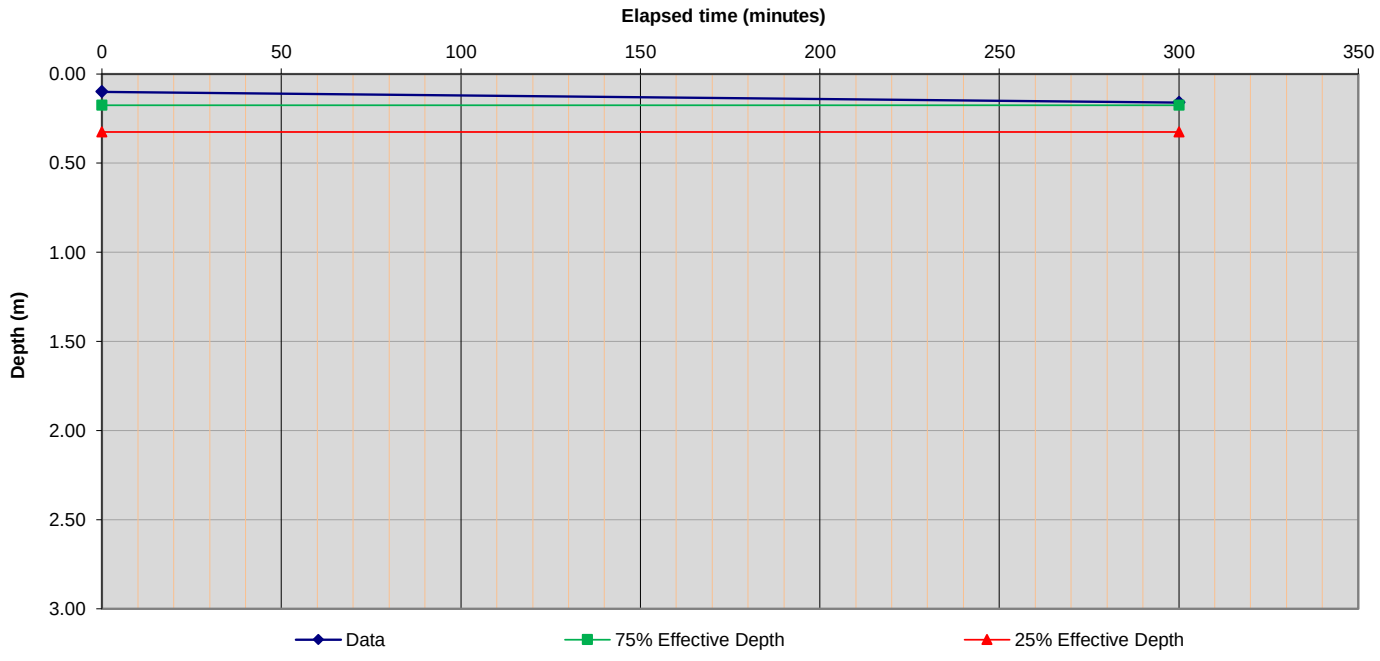
Elapsed time (mins):	Water depth (m below GL):	Remarks:
0	0.10	
300	0.16	

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Invert level source:
75%	0.18	75%		0.10	Assumed
50%	0.25				
25%	0.33	25%			

Base area of pit	0.09	m^2
Mean surface area through which outflow occurs	0.27	m^2
Volume outflow between 75 and 25% effective depth	0.01	m^3

Soil infiltration rate, f	N/A	$m^3/m^2/s$
Soil infiltration rate, f	N/A	m/hr
Percolation Value, vp	N/A	s/mm

Notes:
Stratum:
0.00 - 0.15: Dark brown slightly gravelly CLAY.
0.15 - 0.40: Brown gravelly CLAY.



Issue:	DRAFT	Project:	Ysgol I.D. Hoosan
Operator:	CW	Proj. No:	
Checked by:	DD	Client:	Reed Construction Holdings Ltd

Infiltration Test Report

Exploratory/Test Location: **PT03**

Test no:	Date:	Method:	Weather:	Dimensions:	Start:	End:	Location:	
1	28/10/24	BS6297:2007+A1:2008	Overcast, showers	Length (m):	0.30	0.30	mE:	328793.90
Method of pit construction:				Width (m):	0.30	0.30	mN:	346024.62
Hand excavated				Depth (m):	0.40	0.40	GL:	N/A
							Grid:	OSGB

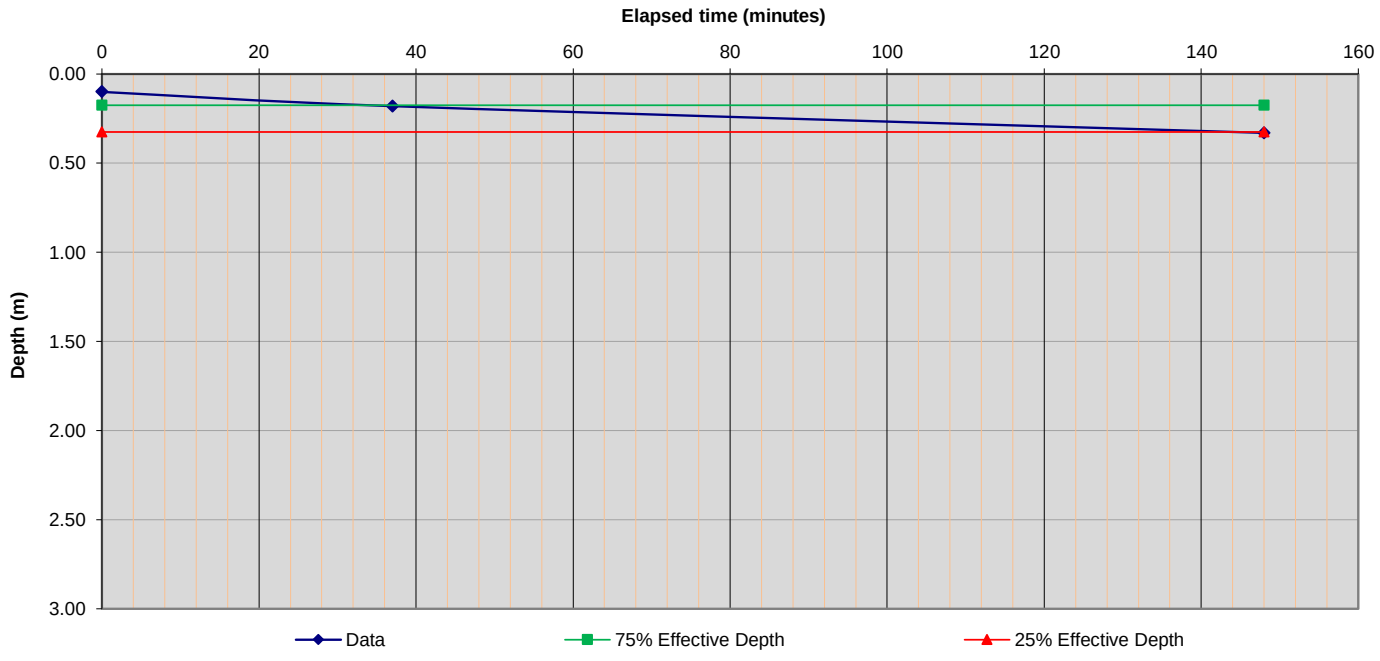
Elapsed time (mins):	Water depth (m below GL):	Remarks:
0	0.10	
37	0.18	
148	0.33	

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Invert level source:
75%	0.18	75%	37.00	0.10	Assumed
50%	0.25				
25%	0.33	25%	148.00		

Base area of pit	0.09	m^2
Mean surface area through which outflow occurs	0.27	m^2
Volume outflow between 75 and 25% effective depth	0.01	m^3

Soil infiltration rate, f	N/A	$m^3/m^2/s$
Soil infiltration rate, f	N/A	m/hr
Percolation Value, vp	4.44E+01	s/mm

Notes:
Stratum:
0.00 - 0.40: Dark grey gravelly CLAY.



Issue:	DRAFT	Project:	Ysgol I.D. Hoosan
Operator:	CW	Proj. No:	
Checked by:	DD	Client:	Reed Construction Holdings Ltd

Infiltration Test Report

Exploratory/Test Location: **PT04**

Test no:	Date:	Method:	Weather:	Dimensions:	Start:	End:	Location:	
1	28/10/24	BS6297:2007+A1:2008	Overcast, showers	Length (m):	0.30	0.30	mE:	328761.28
Method of pit construction:				Width (m):	0.30	0.30	mN:	346034.44
Hand excavated				Depth (m):	0.40	0.40	GL:	N/A
							Grid:	OSGB

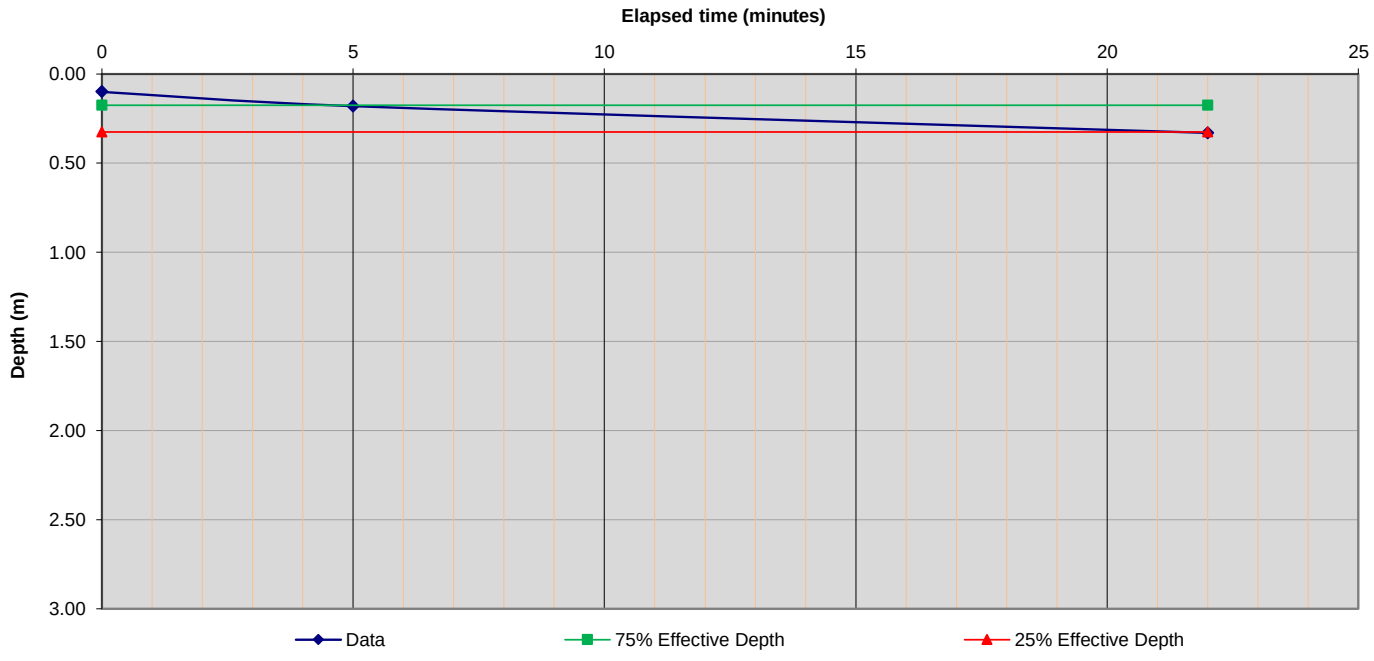
Elapsed time (mins):	Water depth (m below GL):	Remarks:
0	0.10	
5	0.18	
22	0.33	

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Invert level source:
75%	0.18	75%	5.00	0.10	Assumed
50%	0.25				
25%	0.33	25%	22.00		

Base area of pit	0.09	m^2
Mean surface area through which outflow occurs	0.27	m^2
Volume outflow between 75 and 25% effective depth	0.01	m^3

Soil infiltration rate, f	N/A	$m^3/m^2/s$
Soil infiltration rate, f	N/A	m/hr
Percolation Value, vp	6.80E+00	s/mm

Notes:
Stratum:
0.00 - 0.20: Brown slightly gravelly CLAY (MG).
0.20 - 0.40: Brown very gravelly CLAY (MG).



Issue:	DRAFT	Project:	Ysgol I.D. Hoosan
Operator:	CW	Proj. No:	
Checked by:	DD	Client:	Reed Construction Holdings Ltd

Infiltration Test Report

Exploratory/Test Location: **PT04**

Test no:	Date:	Method:	Weather:	Dimensions:	Start:	End:	Location:	
2	28/10/24	BS6297:2007+A1:2008	Overcast, showers	Length (m):	0.30	0.30	mE:	328761.28
Method of pit construction:				Width (m):	0.30	0.30	mN:	346034.44
Hand excavated				Depth (m):	0.40	0.40	GL:	N/A
							Grid:	OSGB

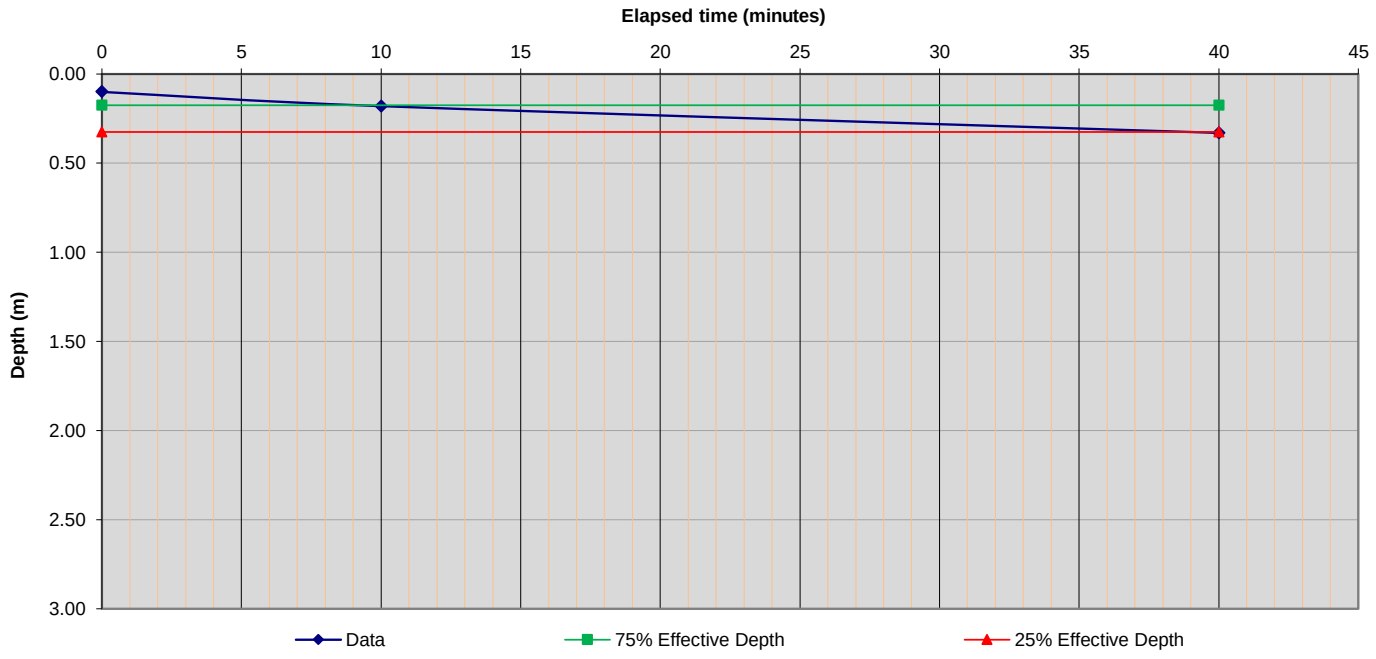
Elapsed time (mins):	Water depth (m below GL):	Remarks:
0	0.10	
10	0.18	
40	0.33	

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Invert level source:
75%	0.18	75%	10.00	0.10	Assumed
50%	0.25				
25%	0.33	25%	40.00		

Base area of pit	0.09	m^2
Mean surface area through which outflow occurs	0.27	m^2
Volume outflow between 75 and 25% effective depth	0.01	m^3

Soil infiltration rate, f	N/A	$m^3/m^2/s$
Soil infiltration rate, f	N/A	m/hr
Percolation Value, vp	1.20E+01	s/mm

Notes:
Stratum:
0.00 - 0.20: Brown slightly gravelly CLAY (MG).
0.20 - 0.40: Brown very gravelly CLAY (MG).



Issue:	DRAFT	Project:	Ysgol I.D. Hoosan
Operator:	CW	Proj. No:	
Checked by:	DD	Client:	Reed Construction Holdings Ltd

Infiltration Test Report

Exploratory/Test Location: **PT04**

Test no:	Date:	Method:	Weather:	Dimensions:	Start:	End:	Location:	
3	28/10/24	BS6297:2007+A1:2008	Overcast, showers	Length (m):	0.30	0.30	mE:	328761.28
Method of pit construction:				Width (m):	0.30	0.30	mN:	346034.44
Hand excavated				Depth (m):	0.40	0.40	GL:	N/A
							Grid:	OSGB

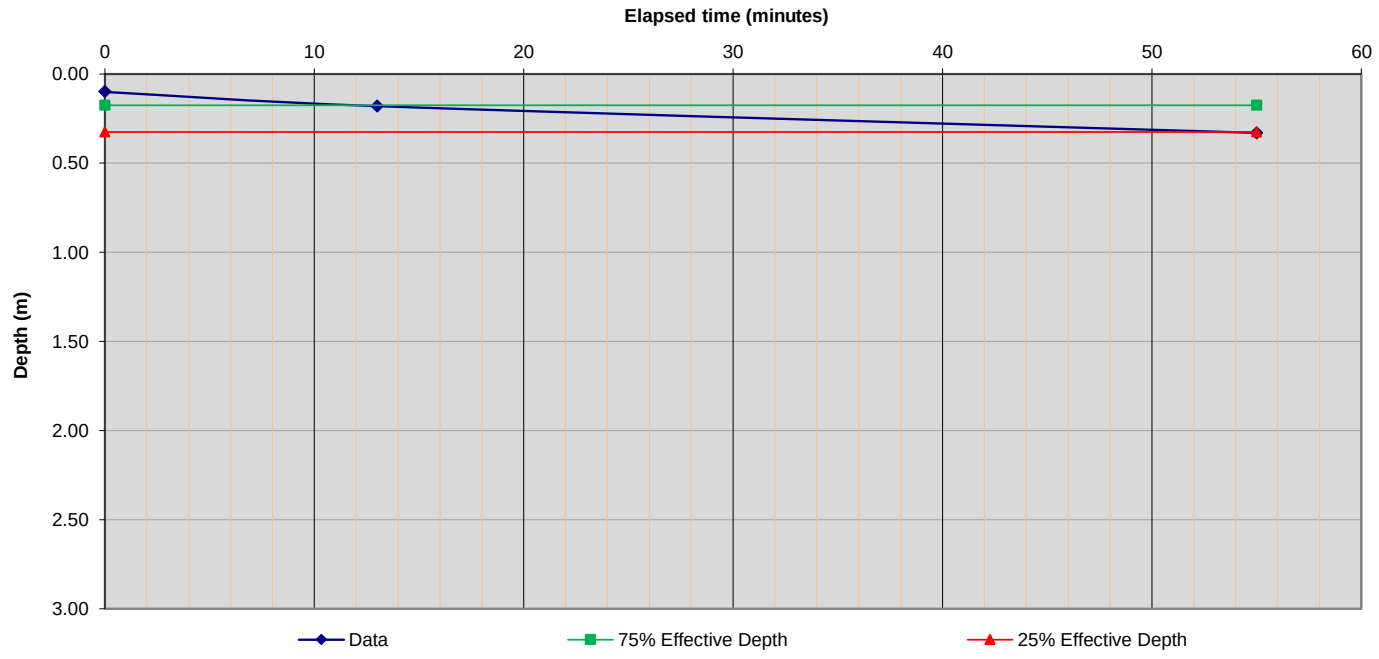
Elapsed time (mins):	Water depth (m below GL):	Remarks:
0	0.10	
13	0.18	
55	0.33	

Effective depth (m):		Elapsed time (mins) (from graph):		Invert level:	Invert level source:
75%	0.18	75%	13.00	0.10	Assumed
50%	0.25				
25%	0.33	25%	55.00		

Base area of pit	0.09	m^2
Mean surface area through which outflow occurs	0.27	m^2
Volume outflow between 75 and 25% effective depth	0.01	m^3

Soil infiltration rate, f	N/A	$m^3/m^2/s$
Soil infiltration rate, f	N/A	m/hr
Percolation Value, vp	1.68E+01	s/mm

Notes:
Stratum:
0.00 - 0.20: Brown slightly gravelly CLAY (MG).
0.20 - 0.40: Brown very gravelly CLAY (MG).



Issue:	DRAFT	Project:	Ysgol I.D. Hoosan
Operator:	CW	Proj. No:	
Checked by:	DD	Client:	Reed Construction Holdings Ltd


YSGOL I.D
HOOSON
PT1
30.10.24


YSGOL I.D
HOOSON
PT1
30.10.24


YSGOL I.D
HOOSON
PT3
28.10.24


YSGOL I.D
HOOSON
PT3
28.10.24


YSGOL I.D
HOOSON
PT4
28.10.24


YSGOL I.D
HOOSON
PT4
28.10.24

EAL

APPENDIX IV – GEOTECHNICAL LABORATORY TESTING

APPENDIX IV GEOTECHNICAL LABORATORY TESTING

LABORATORY REPORT

Contract Number: PSL24/8057

Report Date: 08 November 2024

Client's Reference:

Client Name: Eccles Associates Ltd (EAL)
55 St Catherine Drive
Hartford
Cheshire
CW8 2FE

For the attention of: Catherine Kenny

Contract Title: Ysgol I D Hooson

Date Received: 4/11/2024
Date Commenced: 4/11/2024
Date Completed: 8/11/2024

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

A Watkins (Managing Director)
R Berriman (Associate Director)
S Royle (Laboratory Manager)
[redacted]
L Knight (Assistant Laboratory Manager)
D Nicholson (Senior Technician)
T Watkins (Senior Technician)

5 – 7 Hexthorpe Road,
Hexthorpe,
Doncaster,
DN4 0AR
Tel: 01302 768098
Email: rberriman@prosoils.co.uk
awatkins@prosoils.co.uk

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS1		B	1.50	2.00	Brownish grey slightly sandy slightly gravelly CLAY.
WS2	1	D	2.90	3.00	Brown sandy slightly gravelly CLAY.
WS2	2	D	3.50	3.65	Brown sandy slightly gravelly CLAY.
WS2		U	3.80	4.00	Stiff brown sandy slightly gravelly CLAY.
WS3	1	D	1.00	1.20	Brown slightly sandy slightly gravelly CLAY.
WS5	1	D	3.70	3.80	Brown mottled grey slightly sandy slightly gravelly CLAY.
WS5		U	2.60	2.80	Stiff brown slightly sandy slightly gravelly CLAY.
BH2	1	D	6.00		Brown sandy slightly gravelly CLAY.
BH2	2	D	9.00		Brown sandy slightly gravelly CLAY.
BH2	3	D	12.00		Brown sandy slightly gravelly CLAY.

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Ysgol I D Hooson

Contract No:

PSL24/8057

Client Ref:

SUMMARY OF SOIL CLASSIFICATION TESTS

BS 1377 - Part 2 : 2022 in accordance with BS EN ISO 17892 (as below)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Water Content %	Linear Shrinkage	Particle Density Mg/m^3	Liquid Limit %	Plastic Limit %	Plasticity Index %	Passing 0.425mm %	Remarks
WS1		B	1.50	2.00	10.1			32	15	17	68	Low Plasticity CIL
WS2	1	D	2.90	3.00	10.4			27	13	14	81	Low Plasticity CIL
WS2	2	D	3.50	3.65	7.9			25	12	13	88	Low Plasticity CIL
WS2		U	3.80	4.00	10.4			26	12	14	70	Low Plasticity CIL
WS3	1	D	1.00	1.20	21.1			43	23	20	71	Medium Plasticity CIM
WS5	1	D	3.70	3.80	13.6			38	15	23	85	Medium Plasticity CIM
WS5		U	2.60	2.80	17.3			50	22	28	84	High Plasticity CIH
BH2	1	D	6.00		10.6			26	13	13	92	Low Plasticity CIL
BH2	2	D	9.00		9.8			26	12	14	88	Low Plasticity CIL
BH2	3	D	12.00		9.1			26	12	14	88	Low Plasticity CIL

Water Content - BS 1377 - Part 2 : 2022 : Clause 4 in accordance with BS EN ISO 17892 - 1 : 2014 + A1 : 2022
Linear Shrinkage - BS 1377 - Part 2 : 2022 : Clause 7
Particle Density (Gas Jar method) - BS 1377 - Part 2 : 2022 : Clause 9
Liquid, Plastic Limit & Plasticity Index - BS 1377 - Part 2 : 2022 : Clause 5 & 6 in accordance with BS EN ISO 17892 - 12 : 2018 + A2 : 2022

SYMBOLS : NP = Non Plastic

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Ysgol I D Hooson

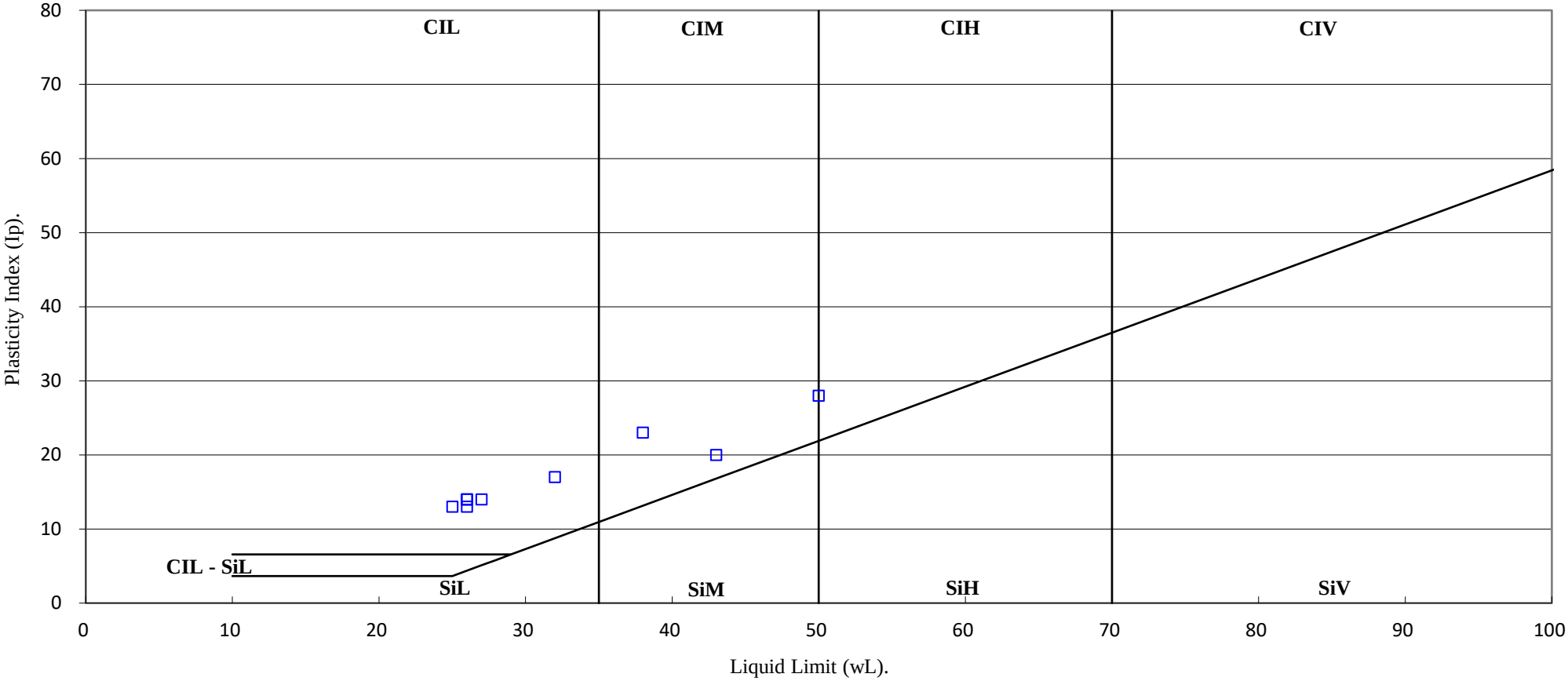
Contract No:

PSL24/8057

Client Ref:

PLASTICITY CHART

BS EN ISO 14688-2:2017 Clause 4.4



UKAS TESTING 4043 / PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY	**Ysgol I D Hooson**	**Contract No:**
		PSL24/8057
		Client Ref:

PARTICLE SIZE DISTRIBUTION TEST

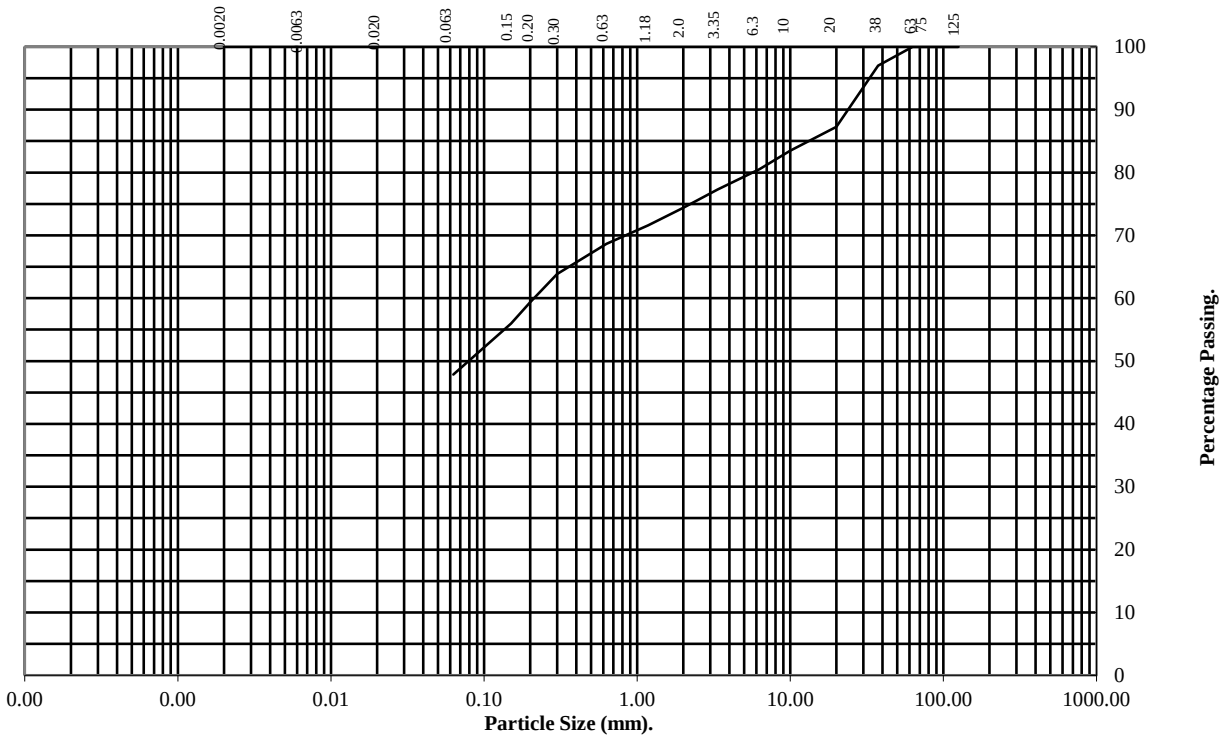
BS 1377 - Part 2 : 2022 : Clause 10 in accordance with BS EN ISO 17892 - 4 : 2016

Sieve Method, Clause 5.2

Hole Number: WS1 **Top Depth (m):** 1.50

Sample Number: **Base Depth (m):** 2.00

Sample Type: B



BS Test Sieve (mm)	Percentage Passing
125	100
75	100
63	100
37.5	97
20	87
10	83
6.3	81
3.35	77
2	74
1.18	72
0.63	69
0.3	64
0.2	59
0.15	56
0.063	48

Soil Fraction	Total Percentage
Cobbles	0
Gravel	26
Sand	26
Silt/Clay	48

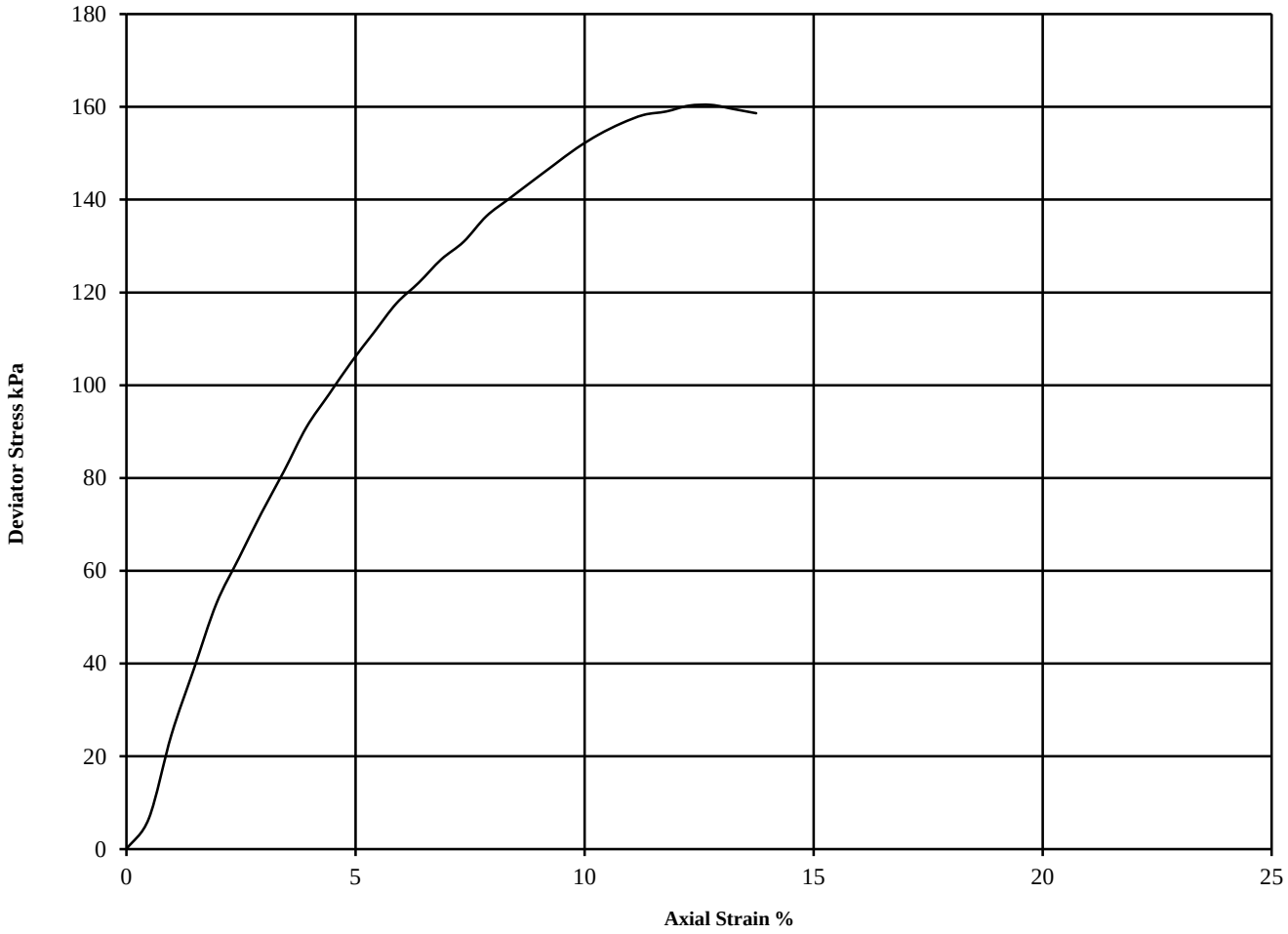
Remarks:

See Summary of Soil Descriptions

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

BS 1377 - Part 2 : 2022 : Clause 28 in accordance with BS EN ISO 17892 - 8 : 2018

Hole Number:	**WS2**	**Top Depth (m):**	**3.80**
Sample Number		**Base Depth (m):**	**4.00**
Sample Type	**U**		



Diameter (mm):		75	Height (mm):		153	Test:	UU Single Stage		Remarks:
Specimen	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)		Undisturbed Sample Sample taken from top of tube Rate of strain = 1.3 %/min See summary of soil descriptions
1	9.9	2.14	1.95	70	160	80	12.3	Plastic	

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

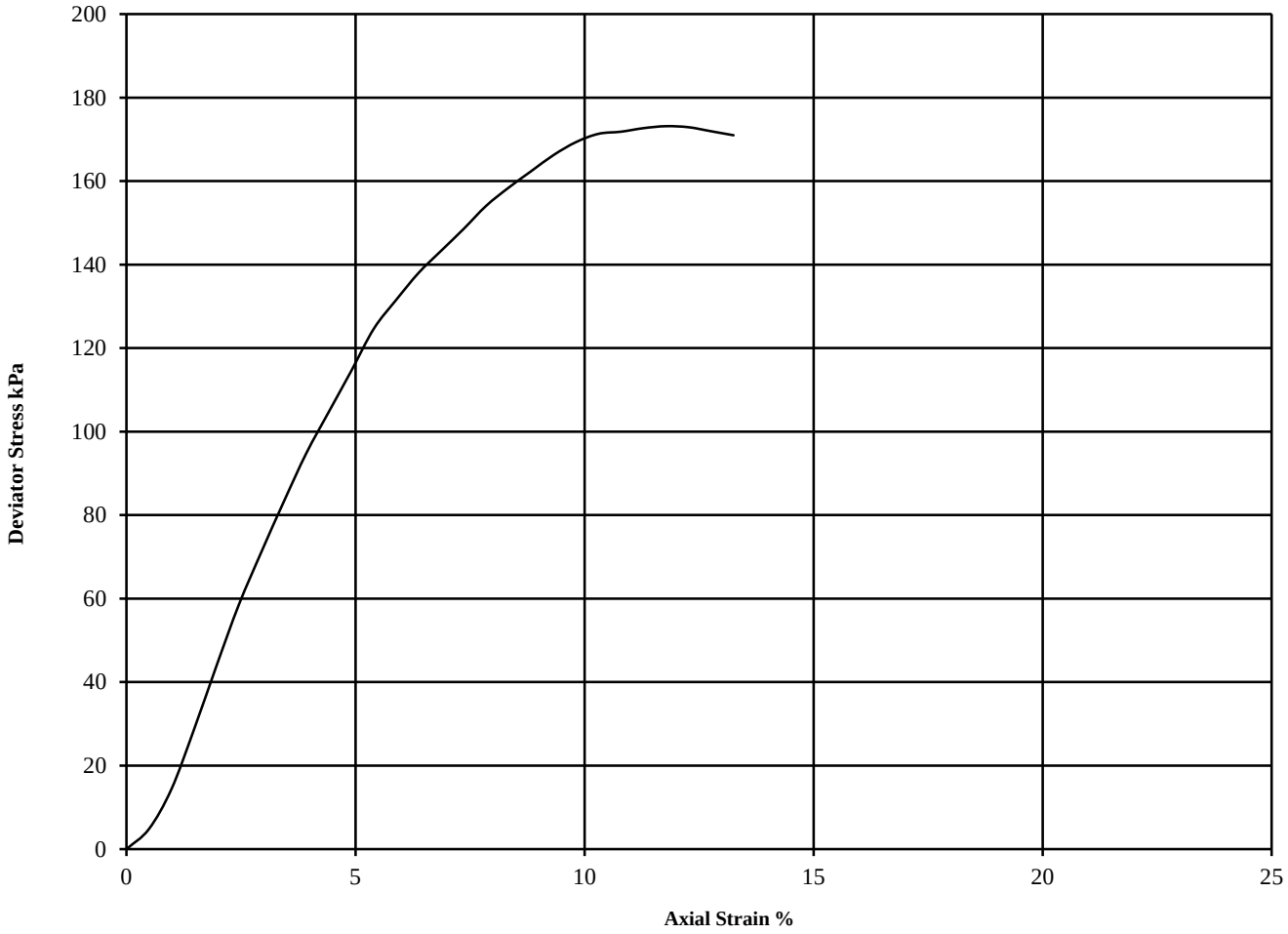
Ysgol I D Hooson

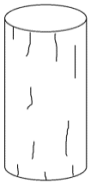
Contract No:
PSL24/8057
Client Ref:

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

BS 1377 - Part 2 : 2022 : Clause 28 in accordance with BS EN ISO 17892 - 8 : 2018

Hole Number:	**WS5**	**Top Depth (m):**	**2.60**
Sample Number		**Base Depth (m):**	**2.80**
Sample Type	**U**		



Diameter (mm):		75	Height (mm):		153	Test:	UU Single Stage		Remarks:
Specimen	Water Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)		Undisturbed Sample Sample taken from top of tube Rate of strain = 1.3 %/min See summary of soil descriptions
1	19.6	1.99	1.67	50	173	87	11.3	Plastic	

UKAS TESTING 4043

PSL PROFESSIONAL SOILS LABORATORY A PHENNA GROUP COMPANY

Ysgol I D Hooson

Contract No:
PSL24/8057
Client Ref:

EAL

APPENDIX V – GEOENVIRONMENTAL LABORATORY TESTING

APPENDIX V – GEOENVIRONMENTAL LABORATORY TESTING

Eccles Associates Ltd
55 St Catherine Drive, Hartford
CE8 2FE

7 - 11 Harding Street
Leicester
LE1 4DH

Analytical Test Report: E24/00443/ECC - 24-52067

Your Project Reference:	**Ysgol I D Hooson**		
Your Order Number:	WS1	Samples Received / Instructed:	01/11/2024 / 04/11/2024
Report Issue Number:	1	Sample Tested:	04/11 to 13/11/2024
Samples Analysed:	14 sample(s)	Report issued:	13/11/2024

Signed

James Gane
Analytical Services Manager
CTS Group

Notes:

General

Please refer to Methodologies page for details pertaining to the analytical methods undertaken.

Samples will be retained for 14 days after issue of this report with the exception of the asbestos test portion which is held for 6 months unless otherwise requested.

Moisture Content was determined in accordance with CTS method statement MS - CL - Sample Prep, oven dried at <30˚C.

Moisture Content is reported as a percentage of the dry mass of soil, this calculation is in accordance with BS1377, Part 2, 1990, Clause 3.2

Stone Content was determined in accordance with CTS method statement MS - CL - Sample Prep and refers to the percentage of stones retained on a 10mm BS test sieve.

Where specification limits are included these are for guidance only. Where a measured value has been highlighted this is not implying acceptance or failure and certainty of measurement values have not been taken into account.

Uncertainty of measurement values are available on request.

Samples were supplied by customer, results apply to the samples as received.

Asbestos

Please note: Where futher analaysis is required samples identified as containing asbestos are screened and tested on an as recevied basis. No correction is made for moisture content and these results are not covered by our accrediation

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation

WAC Testing

Samples were leached to our inhouse method statement in accordance with BS EN 12457-2: 2002.

Eluate Results are reported as L/S 10. These results have been calculated to report in accordance with BS EN 12457-2:2002.

Comparative values are taken from the Council Decision Annex - CRITERIA AND PROCEDURES FOR THE ACCEPTANCE OF WASTE AT LANDFILLS, (2003/33/EC).

Deviating Samples

On receipt samples are compared against our sample holding and handling protocols, where any deviations have been noted these are reported on our deviating sample page (if present)

Accreditation Key

UKAS = UKAS Accreditation, MCERTS = MCERTS Accreditation, u = Unaccredited, subUKAS - Subcontracted to a laboratory UKAS accredited for this test, subMCERTS - Subcontracted to a laboratory MCERTS accredited for this test

MCERTS Accreditation only covers the SAND, CLAY and LOAM matrices

UKAS accreditation on waters only covers the Ground water and Surface water matrices

Date of Issue: 11.11.2024

Issued by: J. Gane

Issue No: 4

Rev No: 18

CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Analytical Test Results - Solid

Lab Reference			414986	414987	414989	414991	414992	414993	414994
Client Sample ID			WS1	WS2	WS3	WS4	WS5	WS5	PT4
Client Sample Location			-	-	-	-	-	-	-
Client Sample Type			ES	WAC	ES	ES	ES	ES	ES
Client Sample Number			1	1	1	2	1	2	1
Depth - Top (m)			0.10	0.1	1.80	2.70	3.90	1.50	0.25
Depth - Bottom (m)			0.20	0.25	2.00	2.80	4.00	1.70	0.40
Date of Sampling			29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	29/10/2024	28/10/2024
Time of Sampling			-	-	-	-	-	-	-
Sample Matrix			Sand	Clay	Clay	Clay	Clay	Clay	Soil
Determinant	**Units**	**Accreditation**							
Arsenic	(mg/kg)	MCERTS	12	< 10	42	58	11	11	-
Cadmium	(mg/kg)	MCERTS	1.5	1.7	17	81	1.5	6.6	-
Chromium (Total)	(mg/kg)	UKAS	12	6.7	7.9	19	5.6	10	-
Copper	(mg/kg)	MCERTS	61	30	180	180	30	110	-
Lead	(mg/kg)	MCERTS	74	190	370	4300	160	2100	-
Mercury	(mg/kg)	UKAS	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	-
Nickel	(mg/kg)	MCERTS	27	25	44	37	35	39	-
Selenium	(mg/kg)	u	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0	-
Zinc	(mg/kg)	MCERTS	120	440	850	34000	180	4600	-
Sulphate (Acid Soluble)	(%)	u	0.03	0.05	0.16	0.82	0.02	0.07	-
pH	pH Units	MCERTS	7.2	8.6	8.3	7.4	8.6	8.1	-
Sulphate (Water soluble as SO_4)	(mg/l)	u	< 10	36	230	1500	36	87	-
Acenaphthene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.05	-
Acenaphthylene	(mg/kg)	UKAS	0.03	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	-
Anthracene	(mg/kg)	UKAS	< 0.02	< 0.02	0.04	0.04	< 0.02	0.06	-
Benzo (a) anthracene	(mg/kg)	MCERTS	0.07	0.07	0.08	0.09	< 0.02	0.08	-
Benzo (a) pyrene	(mg/kg)	MCERTS	0.08	0.09	0.05	0.06	< 0.02	0.06	-
Benzo (b) fluoranthene	(mg/kg)	MCERTS	0.10	0.12	0.09	0.09	< 0.02	0.09	-
Benzo (g, h, i) perylene	(mg/kg)	MCERTS	0.07	0.08	0.06	0.06	< 0.02	0.08	-
Benzo (k) fluoranthene	(mg/kg)	MCERTS	0.03	0.03	< 0.02	< 0.02	< 0.02	< 0.02	-
Chrysene	(mg/kg)	MCERTS	0.09	0.10	0.11	0.12	< 0.02	0.13	-
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	-
Fluoranthene	(mg/kg)	MCERTS	0.11	0.14	0.15	0.15	< 0.02	0.20	-
Fluorene	(mg/kg)	MCERTS	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	0.06	-
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS	0.05	0.06	0.03	0.03	< 0.02	0.03	-
Naphthalene	(mg/kg)	MCERTS	< 0.02	< 0.02	0.11	0.09	< 0.02	0.20	-
Phenanthrene	(mg/kg)	MCERTS	0.05	0.09	0.26	0.33	< 0.02	0.47	-
Pyrene	(mg/kg)	MCERTS	0.12	0.13	0.13	0.14	< 0.02	0.17	-
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS	0.92	1.1	1.2	1.3	< 0.32	1.8	-
GRO (>C_8 to C_{10}) [EH_1D_Total]	(mg/kg)	MCERTS	8.5	< 5.0	7.9	7.0	< 5.0	9.8	-
Total TPH (>C_{10} to C_{12}) [EH_1D_Total]	(mg/kg)	MCERTS	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	7.6	-
Total TPH (>C_{12} to C_{16}) [EH_1D_Total]	(mg/kg)	MCERTS	6.0	< 5.0	16	14	< 5.0	22	-
Total TPH (>C_{16} to C_{21}) [EH_1D_Total]	(mg/kg)	MCERTS	14	11	30	23	< 5.0	34	-
Total TPH (>C_{21} to C_{35}) [EH_1D_Total]	(mg/kg)	MCERTS	73	110	95	71	< 10.0	130	-
Total TPH (>C_{35} to C_{40}) [EH_1D_Total]	(mg/kg)	MCERTS	19	47	22	15	< 5.0	33	-
DRO (>C_{10} to C_{21}) [EH_1D_Total]	(mg/kg)	MCERTS	23	20	52	42	< 10	64	-
MRO (>C_{21} to C_{40}) [EH_1D_Total]	(mg/kg)	MCERTS	91	150	120	85	< 15.0	170	-
Total TPH (>C_8 to C_{40}) [EH_1D_Total]	(mg/kg)	MCERTS	120	180	180	130	21	240	-
TOC	(%)	MCERTS	2.7	2.0	7.4	8.0	< 0.5	5.0	-
Asbestos	-	UKAS	-	-	No asbestos detected	No asbestos detected	-	-	No asbestos detected

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Analytical Test Results - Solid

Lab Reference	
Client Sample ID	
Client Sample Location	
Client Sample Type	
Client Sample Number	
Depth - Top (m)	
Depth - Bottom (m)	
Date of Sampling	
Time of Sampling	
Sample Matrix	

Determinant	**Units**	**Accreditation**
Arsenic	(mg/kg)	MCERTS
Cadmium	(mg/kg)	MCERTS
Chromium (Total)	(mg/kg)	UKAS
Copper	(mg/kg)	MCERTS
Lead	(mg/kg)	MCERTS
Mercury	(mg/kg)	UKAS
Nickel	(mg/kg)	MCERTS
Selenium	(mg/kg)	u
Zinc	(mg/kg)	MCERTS
Sulphate (Acid Soluble)	(%)	u
pH	pH Units	MCERTS
Sulphate (Water soluble as SO_4)	(mg/l)	u
Acenaphthene	(mg/kg)	MCERTS
Acenaphthylene	(mg/kg)	UKAS
Anthracene	(mg/kg)	UKAS
Benzo (a) anthracene	(mg/kg)	MCERTS
Benzo (a) pyrene	(mg/kg)	MCERTS
Benzo (b) fluoranthene	(mg/kg)	MCERTS
Benzo (g, h, i) perylene	(mg/kg)	MCERTS
Benzo (k) fluoranthene	(mg/kg)	MCERTS
Chrysene	(mg/kg)	MCERTS
Dibenzo (a,h) anthracene	(mg/kg)	MCERTS
Fluoranthene	(mg/kg)	MCERTS
Fluorene	(mg/kg)	MCERTS
Indeno (1, 2, 3,-cd) pyrene	(mg/kg)	MCERTS
Naphthalene	(mg/kg)	MCERTS
Phenanthrene	(mg/kg)	MCERTS
Pyrene	(mg/kg)	MCERTS
Total PAH (Sum of USEPA 16)	(mg/kg)	UKAS
GRO (>C_8 to C_{10}) [EH_1D_Total]	(mg/kg)	MCERTS
Total TPH (>C_{10} to C_{12}) [EH_1D_Total]	(mg/kg)	MCERTS
Total TPH (>C_{12} to C_{16}) [EH_1D_Total]	(mg/kg)	MCERTS
Total TPH (>C_{16} to C_{21}) [EH_1D_Total]	(mg/kg)	MCERTS
Total TPH (>C_{21} to C_{35}) [EH_1D_Total]	(mg/kg)	MCERTS
Total TPH (>C_{35} to C_{40}) [EH_1D_Total]	(mg/kg)	MCERTS
DRO (>C_{10} to C_{21}) [EH_1D_Total]	(mg/kg)	MCERTS
MRO (>C_{21} to C_{40}) [EH_1D_Total]	(mg/kg)	MCERTS
Total TPH (>C_8 to C_{40}) [EH_1D_Total]	(mg/kg)	MCERTS
TOC	(%)	MCERTS
Asbestos	-	UKAS

CONSTRUCTION TESTING SOLUTIONS
A PHENNA GROUP COMPANY

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Analytical Test Results - Chemical Analysis

Lab Reference			414995	414996	414997	414998	414999
Client Sample ID			WS1	WS2	WS3	WS4	WS5
Client Sample Location			-	-	-	-	-
Client Sample Type			BRE	BRE	BRE	BRE	BRE
Client Sample Number			1	1	1	1	1
Depth - Top (m)			0.70	4.60	1.40	1.75	2.40
Depth - Bottom (m)			0.70	4.75	1.40	1.75	2.50
Date of Sampling			-	-	-	-	-
Time of Sampling			-	-	-	-	-
Sample Matrix			Clay	Clay	Clay	Clay	Clay
Determinant	**Units**	**Accreditation**					
Water soluble sulphate (as SO_4)	(mg/l)	u	20	57	43	53	55
Acid Soluble Sulphate	(%)	u	0.03	0.05	0.05	0.11	0.06
Total Sulphur	(%)	UKAS	0.04	0.18	0.11	0.18	0.09
pH Value	pH Units	MCERTS	8.5	8.5	8.2	7.8	7.1
Water Soluble Chloride	(mg/l)	u	6.6	9.3	13	10	14
Water Soluble Nitrate (As NO_3)	(mg/l)	u	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Magnesium	(mg/l)	u	2.9	3.2	6.1	4.8	6.9

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Analytical Test Results - VPH / EPH

Lab Reference			414987	414990	414993
Client Sample ID			WS2	WS4	WS5
Client Sample Location			-	-	-
Client Sample Type			WAC	ES	ES
Client Sample Number			1	1	2
Depth - Top (m)			0.1	1.30	1.50
Depth - Bottom (m)			0.25	1.50	1.70
Date of Sampling			29/10/2024	29/10/2024	29/10/2024
Time of Sampling			-	-	-
Sample Matrix			Clay	Clay	Clay
Determinant	**Units**	**Accreditation**			
Benzene	(mg/kg)	MCERTS	< 0.01	0.05	< 0.01
Toluene	(mg/kg)	MCERTS	< 0.01	0.09	0.05
Ethylbenzene	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
m&p Xylene	(mg/kg)	MCERTS	< 0.02	0.07	0.02
o-Xylene	(mg/kg)	MCERTS	< 0.01	0.04	< 0.01
MTBE	(mg/kg)	MCERTS	< 0.01	< 0.01	< 0.01
Aliphatic >C_5 to C_6 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	0.13
Aliphatic >C_6 to C_8 [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	0.21	0.26
Aliphatic >C_8 to C_{10} [HS_MS_1D_AL]	(mg/kg)	MCERTS	< 0.06	< 0.06	0.14
Aliphatic >C_{10} to C_{12} [EH_2D_AL]	(mg/kg)	MCERTS	1.8	5.3	6.2
Aliphatic >C_{12} to C_{16} [EH_2D_AL]	(mg/kg)	MCERTS	3.1	8.8	11
Aliphatic >C_{16} to C_{21} [EH_2D_AL]	(mg/kg)	MCERTS	3.1	6.8	11
Aliphatic >C_{21} to C_{35} [EH_2D_AL]	(mg/kg)	MCERTS	15	9.5	21
Aliphatic >C_{35} to C_{44} [EH_2D_AL]	(mg/kg)	u	6.1	< 5.0	< 5.0
Aromatic >C_5 to C_7 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	0.05	< 0.01
Aromatic >C_7 to C_8 [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.01	0.09	0.05
Aromatic >C_8 to C_{10} [HS_MS_1D_AR]	(mg/kg)	MCERTS	< 0.06	0.16	< 0.06
Aromatic >C_{10} to C_{12} [EH_2D_AR]	(mg/kg)	MCERTS	< 1.0	< 1.0	1.2
Aromatic >C_{12} to C_{16} [EH_2D_AR]	(mg/kg)	MCERTS	1.3	5.8	8.4
Aromatic >C_{16} to C_{21} [EH_2D_AR]	(mg/kg)	MCERTS	2.5	10	13
Aromatic >C_{21} to C_{35} [EH_2D_AR]	(mg/kg)	MCERTS	30	17	27
Aromatic >C_{35} to C_{44} [EH_2D_AR]	(mg/kg)	u	17	< 5.0	7.2
Total >C_5 to C_{35} [EH_2D+HS_1D_Total]	(mg/kg)	MCERTS	57	64	99

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Certificate Of Analysis - WAC Suite

Lab Reference	414989
Client Sample ID	WS3
Client Sample Location	-
Client Sample Type	ES
Client Sample Number	1
Depth - Top (m)	1.8
Depth - Bottom (m)	2
Date of Sampling	29/10/2024
Time of Sampling	-
Sample Description	Made Ground- brownish dark grey gravelly sandy silty clay with occasional brick fragments slag
Sample Matrix	Clay
Moisture Content (%)	18
Stone content (%)	26

			Determined Result	Inert Waste Landfill	Stable non reactive hazardous waste in a non hazardous landfill	Hazardous Waste Landfill
Solid Analysis						
Total Organic Carbon	%	MCERTS	7.4	3.0	5.0	6.0
Loss on Ignition	%	UKAS	12	-	-	10.0
BTEX	mg/kg	MCERTS	0.2	6.00	-	-
PCB's (7 Congeners)	mg/kg	MCERTS	< 0.025	1.00	-	-
Mineral Oil (>C10 to C40) [EH_1D_Total]	mg/kg	MCERTS	170	500	-	-
PAH	mg/kg	u	1.2	100	-	-
pH	units	MCERTS	8.3	-	> 6	-
Eluate Analysis						
Arsenic	mg/kg	UKAS	0.03	0.50	2	25
Barium	mg/kg	UKAS	0.96	20	100	300
Cadmium	mg/kg	UKAS	< 0.0025	0.04	1	5
Chromium (total)	mg/kg	UKAS	0.01	0.5	10	70
Copper	mg/kg	UKAS	< 0.025	2.0	50	100
Mercury	mg/kg	UKAS	< 0.00050	0.01	0.2	2
Molybdenum	mg/kg	UKAS	0.40	0.5	10.0	30
Nickel	mg/kg	UKAS	< 0.075	0.4	10.0	40
Lead	mg/kg	UKAS	0.18	0.5	10.0	50
Antimony	mg/kg	UKAS	0.06	0.06	0.7	5
Selenium	mg/kg	UKAS	0.01	0.1	0.5	7
Zinc	mg/kg	u	1.49	4	50	200
Chloride	mg/kg	UKAS	7	800	15000	25000
Fluoride	mg/kg	u	10	10	150	500
Sulphate (as SO_4)	mg/kg	UKAS	570	1000	20000	50000
Total Dissolved Solids	mg/kg	u	1800	4000	60000	100000
Phenol Index	mg/kg	u	< 1.0	1	-	-
Dissolved Organic Carbon	mg/kg	UKAS	24.0	500	800	1000

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Soils - No Testing Scheduled

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Status
414988	WS2	-	ES	1	No Testing Scheduled

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Sample Descriptions

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Description	Moisture Content (%)	Stone Content (%)	Passing 2mm test sieve (%)
414986	WS1	-	ES	1	Brown gravelly clayey silty sand with occasional rootlets	17	4.1	73
414987	WS2	-	WAC	1	Greyish brown gravelly sandy silty clay with occasional rootlets	14	15	87
414989	WS3	-	ES	1	Made Ground- brownish dark grey gravelly sandy silty clay with occasional brick fragments slag	18	26	78
414990	WS4	-	ES	1	Made Ground- dark grey gravelly sandy silty clay with occasional brick fragments slag organic matter	23	< 0.1	-
414991	WS4	-	ES	2	Made Ground- brownish dark grey gravelly sandy silty clay with occasional brick fragments slag	19	4.5	81
414992	WS5	-	ES	1	Greyish light brown slightly gravelly slightly sandy silty clay	11	10	83
414993	WS5	-	ES	2	Dark grey slightly gravelly slightly sandy silty clay	15	24	83
414995	WS1	-	BRE	1	Greyish brown gravelly sandy silty clay	-	-	65
414996	WS2	-	BRE	1	Greyish brown gravelly silty clay	-	-	74
414997	WS3	-	BRE	1	Dark brownish grey gravelly sandy silty clay	-	-	73
414998	WS4	-	BRE	1	Dark brownish grey gravelly sandy silty clay	-	-	80
414999	WS5	-	BRE	1	Greyish brown slightly gravelly silty clay	-	-	67

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Sample Comments

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Comments
414986	WS1	-	ES	1	
414987	WS2	-	WAC	1	
414989	WS3	-	ES	1	VPH/BTEX - Sample taken from container with headspace.
414990	WS4	-	ES	1	
414991	WS4	-	ES	2	
414992	WS5	-	ES	1	
414993	WS5	-	ES	2	VPH/BTEX - Sample taken from container with headspace.
414995	WS1	-	BRE	1	
414996	WS2	-	BRE	1	
414997	WS3	-	BRE	1	
414998	WS4	-	BRE	1	
414999	WS5	-	BRE	1	

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
ANIONSS	MS - CL - Anions by Aquakem (2:1Extract)	Oven dried	Passing 2mm test sieve	Determination of Anions (inc Sulphate, chloride etc.) in soils by Aquakem. Analysis is based on a 2:1 water to soil extraction ratio
WACMETALS1	MS-CL-Metals in Waters by ICP-MS (WAC)	As received	MS-CL-Soil Leachate Preparation	Determination of dissolved metals in leachates via ICP-MS, expressed as quantity of analyte leached from the original material.
WACDOC	MS - CL - DOC (WAC)	As received	BSEN:12457 Leaching	Determination of dissolved organic carbon in a leachate as part of a WAC test
ICPMETS	MS - CL - ICP Metals	Air dried	Passing 10mm test sieve	Determination of metals in soils via ICP
WACPHS	MS - CL - pH in Soils (WAC)	As received	BSEN:12457 Leaching	Determination of pH in soils as part of a WAC test via pH probe
PHS	MS - CL - pH in Soils	As received	Passing 10mm test sieve	Determination of pH in soils using a pH probe (using a 1:3 soil to water extraction)
PCB7S	MS - CL - PCB Soils	As received	Passing 10mm test sieve	Determination of PCB's (7 congeners) in soils via GC-MS
PAHASRDS	MS - CL - PAH (As Received)	As received	Passing 10mm test sieve	Determination of Polyaromatic hydrocarbons in soil via GC-MS
WACANIONS	MS - CL - Anions by Aquakem (WAC)	As received	BSEN:12457 Leaching	Determination of sulphate, chloride and fluoride in a leachate as part of a WAC test using a Aquakem analyser
TDSL	MS-CL-Conductivity in Water(TDS by Calc)	As received	BSEN:12457 Leaching	Determination of total dissolved solids in leachates (by calculation)
ASSO4S	MS - CL - Acid Soluble Sulphate	Oven Dried	Passing 2mm test sieve	Determination of total sulphate in soils by acid extraction followed by ICP analysis
WACTOCS	MS - CL - TOC Eltra (WAC)	Air dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soil as part of a WAC test
TOCS	MS - CL - TOC Eltra	Air Dried	Passing 10mm test sieve	Determination of Total Organic Carbon in soils
TPHS	MS - CL - TPH (GC-FID)	As received	Passing 10mm test sieve	Determination of Total Petroleum Hydrocarbons in soil using GC-FID
WACSKALAR	MS - CL - Phenols by Skalar (WAC)	As received	BSEN:12457 Leaching	Determination of Total Phenols within leachate as part of a WAC test using a Skalar Segmented flow analyser
GCXGCS	MS - CL - TPH & EPH by GCXGC	As received	Passing 10mm test sieve	Determination of TPH and EPH in soils via GCxGC-FID
CWGS	Calculation from VPH-S and EPH-S	As received	Passing 10mm test sieve	Determination of TPH CWG (Volatile Petroleum Hydrocarbons and Extractable Petroleum Hydrocarbons) in soils via Headspace-GC-MS and GC-GC-FID respectively
VPHS	MS - CL - VPH	As received	Passing 10mm test sieve	Determination of VPH in soils via Headspace-GC-MS
ASB	MS - AS - Asbestos	-	-	Fibre identification is in accordance with in house documented methods which are based on the procedure documented in the HSE Document HSG 248 "Asbestos: The analysts guide for sampling, analysis and clearance procedures"
HOLD	No Testing Scheduled	-	-	No Testing Scheduled
SAMPLEPREP	MS - CL - Sample Preparation	-	-	Preparation of samples (including determination of moisture content) to allow for subsequent analysis

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Analysis Methodologies

Test Code	Test Name / Reference	Sample condition for analysis	Sample Preperation	Test Details
LEACH-SS-P	MS-CL-Soil Leachate Preparation (SS)	As Received	All crushed to pass 4mm test sieve	Preparation of single stage soil leachates in accordance with MS-CL-Soil Leachate Preparation
1377LOI	BS1377 LoI	Oven dried	Passing 2mm test sieve	Testing was in accordance with BS 1377: Part 3: 2018 + A1 :2021 Clause 6. Determination of the mass loss on ignition. Some information required by BS1377: 2016: Part 1 has not been reported. This information is available on request.
1377TS-ELT	BS1377 Total Sulphur Content by HTC	Oven dried	BS1377 : Part 1 : 2016	Total Sulphur Content testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 7.10 (using Eltra CS-800 Analyser)
1377MGICP	BS1377 WS Magnesium (ICP)	Oven dried	Passing 2mm test sieve	Water Soluble Magnesium testing of Soil in accordance with BS 1377 : Part 3 : 2018 + A1 : 2021 Clause 10.

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

Sample Deviations

Deviations are listed below against each sample and associated test method, where deviation(s) are noted it means data may not be representative of the sample at the time of sampling and it is possible that results provided may be compromised.

Observations on receipt

A - No date of sampling provided
W - No time of sampling provided for water sample
C - Received in inappropriate container
H - Contains headspace
T - Temperature on receipt exceeds storage temperature
R - Sample(s) received with less than 96 hours for testing to commence/complete, any result formally classed as deviating will be marked with an X against the applicable test (i.e. RX)

Observations whilst in laboratory

X - Exceeds sampling to extraction or analysis timescales

Lab Reference	Client Sample ID	Client Sample Location	Client Sample Type	Client Sample Number	Test	Deviations
414986	WS1	-	ES	1	MS - CL - pH in Soils	RX
414987	WS2	-	WAC	1	MS - CL - pH in Soils	R
414987	WS2	-	WAC	1	MS - CL - VPH	R
414989	WS3	-	ES	1	MS - CL - pH in Soils	R
414989	WS3	-	ES	1	MS - CL - pH in Soils (WAC)	R
414989	WS3	-	ES	1	MS - CL - VPH	R
414990	WS4	-	ES	1	MS - CL - VPH	R
414991	WS4	-	ES	2	MS - CL - pH in Soils	R
414992	WS5	-	ES	1	MS - CL - pH in Soils	R
414993	WS5	-	ES	2	MS - CL - pH in Soils	R
414993	WS5	-	ES	2	MS - CL - VPH	RX
414995	WS1	-	BRE	1		A
414996	WS2	-	BRE	1		A
414997	WS3	-	BRE	1		A
414998	WS4	-	BRE	1		A
414999	WS5	-	BRE	1		A

7 - 11 Harding Street
Leicester
LE1 4DH

E24/00443/ECC - 24-52067

Project Reference - Ysgol I D Hooson

HWOL TPH Acronym Index

Acronym	Description
HS	Headspace Analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics and Aromatics
AL	Aliphatics Only
AR	Aromatics Only
2D	GC-GC - Double Coil Gas Chromatography
#1	EH_Total but with humics mathmatically subtracted
#2	EH_Total but with fatty acids mathmatically subtracted
_	Operator - underscore to separate acronyms (except for +)
+	Operator to indicate cumlative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry

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APPENDIX VI – SUMMARY OF CONTAMINATION TEST RESULTS & THRESHOLD VALUES

APPENDIX V I– SUMMARY OF CONTAMINATION RESULTS & THRESHOLD VALUES

APPENDIX VI - SUMMARY OF CONTAMINATIONTEST RESULTS & THRESHOLD VALUES

Analyte	No of tests	Minimum Test Result	Mean Test Result	Maximum Test Result	SSAC Residential with Gardens Tier 1 Screening Threshold	SSAC POS-Park Tier 1 Screening Threshold	Source of Screening Criteria	Tier 1 Screening Threshold
Asbestos	3	Not detected	Not detected	Not detected				
Metals								
Arsenic	6	<10	27	58	37	170	CLEA v1.071	LQM 2009
Cadmium	6	1.5	18	81	11	532	CLEA v1.071	LQM 2009
Chromium (Assume all is CrIV)	6	5.6	10	19	-	220	CLEA v1.071	LQM 2009
Copper	6	30	99	180	2400	44000	CLEA v1.071	LQM 2009
Lead	6	74	1199	4300	210	1400	CLEA v1.071	DEFRA/C4SL
Mercury	6	<2.5	<2.5	<2.5	40	240	SC050021*	LQM 2009
Nickel	6	24	35	44	180	3400	CLEA v1.071	LQM 2009
Selenium	6	<8	<8	<8	250	1800	SC050021*	LQM 2009
Zinc	6	120	6698	34000	3700	17000	CLEA v1.071	LQM 2009
Anions, pH & TOC								
Water Soluble Sulphate (g/l)	11	<0.01	0.212	1.5	1.8	1.8	BRE SD1 for DS-1	
Acid Soluble Sulphate (%)	11	0.02	0.13	0.82	-	-	-	
pH	11	7.1	8.0	8.6	>5.5	>5.5	BRE SD1 for DS-1	
Polyaromatic Hydrocarbons								
Naphthalene	6	< 0.02	0.13	0.2	2.3	190	CLEA v1.071	LQM 2009
Acenaphthylene	6	< 0.02	0.03	0.03	170	29000	CLEA v1.071	LQM 2009
Acenaphthene	6	< 0.02	0.05	0.05	210	29000	CLEA v1.071	LQM 2009
Fluorene	6	< 0.02	0.06	0.06	170	20000	CLEA v1.071	LQM 2009
Phenanthrene	6	<0.02	0.24	0.47	95	6200	CLEA v1.071	LQM 2009
Anthracene	6	<0.02	0.05	0.06	2400	150000	CLEA v1.071	LQM 2009
Fluoranthene	6	<0.02	0.15	0.2	280	6300	CLEA v1.071	LQM 2009
Pyrene	6	<0.02	0.14	0.17	620	15000	CLEA v1.071	LQM 2009
Benzo(a)anthracene	6	<0.02	0.08	0.09	7.2	49	CLEA v1.071	LQM 2009
Chrysene	6	<0.02	0.11	0.13	15	93	CLEA v1.071	LQM 2009
Benzo(b)fluoranthene	6	<0.02	0.10	0.12	2.6	13	CLEA v1.071	LQM 2009
Benzo(k)fluoranthene	6	<0.02	0.03	0.03	77	370	CLEA v1.071	LQM 2009
Benzo(a)pyrene	6	<0.02	0.07	0.09	2.2	11	CLEA v1.071	Defra5/C4SL
Indeno(1,2,3-cd)pyrene	6	<0.02	0.04	0.06	27	150	CLEA v1.071	LQM 2009
Dibenzo(a,h)anthracene	6	<0.02	<0.02	<0.02	0.24	1.1	CLEA v1.071	LQM 2009
Benzo[g,h,i]perylene	6	<0.02	0.07	0.08	320	1400	CLEA v1.071	LQM 2009
Total PAH(16)	6	0.92	1.26	1.8	-	-	-	-

Analyte	No of tests	Minimum Test Result	Mean Test Result	Maximum Test Result	SSAC Residential with Gardens Tier 1 Screening Threshold	SSAC Commercial Tier 1 Screening Threshold	Source of Screening Criteria	Tier 1 Screening Threshold
BTEX								
Benzene	2	<0.001	-	0.05	0.087	43.6	CLEA v1.071	LQM 2009
Toluene	2	0.05	-	0.09	130	86200	CLEA v1.071	LQM 2009
Ethylbenzene	2	<0.01	-	<0.01	47	25000	CLEA v1.071	LQM 2009
Xylenes	2	<0.001	-	0.07	56	9,630	CLEA v1.071	LQM 2009
TPH CWG								
MTBE	2	<0.01	-	<0.01	-	-	-	-
Aliphatic >C_5 - C_6	2	< 0.06	-	0.13	42	3400	CLEA v1.071	LQM 2009
Aliphatic >C_6 - C_8	2	0.21	-	0.26	100	8300	CLEA v1.071	LQM 2009
Aliphatic >C_8 - C_{10}	2	< 0.06	-	0.14	27	2100	CLEA v1.071	LQM 2009
Aliphatic >C_{10} - C_{12}	2	5.3	-	6.2	130	10000	CLEA v1.071	LQM 2009
Aliphatic >C_{12} - C_{16}	2	8.8	-	11	1100	61000	CLEA v1.071	LQM 2009
Aliphatic >C_{16} - C_{21}	2	6.8	-	11	65000	1600000	CLEA v1.071	LQM 2009
Aliphatic >C_{21} - C_{35}	2	9.5	-	21	6500	1600000	CLEA v1.071	LQM 2009
Aromatic >C_5 - C_7	2	< 0.01	-	0.05	70	28000	CLEA v1.071	LQM 2009
Aromatic >C_7 - C_8	2	0.05	-	0.09	130	59000	CLEA v1.071	LQM 2009
Aromatic >C_8 - C_{10}	2	< 0.06	-	0.16	34	3700	CLEA v1.071	LQM 2009
Aromatic >C_{10} - C_{12}	2	< 1.0	-	1.2	74	17000	CLEA v1.071	LQM 2009
Aromatic >C_{12} - C_{16}	2	5.8	-	8.4	140	36000	CLEA v1.071	LQM 2009
Aromatic >C_{16} - C_{21}	2	10	-	13	260	28000	CLEA v1.071	LQM 2009
Aromatic >C_{21} - C_{35}	2	17	-	27	1100	28000	CLEA v1.071	LQM 2009
Mineral Oil					42	3400	CLEA v1.071	Aliphatic LQM

Notes

1. Generic Qualitative Assessment Criteria have been used where appropriate based on the current CLEA 1.071 Model (default values, sandy loam 1%SOM). Where no CLEA generic guideline value has been calculated no assessment has been made.
2. For metals, where an SGV has been published, this value has been used. Note that the published SGVs do not include the residential without plant uptake scenario. CLEA v1.06 has therefore been used to derive GACs for this scenario. For organics, CLEA v1.071 has been used (as the SGV assumes 6% SOM)
3. C4SL based on adjusted toxicology and exposure assumptions
4. C4SL for benzene assumes 6% SOM
5. Assessment criteria for pH, Sulphide and Sulphate are not based on human health. Sulphate criteria assumes DS-1 ACEC classification for concrete.

EAL

APPENDIX VII:- UNFORESEEN GROUND CONTAMINATION& ASBESTOS MANAGEMENT PLAN

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There is the potential for areas of previously unexpected contamination to be present, as is the case with any "brownfield" site. Any significant quantities of asbestos, unusual, brightly coloured, or significantly oily or odorous material should be considered in this category.

If unexpected contamination is found the following procedures should be adhered to:

1. All site works at the position of the suspected contamination will cease.
2. A suitably trained geo-environmental specialist should assess the visual and olfactory observations of the condition of the ground, the extent of contamination and take suitable samples so that a preliminary assessment can be made.
3. The Principal Contractor, their Client and the Local Authority contaminated land officer should be informed of the discovery. Should the contamination be likely to affect controlled waters the Environment Agency shall also be informed.
4. Depending on the findings of the preliminary assessment, a more detailed investigation of the suspected contaminated material will be undertaken appropriately in accordance with the assessed risks. The investigation works will be carried out in the presence of a suitably qualified geo-environmental engineer. The investigation works shall commence to recover samples for testing and, using visual and olfactory observations of the condition of the ground, delineate the area and depth over which contaminated materials are present.
5. Any unexpected contaminated material encountered will either be left in situ or be stockpiled whilst testing is carried out and suitable assessments completed to determine whether the material can be re-used on site or requires to be disposed as appropriate.
6. Where the material is left in situ awaiting results it will be reburied or covered with plastic sheeting.
7. Where the potentially contaminated material is to be temporarily stockpiled it will either be placed either on a prepared surface of compacted clay, or on 2000 gauge Visqueen sheeting (or other impermeable surface) and covered to prevent dust and odour emissions.
8. Any areas where unexpected visual or olfactory ground contamination will be surveyed, a photographic record kept and testing results incorporated into the Verification Report.
9. A photographic recorded will be made of relevant observations.
10. The testing suite will be determined by the independent geo-environmental specialist on the basis of visual and olfactory observations.
11. Test results will be compared against current assessment criteria suitable for the future use of the area of the site affected.
12. The results of the investigation and testing of any suspect unexpected contamination will be used to determine the relevant actions. After consultation with the Local Authority and if necessary the Environment Agency, materials should either be:
    - re-used in areas where test results indicate that it meets compliance targets so it can be reused without treatment; or
    - treatment of material on site to meet compliance targets so it can be reused; or
    - removal from site to a treatment centre or to a suitably licensed landfill or permitted treatment facility.
13. A separate Verification Report will be produced for the work which will be incorporated into an appendix of the main investigation report.

Asbestos

Asbestos is to be expected to be encountered across the site (see the Asbestos Plan of Work). Asbestos cement products and asbestos fibres have locally been encountered in the soils at the site and further Made Ground material containing similar asbestos should be expected to be encountered. If asbestos is encountered in excavations which is assessed to require non-notifiable non-licensed works (e.g. chrysotile asbestos cement board) then it will be dealt with in accordance with the Control of Asbestos Regulations 2012 (CAR 2012) and the HSE's ACoP for asbestos (2013) and the Asbestos Plan of Work set out in at the end of this Appendix. Finding non-notifiable asbestos is a very common occurrence on brownfield sites and is a relatively low risk activity and can be dealt with as a matter of routine. Therefore, it is not proposed that the Council will be notified but an appropriate record will be kept of confirmatory testing and disposal. This will be included in remediation verification reports.

Based on the investigations licensable asbestos works will be carried out to remove AIB at this location. A separate Licensable Asbestos Working Plan will be produced for this work in accordance CAR (2012) and the HSE's ACoP for asbestos (2013). Further areas requiring Licensable Asbestos Work to carry out remediation is to be expected and the Council and the HSE will be notified. Any additional areas with Licensable Asbestos Work will be carried out using this Licensable Asbestos Working Plan (updated as necessary if risks are different).

Unexpected Tanks

No buried underground fuel storage tanks have been encountered during the site investigation works and are not expected. However, there remains a low risk that tanks are present on site. Should an underground tank be encountered, operations should cease in the area. Additionally there may be pipework associated with these tanks which could have oily residues. The following procedures are to be adhered to if tanks and pipework are identified:

1. All site works at the position of the tanks/pipework should stop.
2. A description of the tank should be made by the geo-environmental engineer including; condition and surround, along with visual and olfactory observations should any contents in the tank be apparent. A photographic recorded will also be made of relevant observations.
3. The tank's position and depth should be determined and marked on a plan of the site.
4. The independent geo-environmental engineer will inform Client and the Local Authority.
5. During the presence of the independent geo-environmental engineer, investigation works should be undertaken to obtain samples of any liquid or sludge contents and to establish dimensions of the tank.
6. Testing will be determined on the basis of visual and olfactory observations by independent geo-environmental engineer.
7. Test results will be compared against current assessment criteria and proposals for disposal of any contents determined in agreement with the appropriate Regulatory Parties.
8. Emptying the tank and disposal of contents to a suitable licenced disposal facility.
9. Degassing and removal of the tank by a suitably qualified contractor will be required, and a Naked Flame Certificate should be provided.
10. Once the tank has been emptied in accordance with the above proposals, it is to be removed for disposal to a licensed waste management facility. Copies of the relevant waste consignment notes are to be kept and included in the Verification Report.
11. Excavation and remediation of any contaminated soils around the tank will be carried out.
12. Samples of the base and sides of the resultant hole will be sampled and supervised by the independent geo-environmental engineer to confirm whether risks to human health or controlled waters.

Verification

All of the above information will be incorporated into the Verification Report and submitted to the regulatory parties, the Local Authority and the Environment Agency where groundwater may potentially have been impacted.

Asbestos Management Plan

Asbestos has not been encountered to date; although it is prudent, considering the history of this site, to have a plan should asbestos be encountered during the enabling and groundworks phase of the development.

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 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. Construction works on site will need to be undertaken in compliance with these requirements.

Specialist remediation contractor is not required for the construction-phase groundworks but specific training of groundworkers and management of the groundworks is required. CL:AIRE have published guidance to aid in the classification of remediation works on Asbestos Containing Soils (ACS) compliant with Control of Asbestos Regulations 2012 (CAR). This is detailed in CL:AIRE (2016) "Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry Guidance.

Where asbestos containing soils are classified in accordance with CAR they can fall into three designations:

- Licensed Asbestos Works (LAW);
- Notifiable Non-Licensed Works (NNLW); and
- Non-Licensed Works (NLW).

Based on the site investigation findings, the groundworks at this site will be classified as Non-Licensed Works (NLW).

The Asbestos Management Plan, which will only need to be enacted should asbestos be encountered, will need to be produced by the Principal Contractor, and will not be limited to but will include the following information describing;

- Site Welfare Facilities, Access and Health & Safety.
- Information relating to site delineation, parking, traffic management, access and egress.
- Details of welfare facilities and location.
- Key discussions on management of Health & Safety to include risk assessments and method statements.
- Training of groundworkers on the risks and procedures.
- Control Monitoring and Reporting of General Aerial Emissions, Dusts and Particulates.
- Damping down of soils – to include measures to minimise control the emission of dust, such as site speed limits, use of modern appropriate plant, planning of haul routes, working hours.
- General control of dusts – to include information such as cleaning of roads, damping down, sealing of stockpiles.
- Re-assurance air monitoring – boundary and personal monitoring to assess risk of fibre release when working on sites with risk of asbestos in soils. A specialist UKAS accredited asbestos consultant is required to undertake asbestos air monitoring following procedures of HSG248 (HSE, 2005).
- The qualification and competencies of all operatives undertaking monitoring and calibration documentation of equipment is to be provided to the Principal Contractor.
- The Principal Contractor is to be responsible for management and record keeping as detailed in their method statement document. Failure to keep accurate records of these works will be considered the same as registering excess fibre levels and the Specialist Remediation Contractor would be liable for any retrospective works required.
- The verification approach for asbestos air monitoring is to be reflective of the site-specific risk, factoring in the source, type of works, duration of works, and the persons potentially exposed.
- The initial monitoring proposals may be reduced subject to the confidence in the works and findings of the monitoring results. The tiered approach is subject to the results being provided to the Principal Contractor and agreement that it is appropriate to reduce the monitoring frequency.
- The results of the air monitoring must be provided to the Principal Contractor within 48 hours of the completion of the monitoring to ensure the results can be appraised and records verified for approval.
- Any advice or recommendations made by the appointed asbestos consultant should be followed and documented. Should monitoring results disclose fibre concentrations approaching the HSE clearance indicator of 0.01f/ml then site procedures will need to be reviewed in order to mitigate asbestos airborne fibre release such as: Increased soaking of soils and misting systems) and procedures documented.
- Where fibre concentrations above the clearance indicator level of 0.01f/ml are present all Made Ground works should cease, and asbestos monitoring consultants should meet with the Principal Contractor to assess and revise the mitigation procedures and monitoring requirements.
- The monitoring data should include all relevant information to allow correlation of monitoring data, including locations of monitoring, weather conditions, sample volumes, fibre count, graticule diameter, number of fields examined, exposed filter diameter, and fibre concentrations. The air monitoring should work to the minimum detection limits defined within HSG248. For initial monitoring to establish background levels the appointed contractor should attempt to increase sample volumes to as large as reasonably practicable to enable lower fibre concentrations to be appraised.

Note that if encountered, Asbestos Containing Material (ACM) is to be picked and removed to a suitably licenced disposal facility when encountered during the construction works; ACM is not to be disturbed by excavation and relocated elsewhere on the site.

EAL

APPENDIX VIII – CHEMICAL ACCEPTABILITY CRITERIA FOR SUBSOIL AND TOPSOIL

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Chemical acceptability criteria for subsoil and topsoil to go in top 600mm of the ground surface for the site is set out in this appendix. In deriving soil reuse criteria HBL have taken into consideration:

- The risk to human health with the relevant exposure pathways for where the material is to be used.
- The phytotoxic risk. For shallow soils where the phytotoxic screening criteria is lower than the criteria for the risk to human health the phytotoxic criteria are used.

Soft Landscaping - Topsoil & Subsoil				
Analyte	**Limit of Detection**	**SSAC Residential Houses With Gardens**	**Source of Screening Criteria**	**Source of Toxicological Data**
Asbestos Screen	0.001%	Negative	-	-
Metals				
Arsenic (total)	<2 mg/kg	37	CLEA v1.071	LQM/CIEH 2014
Cadmium (total)	<0.5 mg/kg	11	CLEA v1.071	LQM/CIEH 2014
Chromium (hexavalent)	<2 mg/kg	6	CLEA v1.071	LQM/CIEH 2014
Chromium (total) (III for S4ULs)	<2 mg/kg	910	CLEA v1.071	LQM/CIEH 2014
Copper (total)	<4 mg/kg	135	BS3882:2015: Topsoil	-
Lead (total)	<3 mg/kg	330	CLEA v1.071	Defra 2015
Mercury (total inorganic)	<1 mg/kg	40	CLEA v1.071	LQM/CIEH 2014
Nickel (total)	<3 mg/kg	180	CLEA v1.071	LQM/CIEH 2014
Selenium (total)	<3 mg/kg	250	CLEA v1.071	LQM/CIEH 2014
Zinc (total)	<3 mg/kg	300	BS3882:2015: Topsoil	-
Inorganic		-	-	-
pH Value	pH Units	>5.5	BRE SD1 for DS-2	-
Sulphate (2:1)	50 mg/l	1800	BRE SD1 for DS-2	-
Cyanide (total)	<1 mg/kg	-	-	-
Cyanide (free)	<1 mg/kg	34	ATRISK SOIL	ATRISK SOIL
Organic				
TOC	-	No Limit	-	-
Phenol (Total Monohydric)	<2 mg/kg	280	CLEA v1.071	LQM/CIEH 2014
PAH		SSAC Residential with Plant Uptake		
Naphthalene	<0.1 mg/kg	2.3	CLEA v1.071	LQM/CIEH 2014
Acenaphthylene	<0.1 mg/kg	170	CLEA v1.071	LQM/CIEH 2014
Acenaphthene	<0.1 mg/kg	210	CLEA v1.071	LQM/CIEH 2014
Fluorene	<0.1 mg/kg	170	CLEA v1.071	LQM/CIEH 2014
Phenanthrene	<0.1 mg/kg	95	CLEA v1.071	LQM/CIEH 2014
Anthracene	<0.1 mg/kg	2400	CLEA v1.071	LQM/CIEH 2014
Fluoranthene	<0.1 mg/kg	280	CLEA v1.071	LQM/CIEH 2014
Pyrene	<0.1 mg/kg	620	CLEA v1.071	LQM/CIEH 2014
Benz(a)anthracene	<0.1 mg/kg	7.2	CLEA v1.071	LQM/CIEH 2014
Chrysene	<0.1 mg/kg	15	CLEA v1.071	LQM/CIEH 2014
Benzo(b)fluoranthene	<0.1 mg/kg	2.6	CLEA v1.071	LQM/CIEH 2014

Benzo(k)fluoranthene	<0.1 mg/kg	77	CLEA v1.071	LQM/CIEH 2014
Benzo(a)pyrene	<0.1 mg/kg	2.2	CLEA v1.071	Defra 2014
Indeno(123cd)pyrene	<0.1 mg/kg	27	CLEA v1.071	LQM/CIEH 2014
Dibenzo(ah)anthracene	<0.1 mg/kg	0.24	CLEA v1.071	LQM/CIEH 2014
Benzo(ghi)perylene	<0.1 mg/kg	320	CLEA v1.071	LQM/CIEH 2014
BTEX		**SSAC Residential with Plant Uptake**		
Benzene	<0.002 mg/kg	0.087	CLEA v1.071	Defra 2014
Toluene	<0.005 mg/kg	130	CLEA v1.071	LQM/CIEH 2014
Ethyl Benzene	<0.01 mg/kg	47	CLEA v1.071	LQM/CIEH 2014
Xylene (o)	<0.01 mg/kg	60	CLEA v1.071	LQM/CIEH 2014
Xylene (m)	<0.01 mg/kg	59	CLEA v1.071	LQM/CIEH 2014
Xylene (p)	<0.01 mg/kg	56	CLEA v1.071	LQM/CIEH 2014
Petroleum Hydrocarbons		**SSAC Residential with Plant Uptake**		
Aliphatic >C_5 - C_6	<0.01 mg/kg	42	CLEA v1.071	LQM/CIEH 2014
Aliphatic >C_6 - C_8	<0.05 mg/kg	100	CLEA v1.071	LQM/CIEH 2014
Aliphatic >C_8 - C_{10}	<1 mg/kg	27	CLEA v1.071	LQM/CIEH 2014
Aliphatic >C_{10} – C_{35}	<1 mg/kg	130	CLEA v1.071 for Aliphatic >C_{10} - C_{12}	LQM/CIEH 2014
Aromatic >C_5 - C_7	<0.01 mg/kg	70	CLEA v1.071	LQM/CIEH 2014
Aromatic >C_7 - C_8	<0.05 mg/kg	130	CLEA v1.071	LQM/CIEH 2014
Aromatic >C_8 - C_{10}	<1 mg/kg	34	CLEA v1.071	LQM/CIEH 2014
Aromatic >C_{10} – C_{35}	<1 mg/kg	74	CLEA v1.071 Aromatic >C_{10} - C_{12}	LQM/CIEH 2014

Notes

1. Generic Qualitative Assessment Criteria have been used where appropriate based on the current CLEA 1.071 Model (default values, sandy loam 1%SOM). Where no CLEA generic guideline value has been calculated no assessment has been made.
2. Cyanide (total)*, in the absence of a GQAC based on current CLEA 1.071 Model, the Atrisk Soil Value for Cyanide (free) has been used.
3. For metals, where an SGV has been published, this value has been used. Note that the published SGVs do not include the residential without plant uptake scenario. CLEA v1.071 has therefore been used to derive GACs for this scenario. For organics, CLEA v1.071 has been used (as the SGV assumes 6% SOM). Use BS3882 limits for copper and zinc because these are lower than the human health derived SSACs.
4. Assessment criteria for pH, Sulphide and Sulphate are not based on human health. Sulphate criteria assumes DS-2 ACEC classification for concrete.
5. TOC – no limit for landscaping materials.

EAL

APPENDIX IX– GAS AND GROUNDWATER MONITORING

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GROUNDWATER AND GROUND GAS MONITORING

Site: Ysgol I D Hooson

EAL

Location	Date	Time	Monitored by	Well Details			Groundwater			Gas													Weather		Serial No.
				Standpipe diameter (mm)	Ground Level (mOD)	Depth to Base (m bgl)	Water Depth (m bgl)	Water Level (mOD)	Water Sample Taken?	Atmospheric Pressure (mbar)	Atmospheric Pressure Comment	Relative Pressure (mb)	Peak Flow (l/h)	Steady Flow (l/h)	CH_4 (% v/v)	GSV CH_4 (l/hr)	CO_2 (% v/v)	GSV CO_2 (l/hr)	O_2 (% v/v)	Hexane (% v/v)	PID (ppm)	CO (ppm)	H2S (ppm)	Conditions	Ambient Temp ^oC	
WS1	30/10/24	15.10	CW	51		1.85	Dry		No																
	01/11/24	8.40	CAK	51		1.87	Dry		No	1000	Low	0.00	0.1	0.1	0.1	0.0001	0.3	0.0003	20.0	0.0	1.0	1	1	Overcast, fine drizzle	12	
	07/11/24	12.18	CAK	51		1.87	Dry		No	1004	Falling	0.00	0.1	0.1	0.1	0.0001	0.4	0.0004	20.0	0.0	1.0	1	1	Overcast	10	
	21/11/24	12.23	CAK	51		1.86	0.48		No	976	Falling	0.00	0.1	0.1	0.1	0.0001	0.7	0.0007	19.4	0.0	1.0	1	1	Sunny, snow and ice on ground	1	
WS4	30/10/24	14.50	CW	33		2.93	2.80		No																
	01/11/24	8.47	CAK	33		2.94	2.86		No	1000	Low	0.00	0.1	0.1	0.1	0.0001	1.0	0.0010	18.2	0.0	1.0	1	1	Overcast, fine drizzle	12	
	07/11/24	12.11	CAK	33		2.94	2.93		No	1004	Falling	0.00	0.1	0.1	0.1	0.0001	1.5	0.0015	20.0	0.0	1.0	1	1	Overcast	10	
	21/11/24	12.38	CAK	33		2.96	2.67		No	974	Falling	0.00	0.1	0.1	0.1	0.0001	2.6	0.0026	5.9	0.023	1.0	1	1	Sunny, snow and ice on ground	1	
WS05	30/10/24	15.00	CW	51		3.69	Dry		No																
	01/11/24	9.05	CAK	51		3.70	3.41		No	1000	Low	0.00	0.1	0.1	0.1	0.0001	0.1	0.0001	20.7	0.0	1.0	1	1	Overcast, fine drizzle	12	
	07/11/24	12.01	CAK	51		3.70	0.97		No	1006	Falling	0.00	0.1	0.1	0.1	0.0001	0.1	0.0001	20.0	0.0	1.0	1	1	Overcast	10	
	21/11/24	12.23	CAK	51*		3.70	1.86		No	976	Falling	0.00	0.1	0.1	0.1	0.0001	0.1	0.0001	20.4	0.028	1.0	1	1	Sunny, snow and ice on ground	1	
				*pipe damaged - gas readings should not be relied upon as it is anticipated that gas can escape around the bung																						

NOTES:
NM = Not Measured.
(x) = Peak value recorded.
[grey] = Below detection limit.

GSV (l/HR) = $\frac{\text{[gas concentration (\%v/v)] x [gas well flow rate (l/hr)}}{100}$

https://barometricpressure.app/
Data for Wrexham. Note: The monitoring station is at a lower elevation compared to the site, hence recorded pressures shown below will be higher than at the site, but the overall trend is the same
Red dot indicates monitoring periods

