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PHASE 2

GEO-ENVIRONMENTAL REPORT

job number	C1772/21/E/4286
date	26/06/23
site address	Gomersal Hall, Oxford Road, Gomersal
written by	I. Sakoor
checked by	R. A. Palmer
issued by	I. Sakoor

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Report on a Phase 2 Geo-environmental Investigation

Location:	Gomersal Hall, Oxford Road, Gomersal
For:	Martin Walsh Architectural Ltd
Report No.	C1772/21/E/4286 Report date: June 2023

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

Imran Sakoor BEng FGS Geo-environmental Engineer	**Rob Palmer** MSc FGS ACIEH Senior Geo-environmental Engineer

Report Summary[1]

Item	Comments	Section
Development	Development plans have recently changed from a single large new property with basement and swimming pool to a number of residential dwellings with gardens and driveways.	1.
Geology	Superficial geology: none. Solid geology: Lepton Edge Rock.	5.
Strata Conditions	Generally topsoil and localised made ground over loose to medium dense gravel. Variably weathered (residual to completely weathered sandstone) then encountered between 1.2m and 3.2m depth, over extremely weak sandstone over mudstone. No coal seams, mine workings or flush losses experienced.	6.
Groundwater	Groundwater strikes encountered at 9.0m in RO1 and 10m in RO2.	6.2
Foundation Design	Shallow foundations onto rockhead.	10.1
Soakaways	May be possible as good drainage characteristics were demonstrated within soakaway tests.	10.4
Effect of Sulphates	DC-1 concrete.	10.6
Contamination	No significant contamination revealed.	11.
Ground Gasses	Low levels of carbon dioxide revealed and site is CS1. No protection measures are required.	11.

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

1. Introduction

It is understood that the land associated with Gomersal Hall, off Oxford Road, Gomersal is to be developed for residential end use. Initial plans involved the demolition of the existing property and the construction of a significantly larger property incorporating a basement and swimming pool. A geo-environmental report was issued by Rogers Geotechnical Services Ltd in August 2021.

However, the development plans have now changed to the construction of 7No. detached residential plots, each with its own driveway and garden area. Additionally, a new access road is to be created which will not only maintain the original entrance on the corner of Oxford road but also create a new access of West Lane. Allotments are also proposed for NW corner of the site.

Consequently, in order to fill any gaps within the existing geo-environmental ground model (relative to the new plans), further site investigation has been undertaken in accordance with the instruction from the client. This work was required in order to determine the nature of the underlying soils, to assess their engineering properties and to assist in the design of safe and economical foundations in relation to the updated plans This investigation also takes into consideration the risk of any contamination present. It should be appreciated that this report incorporates the findings of the previous investigation, and describes the most recent work undertaken, presents the data obtained and discusses the ground conditions in relation to the proposed works.

2. Limitations

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

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

3. Desk Study

A Phase 1 Desk Study has been undertaken by Rogers Geotechnical Services (RGS) and the results were presented as report number C1772/21/E/2763 in June 2021. A Phase 2 Geo-environmental report was then undertaken by Rogers geotechnical Services Ltd in August 2021. Both reports have been extensively considered for this report.

4. Fieldworks

The first phase of fieldworks were undertaken on the 22nd and 23rd of June 2021 and included the following:

- Four windowless sample boreholes.
- Two rotary boreholes.
- Four dynamic probes.
- Two trial pits.
- Four TRL probes.
- Two soakaway tests.
- Three gas monitoring standpipes.

Subsequent from the revision of the development plans, the following works have also been undertaken between the 12th to the 23rd May 2023:

- Three hand-held windowless sample boreholes.
- Three TRL probes.
- Coal Authority License.
- Two rotary open-hole boreholes.
- Two gas monitoring standpipes.

All investigatory locations are shown on the site plan which is presented in Appendix 1 to this report.

4.1 Acquisition of Coal Authority Permit

In order to undertake the rotary probing aspect of this investigation, it was necessary to obtain permission to enter or disturb Coal Authority interests. This permission was granted on the 15th May 2023 as permit reference number 26664, which is presented in Appendix 2 to this report. In accordance with the joint Coal Authority and Health and Safety Executive positioning statement, and under the requirements of the permit, the works were undertaken employing water flush drilling techniques. Furthermore, the drillers wore gas detectors on their person throughout the works.

4.2 Boreholes

The overburden was drilled using a drive-in windowless sampling rig in the initial phase of investigation and with hand-held equipment on the second phase. The cores were undertaken in 1m lengths and reduced in diameter from 90mm for the first 1m through 80mm, 70mm and 60mm for subsequent 1m increments (57mm through to 47mm for the hand-held boreholes). The recovered cores were sealed and returned to the laboratory for logging and subsequent testing.

During the initial phase, two rotary boreholes were undertaken using a Commachio GEO 205 rotary drilling rig. At the locations indicated on the site plan, rotary open-hole drilling methods were employed through the overburden. Upon encountering the rockhead at 2.7m in BH1 and 3.2m in BH2, rotary coring was then undertaken, utilising air/mist flushing, and 85mm cores were recovered. For both boreholes, casing was installed through the overburden to support the sides of the bore. It

should be noted that as part of the rotary probing aspect of the works (second phase), two boreholes were drilled down to a depth of 30m below ground level utilising open-hole techniques to check for the presence of mine workings under the Coal Authority License outlined under Section 4.1.

The recovered cores were sealed and returned to the laboratory for logging and subsequent testing. The soils and rock were described in general accordance with BS5930: 2015 +A1: 2020 and full descriptions are given on the borehole records which are also presented in Appendix 3. Also included on these records are the sample depths, the percentages of *Total Core Recovery* (TCR), *Solid Core Recovery* (SCR), *Rock Quality Designation* (RQD) and *Fracture Indices (FI).*

4.3 Dynamic Probes

Dynamic penetration tests were undertaken adjacent to the windowless sample boreholes WS1 to WS4 in accordance with the procedure given in BS EN ISO 22476: Part 2: 2005 +A1: 2011, using the super heavy penetrometer (DPSH). This probe consists of a 63.5kg mass falling through 750mm onto an anvil, which drives a 50mm diameter cone into the ground. The number of blows required to drive the cone through successive 100mm increments are recorded as the N_{100} values. The results of the dynamic penetration tests are tabulated and presented as bar charts of N_{100} values versus depth in Appendix 4.

4.4 Trial Pits

Two trial pits were excavated using a JCB 3CX in order to reveal the nature of the near surface soils and to undertake soakaway testing. The soils were logged on site in general accordance with BS5930: 2015+A1: 2020, and full descriptions are given on the trial pit records which are presented in Appendix 5.

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

4.5 TRL Dynamic Cone Penetrometer Tests

Seven TRL Dynamic Cone Penetrometer tests were undertaken at the locations indicated on the site plan. The penetrometer consists of an 8kg slide hammer falling through 575mm onto an anvil, which drives a 20mm diameter 60° cone into the ground. The depth of the cone driven per blow of the hammer is recorded. The results of the dynamic penetration tests are presented as Appendix 6 and include graphs of penetration blows and CBR values versus depth. The percentage CBR value has been obtained from the correlation provided in TRRL Road Note 8 which is given below:

$$Log_{10}(CBR) = 2.48 – 1.057Log_{10}(mm/blow)$$

4.6 Soakaway Tests

Soakaway tests were conducted within both trial pits. At the elected test depths, the pit was trimmed and squared as much as practicable. Water was then pumped into the pit and the level monitored at timed intervals relative to a reference bar at ground level. These tests were conducted and calculated in general accordance with the method given by BRE Digest 365 and the results are presented in Appendix 7.

4.7 Gas Monitoring Standpipes

Gas monitoring standpipes were installed to 2.8m in WS1, 2.9m in WS2, 2.55m in WS4, 1.55m in WSA and 1.75m WSC. The installation details are shown on the appropriate borehole records. In all cases, the monitoring standpipe consisted of a perforated pipe from the base of the borehole to between 0.5m and 1.0m below surface, with a non-perforated pipe to ground level. The response zone was filled with pea gravel, with a bentonite seal at above, and the installation was capped with a stop box cover in a concrete surround.

5. Geology

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

Table 1: Geological Data for the Site

Strata Type	Strata Name[2]	Previous Name[3]	Description[3]
Superficial Geology	None recorded onsite.		
Solid Geology	Lepton Edge Rock	Gomersal Rock	Regionally the Lepton Edge Rock (also referred to as the Gomersal Rock) is a fine-grained, cross-bedded flaggy sandstone that forms prominent features. Also, can be present as fine- to very fine-grained, thinly bedded to flaggy sandstone.

[2] Sources: British Geological Survey (NERC) Map Sheet 77; Huddersfield; Solid and Drift Edition, and Geology of Britain Viewer [*online resource from www.bgs.ac.uk*]
[3] Sources: British Geological Survey (NERC) Lexicon of Named Rock Units [*online resource from www.bgs.ac.uk*]

6. Strata Conditions

In accordance with the geology of the area, the succession has been shown to include the following:

Table 2: Generalised Strata Profile

Depth m below ground level to underside of layer	**Strata Type**	**Positions Encountered**	**Groundwater Strikes** m below ground level
0.2 – 0.60	TOPSOIL.	All	None
0.7 – 1.0	MADE GROUND (Sandy GRAVEL).	WS1, BH2	None
1.10	MADE GROUND (Very gravelly CLAY).	WS4	None
0.6 – 3.2	Sandy gravelly CLAY. [RESIDUAL SANDSTONE].	TP1, BH2, WSA, WSB, WSC, RO1 and RO2	None
1.2 – +1.9	Very sandy GRAVEL. Occasional bands of gravelly sand. [COMPLETELY WEATHERED SANDSTONE].	WS1, WS2, WS3, WS4, TP1, TP2, WSB	None
+2.0 – 2.7 5.0 – 5.6	Extremely weak SANDSTONE. [HIGHLY WEATHERED SANDSTONE].	WS2, BH1, WSB, RO1, RO2	None
1.90 – 1.95	Silty CLAY.	WS1, WS4	None
+1.65 – +2.90	Extremely weak thinly laminated SILTSTONE.	WS1, WS2, WS4, WSA, WSC	None
+10.0 – 26.0	Extremely weak thinly laminated clayey MUDSTONE.	BH1, BH2, RO1, RO2	9.0m (RO1), 10.0m (RO2)
+30.0	Interbedded SANDSTONE and MUDSTONE.	RO1, RO2	None

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

6.1 General Strata

Below the topsoil in WS1, BH2 and WS4, made ground described as sandy gravel and very gravelly clay was revealed to between 0.7m and 1.1m depth. The granular fill included brick and mortar, whilst the cohesive made ground was found to be representative of reworked natural soils.

Underlying the made ground and topsoil within the remainder of the site, weathered sandstone, generally in the form of a medium dense, locally loose sandy gravel was encountered to depths of between 1.42m and 1.9m. Within TP1, BH2 WSA to WSC, RO1 and RO2, sandy gravelly clay was encountered to 0.8m and 3.2m depth. Extremely weak sandstone was encountered to between 2.0m and 2.7m depth in WS2, BH1, and WSB. Within RO1 and RO2, the sandstone was revealed to between 5.0m and 5.6m depth. With respect to the local geology, it is considered that this material is representative of the Lepton Edge Rock, present in a residual to completely weathered insitu condition.

Generally, below the weathered Lepton Edge Rock, stiff silty brown silty clay was revealed to around 1.9m depth, over extremely weak light grey clayey mudstones and siltstones which continued to the base of the BH1, BH2, 26m depth in RO1 and 20m in RO2. From 26m in RO1 and 26m in RO2, interbedded sandstone and mudstone units were encountered. It is considered that this material represents weathered undifferentiated units of the Pennine Lower Measures Formation.

It should be appreciated that during the progression of the rotary boreholes, no coal seams, broken ground or losses of flush were encountered.

6.2 Groundwater

It should be appreciated that the normal rate of boring does not permit the recording of an equilibrium water level for any one strike. Moreover, groundwater levels are subject to seasonal variation or changes on local drainage conditions. Notwithstanding this, it should be appreciated that water strikes were encountered at 9.0m in RO1 and 10m in RO2

7. Insitu Testing

7.1 Dynamic Penetration Tests

Dynamic penetration tests were undertaken adjacent to WS1 to WS4. A summary of the results is presented below:

Table 3: Summary of Dynamic Penetration Tests

Position	Blows/100mm			Refusal type (Effective/ Abrupt)[4]	Comments
	0 - 2	3 - 10	10+		
	Depth to which blow count range was observed (m)				
DP1	1.1	0.6 2.3	3.2	Abrupt	Results generally poor to around 1.1m depth, followed by blow counts in the range 3 to 6 to 2.3m bgl. Then rapid increase in results with depth.
DP2	0.5	1.8 2.7	2.2 3.3	Abrupt	Initial poor results, followed by blow counts generally in the range 3 to 6 to 2.7m bgl. Then rapid increase in results with depth.
DP3	0.2	1.8	2.2	Abrupt	Blow counts varying between 2 and 4 to around 1.8m depth. Followed by abrupt refusal at 2.2m depth.
DP4	0.8	2.3	2.8	Abrupt	Poor results to 0.8m, followed by blow counts in the range 5 to 6 to 2.3m depth, with a stronger zone present at 1.5m. Followed by a rapid increase in strength with depth.

[4] Abrupt refusal: obstruction or bedrock encountered. Effective refusal: +25 blows/100mm.

7.2 Soakaway Tests

Soakaway tests were undertaken within both TP1 and TP2. A summary of the results is presented below:

Table 4: Soakaway Test Results

Location	Soakage Area Dimensions (average) (m)	Test Depth (m)	Soil Description (base of pit)	Infiltration Rate (m/s)	Drainage Characteristics
TP1	1.9 x 0.6	1.42	Sandy GRAVEL	1.1×10^{-4} 8.1×10^{-5} 5.6×10^{-5}	Good
TP2	2.2 x 0.6	1.55	Sandy GRAVEL.	2.8×10^{-3} 1.6×10^{-3} 8.9×10^{-4}	Good

It should be appreciated that for TP2, the infiltration was so efficient that the pit could not be filled with water quick enough to allow a test to commence. Therefore, the infiltration rate has been estimated by assuming the inflow of water into the pit is equal to the flow through the base.

7.3 TRL DCP Tests

TRL Dynamic Cone Penetrometer tests have been undertaken at the locations indicated on the site plan. The results are summarised below:

Table 5: CBR Test Results

Location	Depth (m)	Average CBR (%)	Comments
TRL 1	0.15 – 0.32 0.34 – 0.40 0.41 – 0.66 0.72 – 0.82 0.83 – 0.88 0.89 – 0.90	7 13 15 6 10 75	CBR values noted to be variable but generally increasing with depth.
TRL 2	0.20 – 0.46 0.48 – 0.83	3 33	High CBR values noted from around 0.5m depth.
TRL 3	0.07 – 0.15 0.16 – 0.18 0.62 – 0.65 0.66 – 0.80 0.85 – 0.88 0.89 – 0.92	10 29 5 15 11 26	Variable but generally high CBR values throughout.
TRL 4	0.16 – 0.56 0.57 – 0.59 0.70 – 0.91	6 23 11	High CBR values from 0.5m depth.
TRL A	0.15 – 0.32 0.33 – 0.48 0.50 – 0.66 0.68 – 0.74 0.76 – 0.81 0.82 – 0.87 0.91 – 0.96	3 8 19 36 35 37 39	CBR values steadily increasing with depth.

TRL B	0.20 – 0.46 0.47 – 0.53 0.60 – 0.64 0.65 – 0.76 0.77 – 0.80 0.81 – 0.91 0.94 – 0.96	5 17 27 34 70 19 8	High CBR values throughout. Drop in values noted from 0.9m depth.
TRL C	0.25 – 0.35 0.36 – 0.45 0.46 – 0.48 0.50 – 0.58 0.59 – 0.62 0.68 – 0.86 0.84 – 0.96	6 13 28 39 14 52 35	Variable but generally high CBR values throughout.

7.4 Gas and Water Level Monitoring

The standpipes within WS1, WS2 and WS4 were monitored between the 29th June to the 8th September 2021. WSA to WSC have been monitored between the 23rd May to the 13th June 2023. The results of the gas monitoring undertaken to date are tabulated below:

Table 6: Gas Monitoring

Location	Date	CH_4 (%)	CO_2 (%)	O_2 (%)	Flow (l/hr)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)
WS1	29.06.21	0.1	1.1	20.1	0.1	1001↓	-	2.8
	06.07.21	0.1	1.2	19.7	0.1	977↓	-	
	13.07.21	0.1	1.3	18.9	0.1	1000↔	2.31	
	21.07.21	0.0	1.4	19.4	0.1	1008↓	2.19	
	25.08.21	0.0	1.6	19.7	0.1	1010↔	2.77	
	08.09.21	0.1	1.5	19.7	0.1	998↔	-	
WS2	29.06.21	0.0	2.4	19.8	0.1	1001↓	-	2.9
	06.07.21	0.0	2.5	19.8	0.1	977↓	-	
	13.07.21	0.0	2.6	19.3	0.1	1000↔	2.36	
	21.07.21	0.0	2.7	19.3	0.1	1009↓	2.44	
	25.08.21	0.0	2.9	19.8	0.1	1010↔	-	
	08.09.21	0.0	2.7	19.6	0.1	998↔	-	
WS4	29.06.21	0.0	2.0	19.5	0.1	1002↓	-	2.55
	06.07.21	0.0	2.2	18.3	0.1	977↓	0.89	
	13.07.21	0.0	2.9	16.3	0.0	1001↔	0.98	
	21.07.21	0.0	4.1	16.2	0.1	1009↓	1.39	
	25.08.21	0.0	3.6	19.0	0.1	1010↔	1.85	
	08.09.21	0.1	3.3	18.6	0.1	998↔	2.41	
2023 Results								
WSA	23.05.23	0.1	3.0	16.5	0.0	1012↔	-	1.55
	30.05.23	0.0	2.7	18.1	0.0	1017↔	-	
	06.06.23	0.1	2.8	18.7	0.0	1011↔	-	
	13.06.23	0.0	2.8	19.3	0.0	1002↔	-	
WSC	23.05.23	0.1	4.7	17.6	0.0	1012↔	-	1.75
	30.05.23	0.1	4.6	18.3	0.0	1018↔	-	
	06.06.23	0.1	4.4	19.1	0.0	1011↔	-	
	13.06.23	0.1	4.7	19.0	0.0	1003↔	-	

↑ - rising pressure ↓ - falling pressure ↔ - steady pressure

The visits undertaken in 2021 were undertaken using a Geotechnical Instruments (UK) Ltd. GA5000 (serial No G503524) which was calibrated on the 5th May 2021. Visits undertaken in 2023, within WSA and WSC, were undertaken using the same gas monitor, which was most recently calibrated on the 1st February 2023. Full results and calibration documents are included in Appendix 8.

8. Laboratory Testing - Geotechnical

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

- Determination of water content — BS EN ISO 17892-1:2014
- Linear Shrinkage — BS 1377: 1990: Pt2: 6.5
- Determination of liquid and plastic limits — BS EN ISO 17892-12:2018
- Soluble sulphate content — BS 1377: 1990: Pt3: 5
- pH value — BS 1377: 1990: Pt3: 9

The test results are presented in Appendix 9 and are summarised below:

Table 7: Summary of Geotechnical Test Results

Test type	Number of tests	Range of results		Comments
Water content determinations	2	15% & 16%		
Index properties (1 Point)	2	LL PL PI LS	32% & 34% 18% & 19% 14% & 15% 6%	Clay of predominantly low plasticity. Consistency index: 1.2. NHBC Class – Low.
Soluble sulphate & pH	8	SO_4 pH	<10 to 15mg/l 6.7 to 8.7	

8.1 Geotechnical Properties

The idealised geotechnical properties employed in design are summarised below.

Table 8: Summary of Geotechnical Properties

Property	Range of values	Comments
Volume change potential (NHBC)	Low	Silty CLAY.
Concrete classification	DC-1	Brownfield locations (static water).

On the basis of the soil descriptions and laboratory test results, the following parameters have been derived.

Table 9: Assumed Effective Stress Parameters

Strata	Description	Bulk unit weight (kN/m^3)	Angle of friction ϕ' (°)	Effective cohesion c' (kN/m^2)
1	MADE GROUND (Granular)	18	26	0
2	MADE GROUND (Cohesive)	19	27	0
3	Sandy gravelly CLAY [Residual Sandstone]	19	27	0
4	Silty CLAY.	20	28	0
5	Very sandy GRAVEL [Completely weathered Sandstone]	21	30	0
6	SANDSTONE/SILTSTONE/MUDSTONE	22	38	0

9. Laboratory Testing - Environmental

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

- Metals – Cd, Cr^{VI}, Cu, Hg, Ni, Pb, V and Zn.
- Semi and Non-Metals - As, Se, Free CN^- and Phenols.
- Polycyclic aromatic hydrocarbons (PAHs).
- Petroleum hydrocarbons (TPHs).
- Others – pH, organic content and total/soluble SO_4^{2-}.
- Asbestos.

For the intrusive works undertaken in 2021, this testing was undertaken by Eurofins Chemtest Ltd. The testing for the samples obtained in 2023 was undertaken by i2 Analytical Ltd. All of the results are presented within Appendix 9 of this report.

10. Discussion of Ground Conditions - Geotechnical

It is understood that the plans for the site have changed from the construction of a large single property incorporating a basement and swimming pool, to the development of 7No. discrete residential plots with driveways, gardens and a new access road. The development details have been taken from drawing reference: HMOR-MWA-XX-XX-DR-A-0010, revision P4, by Martin Walsh Architectural Ltd.

It cannot be recommended that foundations be constructed directly within the topsoil or weak near surface soils revealed at this site. These soils are present in a weak and variable condition such that excessive total and or differential settlement could occur under moderately light surface loading.

10.1 Foundations

The windowless sample boreholes indicate that siltstone/sandstone rockhead will generally be revealed at around 2m below ground level, although the bedrock has been observed to around 2.6m locally. On this basis it is considered that strip or spread foundations for the proposed house

could be constructed directly onto the rock head, assuming an allowable increase in stress probably in excess of 250kN/m^2. It should be appreciated that all of the foundations extend to bear onto the rockhead, as the weathered materials above will possess dissimilar settlement characteristics to the bedrock.

Should any soft or weak material be encountered they should be locally removed and replaced with lean-mix concrete or compacted granular soil. In addition, if the excavations are required to stand open for any period of time then a blinding layer of lean-mix concrete should be placed in the excavation bases. This expedient will reduce softening or loosening of the sub-grade due to the ingress of surface water.

The stability of excavation faces cannot be guaranteed thus temporary support to the excavation faces may become necessary unless the foundations are constructed using trench-fill techniques. In this method the foundation trenches should be excavated, inspected and backfilled with concrete as a continuous operation. Under no circumstances should operatives be allowed to enter unsupported excavations.

Should the excavations be required to stand open, it is considered that a blinding layer of lean-mixed concrete be placed over the sub-grade. This expedient will reduce loosening or softening of the underling soil due to both physical disturbance and the ingress of surface water.

Should seepage of groundwater be encountered it is considered that it could be dealt with using a simple form of de-watering. Such a system could include the excavation of sumps from which the water could be pumped.

10.2 Ground-floors

In light of the made ground and weak near surface soils, it is not recommended that ground bearing ground floor slabs (apart from the area of the basement/pool) be employed. In this instance it would be necessary to suspend floors between foundation positions, such that the floor loads are transmitted via the foundations to competent soils at depth.

10.3 Hard-standing Areas

It is considered that any hard-standing at the site could be constructed employing traditional pavement design. A design California Bearing Ratio (CBR) of 10% could be employed in the pavement design[5]. However, it is recommended that proof rolling of the sub-grade be undertaken to establish the suitability of the soils, to expose any soft or weak ground and to ensure the sub-grade is well compacted prior to construction. Any areas of soft or weak ground should be remediated by increasing the sub-base thickness. Alternatively, weak material could be locally removed and replaced with a compacted granular capping layer. If construction were to be undertaken during the winter or after periods of prolonged rainfall, it may be prudent to employ a geotextile and/or a geogrid between the sub-base and sub-grade.

10.4 Soakaways

The results of the soakaway testing indicate that the weathered sandstone possesses good drainage characteristics. Therefore, it is considered that soakaways could be utilised at this site.

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

Notwithstanding this, it should be appreciated that this type of material is prone to siltation over time, thereby reducing soakage rates. Therefore, it is recommended that the most onerous result of 5.6 x 10^{-5} m/s be used in the design in this instance. It should also be noted that soakaways should be positioned at least 5m away from any foundations.

10.5 Coal Mining Legacy

It should be appreciated that the Phase 1 Desk Study indicates the Middle Little Coal to be present at shallow depth below the site, with the Middleton Main coal being indicated at around 30m depth. However, the rotary boreholes have not found any coal or workings below the site. It is possible that the Middleton Little Coal is absent below the development area. Additionally, it is possible that the Middleton Main could be present beyond 30m depth. However, even if present and worked, it is considered that sufficient competent cover will be present such that the risk to surface structures will be mitigated in the event of a collapse. Therefore, it is considered that a low risk is present from underground coal workings.

10.6 Effects of Sulphates

In view of the nature of the underlying soils it is considered that the design sulphate class be assessed with reference to Table C2[6], which is provided in BRE Special Digest 1, *Concrete in aggressive ground*: Part C. On the basis of this table and considering the soluble sulphate contents recorded, it can be shown that well compacted buried concrete should be designed in accordance with Class DS-1 requirements. Assuming mobile groundwater, the table also indicates that the aggressive chemical environment for concrete (ACEC) classification is AC-1.

In order to evaluate the design chemical (DC) class for the buried concrete at this site reference should be made to Table D1[7], which can be found in Part D, *Specifying concrete for general cast-in-situ use,* of BRE Special Digest 1. From this table it may be shown that for an intended working life of at least 50 years the concrete design class DC-1 is required.

11. Discussion of Ground Conditions - Environmental

11.1 Discussion of Test Results

It is understood that the site is to be developed by the construction of 7No. detached residential plots with driveways, gardens and a new access road. Consequently, the site may be classified as residential with plant uptake.

11.1.1 Soil Samples

The results of the chemical testing undertaken on soil samples obtained during this investigation have been compared to the ATRISK soil screening values (SSVs) as compiled by WS Atkins plc. With respect to the results it should be appreciated that the soil organic matter (SOM) content for the samples tested was found to range between 0.64% and 1.2%. On this basis, it is considered that the screening values associated with 1% SOM should be adopted. These values have been

[6] Table C2, *Aggressive Chemical Environment for Concrete (ACEC) classification for brownfield locations*
[7] Table D1, *Selection of the DC Class and the number of APMs for concrete elements where the hydraulic gradient due to groundwater is 5 or less: for general in-situ use of concrete.*

derived in such a way as to adhere to the principles within the revised CLEA model and include the most current release of the SGVs. A list of subscribers is provided within the website[8] and these include many local authorities.

A comparison of the results of the testing, together with the data given above, can be found within Appendix 9. These results indicate the following:

Table 10: Summary of Contaminated Areas

Location	Depth (m)	Contaminants found to be exceeding SSVs (Residential with plant uptake)
WS1	0.8	None.
WS2	0.5	None.
WS3	0.5	None.
WS4	0.6	None.
WSA	0.6	None.
WSB	0.5	None.
WSC	0.65	None.

Concentrations of chromium(VI), mercury, free cyanide, phenols (total), polyaromatic hydrocarbons (US EPA 16) and total petroleum hydrocarbons (aliphatic C5 to C21; aromatic C5 to C35) were below the detection limits for the tests. Detectable levels of all other contaminants were recorded, but these fell below the associated Atrisk Soil Screening Values. In addition, no asbestos was detected within the soils samples tested.

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

11.1.2 Gas Concentrations

With respect to ground gas, the results of the monitoring visits indicated a maximum concentration of 0.1% methane, with concentrations of carbon dioxide ranging between 1.1% and 4.7%, in association with oxygen levels of between 16.2% and 20.1%. It should be appreciated that on non contaminated sites there is generally about 20% by volume of oxygen, associated with low levels of carbon dioxide. In addition, a maximum flow rate of 0.1 litres per hour was recorded and will be employed in the following calculations.

The principal driving force for initiating the movement of gas in the ground is a change in barometric pressure. The most onerous gas condition on a site is usually observed on days of low or falling barometric pressure, preferably below 1000mb. It has been noted that measurements undertaken solely during high pressure conditions may be of lesser value. At this site the readings undertaken to date were at atmospheric pressures of between 977mb and 1018mb.

In order to establish the gas screening value (GSV) for carbon dioxide or methane, the maximum gas concentration (expressed as a decimal) is multiplied by the borehole flow rate (l/hr). In this case 0.1% (0.001) methane was recorded along with 4.7% (0.047) carbon dioxide, in association with a

[8] http://www.atrisksoil.co.uk/pages/general/subscribers.asp

maximum flow rate of 0.1 l/hr. This results in a GSV of 0.0001 l/hr for methane and a GSV of 0.0041 l/hr for carbon dioxide.

In accordance with Table 2 of BS8485: 2015*, Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings,* the site may be characterised as *Characteristic Situation Level 1*. It is therefore considered that there is a very low risk of harm to end users and site operatives and no special precautionary measures are required in accordance to Table 8.6, *Typical scope of gas protection measures,* of CIRIA report C665.

With regard to the number of monitoring visits required reference is made to Tables 5.5a and 5.5b of CIRIA report C665 (2007)[9]. Accepting that the proposed development is of high sensitivity and that the generation potential is very low, these tables suggest that 6 readings could be undertaken over a period of 3 months. However, C665 notes that *not all sites will require gas monitoring for the period and frequency indicated in Tables 5.5a and 5.5b.*

In this case, the original investigation in 2021 included a total of 6 monitoring visits over an 11-week time period and fully classified as Characteristic Situation Level 1.

On this note, the four further visits undertaken in 2023[10] (WSA and WSC) do not indicate any notable increases in ground gasses, which remain within the limits for Characteristic Situation Level 1. Therefore, it is considered that the original assessment of the site being Characteristic Situation Level 1 remains valid.

11.2 Site Specific Risk Assessment

11.2.1 Approach

The presence of contamination hazards and the risks associated with them should be assessed in accordance with industry practice and the 'suitable for use' approach. This has been conducted with reference to The Department for Environment, Food and Rural Affairs (DEFRA) and The Environment Agency[11] advice on the assessment of risks arising from the presence of contamination in soils and using the source-pathway-receptor approach.[12] This method dictates that there must be a risk of contaminant produced at a 'source' in sufficient concentration to cause harm and there must be a 'pathway' for the contaminant to reach an identifiable 'receptor' for the linkage to be proved and a contamination hazard to be considered present. Not all substances are contaminants and not all contaminants are considered to be a risk. Indeed DEFRA and The Environment Agency state that 'a contaminant is a substance which has the potential to cause harm, while a risk itself is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.'[13]

[9] Adapted from tables 5.5a and 5.5b of CIRIA C665, 2007, *Assessing risks posed by hazardous ground gas to buildings, p60.*
[10] By 2023, the standpipes installed as part of the 2021 investigation had been removed, thus have not been monitored alongside WSA and WSC, during the current investigation.
[11] R&D Publication CLR 8, 'Assessment of Risks to Human Health from Land Contamination: An overview of the Development of Soil Guideline Values and Related Research'.
[12] The pollution linkage approach was developed by 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990' which provides meanings for the terms contained in The Environmental Protection Act 1990 Part IIA, the primary legislation for addressing the issues of contaminated land.
[13] See 'Circular 2/2000 Contaminated Land: Implementation of Part II of The Environmental Protection Act 1990', appendix A.

11.2.2 Conceptual Ground Model and Risk Assessment

In view of the results of the chemical testing undertaken the conceptual site model is presented accordingly as Table 11. Sources of contamination include the following:

On-site – none.

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

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

The results of the risk assessment are presented in Table 11.

Table 11: Conceptual Site Model and Site-Specific Risk Assessment [Contamination: none]				
Conceptual Site Model			**Site Specific Risk Assessment**	
Pathways	**Receptor**	**Linkage Present?**	**Risk Rating**	**Notes**
Direct contact/dermal absorption/soil ingestion	Operative	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed, the majority of determinands are below detection limits.	Low	No further action required.
	End User	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed, the majority of determinands are below detection limits.	Low	
	Neighbours	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed, the majority of determinands are below detection limits.	Low	
Inhalation of Dust/Vapours	Operative	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed the majority of determinands are below detection limits.	Low	No further action required.
	End User	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed the majority of determinands are below detection limits.	Low	
	Neighbours	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed, the majority of determinands are below detection limits.	Low	
Ingestion of fruit/vegetables and/or waters	Operative	No – no edible plants or contained water sources in the area of the proposed new works.	N/A	No further action required.
	End User	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed, the majority of determinands are below detection limits.	Low	
	Neighbours	Yes – whilst some contamination has been revealed, the concentrations are not significant. Indeed, the majority of determinands are below detection limits.	Low	
Migration of hazardous gases via permeable strata or shallow mining activity	Operative	Yes – low concentrations of methane and carbon dioxide have been found to be present (site is *Characteristic Situation Level 1*).	Low	Low concentrations of harmful gases (methane and carbon dioxide) were detected at the site. No special precautionary measures are deemed to be required.
	End User		Low	
	Neighbours	No – whilst low concentrations of ground gas have been found to be present at the site (considering *Characteristic Situation Level 1*), no structures directly adjoin the site, therefore gases migrating from the site would vent to atmosphere before reaching neighbouring structures.	N/A	

Spillage/loss/run off direct to receiving water	Controlled Waters	Yes – whilst some controlled waters are present within 250m no significant contamination has been revealed. Indeed, the majority of determinands are below detection limits.	Low	No further action required.
Migration via permeable unsaturated strata	Controlled Waters	Yes – whilst there is a Secondary A aquifer within the solid geology, no significant contamination has been revealed. Indeed, the majority of determinands are below detection limits.	Low	
Run off via drainage/sewers etc	Controlled Waters	Yes – old services may be present on site. However, no significant contamination has been revealed. Moreover, the majority of determinands were below detection limits.	Low	
Direct contact with contaminated soils	Plants	Yes – whilst some contamination is present, the concentrations revealed are not significant. Moreover, the majority of determinands are below detection limits.	Low	No further action required.
Uptake via root system			Low	
Direct contact with contaminated soils	Building Materials	Yes – whilst some contamination is present, the concentrations revealed are not significant. Moreover, the majority of determinands are below detection limits. Moreover, testing indicates that the aggressive chemical environment for concrete classification is AC-1s.	Moderate (plastic services) Low (buried concrete)	Please see section 11.3.3 for information on good building practice.
Direct contact with contaminated groundwater				
Exposure to Radon	Operative	No – not in an area affected by radon.	N/A	Less than 1% of properties are above the action level. No radon protection measures required.
	End User			
UXO Risk	Operative	Yes – the Zetica[14] online maps indicate that the site is at low risk from UXO.	Low	No further action required.
	End User		Low	

[14] Pre-desk study assessment [*online resource from www.zeticauxo.com*].

11.3 Indicative Remediation Strategy

Whilst no significant chemical contamination was revealed, good practices should still be maintained. However, careful inspection of the sub-grade should be made during the ground-works. Should areas of contamination be detected then further testing may become necessary.

11.3.1 General Approach to Construction

Ground-works

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

- Site operatives at all levels should be made aware of the fundamental principles of identifying potentially contaminated soils and the hazards of working with such soils not identified by the ground investigation.
- Personal hygiene facilities, including washing and messing, must be provided and site operatives be encouraged to use them.
- Where work is undertaken in dry weather the site should be dampened down to avoid dust. In addition, dust masks must be provided to all site operatives for use in dry weather.
- addition, dust masks must be provided to all site operatives for use in dry weather.
- In order for contaminated soils to be disposed of to an appropriate landfill, it may be necessary to carry out Waste Acceptance Criteria (WAC) testing in accordance with BS EN 12457.
- Any stockpiles of contaminated soil on site should be sheeted over to prevent excessive amounts of airborne dust and cross contamination of imported fill.
- Where vehicles are transferring soil to the landfill site they should be covered to prevent contamination of the surrounding area by dust.
- Where work is undertaken in wet weather, vehicle and wheel washing facilities are required to ensure that the vehicles leaving the site do not transfer contamination to surrounding areas.

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

11.4 Fill Materials

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

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

- It is a suitable growing media if it is to be employed as such, including compliance with BS3882 (2015)
- It is free from obvious contamination i.e. visual or olfactory evidence
- It has not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to be growing

- It is not a statutory nuisance, such as being odorous
- It is free from unsuitable material i.e. whole bricks, brick ties, timber or glass.

It should also be appreciated that any fill should be subjected to validation testing to assess its suitability. The following table has been taken from YALPAG[15] documentation and may be used as a guide. Depending on the origin and nature of the material, not all fill will require the sampling frequency and testing indicated, although this should be in agreement with any regulatory bodies (such as the Local Authority).

Table 12: Validation Sampling and Testing

Fill Type	Frequency	Minimum Determinands
Virgin Quarried Material	1 or 2 depending on the type of stone utilised, to confirm the inert nature of the material.	Standard metals/metalloids (should include as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn)
Crushed Hardcore, Stone, Brick	Minimum 1 per 500m³	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, total TPH. Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE).
Greenfield/ Manufactured Soils	Minimum 3 Dependent on source and receptor, between 1 per 50m^3 and 1 per 250m^3	Standard metals/metalloids (as above), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)).
Brownfield/ Screened Soils	Minimum 6 Dependent on source and receptor, between 1 per 50m^3 and 1 per 100m^3	Standard metals/ metalloids (as above), PAH (16 USEPA speciation), TPH (CWG banded), asbestos, pH and SOM (or calculated from TOC). Any additional analysis dependant on the history of the donor site (e.g. phenol, total cyanide, BTEX, MTBE)..

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

Table 13: Fill Screening Values

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

Please see summary sheet within Appendix 10 for full screening values including PAHs & TPHs.

[15] *YALPAG Technical Guidance for Developers, Landowners and Consultants – Verification Requirements for Cover Systems V4 .1* Appendix 1a, June 2021

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

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

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

12. Recommendations for Further Work

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

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

13. References

- British Geological Survey (NERC) (2023), BGS, Keyworth.
  - Geology of Britain Viewer: (*http://maps.bgs.ac.uk/geologyviewer_google/googleviewer.html)*
  - Lexicon of Named Rock Units:
  - (*http://www.bgs.ac.uk/lexicon/)*
- British Standards Institution (1990) BS1377: *British standard methods of test for soils for civil engineering purposes,* B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-2: *Geotechnical investigation and testing – Field testing, Part 2: Dynamic Probing,* B.S.I., London.
- British Standard Institution (2005 +A1: 2011) BS EN ISO 22476-3: *Geotechnical investigation and testing – Field testing, Part 3: Standard penetration test,* B.S.I., London.
- British Standards Institution (2015 +A1: 2020) BS 5930: *Code of practice for ground investigations,* B.S.I., London.
- British Standards Institution (2011), BS 10175: *Investigation of potentially contaminated sites – Code of Practice,* British Standards Institute.
- British Standards Institution (2015 +A1:2019) BS8485: *Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings,* B.S.I., London.
- British Standards Institution (2013), BS 8576 Guidance on Investigations for Ground Gas – Permanent Gases and Volatile Organic Compounds.
- British Standards Institution (2017) BS EN ISO 14688: *Geotechnical investigation and testing – Identification and classification of soil*, B.S.I., London.
- Building Research Establishment (BRE) Special Digest 1 (2005), Third Edition: Concrete in aggressive ground, BRE Press, Garston.
  - Part C: *Assessing the aggressive chemical environment.*
  - Part D: *Specifying concrete for general cast-in-situ use.*
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – Final SC050021/SR2, *Human Health toxicological assessment of contaminants in soil*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs and the Environment Agency (2009) DEFRA Science Report – SC050021/SR3, *Updated technical background to the CLEA model*. Environment Agency, Bristol.
- Department for Environment, Food and Rural Affairs (2014) SP1010: *Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document*.
- Wilson S, Oliver S, Mallet H, Hutchings H, Card G, *Assessing risks posed by ground gasses to buildings,* CIRIA Report C665.

Appendix 1

Site Plan

Notes:

Investigation positions approximated from site operative's notes. Locations greyed from 2021 geo-environmental investigation.

Environmental Geotechnical Specialists

RGS

Rogers Geotechnical Services Ltd

Offices 1 & 2, Barncliffe Business Park,
Near Bank,
Shelley,
Huddersfield,
HD8 8LU

Telephone: 0843 50 66 87
www.rogersgeotech.co.uk

Client:

Martin Walsh Architectural

Job Number:

C1772/22/E/4286

Project Details:

Gomersal Hall, Oxford Road, Cleckheaton

Scale: Not to scale - reference only

Appendix 2

Coal Authority License

The Coal Authority

Permit to Enter or Disturb Coal Authority Interests

Permit 26664

Name and Address of Permit Holder:

Jonathan Haigh
Valley View
Drub Lane
Drighlington
BD19 4BX

Site Location:

Gomersal Hall
Oxford Road
Cleckheaton
BD19 4AT

This certificate hereby grants the above named Permit Holder a Permit to carry out:-

Ground investigation by two boreholes to 30m.

within the Authority's interests at the identified site location above as shown on the Grant Permit Boundary (overleaf) for the period of **12 months** from the granted date shown below. *The granting of this Permit does not constitute advice given by the Authority in relation to the proposed operations. It is the Permit Holder's responsibility to obtain appropriate health, safety, environmental, technical and legal advice.*

Conditions:

- *Manned entry (i.e.) into mine entries/workings) is strictly prohibited.*
- *Water flush*
- *Gas Monitoring CO, CH_4, CO_2, O_2 at borehole and rig*
- *Operators undertaking the work must be in possession of this certificate and the Permit boundary plan at the time of works*
- *Appropriate borehole sealing without delay and to withstand site level changes*

Signed: Helen Day Granted Date: ***15 May 2023***

For and on behalf of The Coal Authority

Nominated Representative: Helen Day, Permitting Manager;
The Coal Authority, Permitting Office, 200 Lichfield Lane, Mansfield, Notts, NG18 4RG
Tel: 01623 637450; E-Mail: permissions@coal.gov.uk

The Coal Authority

Granted Permit Boundary

Permit Ref: 26664

Permit Boundary:

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Appendix 3

Borehole Records

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RO1**

Sheet 1 of 3

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/05/2023	Logged By AB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			TOPSOIL. (Driller's description).
					1.00			Light brown CLAY. (Driller's description).
					5.60			Light brown SANDSTONE. (Driller's description).
	▼	9.00			9.00			Light grey MUDSTONE. (Driller's description).
								Dark grey MUDSTONE. (Driller's description).
								Continued on Next Sheet

Remarks

Cased to 3.0m depth

AGS

Borehole Log

Borehole No. **RO1**

Sheet 2 of 3

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/05/2023	Logged By AB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					14.00			Light grey MUDSTONE. (Driller's description).
								Continued on Next Sheet

11 12 13 14 15 16 17 18 19 20

Remarks

Cased to 3.0m depth

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RO1**

Sheet 3 of 3

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/05/2023	Logged By AB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					26.00			Light brownish grey SANDSTONE. (Driller's description).
					30.00			End of Borehole at 30.00m

21 22 23 24 25 26 27 28 29 30

Remarks

Cased to 3.0m depth

AGS

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **RO2**

Sheet 1 of 3

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 23/05/2023	Logged By AB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.20			TOPSOIL. (Driller's description).
								Dark orangish brown CLAY. (Driller's description).
					1.00			Light brown SANDSTONE. (Driller's description).
					5.00			Light grey MUDSTONE. (Driller's description).
					8.00			Dark grey MUDSTONE. (Driller's description).
	▼	10.00			10.00			Continued on Next Sheet

1 2 3 4 5 6 7 8 9 10

Remarks

Cased to 3.0m depth.

AGS

Borehole Log

Borehole No. **RO2**

Sheet 2 of 3

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 23/05/2023	Logged By AB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Light grey MUDSTONE. (Driller's description).
					20.00			Continued on Next Sheet

Remarks

Cased to 3.0m depth.

Borehole Log

Borehole No. **RO2**

Sheet 3 of 3

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 23/05/2023	Logged By AB

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
								Dark grey MUDSTONE and SANDSTONE. (Driller's description).
					30.00			End of Borehole at 30.00m

21 22 23 24 25 26 27 28 29 30

Remarks

Cased to 3.0m depth.

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **WSA**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type WLS
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 12/05/2023	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.60	ES	57	100		0.45			TOPSOIL (Dark brown slightly gravelly silty SAND with frequent rootlets. Gravel is sub-angular to sub-rounded, fine of sandstone).
										Light brown slightly clayey very sandy sub-angular to sub-rounded, fine to medium GRAVEL of sandstone.
				57	100		1.20			Soft to firm light brown very gravelly very sandy CLAY. Gravel is sub-angular to sub-rounded, fine to medium of sandstone.
							1.55			Extremely weak thinly laminated brown SILTSTONE.
							1.65			End of Borehole at 1.60m

Remarks

AGS

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **WSB**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type WLS
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 12/05/2023	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	ES	57	95		0.45			TOPSOIL (Dark brown silty gravelly CLAY with frequent rootlets. Gravel is sub-angular to sub-rounded, fine to medium of sandstone).
							0.60			Soft brown slightly gravelly sandy CLAY. Gravel is sub-angular to sub-rounded, fine to medium of sandstone.
				47	90		1.55			Light brown slightly clayey very sandy, sub-angular to sub-rounded, fine to medium GRAVEL of sandstone.
							2.00			Extremely weak thinly laminated light brown fine to medium grained SANDSTONE with rare carbonaceous staining.
										End of Borehole at 2.00m

1 2 3 4 5 6 7 8 9 10

Remarks

AGS

Borehole Log

Borehole No. **WSC**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type WLS
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 12/05/2023	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.65	ES	57	85		0.60			TOPSOIL (Soft dark brown silty very gravelly CLAY with frequent rootlets. Gravel is sub-angular to sub-rounded, fine to medium of sandstone).
				47	100					Soft light brown sandy very gravelly CLAY. Gravel is sub-angular to sub-rounded, fine to coarse of sandstone.
							1.80			Extremely weak thinly laminated brown clayey SILTSTONE.
							1.85			End of Borehole at 1.85m

Remarks

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **BH1**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO+RC
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 23/06/2021	Logged By DG+IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.30			TOPSOIL. (Driller's description).
								Weathered clayey SANDSTONE. (Driller's description).
				90 100 81 62 — 4 3 10	2.70			Extremely weak thinly laminated light brownish grey, clayey MUDSTONE with frequent ferruginous staining. Discontinuities are closed, sub-horizontal, very closely to closely spaced, planar, rough, locally infilled with clayey silt.
				90 80 50 0 — 8	4.35			Extremely weak thinly laminated light grey, clayey MUDSTONE with occasional ferruginous staining. Discontinuities are closed, sub-horizontal, very closely spaced, planar, rough, locally infilled with clayey silt.
				90 60 44 0				
				90 46 20 0	7.00			Extremely weak thinly laminated light grey, clayey MUDSTONE with rare ferruginous staining. Discontinuities are closed, sub-horizontal, very closely spaced, planar, rough, locally infilled with gravelly silty clay.
				90 100 73 24 — 6	10.00			End of Borehole at 10.00m
				Dia. (mm) TCR (%) SCR (%) RQD (%) FI				

1 2 3 4 5 6 7 8 9 10

Remarks

AGS

Borehole Log

RGS Environmental Geotechnical Specialists

Borehole No. **BH2**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type RO+RC
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 23/06/2021	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Results					Depth (m)	Level (m)	Legend	Stratum Description
									0.30			TOPSOIL. (Driller's description).
									1.00			MADE GROUND (Brick and rubble).
												Yellow CLAY.
		4.80	D	90	46	15	0	6	3.20			Extremely weak thinly laminated light brownish grey, clayey MUDSTONE with frequent ferruginous staining. Discontinuities are closed, sub-horizontal, closely spaced, planar, rough, infilled with clayey gravel.
				90	26	6	0		4.70			Extremely weak thinly laminated light brownish grey, clayey MUDSTONE with frequent ferruginous staining, recovered as very gravelly CLAY with occasional corestones.
				90	46	36	0	23	6.20			Extremely weak thinly laminated light grey, clayey MUDSTONE with rare ferruginous staining. Discontinuities are closed, sub-horizontal, extremely closely to very closely spaced, planar, rough, locally infilled with gravelly silty clay.
				90	46	13	0		8.60			Extremely weak lightly grey MUDSTONE, recovered as very gravelly silty CLAY with occasional corestones.
				90	100	37	0	5	9.20			Extremely weak thinly laminated light grey, clayey MUDSTONE. Discontinuities are closed, sub-horizontal, closely spaced, planar, rough, locally infilled with gravelly silty clay.
				Dia. (mm)	TCR (%)	SCR (%)	RQD (%)	FI	10.00			End of Borehole at 10.00m

Remarks

AGS

RGS Environmental Geotechnical Specialists

Borehole Log

Borehole No. **WS1**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type WLS
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
							0.25			TOPSOIL (Dark brown silty clayey SAND with frequent rootlets).
				85	100		0.70			MADE GROUND (Light grey very sandy sub-angular to angular, fine to coarse GRAVEL with partial brick fragments. Gravel is of brick and mortar).
		0.80	D							
				75	90					Loose becoming medium dense light brown very sandy silty, sub-angular to sub-rounded, fine to coarse GRAVEL of sandstone. [Weathered Sandstone].
		1.80	D				1.70			Very stiff brown silty CLAY with occasional orangish staining.
				65	100		1.95			Extremely weak thinly laminated light brownish grey SILTSTONE with occasional ferruginous and carbonaceous staining.
							2.80			End of Borehole at 2.80m

Remarks

AGS

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **WS2**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type WLS
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	D	85	100		0.35			TOPSOIL (Dark brown clayey silty SAND with frequent rootlets).
							0.60			Soft brown very gravelly sandy CLAY. Gravel is sub-angular to sub-rounded, fine to medium of sandstone.
				75	100		1.70			Medium dense light brown silty very sandy, sub-angular to sub-rounded, fine to coarse GRAVEL of sandstone. Becomes orangish brown towards base. [Weathered sandstone].
				55	100		2.10			Extremely weak thinly laminated light grey SANDSTONE.
							2.55			Loose to medium dense thinly laminated orangish brown silty fine SAND with occasional medium gravel sized corestones of sandstone.
							2.90			Extremely weak thinly laminated brown SILTSTONE with occasional ferruginous staining.
										End of Borehole at 2.90m

Remarks

AGS

Borehole Log

Borehole No. **WS3**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type WLS
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.50	D	85	100		0.45			TOPSOIL (Dark brown silty SAND with frequent rootlets).
				75	100		1.10			Loose to medium dense light brown silty very sandy, sub-angular to sub-rounded, fine to coarse GRAVEL of sandstone. [Weathered Sandstone].
							1.60			Loose light brown slightly clayey very gravelly silty SAND. Gravel is sub-angular to sub-rounded, fine to coarse of sandstone.
							1.90			Medium dense light brown very sandy, sub-angular to sub-rounded, medium to coarse, and occasionally fine GRAVEL of sandstone.
										End of Borehole at 1.90m

Remarks

Borehole Log

Environmental Geotechnical Specialists

Borehole No. **WS4**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type WLS
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By IMY

Well	Water Strikes	Samples and In Situ Testing: Depth (m)	Type	Dia. (mm)	TCR (%)	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.60	D	85	100		0.30			TOPSOIL (Dark brown slightly gravelly silty SAND with frequent rootlets. Gravel is sub-angular to sub-rounded, fine of sandstone).
							1.10			MADE GROUND (Soft light brown very sandy very gravelly CLAY. Gravel is sub-angular to sub-rounded, medium to coarse and occasionally fine of sandstone. Gravel noted to be randomly oriented). [REWORKED STRATA].
		1.50	D	75	100		1.50			Medium dense to dense light brown silty very sandy, sub-angular to sub-rounded, fine to coarse GRAVEL of sandstone. [Weathered Sandstone].
				65	100		1.90			Stiff thinly laminated brown silty CLAY.
							2.55			Extremely weak thinly laminated brownish grey clayey SILTSTONE with occasional orangish staining.
										End of Borehole at 2.55m

Remarks

AGS

Appendix 4

Dynamic Probe Records

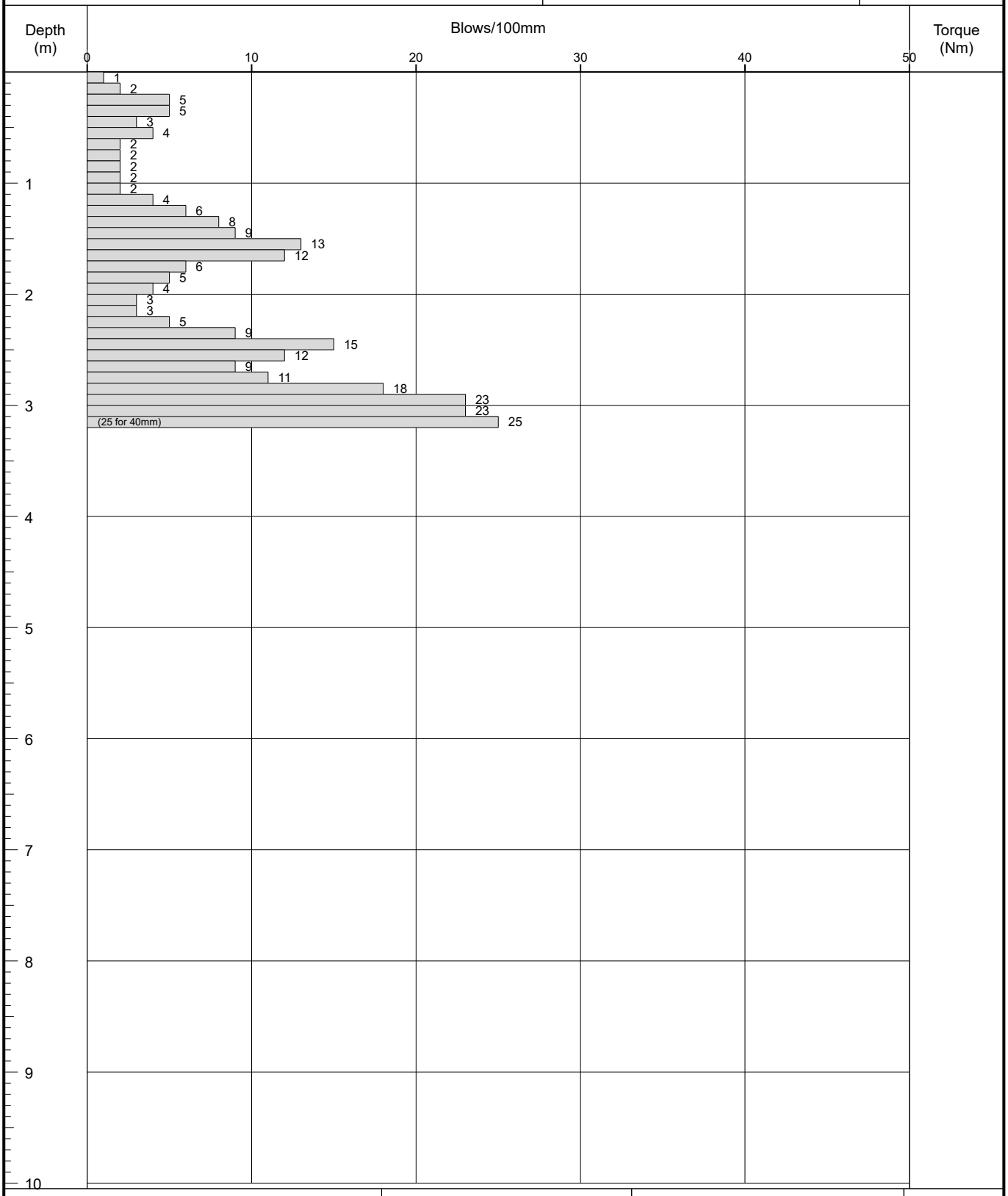
Probe Log

Environmental Geotechnical Specialists

Probe No. **DP1**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type DCP
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By CG



Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	3.2m
Probe Type	DPSH-B		

AGS

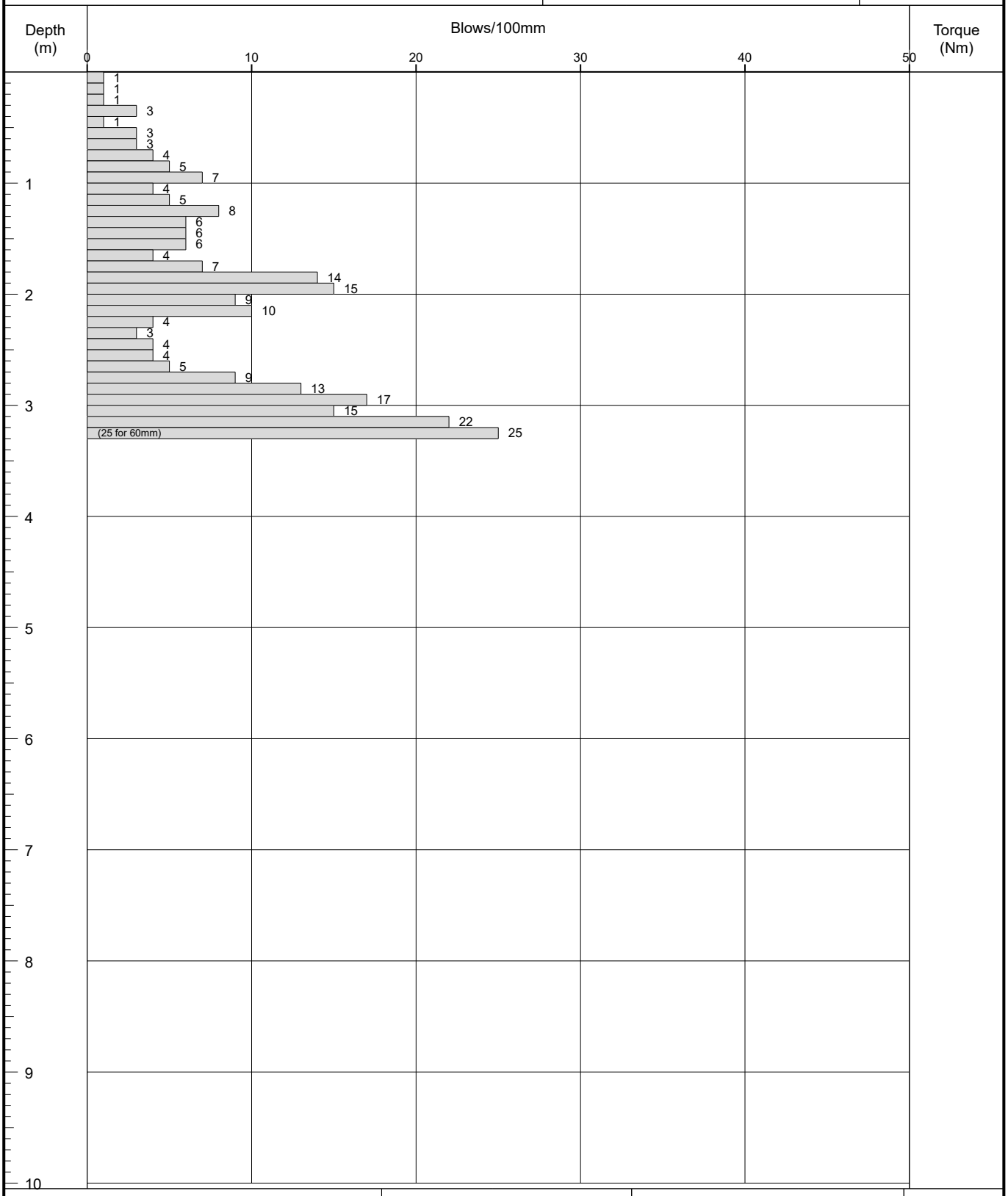
Probe Log

Environmental Geotechnical Specialists

Probe No. **DP2**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type DCP
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By CG



Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	3.3m
Probe Type	DPSH-B		

AGS

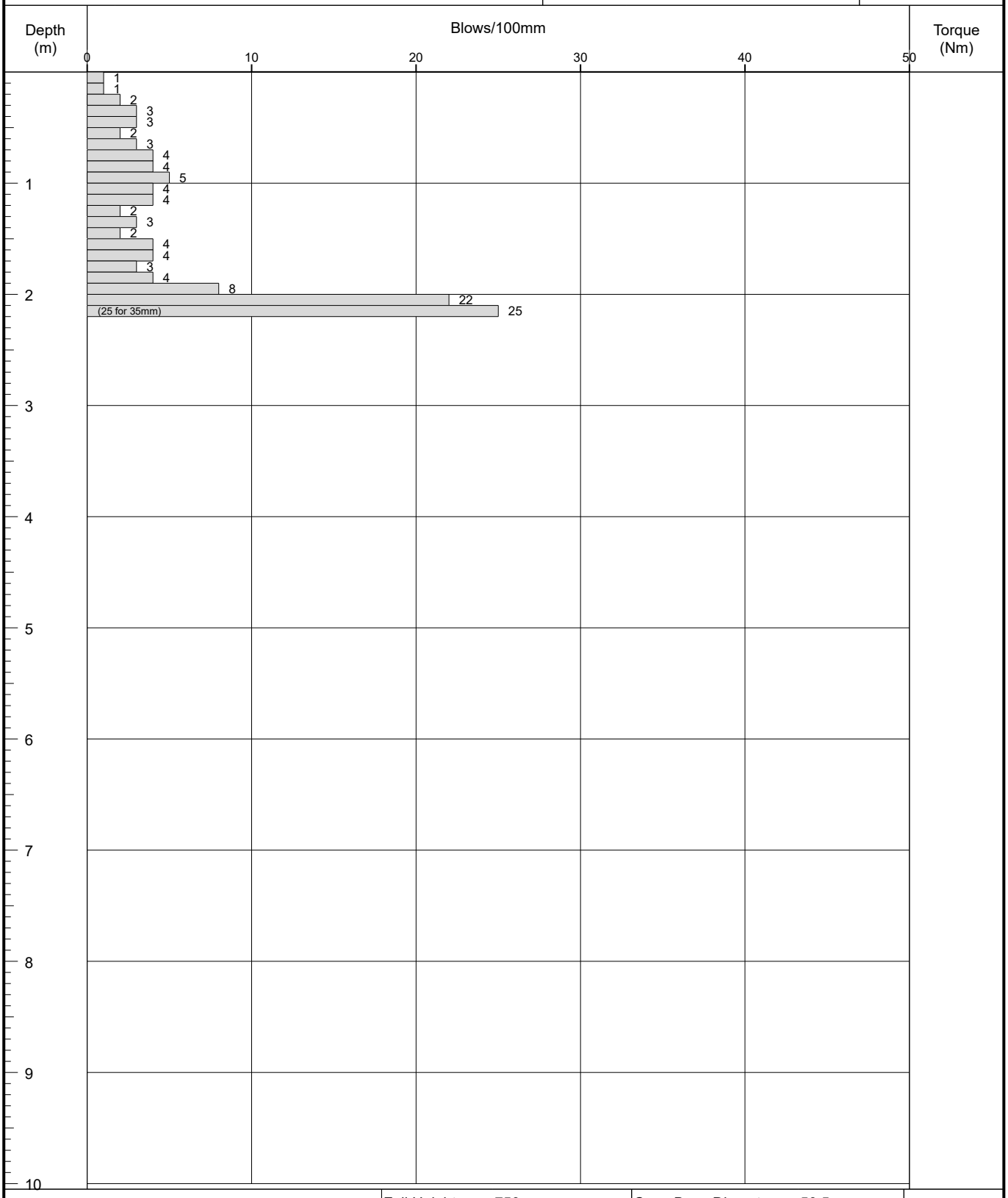
Probe Log

Environmental Geotechnical Specialists

Probe No. **DP3**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type DCP
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By CG



Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	2.2m
Probe Type	DPSH-B		

AGS

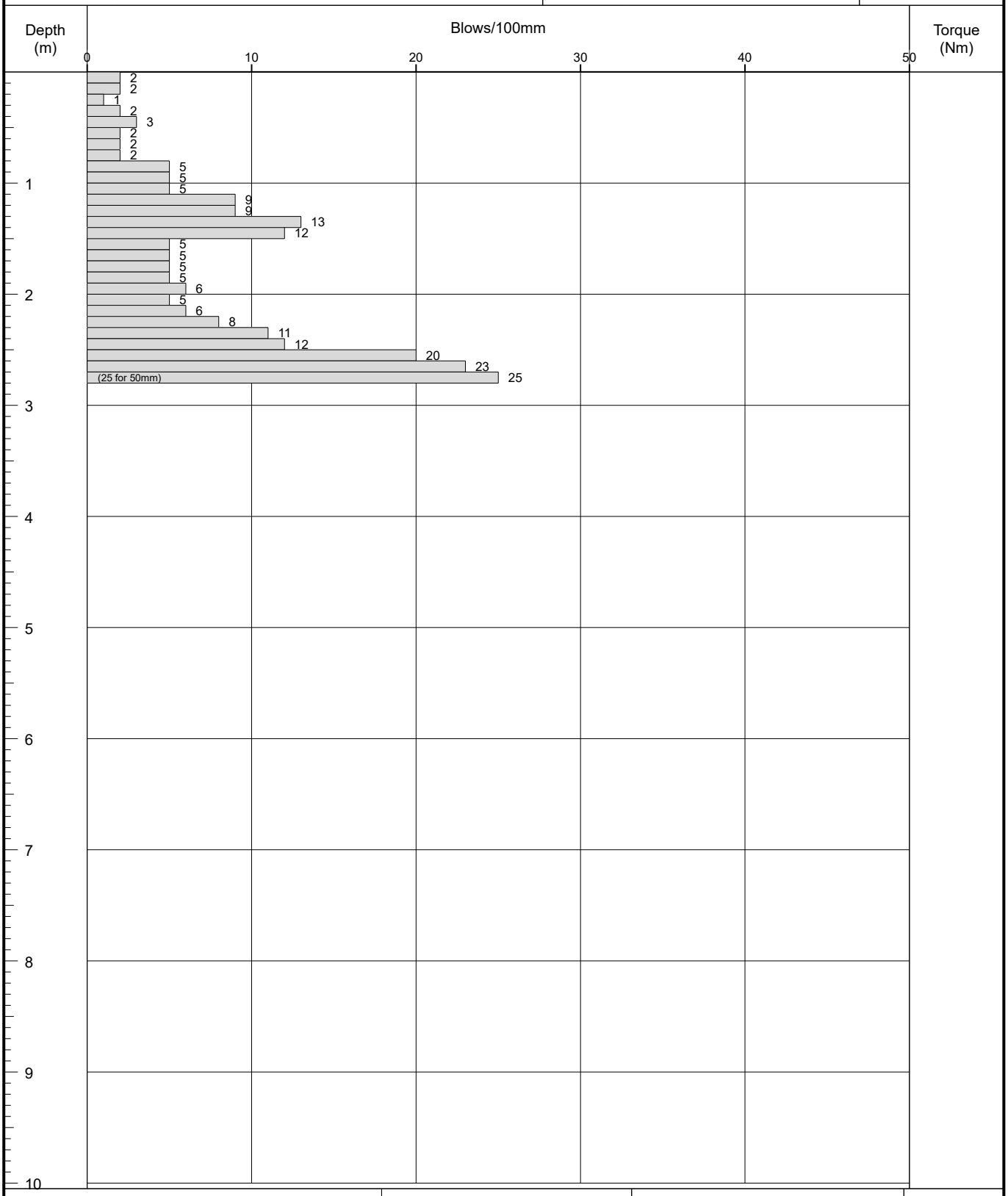
Probe Log

Environmental Geotechnical Specialists

Probe No. **DP4**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords:	Hole Type DCP
Location: Oxford Road, Gomersal		Level:	Scale 1:50
Client: Martin Walsh Architectural Ltd		Dates: 22/06/2021	Logged By CG



Remarks:

Fall Height	750mm	Cone Base Diameter	50.5mm
Hammer Wt	63.5kg	Final Depth	2.8m
Probe Type	DPSH-B		

AGS

Appendix 5

Trial Pit Records

Trial Pit Log

Trialpit No **TP1**

Sheet 1 of 1

Project Name:	Gomersal Hall	Project No. C1772/21/E/4286	Co-ords: - Level:	Date 22/06/2021
Location:	Oxford Road, Gomersal	Dimensions (m): Depth 1.42	1.9 / 0.6	Scale 1:50
Client:	Martin Walsh Architectural Ltd			Logged IMY

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.50			TOPSOIL (Dark brown becoming brown slightly clayey silty SAND with frequent rootlets).
				0.80			Firm yellowish brown sandy gravelly CLAY. Gravel is sub-angular to sub-rounded, tabular, fine to coarse of sandstone.
				1.42			Light brown silty very sandy, sub-angular to sub-rounded, tabular, fine to coarse GRAVEL of sandstone. End of pit at 1.42 m

Remarks:

Stability:

Trial Pit Log

Trialpit No **TP2**

Sheet 1 of 1

Project Name: Gomersal Hall	Project No. C1772/21/E/4286	Co-ords: - Level:	Date 22/06/2021
Location: Oxford Road, Gomersal		Dimensions (m): Depth 1.55 — 2.2 × 0.6	Scale 1:50
Client: Martin Walsh Architectural Ltd			Logged IMY

Water Strike	Samples and In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20			TOPSOIL (Dark brown sandy CLAY with frequent rootlets).
				0.50			Brown slightly clayey silty SAND.
							Light brown silty sandy, sub-angular to sub-rounded, tabular, fine to coarse GRAVEL with high cobble content. Cobbles and gravel are of sandstone.
				1.55			End of pit at 1.55 m

Remarks:

Stability:

Appendix 6

TRL Probe Records

Rogers Geotechnical Services Ltd
Offices 1&2, Barncliffe Business Park,
Near Bank, Shelley,
Huddersfield
HD8 8LU

www.rogersgeotech.co.uk

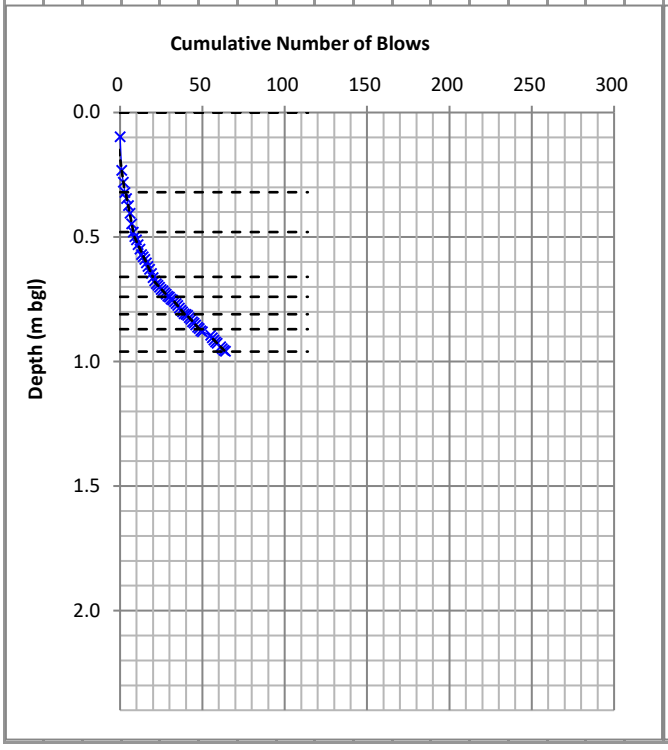
Tel : 0843 50 66687 **Fax : 0843 51 59930**

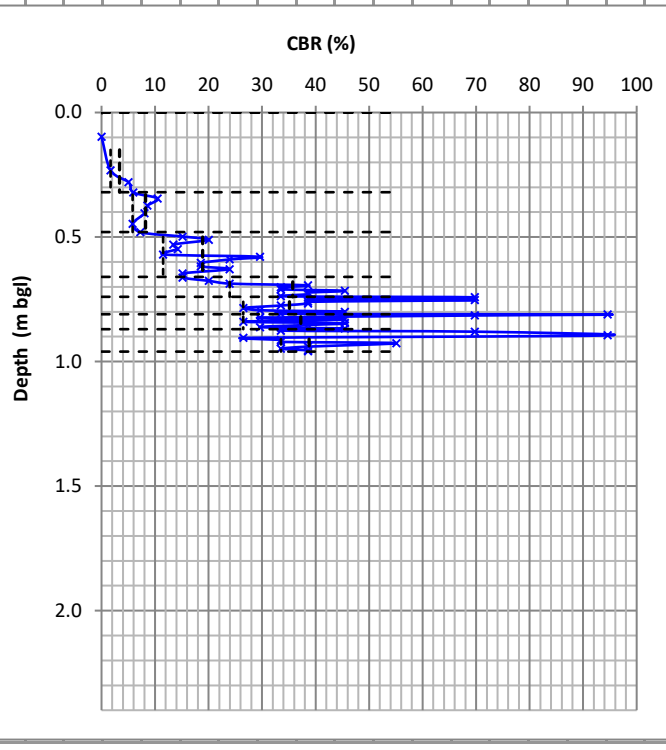
Job No:	Location:
C1772/21/E/4286	TRL A
Site:	Client:
Gomersal Hall	Martin Walsh Architectural
Test Date:	Tested By:
02/05/2023	AG

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	97	-	1	20	663	15	1	40	811	95
1	1	232	2	1	21	676	20	1	41	815	70
1	2	280	5	1	22	687	24	1	42	824	30
1	3	321	6	1	23	694	39	1	43	830	45
1	4	345	10	1	24	702	34	1	44	840	26
1	5	374	9	1	25	710	34	1	45	846	45
1	6	405	8	1	26	716	45	1	46	853	39
1	7	447	6	1	27	723	39	1	47	862	30
1	8	481	7	1	28	730	39	1	48	868	45
1	9	498	15	1	29	738	34	1	49	876	34
1	10	511	20	1	30	742	70	1	50	880	70
1	11	530	13	1	31	749	39	5	55	895	95
1	12	548	14	1	32	753	70	1	56	905	26
1	13	570	12	1	33	760	39	1	57	913	34
1	14	579	30	1	34	767	39	1	58	921	34
1	15	590	24	1	35	775	34	1	59	926	55
1	16	604	19	1	36	785	26	2	61	940	39
1	17	618	19	1	37	794	30	1	62	948	34
1	18	629	24	1	38	800	45	1	63	955	39
1	19	646	15	1	39	808	34	1	64	959	39





Rogers Geotechnical Services Ltd
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Near Bank, Shelley,
Huddersfield
HD8 8LU

www.rogersgeotech.co.uk

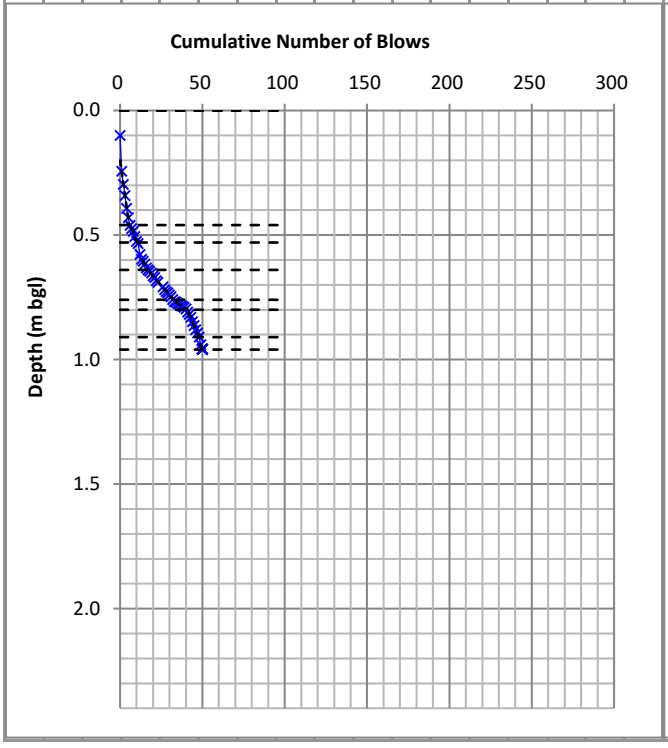
Tel : 0843 50 66687 **Fax : 0843 51 59930**

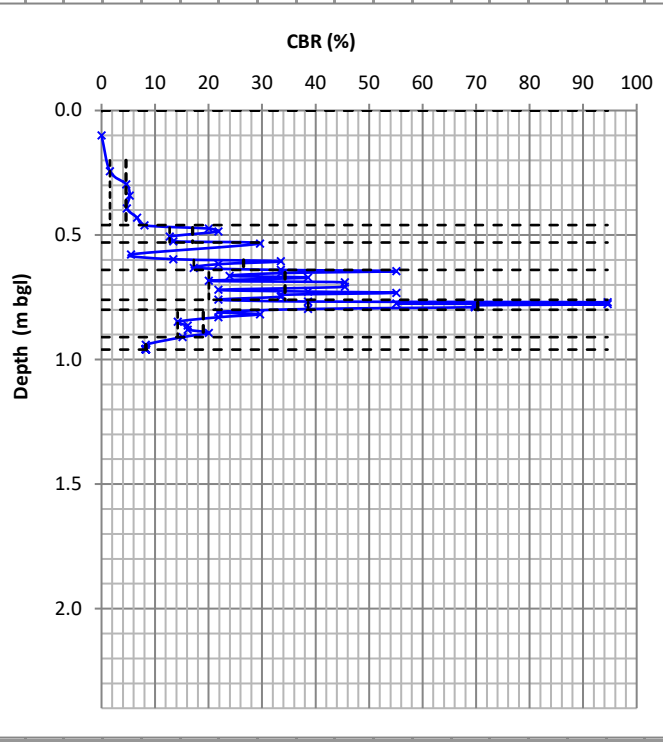
Job No:	Location:
C1772/21/E/4286	TRL B
Site:	Client:
Gomersal Hall	Martin Walsh Architectural
Test Date:	Tested By:
02/05/2023	AG

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	100	-	1	20	664	24	1	42	818	30
1	1	244	2	1	21	671	39	1	43	830	22
1	2	296	5	1	22	684	20	1	44	848	14
1	3	342	5	1	23	690	45	1	45	864	16
1	4	393	5	3	26	708	45	1	46	880	16
1	5	430	7	1	27	720	22	1	47	893	20
1	6	461	8	1	28	727	39	1	48	910	15
1	7	474	20	1	29	732	55	1	49	940	8
1	8	486	22	1	30	740	34	1	50	959	8
1	9	506	13	1	31	748	34				
1	10	525	13	1	32	760	22				
1	11	534	30	1	33	767	39				
1	12	578	6	1	34	770	95				
1	13	597	13	1	35	775	55				
1	14	605	34	1	36	778	95				
1	15	617	22	1	37	782	70				
1	16	632	17	1	38	786	70				
1	17	640	34	1	39	790	70				
1	18	645	55	1	40	797	39				
1	19	653	34	1	41	809	22				





Rogers Geotechnical Services Ltd
Offices 1&2, Barncliffe Business Park,
Near Bank, Shelley,
Huddersfield
HD8 8LU

www.rogersgeotech.co.uk

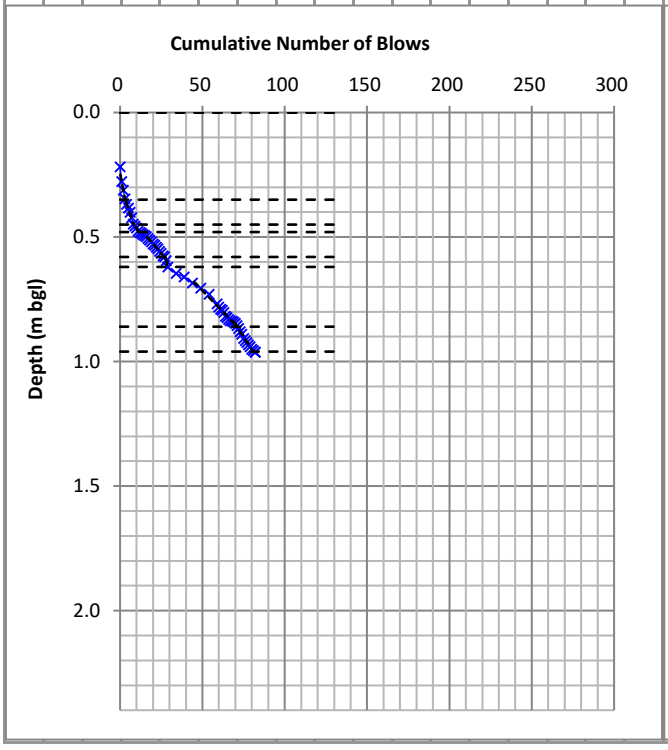
Tel : 0843 50 66687 **Fax : 0843 51 59930**

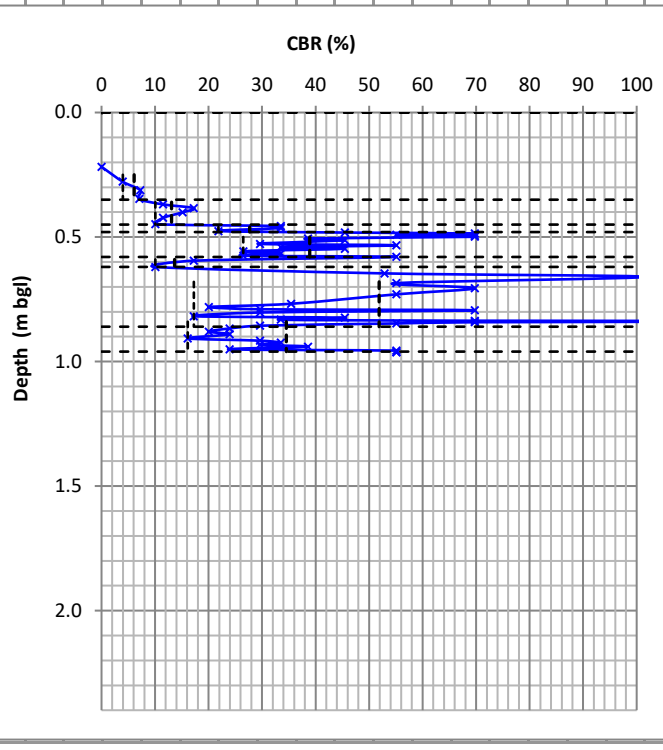
Job No:	Location:
C1772/21/E/4286	TRL C
Site:	Client:
Gomersal Hall	Martin Walsh Architectural
Test Date:	Tested By:
02/05/2023	AG

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	218	-	1	20	528	30	1	64	818	17
1	1	278	4	1	21	533	55	1	65	824	45
1	2	312	7	1	22	541	34	1	66	832	34
1	3	347	7	1	23	547	45	1	67	836	70
1	4	369	12	1	24	557	26	1	68	838	145
1	5	384	17	1	25	565	34	1	69	842	70
1	6	401	15	1	26	575	26	1	70	847	55
1	7	423	12	1	27	580	55	1	71	856	30
1	8	448	10	1	28	595	17	1	72	867	24
1	9	456	34	1	29	620	10	1	73	880	20
1	10	464	34	5	34	646	53	1	74	891	24
1	11	476	22	5	39	660	102	1	75	907	16
1	12	482	45	5	44	685	55	1	76	916	30
1	13	486	70	5	49	705	70	1	77	924	34
1	14	491	55	5	54	730	55	1	78	933	30
1	15	495	70	5	59	768	35	1	79	940	39
1	16	499	70	1	60	781	20	1	80	951	24
1	17	506	39	1	61	790	30	1	81	956	55
1	18	512	45	1	62	794	70	1	82	962	55
1	19	519	39	1	63	803	30				





Rogers Geotechnical Services Ltd
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Huddersfield
HD8 8LU

www.rogersgeotech.co.uk

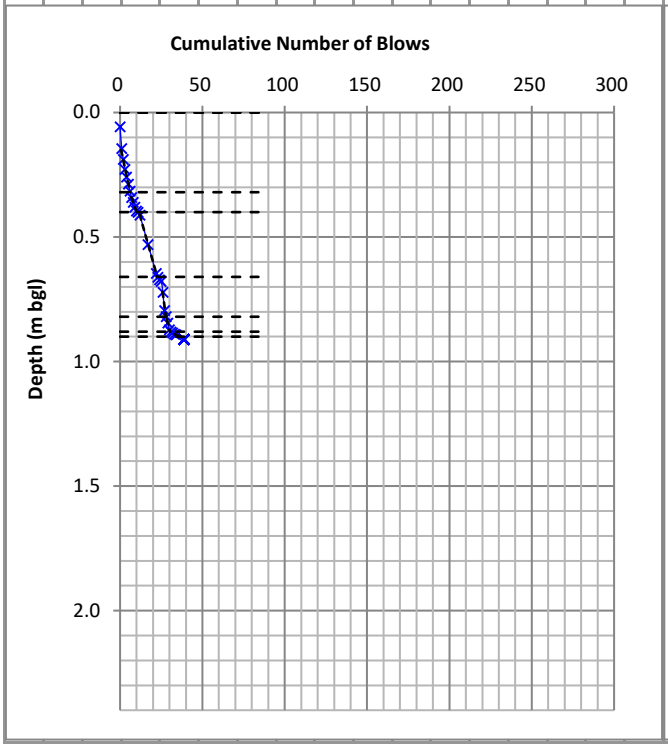
Tel : 0843 50 66687 **Fax : 0843 51 59930**

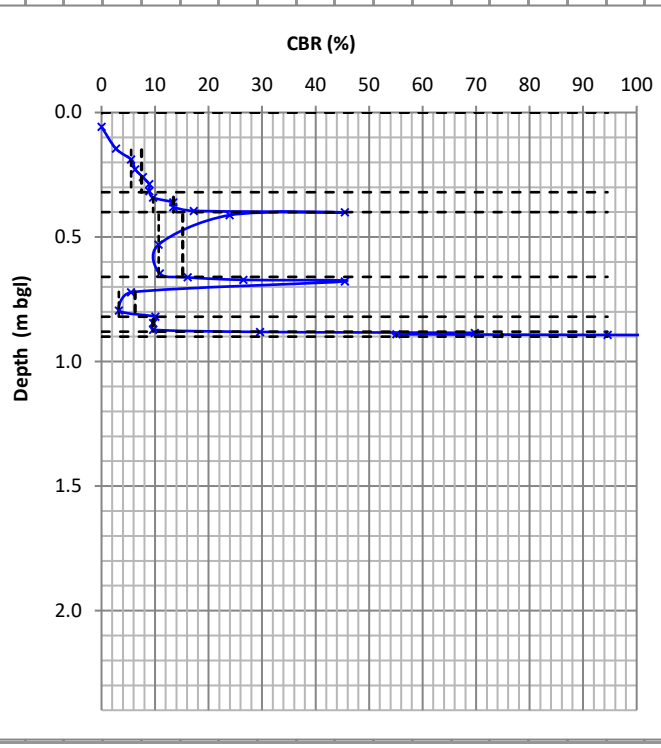
Job No:	Location:
C1772/21/E/4286	TRL DCP 1
Site:	Client:
Gomersal Hall	Martin Walsh Architectural
Test Date:	Tested By:
22/06/2021	RMc

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	58	-	1	28	820	10				
1	1	145	3	1	29	846	10				
1	2	189	6	1	30	872	10				
1	3	228	6	1	31	881	30				
1	4	260	8	1	32	885	70				
1	5	288	9	1	33	890	55				
1	6	316	9	1	34	893	95				
1	7	342	10	5	39	911	518				
1	8	361	13								
1	9	380	13								
1	10	395	17								
1	11	401	45								
1	12	412	24								
5	17	530	11								
5	22	646	11								
1	23	662	16								
1	24	672	26								
1	25	678	45								
1	26	722	6								
1	27	795	3								





Rogers Geotechnical Services Ltd Offices 1&2, Barncliffe Business Park,
Near Bank, Shelley,
Huddersfield
HD8 8LU

www.rogersgeotech.co.uk

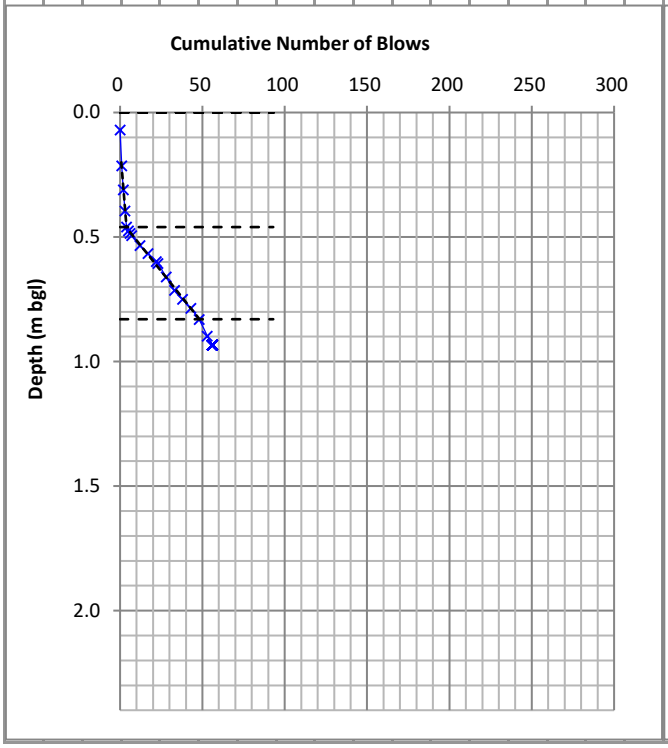
Tel : 0843 50 66687 **Fax : 0843 51 59930**

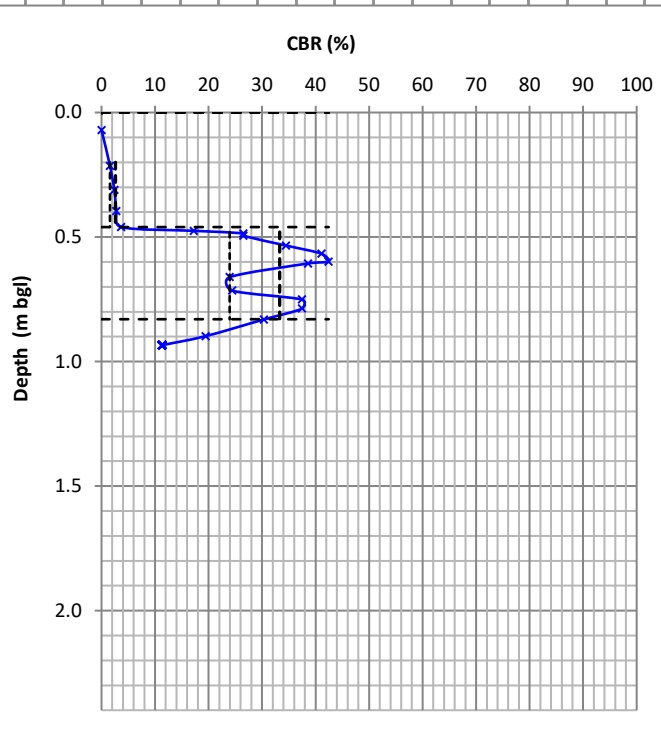
Job No:	Location:
C1772/21/E/4286	TRL DCP 2
Site:	Client:
Gomersal Hall	Martin Walsh Architectural
Test Date:	Tested By:
22/06/2021	RMc

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	70	-								
1	1	214	2								
1	2	311	2								
1	3	395	3								
1	4	460	4								
1	5	475	17								
1	6	485	26								
1	7	495	26								
5	12	534	34								
5	17	567	41								
5	22	599	42								
1	23	606	39								
5	28	661	24								
5	33	715	24								
5	38	751	37								
5	43	787	37								
5	48	831	30								
5	53	898	19								
3	56	934	11								





Rogers Geotechnical Services Ltd
Offices 1&2, Barncliffe Business Park,
Near Bank, Shelley,
Huddersfield
HD8 8LU

www.rogersgeotech.co.uk

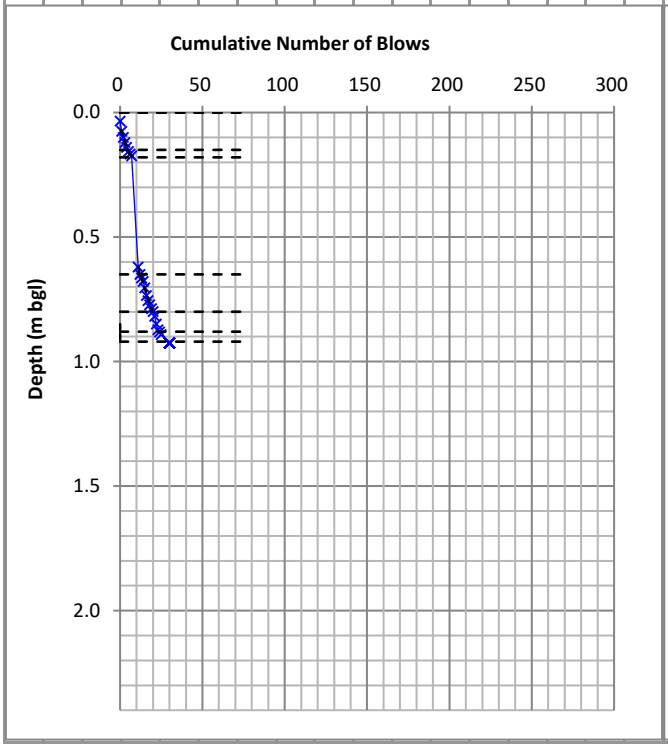
Tel : 0843 50 66687 **Fax : 0843 51 59930**

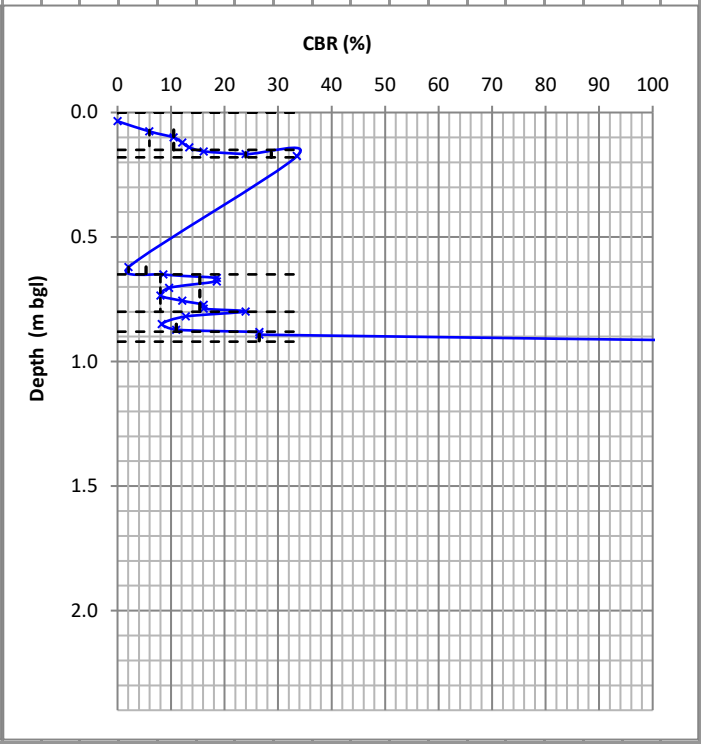
Job No:	Location:
C1772/21/E/4286	TRL DCP 3
Site:	Client:
Gomersal Hall	Martin Walsh Architectural
Test Date:	Tested By:
22/06/2021	RMc

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	35	-	1	23	872	11				
1	1	76	6	1	24	882	26				
1	2	100	10	1	25	892	26				
1	3	121	12	5	30	925	145				
1	4	140	13								
1	5	156	16								
1	6	167	24								
1	7	175	34								
4	11	621	2								
1	12	650	9								
1	13	664	19								
1	14	678	19								
1	15	704	10								
1	16	735	8								
1	17	756	12								
1	18	772	16								
1	19	788	16								
1	20	799	24								
1	21	819	13								
1	22	849	8								





Rogers Geotechnical Services Ltd Offices 1&2, Barncliffe Business Park,
Near Bank, Shelley,
Huddersfield
HD8 8LU

www.rogersgeotech.co.uk

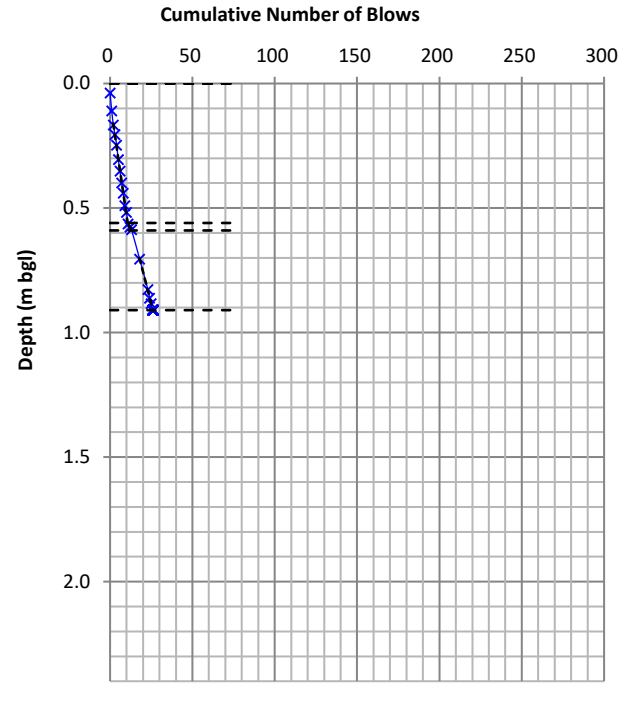
Tel : 0843 50 66687 **Fax : 0843 51 59930**

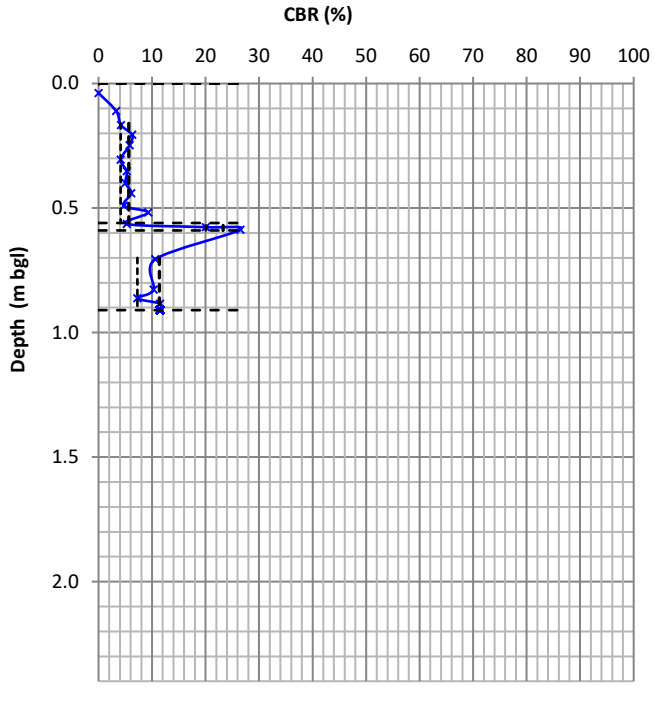
Job No:	Location:
C1772/21/E/4286	TRL DCP 4
Site:	Client:
Gomersal Hall	Martin Walsh Architectural
Test Date:	Tested By:
22/06/2021	RMc

IMPACT (TRL) Dynamic Cone Penetrometer

SL970, TRL Road Note 8, 60° cone.

Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)	Blow Count	Total Blows	Depth (mm)	CBR (%)
0	0	38	-								
1	1	110	3								
1	2	167	4								
1	3	206	6								
1	4	248	6								
1	5	306	4								
1	6	352	5								
1	7	400	5								
1	8	440	6								
1	9	491	5								
1	10	518	9								
1	11	564	5								
1	12	577	20								
1	13	587	26								
5	18	706	11								
5	23	828	10								
1	24	862	7								
1	25	884	12								
1	26	910	12								





Appendix 7

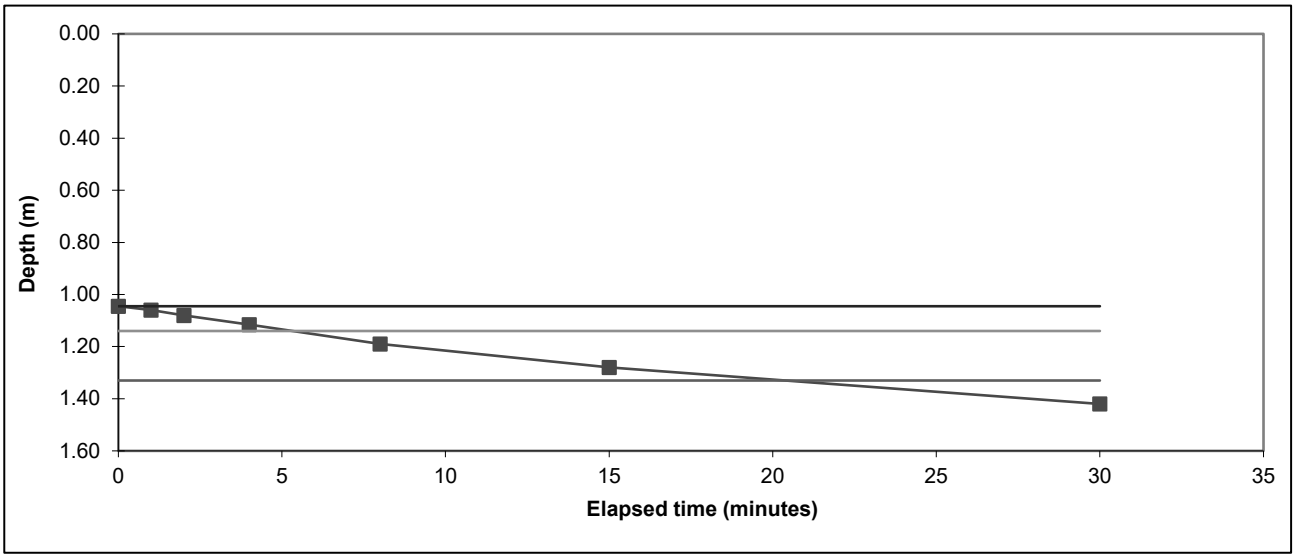
Soakaway Test Results

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	TP1	Test No:	1	Date:	22/06/2021
Length (m):	1.900		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	1.42		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	1.045		
1	1.060		
2	1.080		
4	1.115		
8	1.190		
15	1.280		
30	1.420		



Start water depth for analysis (mbgl):	1.05		
75% effective depth (mbgl):	1.14	Elapsed time (mins):	5.3
50% effective depth (mbgl):	1.23		
25% effective depth (mbgl):	1.33	Elapsed time (mins):	20.4
Base of soakage zone (mbgl):	1.42		

Volume outflow between 75% and 25% effective depth (m^3):	0.217
Mean surface area of outflow (m^2):	2.09
(side area at 50% effective depth + base area)	
Time for outflow between 75% and 25% effective depth (mins):	15.1

Soil infiltration rate (m/s):	**1.1E-4**

Remarks Results processed following BRE 365 (2007).

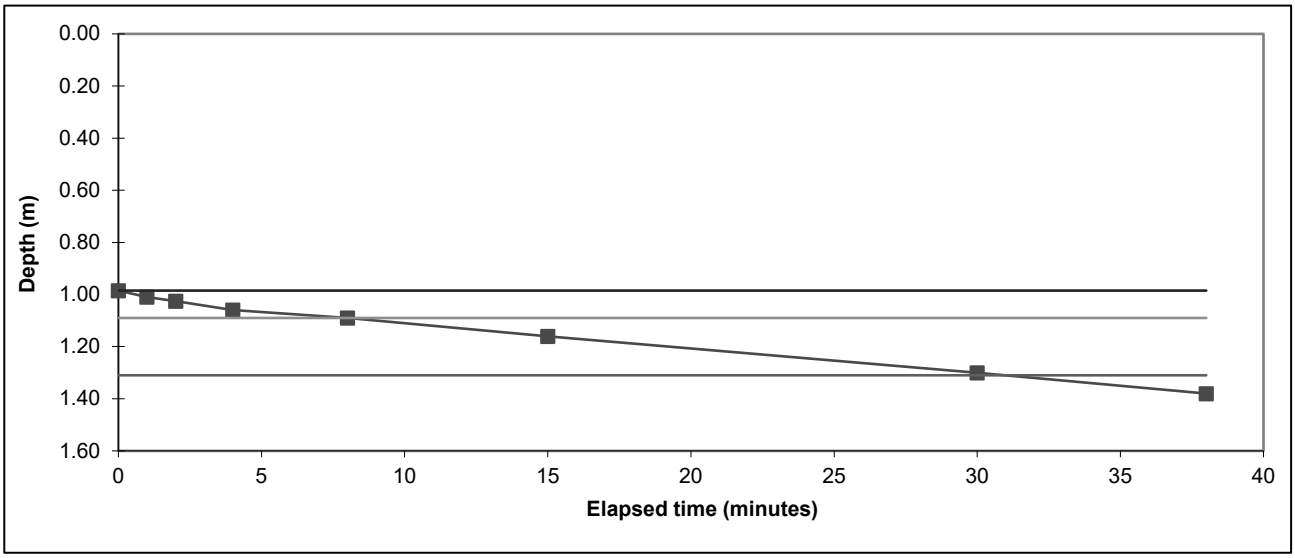
Client:	Martin Walsh Associates Ltd	**Job No:**
Site:	Gomersal Hall, Oxford Road, Gomersal	C1772/21/E/2766

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	TP1	Test No:	2	Date:	22/06/2021
Length (m):	1.900		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	1.42		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.985		
1	1.010		
2	1.025		
4	1.060		
8	1.090		
15	1.160		
30	1.300		
38	1.380		



Start water depth for analysis (mbgl):	0.99		
75% effective depth (mbgl):	1.09	Elapsed time (mins):	8.0
50% effective depth (mbgl):	1.20		
25% effective depth (mbgl):	1.31	Elapsed time (mins):	31.0
Base of soakage zone (mbgl):	1.42		

Volume outflow between 75% and 25% effective depth (m^3):	0.251
Mean surface area of outflow (m^2):	2.24
(side area at 50% effective depth + base area)	
Time for outflow between 75% and 25% effective depth (mins):	23.0

Soil infiltration rate (m/s):	**8.1E-5**

Remarks Results processed following BRE 365 (2007).

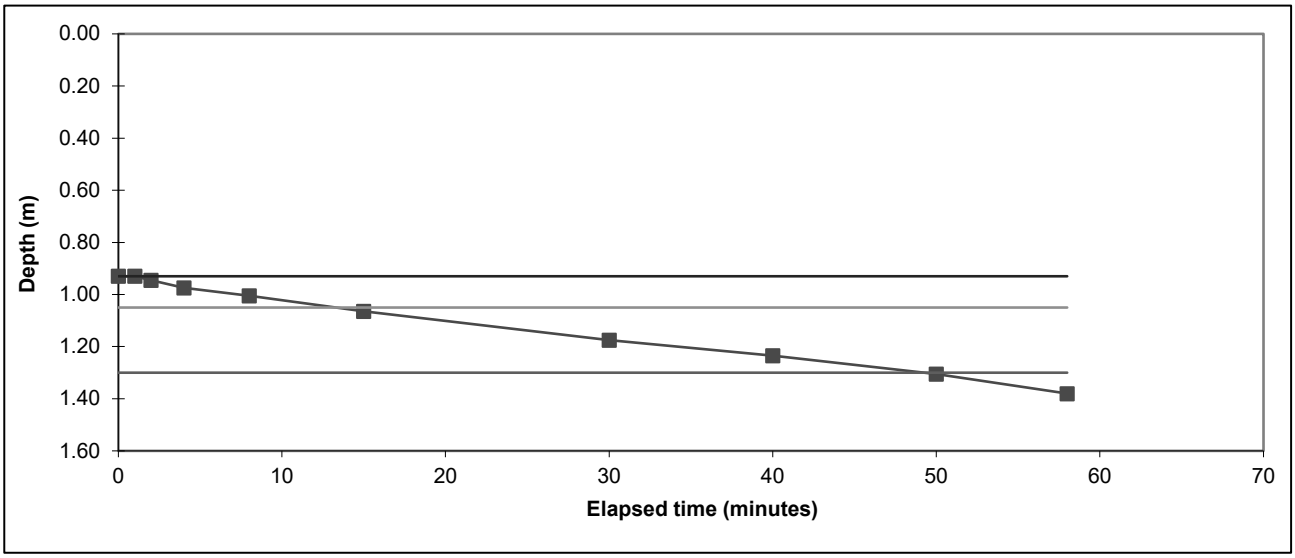
Client:	Martin Walsh Associates Ltd	**Job No:**
Site:	Gomersal Hall, Oxford Road, Gomersal	C1772/21/E/2766

Rogers Geotechnical Services L

Soakaway Test

Trial Pit No:	TP1	Test No:	3	Date:	22/06/2021
Length (m):	1.900		Datum Height:	0.00	m agl
Width (m):	0.60		Granular infill:	None	
Depth (m):	1.42		Porosity of infill:	1	(assumed)

Elapsed time (minutes)	Water Depth (m below datum)	Elapsed time (minutes)	Water Depth (m below datum)
0	0.930		
1	0.930		
2	0.945		
4	0.975		
8	1.005		
15	1.065		
30	1.175		
40	1.235		
50	1.305		
58	1.380		



Start water depth for analysis (mbgl):	0.93		
75% effective depth (mbgl):	1.05	Elapsed time (mins):	13.3
50% effective depth (mbgl):	1.18		
25% effective depth (mbgl):	1.30	Elapsed time (mins):	49.3
Base of soakage zone (mbgl):	1.42		

Volume outflow between 75% and 25% effective depth (m^3):	0.285
Mean surface area of outflow (m^2):	2.34
(side area at 50% effective depth + base area)	
Time for outflow between 75% and 25% effective depth (mins):	36.0

Soil infiltration rate (m/s):	**5.6E-5**

Remarks Results processed following BRE 365 (2007).

Client:	Martin Walsh Associates Ltd	**Job No:**
Site:	Gomersal Hall, Oxford Road, Gomersal	C1772/21/E/2766

Appendix 8

Gas Monitoring Sheets

Rogers Geotechnical Services Ltd

GAS/WATER MONITORING - SITE RECORD

Client: Martin Walsh Architectural Ltd
Site: Gomersal Hall, Gomersal

Gas Monitor: Geotech GA5000
Serial No. G503524
Calibration Date: 01.02.2023
Dip Meter: 003

(If second monitor is used)
Gas Monitor:
Serial No.
Calibration Date:
Dip Meter

Input by : M. Tuck

Date : 13.06.2023

Borehole No	Date	CH_4 (%)	CO_2 (%)	O_2 (%)	Flow (l/hr)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)	Depth During Visit	Atmospheric Conditions	COMMENTS
WSA	23.05.2023	**0.1**	3.0	**16.5**	**0.0**	1012	_		1.77	Sunny	Steady pressure CO 0
	30.05.2023	**0.0**	**2.7**	18.1	**0.0**	1017	_		1.77	Overcast	Steady pressure CO 0
	06.06.2023	**0.1**	2.8	18.7	**0.0**	1011	_		1.77	Overcast	Steady pressure CO 0
	13.06.2023	**0.0**	2.8	**19.3**	**0.0**	**1002**	_		1.77	Sunny	Steady pressure CO 0
WSC	23.05.2023	**0.1**	**4.7**	17.6	**0.0**	1012	_		1.86	Sunny	Steady pressure CO 1
	30.05.2023	**0.1**	4.6	18.3	**0.0**	**1018**	_		1.86	Overcast	Steady pressure CO 0
	06.06.2023	**0.1**	4.4	19.1	**0.0**	1011	_		1.86	Overcast	Steady pressure CO 0
	13.06.2023	**0.1**	**4.7**	19.0	**0.0**	1003	_		1.86	Sunny	Stwady pressure CO 0

CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 01-Feb-2023

Certificate Number: G503524_2/32095

Issued by: QED Environmental Systems Ltd.

Customer: **QED Environmental Systems Ltd (Lease)**
Barncliffe Mills Near Bank Shelley
HUDDERSFIELD HD8 8LU UNITED KINGDOM

Description: Gas Analyser

Model: GA5000

Serial Number: G503524

UKAS Accredited results:

Results after adjustment :

Methane (CH_4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	4.9	0.072
15.0	15.0	0.13
60.0	59.7	0.42

Carbon Dioxide (CO_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.074
15.0	15.0	0.13
40.0	40.1	0.29

Oxygen (O_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
21.5	21.6	0.25

The inwards assessment was carried out 25-Jan-2023.
The maximum adjustment is larger than the specification limit.
Inwards assessment data is available if requested.

All concentrations are molar.

CH_4, CO_2 readings recorded at : 30.6 °C ± 2.5 °C

O2 readings recorded at : 22.1 °C ± 2.5 °C

Barometric Pressure : 1012 mbar ± 4 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

Instrument has passed calibration as the measurement result is within the specification limit. The specification limit takes into account the measurement uncertainty.
The results relate only to the item calibrated

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance:114 IGC Instance:114

www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 01-Feb-2023

Certificate Number: G503524_2/32095

Issued by: QED Environmental Systems Ltd.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS accredited results after adjustment:

Barometer (mbar)	
Reference	**Instrument Reading**
1012	1012

Additional Gas Cells		
Gas	**Certified Gas (ppm)**	**Instrument Reading (ppm)**
CO	505	505
H_2S	258.8	259

Date of Issue : 09-Feb-2023 **Approved by Signatory** Keeley Knight

Laboratory Inspection

End of Certificate

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

Calibration Instance:114 IGC Instance:114

www.qedenv.com +44 (0) 333 800 0088 sales@qedenv.co.uk

QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

Instrument Service Report

Unit Type: GA5000	Part Number:	Date:	Next Service Due:	Customer Name:
Serial Number: G503524	GA5KB0C0-301	09-Feb-2023	01-Aug-2023	QED Environmental Systems Ltd (Lease)

Actions/Investigation Description	Result	Comments
Serial Number Check	Yes	
Battery Requires Replacing	Yes	Battery replaced
Internal Flow Calibrated	Yes	Internal flow calibrated – please reference calibration certificate
Full Automatic Calibration	Pass	
Serial Comms Test (USB)	Pass	
Service history of instrument reviewed	Yes	
Inwards gas check data reviewed	Yes	
Instrument turns on	Pass	
Backlight operates correctly	Yes	
External visual inspection performed	Pass	
Internal visual inspection performed	Pass	
All screws tightened to correct torque	Yes	
All connectors are secure	Pass	
Check diagnostic channels	Pass	
Case compression test	Pass	
Impact and stability test	Pass	
Pressure transducer test(s) as per user operation	Pass	

Instrument Service Report

Unit Type: GA5000	Part Number:	Date:	Next Service Due:	Customer Name:
Serial Number: G503524	GA5KB0C0-301	09-Feb-2023	01-Aug-2023	QED Environmental Systems Ltd (Lease)

Actions/Investigation Description	Result	Comments
Final visual inspection on instrument	Pass	
Case assembly closed and screws tightened to correct torque	Yes	
PTFE filters replaced	Yes	Filter saturated, replaced
Pump flow greater than 550 ml/min	Pass	
Automated instrument pressure system test (leak test)	Pass	
Pump vacuum greater than -400 mb and flow fails	Pass	
GPS function test	Pass	
Temperature probe tested	Pass	
Anemometer tested	Pass	
Chemical gas sensors calibrated – refer to Calibration Certificate	Pass	
Check main PCB and sensor PCB have the latest software	Yes	
Transducers calibrated	Pass	
As Received Chemical Cell Gas Assessment Performed (CAL16)	No	Possibly flooded or blocked
As Received Gas Assessment Performed (CAL01 or CAL02)	Yes	
Chemical sensor(s) replacement over 2yrs UK and 21mths overseas.	Yes	CO and H2S sensors replaced
O2 sensor replacement over 3yrs UK, 33mths overseas	Pass	

Instrument Service Report

Unit Type: GA5000	Part Number:	Date:	Next Service Due:	Customer Name:
Serial Number: G503524	GA5KB0C0-301	09-Feb-2023	01-Aug-2023	QED Environmental Systems Ltd (Lease)

Actions/Investigation Description	Result	Comments
Verification of Instrument	Pass	

Customer Comments

Returned for full service and calibration

Accessory Test	Result	Comments
Charger	Pass	5K Charger Voltage test box indicates charger voltage and current output are in spec.
Download Lead	Pass	Data transfer successful.

General Comments/Feedback

Instrument Service Report

Unit Type: GA5000	Part Number:	Date:	Next Service Due:	Customer Name:
Serial Number: G503524	GA5KB0C0-301	09-Feb-2023	01-Aug-2023	QED Environmental Systems Ltd (Lease)

"Thank you for returning your gas analyser to the QED Service Centre for full service and calibration. We are pleased to inform you that the analyser was received and fully assessed by one of our experienced Service Engineers and no significant faults or issues were observed during the assessment. Our extensive service was carried out, and any necessary components replaced.

We have replaced the internal inlet PTFE filter due to it being discoloured as a result of water being drawn into the analyser as part of its sample and caused the flow fail. Please ensure that when using the analyser that an inline water-trap assembly is used and the filters used are replaced at regular intervals.
The CO electrochemical sensor has been replaced due to it being over 2 years old in accordance with the manufacturer's recommendations, and also as a proactive measure based on our experience of the typical lifetime of this type of sensor.
The H2S electrochemical sensor has been replaced due to it being over 2 years old in accordance with the manufacturer's recommendations, and also as a proactive measure based on our experience of the typical lifetime of this type of sensor.
We have replaced the battery because it is over 2 years old. This is in accordance to the battery cell manufacturer's recommendation.

The analyser has successfully passed all of our rigorous testing and quality checks and has been calibrated using our bespoke, state of the art calibration facility.
For further information about how to get the best use from your instrument please visit our YouTube channel http://www.youtube.com/GeotechTV and on our Website https://qedenv.com

If you require any further assistance with your instrument please email our Technical Support Team at technical@qedenv.co.uk or call us on +44 (0) 333 800 0088 (Monday to Thursday 08.30 - 17.00 & Friday 08.30 - 15.30) UK time zone."

Service Details:		Service Engineer:	Calibration Engineer:	Approved By:	Signature:
Service Scheme	√	Suk Balrey	Andy Townsend	Keeley Knight	
Standard Service					

Rogers Geotechnical Services Ltd

GAS/WATER MONITORING - SITE RECORD

Client: Martin Walsh Architectural Ltd

Site: Gomersall Hall, Gomersal

Input by : GSP/TBM

Date : 29.06.21

Gas Monitor: Geotech GA5000
Serial No. G503524
Calibration Date: 05.05.21
Dip Meter: 003

(If second monitor is used)
Gas Monitor:
Serial No.
Calibration Date:
Dip Meter

Borehole No	Date	CH_4 (%)	CO_2 (%)	O_2 (%)	Flow (l/hr)	Barometric Pressure (mb)	Water Level (m)	Standpipe Depth (m)	Depth During Visit	Atmospheric Conditions	COMMENTS
WS1	29.06.21	0.1	1.1	20.1	0.1	1001	_		2.64	Sunny	Falling Pressure
	06.07.21	0.1	1.2	19.7	0.1	977	_		2.64	Overcast	Falling Pressure
	13.07.21	0.1	1.3	18.9	0.1	1000	2.31		2.64	Overcast	Steady Pressure
	21.07.21	0.0	1.4	19.4	0.1	1008	2.19		2.64	Overcast	Falling Pressure
	25.08.21	0.0	1.6	19.7	0.1	1010	2.77		2.77	Sunny	Steady Pressure
	08.09.21	0.1	1.5	19.7	0.1	998	_		2.77	Sunny	Steady Pressure
WS2	29.06.21	0.0	2.4	19.8	0.1	1001	_		2.50	Sunny	Falling Pressure
	06.07.21	0.0	2.5	19.8	0.1	977	_		2.50	Overcast	Falling Pressure
	13.07.21	0.0	2.6	19.3	0.1	1000	2.36		2.50	Overcast	Steady Pressure
	21.07.21	0.0	2.7	19.3	0.1	1009	2.44		2.50	Overcast	Falling Pressure
	25.08.21	0.0	2.9	19.8	0.1	1010	_		2.62	Sunny	Steady Pressure
	08.09.21	0.0	2.7	19.6	0.1	998	_		2.60	Sunny	Steady Pressure
WS4	29.06.21	0.0	2.0	19.5	0.1	1002	_		2.19	Sunny	Falling Pressure
	06.07.21	0.0	2.2	18.3	0.1	977	0.89		2.29	Overcast	Falling Pressure
	13.07.21	0.0	2.9	16.3	0.0	1001	0.98		2.30	Overcast	Steady Pressure
	21.07.21	0.0	4.1	16.2	0.1	1009	1.39		2.29	Overcast	Falling Pressure
	25.08.21	0.0	3.6	19.0	0.1	1010	1.85		2.41	Sunny	Steady Pressure
	08.09.21	0.1	3.3	18.6	0.1	998	2.41		2.41	Sunny	Steady Pressure

CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 05-May-2021

Certificate Number: G503524_1/28004

Issued by: QED Environmental Systems Ltd.

Customer: **QED Environmental Systems Ltd (Lease)**
Barncliffe Mills Near Bank Shelley
HUDDERSFIELD HD8 8LU UNITED KINGDOM

Description: Gas Analyser

Model: GA5000

Serial Number: G503524

UKAS Accredited results:

Results after adjustment :

Methane (CH_4)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	4.9	0.072
15.0	14.9	0.13
60.0	59.7	0.42

Carbon Dioxide (CO_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
5.0	5.0	0.074
15.0	15.0	0.13
40.0	40.1	0.29

Oxygen (O_2)		
Certified Gas (%)	**Instrument Reading (%)**	**Uncertainty (%)**
21.4	21.5	0.25

The inwards assessment was carried out 27-Apr-2021.
The maximum adjustment is larger than the specification limit.
Inwards assessment data is available if requested.

All concentrations are molar.

CH_4, CO_2 readings recorded at : 31.3 °C ± 2.5 °C

O2 readings recorded at : 22.5 °C ± 2.5 °C

Barometric Pressure : 0998 mbar ± 4 mbar

Method of Test : The analyser is calibrated in a temperature controlled chamber using a series of reference gases, in compliance with procedure LP004.

Instrument has passed calibration as the measurement result is within the specification limit. The specification limit takes into account the measurement uncertainty.
The results relate only to the item calibrated

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

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QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

CERTIFICATION OF CALIBRATION

4533

Date Of Calibration: 05-May-2021

Certificate Number: G503524_1/28004

Issued by: QED Environmental Systems Ltd.

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Calibrations marked 'Non-UKAS Accredited results' on this certificate have been included for completeness.

Non-UKAS accredited results after adjustment:

Barometer (mbar)	
Reference	**Instrument Reading**
998	997

Additional Gas Cells		
Gas	**Certified Gas (ppm)**	**Instrument Reading (ppm)**
CO	486	486
H_2S	250	250

Internal Flow	
Applied (l/hr)	**Instrument Reading (l/hr)**
5.00	4.90
10.00	10.00

Date of Issue : 12-May-2021 **Approved by Signatory**

Dawn Hemings

Laboratory Inspection

End of Certificate

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to the SI system of units and/or to units of measurement realised at the National Physical Laboratory or other recognised national metrology institutes. This certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

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QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

SERVICE REPORT

Issued by: QED Environmental Systems Ltd.

Customer Name: QED Environmental Systems Ltd (Lease)

Model:	GA5000	**Date of Service:**	12-May-2021
Part Number:	GA5KB0C0-301	**Service Engineer:**	David Edwards
Serial Number:	G503524	**Calibration Engineer:**	Suk Balrey

Verification / Approved By: Dawn Hemings **Signature:**

Reason for Return (inc. Customer Comments):

Returned for full service and calibration

Service Comments/Feedback:

Thank you for returning your gas analyser to the QED Service Centre for full service and calibration.

We are pleased to inform you that the analyser was received and fully assessed by one of our experienced Service Engineers and no significant faults or issues were observed during the assessment.

Our extensive service was carried out, and any necessary components replaced.

The analyser has successfully passed all of our rigorous testing and quality checks and has been calibrated using our bespoke, state of the art calibration facility.

For further information about how to get the best use from your instrument please visit our YouTube channel http://www.youtube.com/GeotechTV and on our Website https://qedenv.com

If you require any further assistance with your instrument please email our Technical Support Team at technical@qedenv.co.uk or call us on +44 (0) 333 800 0088 (Monday to Thursday 08.30 - 17.00 & Friday 08.30 - 15.30) UK time zone.

Next Service Due: 05-Nov-2021

17025	5	50	65	7,384	340	25
Our ISO accreditation for our customised auto-calibration facilities	Number of days we aim to complete your service within	Number of checks instruments are subject to when serviced	Number of countries from which we service instruments /accessories each year	Number of calibrations completed in last 12 months	Minimum number of service instruments we process each month	Cost (in £) of fully insured analyser collection for our UK customers

SERVICE REPORT

Issued by: QED Environmental Systems Ltd.

17025	5	50	65	7,384	340	25
Our ISO accreditation for our customised auto-calibration facilities	Number of days we aim to complete your service within	Number of checks instruments are subject to when serviced	Number of countries from which we service instruments /accessories each year	Number of calibrations completed in last 12 months	Minimum number of service instruments we process each month	Cost (in £) of fully insured analyser collection for our UK customers

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QED Environmental Systems Ltd. Cyan Park - Unit 3, Jimmy Hill Way, Coventry, CV2 4QP, UNITED KINGDOM

Registered in England and Wales 1898734

Appendix 9

Laboratory Testing

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LABORATORY REPORT

job number C/1772/21/E/2766	client ref
site address Gomersal Hall, Oxford Road, Gomersal	client address M Walsh Architectural Ltd Firth Buildings, 99-103 Leeds Rd, Dewsbury, WF12 7BU
consultant	
date scheduled 28/06/2021	date issued 16/07/2021
issued by H J Letch	job title Asst. Lab Manager

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

Constructionline
QMS ISO 9001 REGISTERED
QMS ISO 14001 REGISTERED
QMS OHSAS 18001 REGISTERED
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Schedule of UKAS Accredited Laboratory Tests

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

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Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

Telephone 01484 607977
Company No: 5130864

Summary of Classification Test Results

Project No.	Project Name
C1772/21/E/2766	Gomersal Hall

Hole No.	Sample				Soil Description	Density		*w*	Passing 425µm	LL	PL	PI	Particle density	Cone	Water	Remarks
	Ref	Top	Base	Type		bulk	dry							80g/30°	Increase	
						Mg/m3		%	%	%	%	%	Mg/m3	60g/60°	Decrease	
WS1	2	1.80		D	Brown silty CLAY			16.0	100	34 -1pt	19	15		80g/30deg	increacing	
WS4	2	1.50		D	Brown silty CLAY			15.0	100	32 -1pt	18	14		80g/30deg	increacing	

All tests performed in accordance with BS EN ISO 17892 unless specified otherwise

Key

Density test — Liquid Limit — Particle density

Linear measurement unless : — 4pt cone unless : — sp - small pyknometer

wd - water displacement — cas - Casagrande method — gj - gas jar

wi - immersion in water — 1pt - single point test

Date Printed: 16/07/2021

Approved By: Harry

Table 1

sheet 1

Linear Shrinkage - Summary of Results

Project No.	Project Name
C1772/21/E/2766	Gomersal Hall

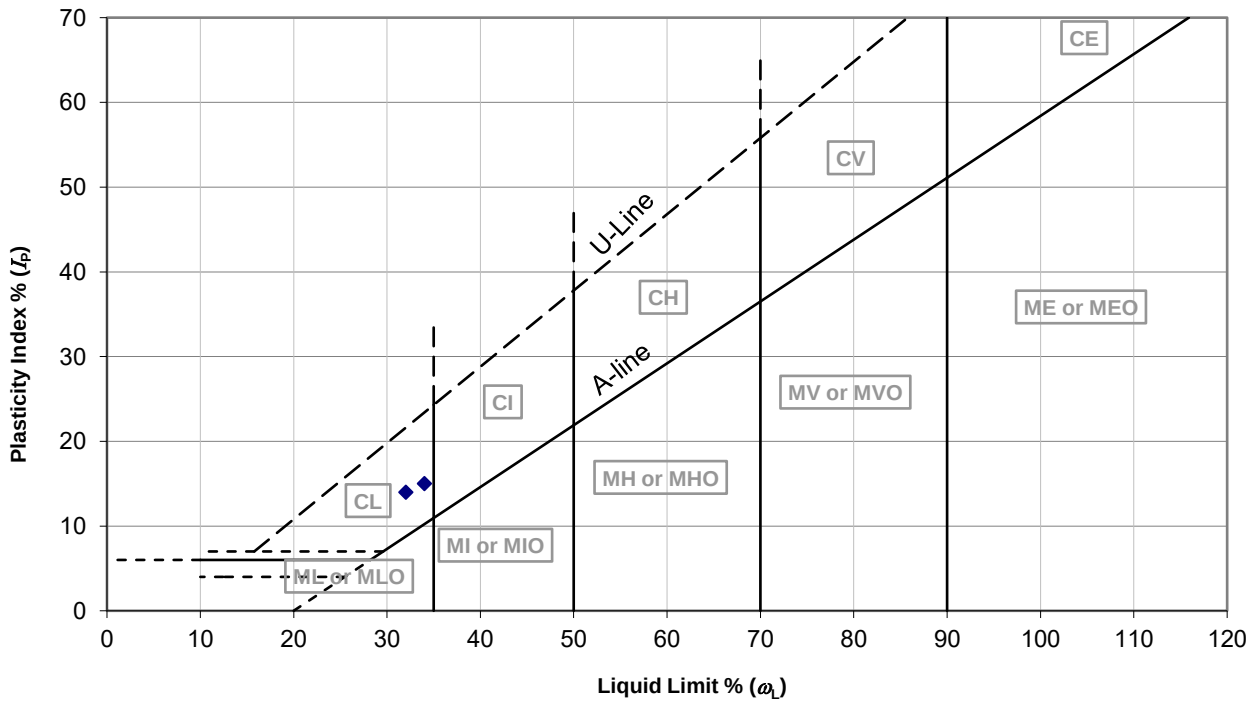
Hole No.	Sample				Soil Description	Material <425µm %	Preparation	Linear Shrinkage %	Date Tested
	Ref	Top	Base	Type					
WS1	2	1.80		D	Brown silty CLAY	100	Specimen prepared from natural material	6	02/07/2021
WS4	2	1.50		D	Brown thinly laminated silty CLAY	100	Specimen prepared from natural material	6	02/07/2021

Remarks:

Notes	Date Printed	Approved By	Table
Tests performed in accordance with BS 1377 : Part 2 : 1990, clause 6.5 unless annotated otherwise	16/07/2021	Harry	2
			Sheet 1

Rogers Geotechnical Services Ltd. Offices 1&2, Barncliffe Business Park, Near Bank, Shelley, Huddersfield, HD8 8LU	**Classification of Index Properties**	**C1772/21/E/2766**	
Project Name: Gomersal Hall	**BS EN ISO: 17892: Parts 1, 12**	Fig. 3	Sheet. 1
Location:		Input By:	Harry
Client: Martin Walsh Architectural Ltd		Check By:	Harry

Location	Depth (m)	Moisture Content (w) (%)	Liquid Limit (wL) (%)	Plastic Limit (wP) (%)	Plasticity Index (IP) (%)	Retained by 0.425mm (%)	Modified (w) (w') (%)	Modified (IP) (IP') (%)	Liquidity/ Consistency (IL) (%)	Liquidity/ Consistency (IC) (%)	Casagrande Class	N.H.B.C Class (%)
WS1	1.80	16.4	34	19	15	0	16	15	-0.2	1.2	C L	LOW
WS4	1.50	15.1	32	18	14	0	15	14	-0.2	1.2	C L	LOW



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Company No: 5130864

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ENVIRONMENTAL LAB RESULTS

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Rogers Geotechnical Services Ltd
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Telephone 01484 607977
Company No: 5130864

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-23768-1		
Initial Date of Issue:	15-Jul-2021		
Client	Rogers Geotechnical Services Ltd		
Client Address:	Offices 1&2, Barncliffe Business Park Near Bank Shelley Huddersfield West Yorkshire HD8 8LU		
Contact(s):	Harry Letch		
Project	Gomersal Hall		
Quotation No.:	Q20-21658	**Date Received:**	12-Jul-2021
Order No.:		**Date Instructed:**	12-Jul-2021
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	16-Jul-2021
Date Approved:	15-Jul-2021		
Approved By:			
Details:	Glynn Harvey, Technical Manager		

Results - Soil

Project: Gomersal Hall

Client: Rogers Geotechnical Services Ltd			**Chemtest Job No.:**		21-23768
Quotation No.: Q20-21658			**Chemtest Sample ID.:**		1238263
Order No.:			Client Sample Ref.:		1
			Client Sample ID.:		D1
			Sample Type:		SOIL
			Top Depth (m):		4.8
			Date Sampled:		08-Jul-2021
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
pH	M	2010		4.0	8.2
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010
Moisture	N	2030	%	0.020	13
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	Stones
Soil Texture	N	2040		N/A	Clay

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

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

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

End of Report

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Rogers Geotechnical Services Ltd
Office 1 & 2 Barncliffe Business Park,
Near Bank, Shelley, Huddersfield, HD8 8LU

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Company No: 5130864

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t: 01484 604354

e: harry.letch@rogersgeotech.co.uk

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

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

Analytical Report Number : 23-35146

Project / Site name:	Gomersal Hall, Gomersal	**Samples received on:**	22/05/2023
Your job number:	C1772 22 E 4286	**Samples instructed on/ Analysis started on:**	22/05/2023
Your order number:	PO-2614	**Analysis completed by:**	30/05/2023
Report Issue Number:	1	**Report issued on:**	30/05/2023
Samples Analysed:	3 soil samples		

Signed:

Anna Goc
Junior Reporting Specialist
For & on behalf of i2 Analytical Ltd.

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

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

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

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

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

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-35146
Project / Site name: Gomersal Hall, Gomersal
Your Order No: PO-2614

Lab Sample Number				2687486	2687487	2687488
Sample Reference				WSA	WSB	WSC
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.60	0.50	0.65
Date Sampled				18/05/2023	18/05/2023	18/05/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	< 0.1	< 0.1	21
Moisture Content	%	0.01	NONE	13	13	7.7
Total mass of sample received	kg	0.001	NONE	0.5	0.5	0.5
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	KWB	KWB	KWB

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.1	6.7	7.6
Free Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Total Sulphate as SO4	%	0.005	MCERTS	0.016	0.021	0.01
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	9.2	14	30
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.0046	0.0068	0.015
Organic Matter (automated)	%	0.1	MCERTS	0.6	0.8	0.1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluorene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Anthracene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Fluoranthene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Pyrene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(a)anthracene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Chrysene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(a)pyrene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	NONE	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	NONE	< 0.80	< 0.80	< 0.80

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	7.6	9.4	4.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Copper (aqua regia extractable)	mg/kg	1	MCERTS	17	16	11
Lead (aqua regia extractable)	mg/kg	1	MCERTS	12	16	8
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27	29	22
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	24	31	17
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	86	82	45

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The results included within the report relate only to the sample(s) submitted for testing.

Analytical Report Number: 23-35146
Project / Site name: Gomersal Hall, Gomersal
Your Order No: PO-2614

Lab Sample Number				2687486	2687487	2687488
Sample Reference				WSA	WSB	WSC
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.60	0.50	0.65
Date Sampled				18/05/2023	18/05/2023	18/05/2023
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Monoaromatics & Oxygenates						
Benzene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
p & m-xylene	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
o-xylene##	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	NONE	< 5.0	< 5.0	< 5.0
Petroleum Hydrocarbons						
TPH-CWG - Aliphatic >EC5 - EC6 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10 $_{HS\_1D\_AL}$	mg/kg	0.001	NONE	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12 $_{EH\_CU\_1D\_AL}$	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16 $_{EH\_CU\_1D\_AL}$	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35 $_{EH\_CU\_1D\_AL}$	mg/kg	8	NONE	< 8.0	18	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AL}$	mg/kg	10	NONE	< 10	20	< 10
TPH-CWG - Aromatic >EC5 - EC7 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10 $_{HS\_1D\_AR}$	mg/kg	0.001	NONE	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12 $_{EH\_CU\_1D\_AR}$	mg/kg	1	NONE	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16 $_{EH\_CU\_1D\_AR}$	mg/kg	2	NONE	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic >EC21 - EC35 $_{EH\_CU\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35) $_{EH\_CU+HS\_1D\_AR}$	mg/kg	10	NONE	< 10	< 10	< 10

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

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

Analytical Report Number : 23-35146
Project / Site name: Gomersal Hall, Gomersal

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
2687486	WSA	None Supplied	0.6	Brown clay and sand with gravel.
2687487	WSB	None Supplied	0.5	Brown clay and sand with gravel.
2687488	WSC	None Supplied	0.65	Brown sand with stones.

Analytical Report Number : 23-35146
Project / Site name: Gomersal Hall, Gomersal

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS. Individual components MCERTS accredited	In-house method based on USEPA8260	L073B-PL	W	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS

Analytical Report Number : 23-35146
Project / Site name: Gomersal Hall, Gomersal

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS

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

Information in Support of Analytical Results

List of HWOL Acronyms and Operators

Acronym	Descriptions
HS	Headspace Analysis
MS	Mass spectrometry
FID	Flame Ionisation Detector
GC	Gas Chromatography
EH	Extractable Hydrocarbons (i.e. everything extracted by the solvent(s))
CU	Clean-up - e.g. by Florisil®, silica gel
1D	GC - Single coil/column gas chromatography
2D	GC-GC - Double coil/column gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics
AR	Aromatics
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
_	Operator - understore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total

- Quality control parameter has a high recovery (outside of limit); however the associated result is below the reporting limit, other checks applied prior to reporting the data have been accepted. The result should be considered as being deviating and may be compromised.

Sample Deviation Report

Analytical Report Number : 23-35146

Project / Site name: Gomersal Hall, Gomersal

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis.Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
WSA	None Supplied	S	2687486	b	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	b
WSA	None Supplied	S	2687486	b	TPHCWG (Soil)	L088/76-PL	b
WSB	None Supplied	S	2687487	b	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	b
WSB	None Supplied	S	2687487	b	TPHCWG (Soil)	L088/76-PL	b
WSC	None Supplied	S	2687488	b	BTEX and MTBE in soil (Monoaromatics)	L073B-PL	b
WSC	None Supplied	S	2687488	b	TPHCWG (Soil)	L088/76-PL	b

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet

Job Number	C1772/21//E/4286
Job Name	Gomersal Hall, Gomersal

A = WS Atkins PLC, Atrisk Soil Screening Values.
A+ = Values updated June 2017.
A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound.
B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report.
C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter.
D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.

KEY
- Exceeds SSV
- Exceeds 2017, Below 2015
- Below limit of detection (LOD)

Date	23/06/23
Client	Martin Walsh Architectural Ltd

Determinand	Units	Ref	LOD	Residential With Plant Uptake 1%		Sample Location	WSA	WSB	WSC								
				Atrisk 2015 (No Free Product	Atrisk 2017	Depth Top	0.60	0.50	0.65								
						Depth Base											
Cadmium	mg/kg	C	0.2		22.1		< 0.2	< 0.2	< 0.2								
Chromium (Hexavalent)	mg/kg	B/C	1.8	20.5	3.62		< 1.8	< 1.8	< 1.8								
Copper	mg/kg	A+	1.0		4730		17	16	11								
Mercury	mg/kg	A/D	0.3		8.81		< 0.3	< 0.3	< 0.3								
Nickel	mg/kg	A+	1.0		136		27	29	22								
Lead	mg/kg	C	1.0		200		12	16	8								
Zinc	mg/kg	A+	1.0		20000		86	82	45								
Vanadium	mg/kg	A+	1.0		136		24	31	17								
Arsenic	mg/kg	C	1.0		37		7.6	9.4	4.9								
Selenium	mg/kg	A	1.0		375		< 1.0	< 1.0	< 1.0								
Cyanide (Free)	mg/kg	A	1.0		34		< 1.0	< 1.0	< 1.0								
Total Phenols	mg/kg	A	1.0		267		< 1.0	< 1.0	< 1.0								
Naphthalene	mg/kg	A+	0.05	5	0.829		< 0.05	< 0.05	< 0.05								
Acenaphthylene	mg/kg		0.05				< 0.05	< 0.05	< 0.05								
Acenaphthene	mg/kg	A+	0.05	608	157		< 0.05	< 0.05	< 0.05								
Fluorene	mg/kg	A+	0.05	9	735		< 0.05	< 0.05	< 0.05								
Phenanthrene	mg/kg		0.05				< 0.05	< 0.05	< 0.05								
Anthracene	mg/kg	A+	0.05	9	10200		< 0.05	< 0.05	< 0.05								
Fluoranthene	mg/kg	A+	0.05		983		< 0.05	< 0.05	< 0.05								
Pyrene	mg/kg	A+	0.05		668		< 0.05	< 0.05	< 0.05								
Benzo[a]anthracene	mg/kg	A	0.05	4.52	1.71		< 0.05	< 0.05	< 0.05								
Chrysene	mg/kg	A	0.05	585	0.44		< 0.05	< 0.05	< 0.05								
Benzo[b]fluoranthene	mg/kg	A	0.05	7.72	1.22		< 0.05	< 0.05	< 0.05								
Benzo[k]fluoranthene	mg/kg	A	0.05	84.4	0.686		< 0.05	< 0.05	< 0.05								
Benzo[a]pyrene	mg/kg	B/C	0.05	4.95	1.51		< 0.05	< 0.05	< 0.05								
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.05	7.31	0.0614		< 0.05	< 0.05	< 0.05								
Dibenz(a,h)Anthracene	mg/kg	A	0.05	0.838	0.00393		< 0.05	< 0.05	< 0.05								
Benzo[g,h,i]perylene	mg/kg	A	0.05	96.2	0.0187		< 0.05	< 0.05	< 0.05								
Total Of 16 PAH's	mg/kg		0.8				< 0.80	< 0.80	< 0.80								
Aliphatic TPH >C5-C6	mg/kg	A+	0.001	0	42.7		< 0.001	< 0.001	< 0.001								
Aliphatic TPH >C6-C8	mg/kg	A+	0.001	0	99.3		< 0.001	< 0.001	< 0.001								
Aliphatic TPH >C8-C10	mg/kg	A+	0.001	0	13.9		< 0.001	< 0.001	< 0.001								
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	81.7	49.9		< 1.0	< 1.0	< 1.0								
Aliphatic TPH >C12-C16	mg/kg	A+	2.0	385	20.9		< 2.0	< 2.0	< 2.0								
Aliphatic TPH >C16-C21	mg/kg	A+	8.0		210000		< 8.0	< 8.0	< 8.0								
Aliphatic TPH >C21-C35	mg/kg	A+	8.0		210000		< 8.0	18	< 8.0								
Aliphatic TPH >C35-C44	mg/kg		10.0														
Total Aliphatic Hydrocarbons	mg/kg		10.0														
Aromatic TPH >C5-C7	mg/kg	A+	0.001		0.137		< 0.001	< 0.001	< 0.001								
Aromatic TPH >C7-C8	mg/kg	A+	0.001	0	113		< 0.001	< 0.001	< 0.001								
Aromatic TPH >C8-C10	mg/kg	A+	0.001	0	20.5		< 0.001	< 0.001	< 0.001								
Aromatic TPH >C10-C12	mg/kg	A+	1.0	0	70		< 1.0	< 1.0	< 1.0								

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd: Soil Screening Value (SSV) Comparison Sheet

Job Number	C1772/21//E/4286
Job Name	Gomersal Hall, Gomersal

A = WS Atkins PLC, Atrisk Soil Screening Values.
A+ = Values updated June 2017.
A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound.
B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report.
C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter.
D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.

KEY

- Exceeds SSV
- Exceeds 2017, Below 2015
- Below limit of detection (LOD)

Date	23/06/23			**Sample Location**		WSA	WSB	WSC							
Client	Martin Walsh Architectural Ltd			Depth Top		0.60	0.50	0.65							
				Depth Base											
Determinand	**Units**	**Ref**	**LOD**	**Residential With Plant Uptake 1%**											
Aromatic TPH >C12-C16	mg/kg	A+	2.0	165	155	< 2.0	< 2.0	< 2.0							
Aromatic TPH >C16-C21	mg/kg	A+	10.0		319	< 10	< 10	< 10							
Aromatic TPH >C21-C35	mg/kg	A+	10.0		1120	< 10	< 10	< 10							
Aromatic TPH >C35-C44	mg/kg		10.0												
Total Aromatic Hydrocarbons	mg/kg		10.0												
Total Petroleum Hydrocarbons	mg/kg		10.0												
pH			N/A			7.1	**6.7**	**7.6**							
Sulphate (2:1 Water Soluble) as SO4	g/l		0.0013			**0.0046**	0.0068	**0.015**							
ACM Type			N/A			-	-	-							
Asbestos Identification	%					None	None	None							
ACM Detection Stage			N/A			-	-	-							
Moisture	%		0.01			13	13	7.7							
Soil Colour			N/A												
Other Material			N/A												
Soil Texture			N/A												
Sulphate (Total)	%		0.005			0.016	0.021	0.01							
Organic Matter	%		0.1			0.6	**0.8**	**0.1**							

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet						
Job Number	C1772/21/E/2766			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.						
Job Name	Gomersal Hall, Oxford Road, Gomersal			**KEY** Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)						
Date	02.08.2021			**Sample Location**	WS1	WS2	WS3	WS4		
Client	Martin Walsh Architectural			Depth Top	0.8	0.5	0.5	0.6		
				Depth Base						
Determinand	**Units**	**Ref**	**LOD**	**Residential With Plant Uptake 1%**						
				Atrisk 2015 (No Free Product	Atrisk 2017					
Cadmium	mg/kg	C	0.10		22.1	0.13	0.18	0.22	0.23	
Chromium (Hexavalent)	mg/kg	B/C	0.5	20.5	3.62	< 0.50	< 0.50	< 0.50	< 0.50	
Copper	mg/kg	A+	0.50		4730	44	36	25	22	
Mercury	mg/kg	A/D	0.10		8.81	< 0.10	< 0.10	< 0.10	< 0.10	
Nickel	mg/kg	A+	0.50		136	30	43	35	46	
Lead	mg/kg	C	0.50		200	20	29	17	14	
Zinc	mg/kg	A+	0.50		20000	70	99	110	110	
Vanadium	mg/kg	A+	5.0		136	24	33	25	31	
Arsenic	mg/kg	C	1.0		37	17	13	9.6	15	
Selenium	mg/kg	A	0.20		375	0.31	0.42	0.28	0.32	
Cyanide (Free)	mg/kg	A	0.50		34	< 0.50	< 0.50	< 0.50	< 0.50	
Total Phenols	mg/kg	A	0.30		267	< 0.10	< 0.10	< 0.10	< 0.10	
Naphthalene	mg/kg	A+	0.10	0	0.829	< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthylene	mg/kg		0.10			< 0.10	< 0.10	< 0.10	< 0.10	
Acenaphthene	mg/kg	A+	0.10	608	157	< 0.10	< 0.10	< 0.10	< 0.10	
Fluorene	mg/kg	A+	0.10	0	735	< 0.10	< 0.10	< 0.10	< 0.10	
Phenanthrene	mg/kg		0.10			< 0.10	< 0.10	< 0.10	< 0.10	
Anthracene	mg/kg	A+	0.10	0	10200	< 0.10	< 0.10	< 0.10	< 0.10	
Fluoranthene	mg/kg	A+	0.10		983	< 0.10	< 0.10	< 0.10	< 0.10	
Pyrene	mg/kg	A+	0.10		668	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[a]anthracene	mg/kg	A	0.10	4.52	1.71	< 0.10	< 0.10	< 0.10	< 0.10	
Chrysene	mg/kg	A	0.10	585	0.44	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[b]fluoranthene	mg/kg	A	0.10	7.72	1.22	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[k]fluoranthene	mg/kg	A	0.10	84.4	0.686	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[a]pyrene	mg/kg	B/C	0.10	4.95	1.51	< 0.10	< 0.10	< 0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.10	7.31	0.0614	< 0.10	< 0.10	< 0.10	< 0.10	
Dibenz(a,h)Anthracene	mg/kg	A	0.10	0.838	0.00393	< 0.10	< 0.10	< 0.10	< 0.10	
Benzo[g,h,i]perylene	mg/kg	A	0.10	96.2	0.0187	< 0.10	< 0.10	< 0.10	< 0.10	
Total Of 16 PAH's	mg/kg		2.0			< 2.0	< 2.0	< 2.0	< 2.0	
Aliphatic TPH >C5-C6	mg/kg	A+	1.0	0	42.7	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C6-C8	mg/kg	A+	1.0	0	99.3	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C8-C10	mg/kg	A+	1.0	0	13.9	< 1.0	< 1.0	< 1.0	< 1.0	
Aliphatic TPH >C10-C12	mg/kg	A+	1.0	81.7	49.9	< 1.0	< 1.0	< 1.0	< 1.0	

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

The Ground Investigation Specialists

Rogers Geotechnical Services Ltd				Soil Screening Value (SSV) Comparison Sheet							
Job Number	C1772/21/E/2766			A = WS Atkins PLC, Atrisk Soil Screening Values. A+ = Values updated June 2017. A* = Atrisk's SSV is lower than Chemtest's detectable limit for this compound. B = health criterion values, which are available from toxicological reviews published in the C4SL project methodology report. C = Category 4 Screening Levels (C4SLs) based on 6% soil organic matter. D = Value provided is based on Methyl Mercury. Should elemental mercury be observed or a source be known then a limit of 102 should be used.							KEY Exceeds SSV Exceeds 2017, Below 2015 Below limit of detection (LOD)
Job Name	Gomersal Hall, Oxford Road, Gomersal										
Date	02.08.2021			**Sample Location**		WS1	WS2	WS3	WS4		
Client	Martin Walsh Architectural			Depth Top		0.8	0.5	0.5	0.6		
				Depth Base							
Determinand	**Units**	**Ref**	**LOD**	**Residential With Plant Uptake 1%**							
Aliphatic TPH >C12-C16	mg/kg	A+	1.0	385	20.9	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C16-C21	mg/kg	A+	1.0		210000	< 1.0	< 1.0	< 1.0	< 1.0		
Aliphatic TPH >C21-C35	mg/kg	A+	1.0		210000	< 1.0	16	< 1.0	< 1.0		
Aliphatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0	< 1.0		
Total Aliphatic Hydrocarbons	mg/kg		5.0			< 5.0	16	< 5.0	< 5.0		
Aromatic TPH >C5-C7	mg/kg	A+	1.0		0.137	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C7-C8	mg/kg	A+	1.0		113	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C8-C10	mg/kg	A+	1.0		20.5	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C10-C12	mg/kg	A+	1.0		70	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C12-C16	mg/kg	A+	1.0	165	155	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C16-C21	mg/kg	A+	1.0		319	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C21-C35	mg/kg	A+	1.0		1120	< 1.0	< 1.0	< 1.0	< 1.0		
Aromatic TPH >C35-C44	mg/kg		1.0			< 1.0	< 1.0	< 1.0	< 1.0		
Total Aromatic Hydrocarbons	mg/kg		5.0			< 5.0	< 5.0	< 5.0	< 5.0		
Total Petroleum Hydrocarbons	mg/kg		10.0			< 10	16	< 10	< 10		
pH			N/A			**8.7**	**7.2**	7.6	8.0		
Sulphate (2:1 Water Soluble) as SO4	g/l		0.010			< 0.010	< 0.010	< 0.010	< 0.010		
ACM Type			N/A			-	-	-	-		
Asbestos Identification	%		0.001			No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		
ACM Detection Stage			N/A								
Moisture	%		0.020			11	13	13	14		
Soil Colour			N/A			Brown	Brown	Brown	Brown		
Other Material			N/A			Stones	Stones	Stones	Stones		
Soil Texture			N/A			Sand	Sand	Sand	Sand		
Sulphate (Total)	%		0.010			0.068	0.035	0.028	0.013		
Organic Matter	%		0.40			0.69	1.2	0.64	0.43		

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd				KEY			
Job Number	C1772/21/E/2766			Exceeds SSV			
Job Name	Gomersal Hall, Oxford Road, Gomersal			Exceeds 2017, Below 2015			
				Below limit of detection (LOD)			
Date	02.08.2021						
Client	Martin Walsh Architectural						
Determinand	**Units**	**Ref**	**LOD**				
Cadmium	mg/kg	C	0.10				
Chromium (Hexavalent)	mg/kg	B/C	0.5				
Copper	mg/kg	A+	0.50				
Mercury	mg/kg	A/D	0.10				
Nickel	mg/kg	A+	0.50				
Lead	mg/kg	C	0.50				
Zinc	mg/kg	A+	0.50				
Vanadium	mg/kg	A+	5.0				
Arsenic	mg/kg	C	1.0				
Selenium	mg/kg	A	0.20				
Cyanide (Free)	mg/kg	A	0.50				
Total Phenols	mg/kg	A	0.30				
Naphthalene	mg/kg	A+	0.10				
Acenaphthylene	mg/kg		0.10				
Acenaphthene	mg/kg	A+	0.10				
Fluorene	mg/kg	A+	0.10				
Phenanthrene	mg/kg		0.10				
Anthracene	mg/kg	A+	0.10				
Fluoranthene	mg/kg	A+	0.10				
Pyrene	mg/kg	A+	0.10				
Benzo[a]anthracene	mg/kg	A	0.10				
Chrysene	mg/kg	A	0.10				
Benzo[b]fluoranthene	mg/kg	A	0.10				
Benzo[k]fluoranthene	mg/kg	A	0.10				
Benzo[a]pyrene	mg/kg	B/C	0.10				
Indeno(1,2,3-c,d)Pyrene	mg/kg	A*	0.10				
Dibenz(a,h)Anthracene	mg/kg	A	0.10				
Benzo[g,h,i]perylene	mg/kg	A	0.10				
Total Of 16 PAH's	mg/kg		2.0				
Aliphatic TPH >C5-C6	mg/kg	A+	1.0				
Aliphatic TPH >C6-C8	mg/kg	A+	1.0				
Aliphatic TPH >C8-C10	mg/kg	A+	1.0				
Aliphatic TPH >C10-C12	mg/kg	A+	1.0				

Rogers Geotechnical Services Ltd.

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

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

A+ = Values update June 2017.

A* Atrisk's SSV is lower than Chemtest's detectable limit for this compound.

B = Health Criterion Values (available from toxicological reviews published in the C4SL project methodology report).

C = Catergory 4 Screening Levels (C4SLs).

D = SSV provided is for Methyl Mercury.

Rogers Geotechnical Services: Soil Screening Values Comparison Sheet

Rogers Geotechnical Services Ltd							
Job Number	C1772/21/E/2766						
Job Name	Gomersal Hall, Oxford Road, Gomersal						
Date	02.08.2021						
Client	Martin Walsh Architectural						

KEY

Exceeds SSV

Exceeds 2017, Below 2015

Below limit of detection (LOD)

Determinand	Units	Ref	LOD				
Aliphatic TPH >C12-C16	mg/kg	A+	1.0				
Aliphatic TPH >C16-C21	mg/kg	A+	1.0				
Aliphatic TPH >C21-C35	mg/kg	A+	1.0				
Aliphatic TPH >C35-C44	mg/kg		1.0				
Total Aliphatic Hydrocarbons	mg/kg		5.0				
Aromatic TPH >C5-C7	mg/kg	A+	1.0				
Aromatic TPH >C7-C8	mg/kg	A+	1.0				
Aromatic TPH >C8-C10	mg/kg	A+	1.0				
Aromatic TPH >C10-C12	mg/kg	A+	1.0				
Aromatic TPH >C12-C16	mg/kg	A+	1.0				
Aromatic TPH >C16-C21	mg/kg	A+	1.0				
Aromatic TPH >C21-C35	mg/kg	A+	1.0				
Aromatic TPH >C35-C44	mg/kg		1.0				
Total Aromatic Hydrocarbons	mg/kg		5.0				
Total Petroleum Hydrocarbons	mg/kg		10.0				
pH			N/A				
Sulphate (2:1 Water Soluble) as SO4	g/l		0.010				
ACM Type			N/A				
Asbestos Identification	%		0.001				
ACM Detection Stage			N/A				
Moisture	%		0.020				
Soil Colour			N/A				
Other Material			N/A				
Soil Texture			N/A				
Sulphate (Total)	%		0.010				
Organic Matter	%		0.40				

Appendix 10

Fill Screening Values