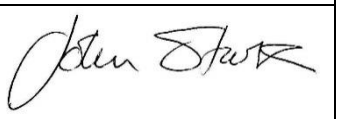
BODLONDEB FORMER RESIDENTIAL CARE HOME, ABERYSTWYTH

PHASE II: GROUND INVESTIGATION INTERPRETATIVE REPORT

Report No. Q1149/IR August 2023

DOCUMENT CONTROL

Contract Name:	**Bodlondeb Former Residential Care Home, Aberystwyth**
Contract Reference:	**Q1149**
Report Type:	**Ground Investigation Interpretative Report**
Report Reference:	**Q1149/IR**
Date of Report Production:	**August 2023**
Client:	**West Wales Housing**

Version:	Date:	Prepared by:	Checked by:	Approved by:
1st Issue	17/08/23	C. Bowrey	P. Darby	J. Stark
				
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APPENDICES

0.0. FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

0.1. General

Recommendations made and opinions expressed in the report are based on the strata observed in the excavations, together with the results of site and laboratory tests. No responsibility can be held for conditions which have not been revealed by the Exploratory Holes or which occur between Exploratory Holes. Whilst the report may suggest the likely configuration of strata, both between Exploratory Holes and below the maximum depth of investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

0.2. Investigation Procedures

Trial Pitting and Windowless Sample Borehole techniques for Ground Investigation have been employed within the project. All Exploratory Hole operations, sampling and logging of soils, rocks and in-situ testing complies with the recommendations of the British Code of Practice BS 5930:2015 + A1:2020, 'Site Investigations', British Code of Practice BS 10175: 2011 + A1:2013, 'Investigation of Potentially Contaminated Sites' and BS 1377: 1990, 'Methods of Test for Soils for Engineering Purposes'.

0.3. Routine Sampling

Representative bulk, undisturbed, disturbed and environmental samples of the different strata are taken following completion of logging. These samples are sealed and labelled in clear plastic bags and 2kg plastic tubs. Soil samples obtained for environmental testing are sampled and sealed in borosilicate amber jars or in specialist vessels where required. All samples are returned from site to QGL's laboratory for controlled storage within 24 hours of sampling to await test scheduling /requirements.

0.4. In-Situ Testing

In-situ testing comprised:

- Soakaway (BRE365) Tests
- Standard Penetration Tests (SPT)

0.5. Groundwater

Where possible, the depth of entry of any influx of groundwater is recorded during excavation or boring operations. The rate of inflow into the excavation or borehole is monitored during the excavation or during boring procedures. Upon encountering any water strikes, work is temporarily halted, and the water levels monitored for a standard twenty minute period recording the change in water level at the end of the twenty minutes.

Groundwater conditions observed in the excavations are those appertaining to the period of investigation. It should be noted, however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions or other causes.

0.6. Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded. Further to notifying the Engineer/ Client with one week's notice all soil and/or rock samples will be discarded 28 days after submission of the approved final report.

1.0 INTRODUCTION

1.1 General

Upon the instructions of West Wales Housing (Client), Quantum Geotechnic Ltd (QGL) has been commissioned to undertake a Phase II Intrusive Ground Investigation for a proposed new residential development at the former Bonlondeb Residential Care Home, Penparcau, Aberystwyth.

The proposed residential development for site will consist of 18 No. new dwellings, a further 4 No. dwellings are already present in the east of the site, these will be refurbished and exist as they are post-development.

In this interpretative report, a factual account of the fieldwork, the strata encountered including contamination and groundwater observations are detailed. Guidance and recommendations on geotechnical matters and contamination issues are provided along with details on any remedial or mitigative measures deemed necessary.

1.2 Purpose of Ground Investigation

The investigation was intended to allow a site-specific geotechnical and geo-environmental assessment of existing ground conditions, to aid with the foundation, road, drainage design, and contaminant risk assessment for the proposed development. The proposed investigation included a series of windowless sample boreholes and trial pits across the site with in-situ density testing and soakaway testing to assess the ground and obtain soil and groundwater (where encountered) samples for geotechnical and geo-environmental lab analysis.

1.3 Previous Studies

The site has previously been subject to a Phase I Assessment for Land Quality/Desk Study by QGL in June 2023 (Report Ref: Q1149/PRA), which should be read in conjunction with this report. The Conclusions of the Desk Study are reiterated below for ease of reference:

Geotechnical Summary:

- The potential exists for Made Ground to be present on-site.
- The soils mapped on the site are Head Deposits (Gravel, Sand, Silt, Clay) and Glaciofluvial Contact Deposits (Gravel and Sand).
- The bedrock is the Aberystwyth Grits Group (sandstone with subsidiary mudstone). The depth to bedrock is not detailed in the GroundSure report searches, with a lack of BGS borehole data locally.
- The site has at negligible and very low risk from geological hazards shrink-swell clays, collapsible deposits, ground dissolution, running sands, compressible ground. With no record of such geo-hazards on/near site.
- The risk presented by landslides is low on site, which means slope stability may need to be considered in a site investigation.

- The site is not underlain by coal bearing strata.
- The site is within the Berwyn Hills area that has a legacy of deep mine excavations for vein material. Despite this, the probability of difficult ground conditions presented from this activity is considered unlikely.

Environmental Issues:

- A potentially harmful source of contamination has been identified on site from the possible emplacement of Made Ground during the construction of the care home on site.
- Another potential source of contamination is associated with the care homes carparks. Oil spills and the runoff from these surfaces means it is possible the soils beneath and adjacent are contaminated.
- Off-site sources of contamination are not thought to constitute a risk worth consideration currently. The few recorded minor pollution incidents/industrial land uses, their distance, and locations likely to be down or not on hydraulic gradient with the site means the associated risk is considered low.
- Ground gas emissions from potential Made Ground could be a risk to future site end users.
- The GroundSure® Enviro+Geo Insight® report states that basic Radon protective measures are not necessary.
- The permeability of the superficial deposits is reported to range from very low to very high.
- The sandstone with subsidiary mudstone bedrock is classified as being of a medium permeability.
- The site has a high vulnerability to a pollutant reaching groundwater.
- One major controlled water, the Afon Rheidol, lies some 190m northeast of the site.
- The Enviro+Geo Insight® report indicates a negligible risk of all types of flooding for the site.
- The site is within the designated UNESCO Dyfi Biosphere.

Evaluation and Recommendations

Several potential geotechnical and environmental issues have been identified within this study. The following evaluations and subsequent recommendations are made:

- The desk study has identified the probability of Made Ground to be present on-site which is a potential source of land contamination that may pose a risk to future site users. It is considered that a targeted investigation to establish the potential for Made Ground to be present on site to gain understanding of its extent and composition.

- For the purposes of development on site, it is recommended a Phase 2 ground investigation is undertaken. The investigation should identify the shallow soils as to their suitability for founding for the proposed development and for contaminated soils, groundwater and ground gases. The ground investigation should include in-situ tests, soil sampling, and subsequent laboratory testing in order to gather the geotechnical and geo-environmental data required for design recommendations and environmental assessments to be made.

- The contamination testing should include a baseline screening that includes a general range of determinants. The potential contaminants that could be tested for includes (but is not limited to): TPH, PAH, BTEX, Phenols, Heavy Metals, General Inorganic Compounds, and Asbestos.

- Owing to the potential for Made Ground, a ground gas risk assessment should be undertaken for the site.

- The laboratory test results, and in-situ test results should then inform an Interpretative Report detailing the site findings, recommendations of foundation design, infrastructure and other geotechnical issues that may have come to light; incorporating a quantitative assessment of human health and

environmental risk, as well as a ground gas risk assessment should also be undertaken. Remedial options should be presented.

- The site has a high vulnerability to pollutants reaching controlled groundwaters. Precaution should be taken to avoid spills by using appropriate chemical storage, implementing strict decanting procedure, and spill kits, impermeable sheets, bunds and trays when machinery/plant is present on site.

1.4 Information on previous site uses

The following section is an extract from the PRA Desk Study that summarises the site's and the immediate surrounding land's former uses:

Map Edition/Date	Observations
1886/1888-1889	The earliest OS mapping of the site shows it being constituted by two fields and a National School built in 1846 occupying the eastern end of site (it has since been converted into four dwellings). Immediately west of the site are the terraced houses and methodist church that comprise the settlement of Pen-Y-Parciau. Parallel to the northern and the eastern boundaries are respectively a path and a road, apart from these the neighboring land to the south, north and east is predominantly fields with occasional trees lining the field boundaries. Further to the north is the southeast to northwest flowing Afon Rheidol, as well as the hamlet of Pen-Y-Bont and a bridge. Further to the east is the hamlet of Tan-Y-Fron, beyond this is heathland. And further to the south are the hamlets of Antaron and Piercefield with associated woodland, further south still is Crugiau Farm and there are two old quarries in the wider area. In the wider area, approximately 700m to the northeast, is the Vale of Rheidol branch of the Great Western Railway (GWR) which is oriented northwest southeast. Beyond this railway is the relatively larger settlement of Llanbadarn-Fawr, comprised of residential buildings with narrow orchard gardens, two churches and a school. Oriented similarly to these to the far southwest (approx. 750-1000m) are the Aberystwyth branch of the GWR and the Afon Ystwyth. Approximately 650-900m to the west is the hill fort of Pen Dinas and a monument to the Duke of Wellington.
1904/1905	The 1904/05 mapping shows no significant change at the site. In the surrounding area, the ribbon developments nearby and some further away have expanded, including Antaron and Piercefield (now collectively known as Southgate) to the south. Within 500m to the northwest a new settlement of residential houses has been built (Caeffynnon). Four springs are now noted to the south and within 500m of the site.
1937-1938	The site itself remains unchanged. Surrounding areas have seen additional housing built, including Antaron to the south, which has also seen two churches built.
1948	By 1948, the site is still unchanged in appearance and in use. The largest development is that an avenue of houses has been built on the eastern side Pen-Parcau.
1962-1963	There is no change to the site and little notable change to the surrounding land use.
1965	The care home that occupies the site today seems to have been built approximately in 1964-1965, with the schoolhouse becoming disused/changed in use by 1965. The suburban area of Southgate has expanded relatively fast in two years, with surrounding land having been turned over to residential housing in all directions. Immediately to the south the park has been defined and at this time is part of a larger playing field. To the southeast, Penparcau Junior County Primary School and Pencarcau Infants School have been built.
1970/1970-1972/1972-1975	No change is shown on site. To the east further housing estates have been constructed. To the south, Southgate has expanded northward towards the site. Two electricity sub-stations are mapped by the 1970s: one is 265m northwest of site; one is 140m west of site.
1983/1986-1988/1988	No change is shown on or immediately near to site. At approximately 500m to the south poultry houses part of Crugiau Farm have appeared. To the southeast a caravan park has appeared 500m away. Farther to south, over 700m away the settlement Rhydyfelin has expanded in size along the road passing through from south to the north. Over 250m to the southwest, several detached/semi-detached houses have been constructed. The Aberystwyth branch of the GWR that was 750m southwest of the site has been dismantled by 1983.

2001/2003	The site remains unchanged. The playing field that once occupied the area to the south, has been developed into the roundabout and arterial roads that stand there today. Only the park is left immediately south of the site. Northeast of the site, approximately 300m away Parc Y Llyn Retail Park has appeared and a new road called Boulevard St Brieuc. Crugiau Farm has been redeveloped into housing in the south.
2010	The site has not visibly changed. The notable changes in the site's surroundings includes open land that was immediately northwest of site has been developed into a semidetached building; the pavilion that was in the southwest corner of the park (immediately south of site) has been replaced by the larger Penparcau Community Centre; and land northwest through (clockwise) to the northeast of the Parc Y Llyn Retail Park has been developed into low density residential housing,
2023	There has been no change on the site. Except for the care home becoming vacant in January 2018. There has been light residential development to the south where Crugiau Farm was once located and 750m directly north where local authority and government buildings have been built adjacent to the railway.

2.0 SITE OVERVIEW

2.1 Site Description

The site lies within the Penparcau area of Aberystwyth and is located 1.65km southeast of Aberystwyth's town centre.

The site is a former residential care home and is occupied with areas of short and high lying vegetation, the former care home building at the centre of the site, an out-building in the west, a short terrace of houses in the east of site oriented north-south and existing asphalt/concrete carpark, roads and pavements.

Internet sources give a site elevation between 25-32maOD, the western, southern and eastern areas of the site are elevated higher than the low area along the north and north-eastern area of the site. The Afon Rheidol flows 190m NE of site. The elevation of the water surface there is approximately 6maOD. Assuming groundwater is continuous from the river level, then it may be estimated that the groundwater level is approximately 19-26mbgl.

The site is bounded to the east by Heol-Y-Bont/A4120, the only access to site is off this road. Fenced off to the north are low rise residential properties. To the south is Penparcau Park which consists of green space and a playground, this is fenced off from the site. To the west of the site is residential housing which is separated from the site by fencing. In general, the site is in a residential suburban area. The approximate eastings and northings of site centre is 259256E 280170N, with a nearby postcode of SY23 1SR. The layout of the proposed development on site is indicated on the site plans presented in Appendix I.
An aerial view of the site from current on-line mapping is presented below with the approximate site boundary highlighted in yellow. The site has not been visited as part of this desk study assessment.

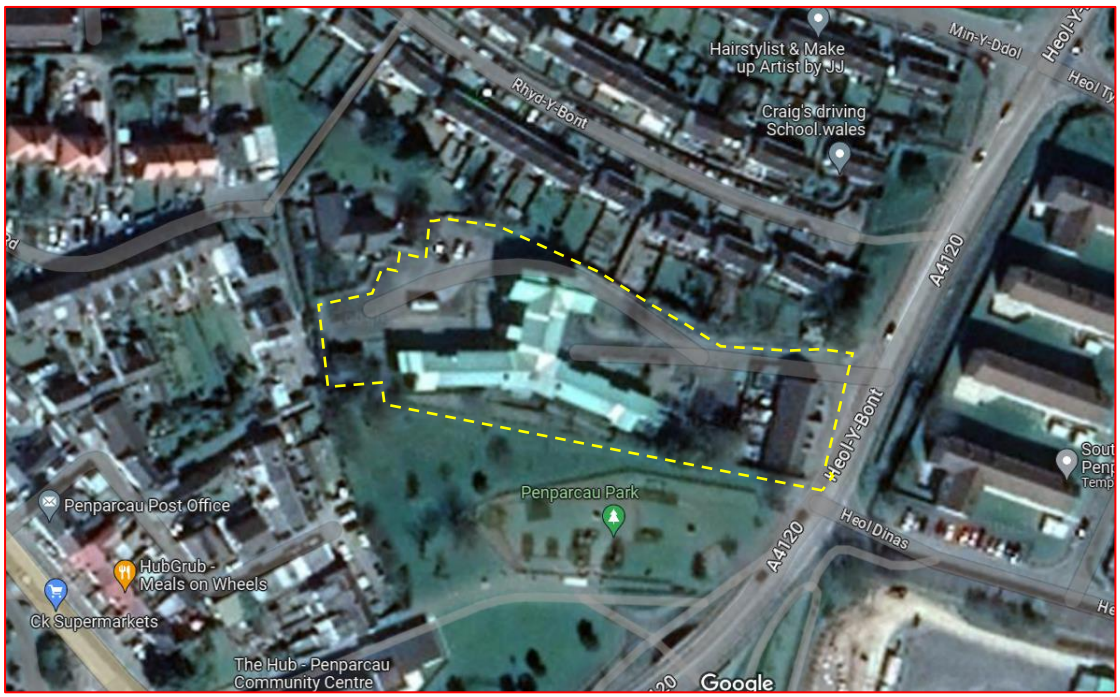


Figure 1: Current Aerial Mapping of the Site © 2023 Google Inc.

2.2 Published Geology

Details of the geology of the site are provided by the two British Geological Survey (BGS) sheets for the *Drift* and *Solid* geology, both with the sheet number 163 and titled 'Aberystwyth' at a 1:50,000 scale. Geological details are also sourced from BGS's online resource *Geology Viewer*.

The BGS *Drift* sheet indicates the site is covered by the granular and/or cohesive soils of Morainic Drift. In contrast, the BGS *Geology Viewer* gives a more detailed superficial setting, with the site (highlighted in yellow) is anticipated to be mantled by two superficial deposit units. This includes the potentially granular and/or cohesive soils of Head Deposits that cover most of the site (>90% site overage). The remaining area of land in the south of the site is an apron of the predominantly granular Glaciofluvial Ice Contact Deposits. Specific thicknesses of these soils are not clearly indicated on the geology sheets, neither on the BGS *Geology Viewer* and also with no previous boreholes recorded in the vicinity of site.

The BGS map sheet for *Solid* geology indicates that the site is underlain by strata of the Aberystwyth Grits Formation, which is the obsolete name for this strata. The BGS *Geology Viewer* corroborates the geological mapping, indicating that the site is underlain by sandstone and mudstone bedrock of the Aberystwyth Grits Group (the new name).

An extract of the BGS *Geology Viewer'* virtual geological map of the superficial cover is presented below. The approximate site boundary is highlighted in yellow.

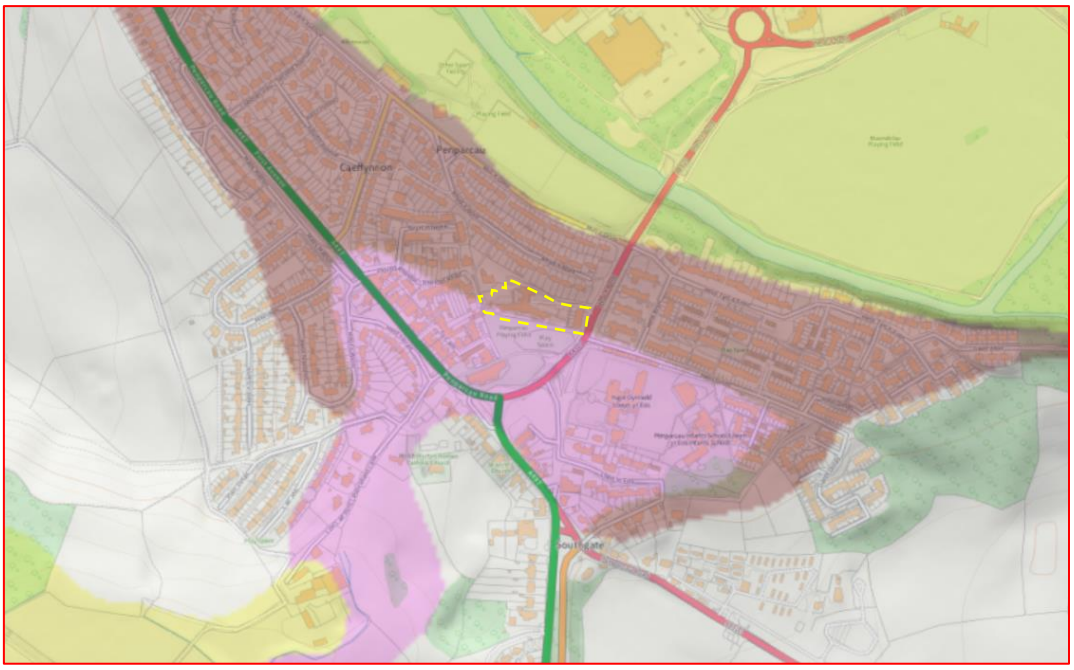


Figure 2: BGS Sheet 249 Newport Extract (1968). © NERC

Legend

- Alluvium – Clay, Silt, Sand and Gravel
- Glaciofluvial Ice Contact Deposits - Sand and Gravel with occasional Silt and Clay
- Head – Clay, Silt, Sand and Gravel

The site does not lie within an area of coal bearing strata.

Made Ground is likely to be present on the site associated with historic re-profiling of the site associated with the construction of the nursing home building, roadways and carparking.

2.3 Radon

The report states that the property is in area that has a likelihood of having a radon level at or above the Action Level in Great Britain between 1% and 3%. This range does not prompt for Radon Protection Measures being required.

2.4 Hydrology & Hydrogeology

Most of the sites superficial cover has been designated as a Secondary Undifferentiated aquifer; this designation corresponds with the area covered by the variable (granular with subsidiary cohesive soils) Head deposits. This designation is assigned where it is not possible to attribute either category A or B to a rock type. In general, these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. In the south of site, the anticipated predominantly granular Glaciofluvial Ice Contact deposits are designated as a Secondary A aquifer.

The Aberystwyth Grits Group bedrock that underlies the whole site and the wider area is also designated a Secondary A aquifer. This designation is defined as permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one-kilometre square grid is presented. Groundwater vulnerability is described as High, Medium or Low as follows:
High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
Medium - Intermediate between high and low vulnerability.
Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

The characterisation of vulnerability to groundwater by a pollutant discharged at ground level for the site area is recorded in the Groundsure report as being of ‘high’ vulnerability. The leaching class is ‘high’, the infiltration valuer is >70%, the dilution value is >550mm/year for the whole site. Specifically, the superficial soil has a ‘high’ vulnerability, with an anticipated thickness of <3m, >90% patchiness value, and a recharge potential that is ‘high’. The bedrock has a ‘medium’ vulnerability, with a flow mechanism of well-connected fractures.

There are no Soluble Rock Risk records within 1km of the site and no further Local Information regarding groundwater vulnerability.

There are 12 No. licensed Groundwater Abstractions within 2000m of site, this includes sites extracting more than 20 cubic metres of water a day and includes active and historical records. The two nearest of these are at the same location 773m northeast of site. One of these is historical dating from 28/02/1966 to 01/04/2008,

the other continues from 01/04/2008 and is still active. The annual volume of water that is abstracted is 454.6m^3 and the name of the abstracting party is Vale of Rheidol Railway Ltd. Seven of the other abstraction licences are historical, whilst the remaining three are active under the possession of Rachel's Dairy Ltd, 1665m east of site, with total abstraction at <1000m3 per day and a start date of 31/07/2017 and an expiry date of 31/03/2028.

There is 1 No. Surface Water Abstraction licence within 2000m of site, this is a historic license located 196m northeast of site. The University College of Wales had abstracted an unknown amount of water directly from the river Rheidol for irrigation purposes, dated to 30/08/1996.

There have been 2 No. Potable Water Abstraction licences listed; both are from the same location 1665m east of the site at Rachel's Dairy Ltd. One of these is still active and abstracts from underground river gravels, starting on 31/07/2017 and expiring on 31/03/2028.

No Source Protection Zones are recorded within 500m of the site.

There are nine entries for Water Network features within 250m of the site; relating to positions along the Afon Rheidol, 192-239m east/northeast of the site's centre. The two Surface Water Feature recorded within 250m of the site are also positioned on the Afon Rheidol.

The site lies within WFD Surface Water Body Catchments, that include the operational catchment of the Rheidol and Clarach and the management catchment Teifi and North Ceredigion as defined by the Water Framework Directive (WFD). The site is not part of a waterbody catchment. The site is not a WFD Surface Water Body but is in a WFD Groundwater Body. The nearest WFD Surface Water Body is 165m northeast and encompasses the Ystwyth and Rheidol Estuaries. The WFD Groundwater Body is North Ceredigion Rheidol Area.

2.5 Statutory Service Information

A complete set of Service plans were provided by the Client prior to starting the site works. QGL undertook full Cable Avoidance Tool (CAT) scans of each exploratory hole location before breaking the ground. Safe digging practices in accordance with HS(G)47 were employed when breaking and excavating grounds with all traceable services demarcated prior to works commencing.

3.0 FIELDWORK

3.1 General

In June 2023, QGL undertook a Ground Investigation across the site in preparation for the proposed new residential development. Site supervision and attendance by an Engineering Geologist from QGL was undertaken on all aspects of the site works and subsequent reinstatement works of all exploratory hole locations.

All works were conducted within safe working practices set out by QGL's Risk Assessed Method Statement including CAT scanning and service inspection hand excavated pits to 1.2mbgl in all exploratory hole locations. All inductions and daily site briefings were carried out by QGL's Engineering Geologist. No incidents or near misses were recorded during the fieldworks, with the works being incident free. No deviations from the Standards and Procedures adopted for the works were recorded.

A summary of the fieldworks is outlined below;

- 10 No. Windowless Sample Boreholes
- 8 No. Machine Excavated Trial Pits
- In-situ Soakaway Tests within selected Trial Pits
- Geotechnical and Environmental Soil Sampling
- Logging of all samples retrieved

3.2 Exploratory Hole Locations

The exploratory hole locations were set out by a QGL Engineering Geologist to obtain general coverage of the site.

An Exploratory Hole Location Plan is presented as Figure 2 in Appendix I.

3.3 Windowless Sample Boreholes

A total of 10 No. Windowless Sample Boreholes (WS01-WS10) were undertaken during the site works. Windowless Sampling techniques involve a sampler dynamically driven down to depth using sampling tubes, nominally 116mm in diameter and reducing as depth increases. This technique allows a relatively undisturbed sample of soil to be taken in a plastic liner, or alternatively sub sampled as a disturbed jar sample. Within competent granular-cohesive soils the portable equipment used for Windowless Sampling is limited by the nature of the ground and robustness of the driving tool. The recovered sample liners were subsequently split and logged on site in accordance with BS5930: 2015; BS EN ISO 14688-1:2002 and BS EN ISO 14688-2:2005, by a Quantum Engineering Geologist. Each Windowless Sample location was reinstated with Bentonite and surface replaced as per pre-existing construction.

The sequence of deposits encountered during the investigation is detailed within the Engineering Geologist's logs presented within Appendix II. The logs highlight the nature of the soils encountered and provide descriptions of the strata revealed at the site. Details of the Windowless Sample Boreholes, including final depths in metres below ground level (mbgl) are provided below in Table 1:

Table 1: Windowless Sample Borehole Detail

Exploratory Hole ID	Terminated Depth (m.bgl)	Reason for Termination
WS01	2.0	Encountered Refusal on rock
WS02	0.9	Encountered Refusal on rock
WS03	1.2	Encountered Refusal on rock
WS04	0.7	Encountered Refusal on rock
WS05	2.7	Encountered Refusal on rock
WS06	1.9	Encountered Refusal on rock
WS07	0.8	Encountered Refusal on rock
WS08	3.6	Encountered Refusal on rock
WS09	1.4	Encountered Refusal on rock
WS10	1.4	Encountered Refusal on rock

A complete set of Engineering Geologist Window Sample logs are presented within Appendix II.

3.4 Machine Excavated Trial Pits

8 No. Trial Pits (TP1 – TP8) were excavated using a 9 tonne tracked excavator.

This method of investigation allows direct sampling of the near surface deposits for identification purposes, as well as assessment of any salient features and Made Ground or disturbed ground. The trial pits were logged in accordance with BS5930:2015; BS EN ISO 14688-1:2017 and BS EN ISO 14688-2:2017, and supervised at all times by an Engineering Geologist from QGL. All of the trial pits were backfilled with compacted layers of arisings upon completion with suitable surface reinstatement where required.

A complete set of Engineering Geologist Trial Pit logs are presented within Appendix III. Details of the Trial Pits including final depths in metres below ground level (mbgl) are provided below in Table 2.

Table 2: Trial Pit Detail

Exploratory Hole ID	Terminated Depth (mbgl)	Reason for Termination
TP1	2.0	Encountered Refusal on rock
TP2	2.0	Encountered Refusal on rock
TP3	3.0	Encountered Refusal on rock
TP4	1.4	To undertake soakaway test

TP5	3.0	Encountered Refusal on rock
TP6	3.0	Encountered Refusal on rock
TP7	2.0	Encountered Refusal on rock
TP8	2.2	Encountered Refusal on rock

3.5 In-Situ Testing

3.5.1 Standard Penetration Tests

Standard penetration tests (SPTs) were undertaken within all boreholes, at intervals specified by Redstart.

This is a dynamic test as described in BS EN ISO 22476-3:2005 + A1:2011. Within fine grained or cohesive soils, the test incorporates a small diameter tube (650mm length, 50mm external diameter and 35mm internal diameter) with a cutting shoe known as the 'split barrel sampler'. The sampler is forced into the soil dynamically using blows from a 63.5kg hammer dropped through 760mm. The sampler is initially advanced 150mm into the soil with seating blows, then the number of blows required to advance the sampler each 75mm increment up to a depth of 300mm is recorded. This cumulative total number of blows over the 300mm test is referred to as the "N" value. For coarse gravels and bedrock the split barrel is replaced by a 60□ cone (SPT(C) - Standard Penetration Test (Cone)). SPT/SPT(C) results are detailed within the relevant borehole Logs. The SPT calibration certificate for the SPT hammer used during this investigation is presented in Appendix II.

3.5.2 Soakaway Tests

Soakaway testing was performed in selected Trial Pits in accordance with BRE Digest 365 guidelines. Trial Pits TP1, TP3, TP4, TP6, TP7 and TP8 were subjected to soakaway testing which involved filling of the pits with clean water and recording the time it takes for the water to drain at set intervals.

The tests certificates for the Soakaway Tests can be found in Appendix IV with Table 4 outlining the tests undertaken.

Table 4: *Soakaway Test details*

Exploratory Hole ID	Test Depth (mbgl)	Strata Identified
TP1 – Test 1	1.1 - 2.0	Weak Siltstone
TP3 – Test 1	2.0 – 3.0	Head Deposits & Weak Siltstone
TP3 – Test 2	2.0 – 3.0	Head Deposits & Weak Siltstone
TP4 – Test 1	1.02 – 1.4	Weathered Siltstone
TP4 – Test 2	1.0 – 1.4	Weathered Siltstone
TP4 – Test 3	1.0 – 1.4	Weathered Siltstone
TP6 – Test 1	2.8 – 3.0	Weak Siltstone

TP6 – Test 2	2.78 – 3.0	Weak Siltstone
TP6 – Test 3	2.76 – 3.0	Weak Siltstone
TP7 – Test 1	0.88 – 2.0	Weathered Siltstone
TP8 – Test 1	0.63 – 2.2	Head Deposits & Weathered Siltstone

3.6 Sampling - General

Geotechnical bulk and disturbed samples were taken where required within the superficial deposits for strata identification and laboratory testing purposes. In addition, environmental samples were taken for laboratory testing. All environmental samples were sent to the laboratory within 24-36 hours of having been obtained, whilst geotechnical samples were returned from site to QGL's laboratory for controlled storage to await test scheduling/requirements. For specific details of laboratory testing see Section 4.0. Sample type and sample depth are recorded on the Engineering Geologist's Exploratory Hole Logs found within Appendix II and III.

3.7 Borehole Standpipe Installations

Three Windowless Sample boreholes were installed with 50mm Ø HDPE combined land gas and groundwater monitoring standpipe to permit post-fieldwork landgas and groundwater monitoring visits.

Groundwater and landgas monitoring standpipes consist of plastic pipework set in filter aggregate (pea gravel) forming a well. The filter is sealed at one or both ends by use of bentonite pellets which swell and become watertight. Parts of the pipe itself are slotted, allowing the infiltration of groundwater which can then be accessed through the pipe from ground level. Slotted sections are covered by 'geo-sock' to reduce the intrusion of silt into the standpipes and the range of depths at which the groundwater is intercepted is known as the 'response zone'.

Standpipes were installed using a combination of 1m and 3m lengths of pipework (threaded at either end) fitted together and lowered into the borehole. The boreholes were then filled with either pea gravel or bentonite pellets (depending on which zone or level) and cemented in place at ground level with a steel flush cover. Each standpipe was designed by the Investigation Supervisor. All standpipe installations were sealed above the response zone by a minimum of 0.50m of bentonite pellets. Table 5 details the installation undertaken.

Table 5: Borehole Installation Detail

Exploratory Hole ID	Installation Standpipe Internal Diameter (mm)	Installation Depth (m.bgl)	Installation Response Zone (m.bgl)
WS5	50	2.7	0.5-2.7
WS8	50	3.6	0.6-3.6
WS10	50	1.4	0.4-1.4

4.0 LABORATORY TESTING

4.1 General

The laboratory testing was scheduled by QGL and comprised geotechnical and geo-environmental tests on selected soil and soil leachate samples obtained during the investigation.

4.2 Geotechnical Laboratory Testing

All the geotechnical soil testing work was carried out in accordance with the procedures stipulated in the various sections of BS 1377:1990 Parts 1 - 9 Methods of test for soils for civil engineering purposes. Table 6 details the tests undertaken.

Table 6: Geotechnical Tests Undertaken

Type of Test	No of Tests
Moisture Content	3
Particle Size Distribution by Wet Sieve	3
Plasticity Limits (Atterberg Testing)	6
Concrete Classification BRE Suite D	7

A full set of geotechnical laboratory test certificates are provided within Appendix V.

4.3 Geo-Environmental Laboratory Testing

Geo-Environmental testing was carried out on selected soil and soil-leachate samples gained from the ground investigation. The purpose of the testing is to gain a holistic view of any raised levels of contaminants that may exist onsite and any risks they may pose to future site users but more prominently the construction workers during the construction phase and future residents. Table 7 details Geo-Environmental tests undertaken on selected soil samples, plus leachate tests undertaken on selected soil samples.

Table 7: Geo-environmental tests undertaken on soil samples

Type of Test	No of Tests
Suite E including asbestos identification, heavy metals, speciated PAH's, Phenols, Total TPH	9
Speciated TPH	5

Table 7A: *Geo-environmental tests undertaken on soil leachate samples*

Type of Test	No of Tests
Suite F on soil leachate including heavy metals, speciated PAH's, Phenols, Total TPH	3
Hardness on soil leachate	3

A full set of Geo-Environmental laboratory test certificates are provided within Appendix VI.

5.0 GROUND CONDITIONS ENCOUNTERED

5.1 General

The sequence of deposits encountered during the investigation is detailed within the Engineering Geologist's logs presented within Appendix II and III. The following sections summarise the findings of the exploratory holes.

5.2 Ground Conditions

5.2.1 Overview of Strata Encountered

The ground conditions encountered across the site generally comprised a surface layer of Topsoil or Tarmac. Made Ground was encountered below the Topsoil / Tarmac within the exploratory holes undertaken to the north of the main nursing home building. Underlying the Made Ground, or directly below the Topsoil within the exploratory holes to the south of the building, either Head Deposits or weak / weathered Siltstone (Aberystwyth Grits Formation) were encountered. Where no Head Deposits were present, the Topsoil / Tarmac was directly above weathered and / or weak Siltstone (Aberystwyth Grits Formation). A summary of the ground conditions encountered is presented in Table 8.

General Strata Description	Elevation of base of Strata (mbgl)									
	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8		
Topsoil	0.08	0.07	0.07	0.06	--	0.05	0.06	--		
Tarmac	--	--	--	--	--	--	--	0.08		
Made Ground	--	0.8	1.8	0.9	0.35	1.05	--	0.3		
Head Deposits	--	1.4	2.3	--	0.8	--	0.8	2.2+		
Aberystwyth Grits Formation	2.0+	2.0+	3.0+	1.4+	3.0+	3.0+	2.0+	--		
	WS1	WS2	WS3	WS4	WS5	WS6	WS7	WS8	WS9	WS10
Topsoil	--	--	0.1	0.1	0.1	--	0.1	--	--	--
Tarmac	0.07	0.07	--	--	--	--	--	0.25	0.25	0.25
Made Ground	0.4	--	--	--	--	0.5	--	1.6	--	--
Head Deposits	--	--	0.9	--	1.5	--	--	1.9	--	--
Aberystwyth Grits Formation	2.0+	0.9+	1.7+	0.7+	2.7+	1.9+	0.8+	3.6+	1.4+	1.4+

-- Strata not encountered within exploratory hole
+ Depth of strata not proven

Topsoil / Tarmac

Topsoil was encountered within all the exploratory holes undertaken within the grassed areas of the site to depths of between 0.05 and 0.1mbgl.

A layer of Tarmac was encountered within all exploratory holes undertaken within the areas of hardstanding, to depths of between 0.07 and 0.25mbgl.

Made Ground

Made Ground was encountered within the majority of exploratory holes undertaken to the north of the nursing home building. The Made Ground generally comprised brown clayey slightly silty slightly sandy siltstone, brick, tile and glass Gravel with brick cobble content, and grey slightly silty slightly sandy siltstone, sandstone and brick Gravel. The Made Ground was proven to depths of between 0.3 and 1.8mbgl.

Head Deposits

Pockets of soil interpreted to be Head Deposits were encountered either underlying the Made Ground or directly below the Topsoil where Made Ground was not found to be present. These deposits were encountered to depths of between 0.8 and 2.3mbgl.

Aberystwyth Grit Formation

Within each exploratory hole, with the exception of TP8, strata interpreted to be the Aberystwyth Grit Formation was encountered either below the Made Ground deposits or the Head Deposits. These deposits were either highly weathered to slightly silty sandy Gravel or weak Siltstone. The competency of these deposits increased with depth and the exploratory holes terminated upon refusal at depths of between 0.7 and 3.0mbgl.

5.2.2 Groundwater Conditions

No groundwater was encountered during the investigation or post fieldwork monitoring.

Please Note: The groundwater conditions observed in these exploratory holes are those appertaining to the period of the investigation and monitoring. However, it should be noted that groundwater levels are subject to diurnal, seasonal and climatic conditions or may vary due to other causes.

5.2.3 Visual & Olfactory Evidence of Soil Contamination

No visual or olfactory evidence of soil contamination was observed/ recorded.

5.2.4 Visual & Olfactory Evidence of Groundwater & Surface Water Contamination

No visual or olfactory evidence of any groundwater contamination or surface water contamination during the investigation works was observed/ recorded.

6.0 GEOTECHNICAL ENGINEERING APPRAISAL

6.1 General

The purpose of this Ground Investigation and subsequent reporting is to determine and assess the existing ground conditions on site in preparation for the proposed residential development for site that will consist of 18 No. new dwellings, a further 4 No. dwellings are already present in the east of the site, these will be refurbished and exist as they are post-development.

A main aim of the geotechnical investigation is to provide an assessment of the ground conditions to inform initial design of the foundations and general geotechnical characteristics and properties of the shallow ground.

6.2 Engineering Properties of Strata

In summary, the exploratory holes undertaken generally encountered a surface layer of Topsoil or Tarmac, with Made Ground encountered below the Topsoil / Tarmac within the exploratory holes undertaken to the north of the main nursing home building. Underlying the Made Ground, or directly below the Topsoil within the exploratory holes to the south of the building, either Head Deposits or weak / weathered Siltstone (Aberystwyth Grits Formation) were encountered. Where no Head Deposits were present, the Topsoil / Tarmac was directly above weathered and / or weak Siltstone (Aberystwyth Grits Formation).

The engineering properties of each strata is summarised below:

Table 8: *Summary of Laboratory/In-situ Test Results*

Made Ground		**Range**	**Average**	**No. Tests**
Particle Size Distribution	Cobbles (%) Gravel (%) Sand (%) Silt & Clay	19 57 8 16	19 57 8 16	1
Water Soluble Sulphate as SO_4	mg/l	<10	<10	7
pH	NA	6.8-8.2	7.7	7
SPT 'N' Value		5	5	1
Head Deposits		**Range**	**Average**	**No. Tests**
Moisture Content	(%)	8.-18	12	3
Atterberg Limits	Liquid Limit (%) Plastic Limit (%) Plasticity Index (%)	21-38 14-20 7-18	29 18 11	3
Passing 0.425mm	(%)	35-85	54	3
Particle Size Distribution	Cobbles (%) Gravel (%) Sand (%) Silt & Clay	0 45-56 15-20 29-35	0 51 18 32	2
Water Soluble Sulphate as SO_4	mg/l	<10	<10	3
pH	NA	6.8-8.8	7.8	3
SPT 'N' Value		7	7	1
Weathered / Weak Aberystwyth Grit Formation		**Range**	**Average**	**No. Tests**

Particle Size Distribution	Cobbles (%) Gravel (%) Sand (%) Silt & Clay	0-20 55-69 13-15 11-20	7 63 14 16	3
Water Soluble Sulphate as SO_4	mg/l	<10-22	14	3
pH	NA	6.7-6.9	6.8	3
SPT 'N' Value		5-50+	29	9

It should be noted higher SPT 'N' values may be due to encountering cobbles or boulders during the test, potentially resulting in elevated 'N' values.

Made Ground

The single Particle Size Distribution (PSD) test undertaken on a sample of Made Ground indicates the deposits to be slightly clayey / silty slightly sandy Gravel with cobbles, consistent with the Engineers description.

A single SPT was undertaken within the Made Ground, with a value of 5 recorded. The corrected SPT 'N' value is 7, which indicate the strata to be loose.

Head Deposits

The Atterberg Limit testing undertaken indicates the fines content of the material to be Clay. The Plasticity Index of these deposits ranged between 7 and 18%, with an average of 11%. The Modified Plasticity Index is calculated to range between 2.45 and 15.3 with an average of 6.92%. The Modified Plasticity Indices indicate low volume change potential.

A single SPT was undertaken within the Head Deposits, with a value of 7 recorded. The corrected SPT 'N' value is 10.

This correlated SPT 'N' value along with the Plasticity Indices of this strata indicates a correlated undrained shear strengths of 70kN/m^2 (after Stroud, 1974).

Weathered / Weak Aberystwyth Grit Formation

Particle Size Distribution (PSD) tests undertaken on three samples of Weathered / Weak Aberystwyth Grit Formation indicate this strata to be slightly silty slightly sandy Gravel, locally with cobbles, consistent with the Engineers description of the material.

The SPT's undertaken within these deposits recorded values between 5 and 50, with an average of 29. The corrected SPT 'N' values ranged between 7 and 50 with an average of 39. The corrected SPT 'N' values indicate the strata interpreted to be highly weathered to granular deposits, to range between loose and very dense, with the average value being dense.

6.3 Earthworks

6.3.1 Site Preparation

Prior to commencing any earthworks / groundwork for the development, any live services on and in the vicinity of the site should be accurately located and protected, or if required diverted.

Any exposed formations should be protected from the effects of the weather, site traffic, or water in order to prevent deterioration of this surface. It is recommended that any exposed formations be protected with a minimum thickness of 200mm of suitable granular material or a thin layer of blinding concrete, which should be placed immediately after excavation and exposure. All topsoil has already been stripped and stockpiled.

6.3.2 Cutting and Filling

If site won material is to be utilised as fill on site, it is recommended a suite of earthworks testing is undertaken to confirm suitability and the required compaction methods.

6.3.3 Excavation Plant

On the basis of the observations made during the exploratory investigation, it is considered that excavations within the shallow soils can be undertaken by conventional excavation plant, however it should be noted, Trial Pit TP4 located in the north eastern area of the site terminated upon refusal within the Abersytwyth Grits Formation at a depth of 1.4mbgl, suggesting localised areas of 'competent' rock may be present at depths as shallow as 1.4mbgl. If excavations are required to significant depths, ripping or breaking equipment may be required in localised areas.

6.3.4 Stability of Excavation Sides

Excavations undertaken during the ground investigation generally remained stable however, given the predominately granular nature of the significant thicknesses of Made Ground and the upper weak / weathered Aberystwyth Grits Formation, the potential exists for instability to occur. If excavations are to remain open for a prolonged period of time it would be prudent to allow for shoring, support or battering back to a suitable safe angle and most definitely if man access is required.

6.3.5 Control of Groundwater

Groundwater was not encountered during the investigation or post fieldwork monitoring.

Based on the observations made during the ground investigation, it is unlikely shallow excavations will encounter significant quantities of groundwater. It is possible surface water ingress into excavations may occur and sump pumping may be required to dewater excavations if this occurs.

6.3.6 Drainage Considerations

Soakaway testing in accordance with BRE 365 was undertaken within the Head Deposits and Aberystwyth

Grits Formations in selected Trial Pits. The findings of the tests are summarised in Table 9.

Table 9: Summary of Soakaway Test Results

Exploratory Hole ID	Test Depth (mbgl)	Strata Identified	Permeability Result Recorded (m/sec)	Comment
TP1 – Test 1	1.1 - 2.0	Weak Siltstone	4.78×10^{-6}	
TP3 – Test 1	2.0 – 3.0	Head Deposits & Weak Siltstone	1.20×10^{-5}	
TP3 – Test 2	2.0 – 3.0	Head Deposits & Weak Siltstone	2.28×10^{-5}	
TP4 – Test 1	1.02 – 1.4	Weathered Siltstone	8.95×10^{-5}	
TP4 – Test 2	1.0 – 1.4	Weathered Siltstone	4.82×10^{-5}	
TP4 – Test 3	1.0 – 1.4	Weathered Siltstone	4.18×10^{-5}	
TP6 – Test 1	2.8 – 3.0	Weak Siltstone	3.58×10^{-4}	
TP6 – Test 2	2.78 – 3.0	Weak Siltstone	3.58×10^{-4}	
TP6 – Test 3	2.76 – 3.0	Weak Siltstone	3.88×10^{-4}	
TP7 – Test 1	0.88 – 2.0	Weathered Siltstone	Insufficient reduction in water level over test period to calculate soil infiltration rate	No reduction in water level over the 240 minute test period
TP8 – Test 1	0.63 – 2.2	Head Deposits & Weathered Siltstone	Insufficient reduction in water level over test period to calculate soil infiltration rate	No reduction in water level over the 240 minute test period

Based on the above permeability calculations, soakaway drainage placed in the upper Aberystwyth Grits Formation may be feasible depending on water quantities generated.

The soakaway test certificates are presented within Appendix IV.

6.4 Structural Assessment

6.4.1 Foundation Recommendations

The proposed residential development for site will consist of 18 No. new dwellings, a further 4 No. dwellings are already present in the east of the site, these will be refurbished and exist as they are post-development.

Made Ground was encountered below a layer of Topsoil or Tarmac to depths of between 0.3 and 1.8mbgl. The deeper areas of Made Ground were localized within the central area of the site (within exploratory holes TP3, TP6 and WS8). Underlying the Made Ground, or directly below the Topsoil within the exploratory holes to the south of the building, either Head Deposits or weak / weathered Siltstone were encountered. Where no Head Deposits were present, the Topsoil / Tarmac was directly above weathered and / or weak Siltstone.

The use of shallow trench fill, pad or strip foundations are considered suitable for the proposed development across the majority of the site, where deeper Made Ground is not present. The firm to stiff Head Deposits, dense weathered and weak Aberystwyth Grit Formation will provide an allowable bearing capacity in excess of 100kN/m^2.

Due to its loose and potentially variable nature, the Made Ground will not provide a suitable founding strata. Where present, foundations should extend through the Made Ground to found on the underlying firm Head deposits or the dense weathered / weak Aberystwyth Grits Formation.

Alternatively, excavation / replacement ground improvement of the Made Ground may be undertaken; i.e. excavation of the Made Grond and replacement with an engineered fill in accordance with an appropriate earthworks engineering specification.

Due to the presence of Made Ground and localised area of loose weathered Aberystwyth Grit Formation (at WS8 at 2.0mbgl), it is recommended the founding strata is inspected by a competent person and any soft / loose spots excavated and replaced with a suitable compacted engineered fill. In-situ density testing in the form of Plate Load Bearing tests can be undertaken to confirm any prepared formations have achieved the desired strength and ensure settlements are within tolerance.

6.4.2 Floor Slabs

Ground bearing floor slabs would be suitable where placed on either the Head Deposits or the Aberystwyth Grit Formation present at shallow depths. It is not recommended that ground bearing floor slabs are placed on Made Ground and therefore, where deeper Made Ground is present in the central area of the site, either a suspended floor slab system is utilised, or the Made Ground should be excavated and replaced with a suitably compacted engineered fill material.

It is recommended formations are proof rolled and any soft spots identified are excavated and replaced using a suitably compacted engineered fill material.

6.4.3 Foundation Concrete Class Designation

The Aggressive Chemical Environment for Concrete (ACEC) classification for the site has been assessed according to the guidelines within BRE Special Digest 1 (2005). For classification purposes, based on the BRE guidance, the groundwater must be classed as ‘mobile’ unless proven to be ‘static’ over a 24hr period. The pH values of the soil samples taken from across the site ranged from 6.7 to 8.8. The levels of water-soluble sulphate (SO_4) content of the tested soil samples ranged between <10 to 22mg/l. Based on the above, the Design Sulphate (DS) class for the site is DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification is generally AC-1, assuming mobile groundwater conditions.

7.0 GEO-ENVIRONMENTAL CONSIDERATIONS

7.1 General

The following Section assesses the findings of the geo-environmental laboratory test results from samples obtained during the ground investigation. The risks to human health and the environment are both considered herein. This Section sets out the preliminary Conceptual Site Model (CSM) for pollutant linkages and aims to review this CSM following assessment of the test result findings from the intrusive investigation.

Section 5.2 of the Phase I Preliminary Risk Assessment Report assessed all the potential contaminative sources associated with the site based on past uses of the site itself and surrounding lands. Using the Source-Pathway-Receptor analogy the potential risks to the proposed development and adjacent land have been assessed by consideration of the potential pollution linkages.

For a risk to exist there must be a source of contamination, a receptor that may be harmed and a pathway by which the receptor could be exposed to the contaminant. Only when all three factors are present (i.e. source, pathway, receptor) can a pollution linkage, and consequently an unacceptable risk, exist. The conceptual site model considers all three elements and the potential for pollution linkages that may exist. If no linkage is identified then there is considered to be none or negligible risk.

The Preliminary Risk Assessment Report concluded the low possibility of Made Ground to be present on-site and hydrocarbon contamination within near surface deposits, which may pose a risk to future site users.

Selected soil and soil leachate testing was undertaken on soil samples obtained from the ground investigation to establish the chemical concentrations within Made Ground and near surface natural deposits across the site. This section of the report discusses the results of the chemical laboratory testing undertaken.

7.2 Human Health Risk Assessment

7.2.1 Legislative Background

There have been several major changes in Contaminated Land non-statutory guidance over the past decade, in particular relating to Contaminated Land Regime (CLR) documentation and their derivatives i.e. Soil Guideline Values and Toxicological Reports. In 2006, DEFRA commenced work on their 'Way Forward' exercise which aimed to redefine the way contaminated land is assessed with the aid of devising revamped technical guidance and soil guideline values. A working group of various environmental consultancies/ establishments/ stakeholders set about determining how the non-statutory guidance of CLEA 2002 may be amended to be increasingly user friendly for assessors of contaminated land and ultimately to help in defining whether land qualifies as contaminated land under Part IIA Environmental Protection Act 1990. July 2008 saw the findings of this exercise published. Firstly, the document entitled *'Guidance on the Legal Definition of*

Contaminated Land' was published followed closely by the publication of the fourteen measures derived to improve contaminated land non-statutory technical guidance i.e. CLR Publications.

In light of these improvements, the toxicology of various contaminants and therefore the generic soil guideline values, has been revised by EA and DEFRA. The revised paper published in August 2008 is entitled *'Human Health Toxicological Assessment of Contaminants in Soil"*. Based on the findings of this paper, EA are developing a new set of Toxicological Reports and subsequently a new, expanded set of SGV'. Upon publishing, these new SGV's may then be used in assessing risks to human health.

In parallel to much of these developments, in 2006/07 it was recognised that due to the limited number of revised SGVs being produced, the Chartered Institute of Environmental Health (CIEH) co-jointly with Land Quality Management (LQM) researched and developed an additional or alternate set of Soil Guideline Values known as Generic Assessment Criteria (GAC) values, producing GACs for 31 contaminants for Residential, Allotment and Commercial End Land Uses. These new values complete with details of how they were derived and including toxicological datasets was published in a single document 'The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment'.

Following publication of the '*Way Forward'* document in late 2006, LQM/CIEH looked to review their GAC and add to them. By 2009 a 2nd Edition of 'The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment' was published using updated methods and culminated in GAC for 82 substances.

In 2013, a cross-government steering group commenced the development of a new set of Generic Assessment Criteria as driven by DEFRA. The newly derived Guideline Values are termed C4SLs – Category 4 Screening Levels and are considered more pragmatic (but still precautionary) by DEFRA and were proposed as more suitable and sensible comparison values.

In November 2014, the LQM/CIEH produced its third set of Generic Assessment Criteria for 89 potential contaminants as knowledge of toxicity and interaction continued to progress, thus replacing the 2nd Edition with the new publication entitled *'The LQM/CIEH S4ULs for Human Health Risk Assessment'*. This most recent set of GACs are referred to as 'S4ULs' – Suitable for Use Levels'

7.2.2 Human Health Risk Assessment Criteria

For the purposes of Quantum Geotechnic Ltd assessments, the most recent and applicable SGVs, GACs, SU4Ls and C4SLs are used based on site end use and development and overall suitability. These are all referenced within the text. SU4Ls take precedence in QGL assessments. Where these are not available or suitable, C4SLs are adopted.

By adopting the CLEA approach to human health risk assessment as defined in CLR11, a human health risk assessment has been undertaken for the proposed residential development adopting the Residential with Plant Uptake threshold values.

The assessment criteria used in this assessment is that presented by LQM/CIEH in their publication *The LQM/CIEH S4ULs for Human Health Risk Assessment (2015)*. The *S4ULs* (Suitable for Use Levels) used have been derived in accordance with UK legislation, national as well as Environment Agency policy and using a modified version of the Environment Agency CLEA software and available guidance provided to the contaminated land practitioner community for the purpose of deriving Generic Assessment Criteria (GAC).

The LQM/CIEH S4ULs are intended for use in assessing potential risks posed to human health by contaminants in soil and as transparently derived and cautious 'trigger values' above which further assessment or remedial action may be necessary. By using the LQM/CIEH S4AULs, Quantum Geotechnic acknowledges *Copyright Land Quality Management Ltd reproduced with permission; Publication Number S4AUL3409. All Rights Reserved.*

7.3 Soil Sample Test Results Comparisons

The results of chemical laboratory testing on selected soil samples from the shallow lying soils are presented and discussed within this Section.

7.3.1 Heavy Metal and Inorganic Compounds

The results of levels of potential contaminants have been compared to generic assessment criteria as described above, for a Residential with Plant Uptake end use. The test certificates are included in Appendix VI. The concentrations of heavy metal and inorganic compounds are summarised in Table 10.

Table 10: Summary of Heavy Metals and Inorganic Soil Test Results

Determinant	Results Range (mg/kg)	*LQM/CIEH (2015)* GAC (mg/kg) Residential with Plant Uptake End Use [(1)]	Exceedances
Arsenic	10-33	37	0
Boron	<50	290	0
Cadmium	<0.1-11	11	0
Chromium	14-43	910	0
Copper	19-78	2,400	0
Lead[3]	8.4-14	200	0
Mercury	<0.5–0.58	40	0
Nickel	17-48	130	0
Zinc	63-410	3,700	0

Notes:

(1). GAC from LQM/CIEH S4ULs 2015. (2). GAC from LQM/CIEH 2009 & 2015. (3). GAC from DEFRA C4SL. (4). GAC from AtRisk adopting most sensitive end use for acute risk.

7.3.2 Polycyclic Aromatic Hydrocarbons

The results of levels of potential polycyclic aromatic hydrocarbon contaminants have been compared to generic assessment criteria as described and for a Soil Organic Matter (SOM) content of 1% as the lowest recorded

SOM was <0.4%. The test certificates are included in Appendix VI.

The concentrations of speciated Polycyclic Aromatic Hydrocarbon are summarised and compared in Table 11.

Table 11: Summary of Polycyclic Aromatic Hydrocarbon Soil Test Results

Determinant	Site Results Range (mg/kg)	*LQM/CIEH (2015)* GAC (mg/kg) Residential with Plant Uptake End Use [(1)]	
		1% SOM	Exceedances
Soil Organic Matter (SOM)	<0.4-4.8		
Acenaphthene	<0.1	210	0
Acenaphthylene	<0.1	170	0
Anthracene	<0.1-0.26	2,400	0
Benzo(a)anthracene	<0.1-1.7	7.2	0
Benzo(a)pyrene	<0.1-0.68	2.2	0
Benzo(b)fluoranthene	<0.1-0.67	2.6	0
Benzo(ghi)perylene	<0.1	320	0
Benzo(k)fluoranthene	<0.1-0.36	77	0
Chrysene	<0.1-0.73	15	0
Dibenz(a,h)anthracene	<0.1	0.24	0
Fluoranthene	<0.1-1.4	280	0
Fluorene	<0.1	170	0
Indeno(1,2,3-cd)pyrene	<0.1	27	0
Naphthalene	<0.1	2.3	0
Phenanthrene	<0.1-0.58	95	0
Pyrene	<0.1-2.0	620	0

Notes: (1). GAC from LQM/CIEH S4ULs 2015.

7.3.3 Total Petroleum Hydrocarbons

The results of levels of potential petroleum hydrocarbon contaminants have been compared to generic assessment criteria as described and for a Soil Organic Matter (SOM) content of 1%. The test certificates are included in Appendix VI. The concentrations of speciated Petroleum Hydrocarbons are summarised and compared in Table 12.

Table 12: Summary of Petroleum Hydrocarbon Soil Test Results

Determinand	Site Results Range (mg/kg)	*LQM/CIEH (2015)* GAC (mg/kg) Residential with Plant Uptake End Use [(1)]	
		1% SOM	Exceedances
TPH – Aliphatic EC5-6	<0.05	42	0
TPH – Aliphatic >EC6-8	<1.0	100	0
TPH – Aliphatic >EC8-10	<0.05	27	0
TPH – Aliphatic >EC10-12	<2.0-5.2	130	0
TPH – Aliphatic >EC12-16	<1.0	1,100	0
TPH – Aliphatic >EC16-21	<2.0	NA	0

TPH – Aliphatic >EC21-35	<3.0-40	NA	0
TPH – Aromatic >EC5-7	<0.05	70	0
TPH – Aromatic >EC7-8	<0.05	130	0
TPH – Aromatic >EC8-10	<0.05	34	0
TPH – Aromatic >EC10-12	<1.0	74	0
TPH – Aromatic >EC12-16	<1.0	140	0
TPH – Aromatic >EC16-21	3.6-8.9	260	0
TPH – Aromatic >EC21-35	9.1-73	1,100	0

Notes: (1). GAC from LQM/CIEH S4ULs 2015. (2). GAC for C16 – C35 only quoted. NA – Not available

7.3.4 Total Phenols

Total Phenols (monohydric) all recorded values of <1.0mg/kg.

7.3.5 Asbestos

9 No. soil samples were sent for routine Asbestos testing and identification. All recorded 'Not Detected'.

7.4 Environmental Risk Assessment

The following section presents the findings of the soil leachate test results and provides assessment in relation to risks to the environment, particularly controlled waters.

7.4.1 Soil Leachate Test Criteria

The risk to controlled waters, i.e. nearby watercourses and groundwater, is defined by the potential for any contaminants present on site to leach from the soils beneath the site. 3 No. soil samples from the shallow underlying soils were subjected to leachate testing. The result ranges are presented together with the threshold levels given by the United Kingdom Drinking Water Standards (UKDWS) as well as the relevant Environmental Quality Standards (EQS) guideline values.

7.4.2 Soil Leachate Test Results Comparisons

Table 13 presents the summarised findings of the soil leachate testing undertaken. The test certificates are included in Appendix VI.

Table 13: Summary of Soil Leachate Chemical Analysis

Determinant	Units	Site Results Range (µg/l) Soil Leachate –	Environmental Quality Standards – Freshwater[1]	UK Drinking Water Standards[2]	Exceedances
Arsenic	µg/l	1.7-2.5	50	10	0
Cadmium	µg/l	<0.11-0.23	5	5	0
Chromium	µg/l	<0.05-0.66	5	50	0
Copper	µg/l	3.1-5.6	5	2000	1 WS6 at 0.3mbgl
Lead	µg/l	0.56-16	4	10	2 TP4 at 0.5mbgl WS1 at 0.3mbgl
Mercury	µg/l	<0.5	1	1	0
Nickel	µg/l	0.62-0.68	50	20	0

Zinc	µg/l	25-47	8	5000	3 TP4 at 0.5mbgl WS1 at 0.3mbgl WS6 at 0.3mbgl

[1]Figures for Environmental Quality Standards (EQS) are Annual Average Concentrations derived from the Environment Agency [2]UK Drinking Water Standards taken from; Water Supply (Water Quality) Regulations 1989 (SI 1989/1147) (as amended), and Water Supply (Water Quality) Regulations 2000 (SI 2000/3184) (as amended). NT – Not Tested. I/S – Insufficient Sample, NYS – Not Yet Specified

7.5 Recommendations on Contaminated Land

7.5.1 Human Health Risk of Site End Users

All of the potential contaminants tested recorded results within the respective SGV or GAC assessment values for the proposed residential development which would fall under the Residential with Plant Uptake threshold guideline scenario and therefore do not pose a significant risk to site end users of the proposed development.

Therefore, no source has been identified that could lead to a potential source-pathway-receptor linkage being realised.

7.5.2 Human Health Risks during Construction

The geo-environmental laboratory testing did not reveal any raised potential contaminants and therefore the risks posed to construction operatives from chemical contaminants within the shallow ground is considered to be low. However. There is always the possibility of workers coming into or uncovering potential made ground or potential raised contaminants on any site. Operatives working with, or likely to come into contact with made ground with the potential to harness raised concentrations of contaminants, should observe particular precautions concerning personal hygiene. They should be issued with the appropriate personal protective equipment and should be instructed in safe working methods.

Instructions should be issued in the recognition of potentially hazardous materials including oily and odorous soil and water and also any discoloured or fibrous substances for example. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food must be confined to designated clean areas with suitable welfare including washing facilities should be provided.

7.5.3 Risk to the Environment and Controlled Waters

The risk to controlled waters, i.e. nearby water courses, is defined by the potential for any contaminants present on site to leach from the soils beneath the site.

Elevated concentrations of Copper was measured above the EQS within the soil leachate from the sample of Made Ground from WS6, elevated concentrations of Lead was measured above the EQS within the soil leachate from the samples of Made Ground from WS1 and TP4 and elevated concentrations of Zinc was measured within the soil leachate from the samples of Made Ground from WS1, WS6 and TP4.

No other potential contaminants were recorded above the relevant EQS in the laboratory test results.

In general, as no significant quantities of groundwater were encountered during the Ground Investigation and the site is located 192-239m from the nearest surface water body, 773m from the nearest licensed groundwater abstraction location and 1665m from the nearest potable water abstraction location, the risk to controlled waters and associated receptors from potentially aqueous phase mobile contaminants from the site is considered low / negligible.

However, it is recommended the development does not increase the introduction of water into the Made Ground deposits across the site, which may increase the potential for leachate generation. Therefore, it is recommended that soakaways are not constructed within the Made Ground deposits at the site.

7.6 Ground Gas Monitoring Results

3 No. post-fieldwork monitoring ground gas visits have been undertaken. Appendix VII presents the monitoring records with the results discussed below / overpage.

The results show CH_4 concentrations of 0.0%v/v and CO_2 concentrations of between 1.6 and 2.0%v/v. Maximum measured flow rate was recorded as 0.0l/hr whilst O_2 levels ranged between 19.4 and 19.9%v/v. No H_2S or Carbon Monoxide (CO) was recorded.

The potential risks posed by any recorded presence of potentially harmful gases can be assessed on a semi-quantitative basis by reference to the guidance in documents CIRIA 665 and BS8485. The assessment comprises multiplying the maximum measured steady gas flow rate (expressed as litres per hour) by the maximum steady gas concentration (expressed as percentage-by-volume; divided by 100) to derive a Gas Screening Value (GSV). The GSV can then be used to determine a risk classification and a Characteristic Situation for the site as defined in Table 14.

Table 14: *Gas Screening Value and Characteristic Situation Classification*

Characteristic Situation	Risk Classification	Gas Screening Value (l/hr) - GSV
1	Very low	<0.07
2	Low	>0.07, <0.7
3	Moderate	>0.7, <3.5
4	Moderate to High	>3.5, <15
5	High	>15, <70
6	Very High	>70

Based on the ground gas monitoring findings, the site is classified as Characteristic Situation 1 and no special precautions against ground gases are required.

7.7 Review of Conceptual Site Model (CSM)

The onsite investigation and subsequent laboratory testing has not recorded any raised contaminants in terms of human health and therefore, no source has been realised based on the proposed development and existing site conditions. The risk to site end users is negligible from potential contamination held within the soils.

With regards to environmental assessment and potential risk to controlled waters, potentially significantly raised heavy metal concentrations were measured within the soil leachate samples however, the risk to controlled waters is considered negligible due to absence of groundwater and the distance to potential receptors.

Additionally, no elevated concentrations of aggressive chemicals have been identified that may pose a risk of chemical attack on buried utilities.

Based on the Ground Investigation findings, the Conceptual Site Model can be revised such that no source of pollution (contamination) has been realized and therefore no pollutant linkages identified.

Table 15: *Revised Conceptual Site Model Summary*

Sources		
S1	Made Ground	Leachate generated within the Made Ground containing potentially significantly elevated heavy metal concentrations. No groundwater is present and therefore potential for leachate generation is considered low. It is recommended soakaway drainage is not constructed within the Made Ground deposits.
Pathways		
P1	Groundwater	No groundwater was encountered. Therefore groundwater is not anticipated to be a contamination pathway
Receptors		
R1	Controlled Waters	No controlled waters or associated receptors are expected to be impacted by the development. Any drainage strategy should ensure measures are in place to mitigate percolation of waters through any underlying fill material into the ground or water courses.

8.0 REFERENCES

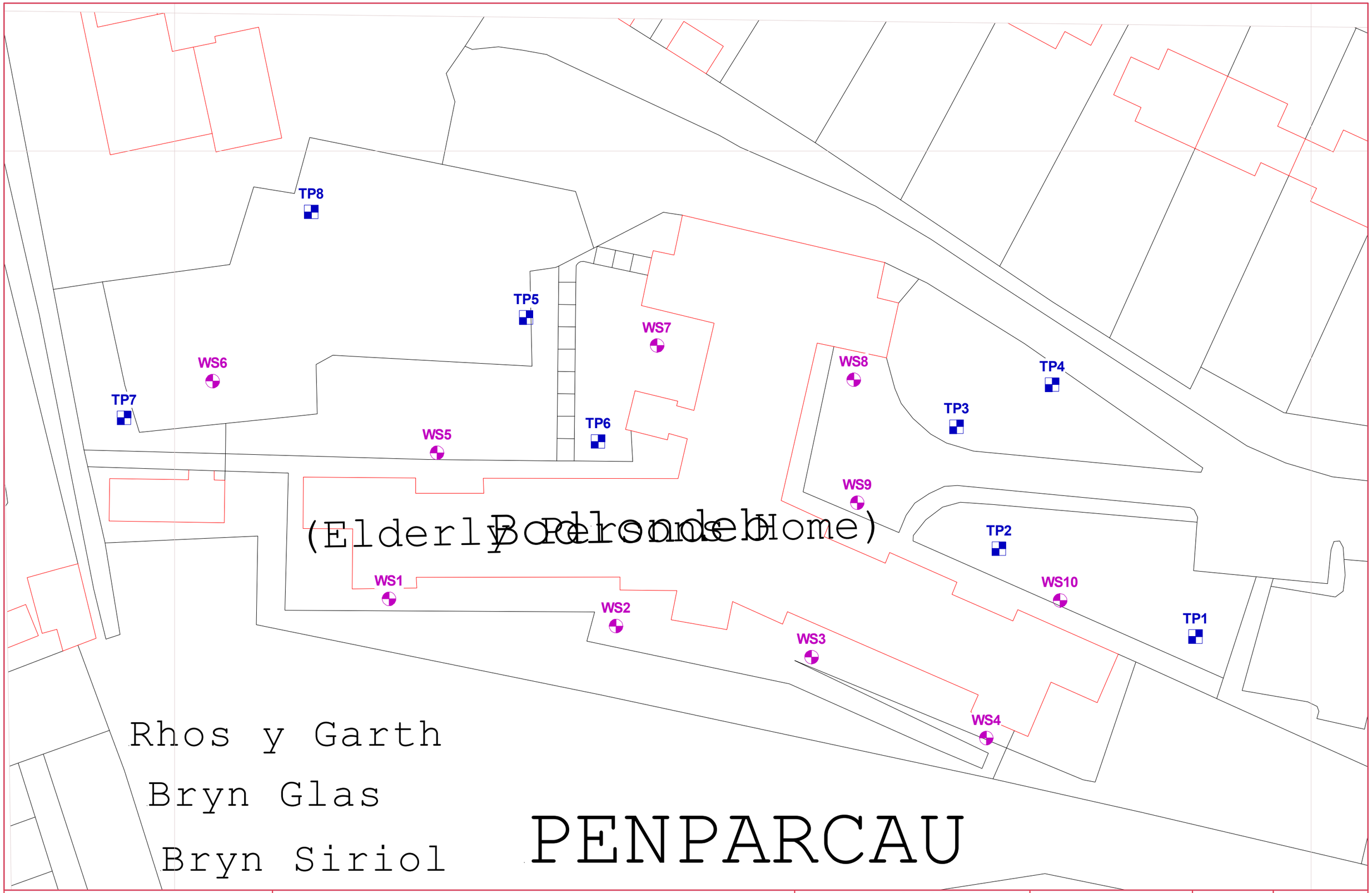
British Geological Survey:

- BGS Geological Sheet 163, 1:50,000 scale (1968)
- BGS Lexicon of Named Rock Units (www.bgs.ac.uk/lexicon)
- BGS Geology of Britain Viewer (www.bgs.ac.uk)

Specialist Publications:

- British Code of Practice BS 5930:2015 *'Code of Practice for Site Investigations'*
- British Code of Practice BS 1377:1990 *'Methods of test for soils for civil engineering purposes'.*
- British Code of Practice BS 10175:2011 *'Code of Practice for Investigation of Potentially Contaminated Sites'*
- British Code of Practice BS EN ISO 14688-1:2002+A2:2013 Geotechnical investigation and testing. Identification and classification of soil. Identification and description
- British Code of Practice BS EN ISO 14688-2:2004+A2:2013 Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification.
- British Code of Practice BS EN ISO 14689-1:2003 Ground Investigation and Testing – Identification and classification of rock
- Health and Safety Executive Guidance Note EH40/90
- BRE (2005) Special Digest 1:2005, 3rd Edition, Concrete in aggressive ground. BRE, Garston.
- BS 6031: 2009 Code of Practice for Earthworks.
- ICE UK Specification for Ground Investigation Second Edition.
- Specification for Highways Works Series 600 Earthworks
- Environment Agency Science Report SC050021/*[various]* (2009) *Soil Guideline Values*
- LQM/CIEH Publication S4UL3409 (2015) *'Generic Assessment Criteria for Human Health Risk Assessment'*
- World Health Organisation (2011) *'Guidelines for drinking-water quality, 4th edition'*
- Statutory Instruments (UK Legislation) 2016 No. 614 *'The Water Supply (Water Quality) Regulations'* retrieved from www.legislation.gov.uk/2016/614
- Statutory Instruments (UK Legislation) 2015 No. 1623 *'The Water Framework Directive (Standards and Classification) Directions (England and Wales)'*

APPENDIX I – SITE PLANS AND FIGURES



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KEY
Borehole
Trial Pit
Dynamic Probe
In-situ Test
Window Sample
Sampling Point
Historical Borehole

PROJECT FORMER BODLONDEB RESIDENTIAL HOME	DRAWING TITLE: EXPLORATORY HOLE LOCATION PLAN	JOB NO. Q1149	FIGURE NO. 2
		DATE 28/06/23	SCALE 1:300

259200 E
259225 E
259250 E
259275 E
259300 E
259325 E
259350 E
259375 E
280225 N
280200 N
280175 N
280150 N
280125 N
280100 N

M.W. SURVEYS Land and Engineering Surveyors Electronic measurement and setting out. Elm House, Templeton, Narberth, Pembs. SA67 8RY Tel. (01834) 861241 Mob. 07811 321 440 mwsurveys@totalise.co.uk	CLIENT WALES AND WEST HOUSING CWRT Y LLAN CHURCH LANE NEWCASTLE EMLYN SA38 9AB	
PROJECT TOPOGRAPHICAL SURVEY OF LAND AT BODLONDEB, PENPARCAU, ABERYSTWYTH, CEREDIGION	SCALE	NUMBER 180123/1
DATUM USED OSTN15 G.P.S V.R.S ORDNANCE SURVEY GRID & DATUM.	DATE 10/02/2023	DRAWN BY SMW JEM

GRID NORTH

A1 Drawing sheet (594mm x 841mm)

CIAT REGISTERED PRACTICE

Proposed Affordable Housing Development, Former Care Home, Bodlondeb, Penparcau

CIAT GROUP MEMBERSHIP SCHEME MEMBER

House Type Mix

- ## 8 x 2P1B Block of Flats, affordabale Units - Plots 15 - 22
- ## 9 x 4P2B House, affordable Units - Plots 1 - 9
- ## 4 x 5P3B House, affordable Units- Plots 10, 11 & 13, 14
- ## 1 x 6P4B House affordabale Units - Plot 12

Total No. Affordable Units = 22 Units

Proposed Roof/Block Plan 1:250

Revision:	Date:	By:
Rev A - Site Layout Amendment.	19th Apr 2023	SE/RH

Notes:

RLH architectural
16 Main Street, Fishguard, Pembrokeshire, SA65 9HJ
01348 435004/06
design@rlharchitectural.com
www.rlharchitectural.com

Tai Wales & West Housing

Client: Tai Wales & West Housing Association

Scale: Noted
Date: Feb '23
Drawn: SE/RH

Drawing Title: MASTER PLAN DRAWINGS - Proposed Block Plan

Job Title: Proposed Affordable Housing Development, Former Care Home, Bodlondeb, Penparcau

R444-MP-03A

APPENDIX II – ENGINEERING GEOLOGIST'S WINDOW SAMPLE LOGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No.

WS1

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.64 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259218.87 E 280160.61 N *Co-ordinates to National Grid*

Samples		Sample Run		Tests		STRATA				
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
							(0.07)	TARMAC			
	0.20 - 0.30	B 1					0.07	MADE GROUND: Grey slightly silty slightly sandy GRAVEL. Gravel is angular to sub angualr fine to coarse sandstone.		31.57	
	0.30	ES 1					(0.33)				
	0.80	ES 2					0.40	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		31.24	
1	1.00 - 1.50	B 2			1.00	SPT (S) 25 (4-4-**6**-**7**-**6**-**6**)	(1.50)				
							1.90			29.74	
2					2.00	SPT (S) 50/90mm (15-25/15mm----)	(0.10)	SILTSTONE rock, recovered as Grey brown slightly silty GRAVEL. Gravel is angular fine to coarse siltstone. (ABERYSTWYTH GRIT FORMATION)			
							2.00	Terminated upon refusal		29.64	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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Operator:	Logged By.	Sheet No.	m Per Page	All measurements in metres unless otherwise stated
QGL	A Jones	1 Of 1	4	

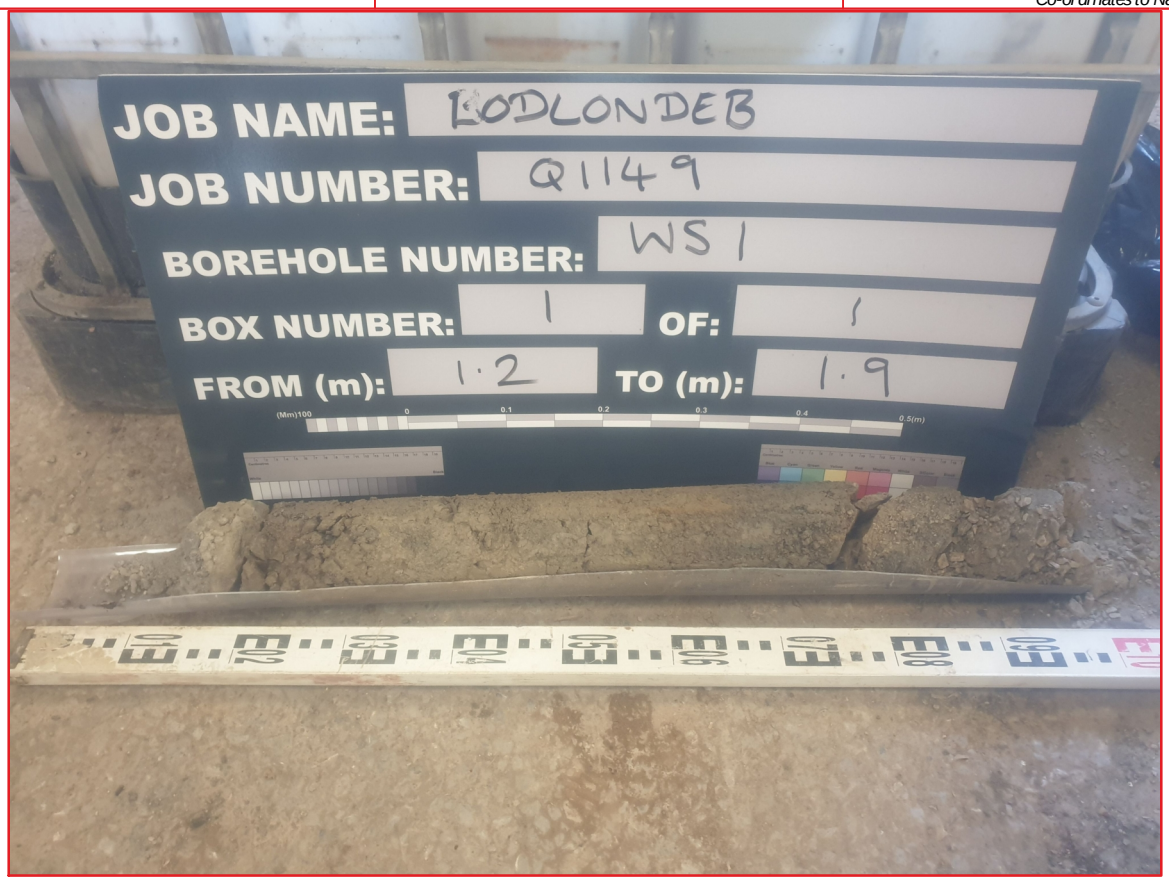
AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Borehole No.
WS1

Dates : 14/6/23 - 14/6/23	Job Number : Q1149	Ground Level : 31.64 m A.O.D. *Level to Ordnance Datum*
Location :	Engineer : Roger Casey Associates	Coordinates: 259218.87 E 280160.61 N *Co-ordinates to National Grid*



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QGL	A Jones	1 Of 1	2	All measurements in metres unless otherwise stated

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No.

WS2

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.48 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259238.85 E 280158.21 N *Co-ordinates to National Grid*

Samples		Sample Run		Tests		STRATA				
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
						(0.07)	TARMAC			
						0.07	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		31.41	
0.30 - 0.80	B 1									
0.50	ES 1					(0.83)				
						0.90	Terminated upon refusal		30.58	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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QGL	A Jones	1 Of 1	4	

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No.

WS3

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.49 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259256.05 E 280155.48 N *Co-ordinates to National Grid*

Samples		Sample Run		Tests		STRATA				Water
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	
							(0.10)	TOPSOIL: Brown slightly clayey slightly gravelly sandy CLAY.			
							0.10			31.39	
	0.30 - 0.80	B 1						Brown slightly sandy gravelly CLAY. Gravel is angular to sub angular fine to coarse siltstone.			
	0.50	ES 1					(0.80)				
							0.90	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		30.59	
1	1.00 - 1.20	B 2			1.00	SPT (S) 50/225mm (3-5-**6-19-22-3/0mm**)	(0.30)				
							1.20	Terminated upon refusal		30.29	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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QGL	A Jones	1 Of 1	4	

AGS

Contract : Former Bodlondeb Residential Home Client : Wales and West Housing			Borehole No. WS3
Dates : 14/6/23 - 14/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.49 m A.O.D. *Level to Ordnance Datum*	
		Coordinates: 259256.05 E 280155.48 N *Co-ordinates to National Grid*	

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QGL	A Jones	1 Of 1	2	All measurements in metres unless otherwise stated

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No.

WS4

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.46 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259271.43 E 280148.37 N *Co-ordinates to National Grid*

Samples		Sample Run		Tests		STRATA				
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
						(0.10)	TOPSOIL: Brown slightly clayey slightly gravelly sandy CLAY.			
						0.10			31.36	
0.30 - 0.50 0.30	B 1 ES 1					(0.60)	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)			
						0.70	Terminated upon refusal		30.76	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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QGL	A Jones	1 Of 1	4	

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No. WS5

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.46 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259223.10 E 280173.45 N *Co-ordinates to National Grid*

Samples		Sample Run		Tests		STRATA				
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
							(0.10)	TOPSOIL: Brown slightly clayey slightly gravelly sandy CLAY.			
							0.10	Brown slightly sandy gravelly CLAY. Gravel is angular to sub angular fine to coarse siltstone.		31.36	
	0.50 - 1.00 0.50	B 1 ES 1									
							(1.40)				
1	1.00 - 1.50	B 2			1.00	SPT (S) 7 (1-1-**1-1-2-3**)					
							1.50	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		29.96	
2	2.00 - 2.70	B 3			2.00	SPT (S) 18 (2-4-**3-5-5-5**)					
							(1.20)				
							2.70	Terminated upon refusal		28.76	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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QGL	A Jones	1 Of 1	4	

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Borehole No.
WS5

Dates : 14/6/23 - 14/6/23	Job Number : Q1149	Ground Level : 31.46 m A.O.D. *Level to Ordnance Datum*
Location :	Engineer : Roger Casey Associates	Coordinates: 259223.10 E 280173.45 N *Co-ordinates to National Grid*

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QGL	A Jones	1 Of 1	2	All measurements in metres unless otherwise stated

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No. WS6

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 30.50 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259203.35 E 280179.76 N *Co-ordinates to National Grid*

Samples		Sample Run		Tests		STRATA				
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
	0.10 - 0.50	B 1						MADE GROUND: Grey slightly silty slightly sandy GRAVEL. Gravel is angular to sub angular fine to coarse sandstone.			
	0.30	ES 1					(0.50)				
							0.50	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		30.00	
	0.90	ES 2									
1					1.00	SPT (S) 18 (2-4-**4-4-4-6**)					
							(1.40)				
	1.50 - 1.90	B 2									
							1.90	Terminated upon refusal		28.60	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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QGL	A Jones	1 Of 1	4	

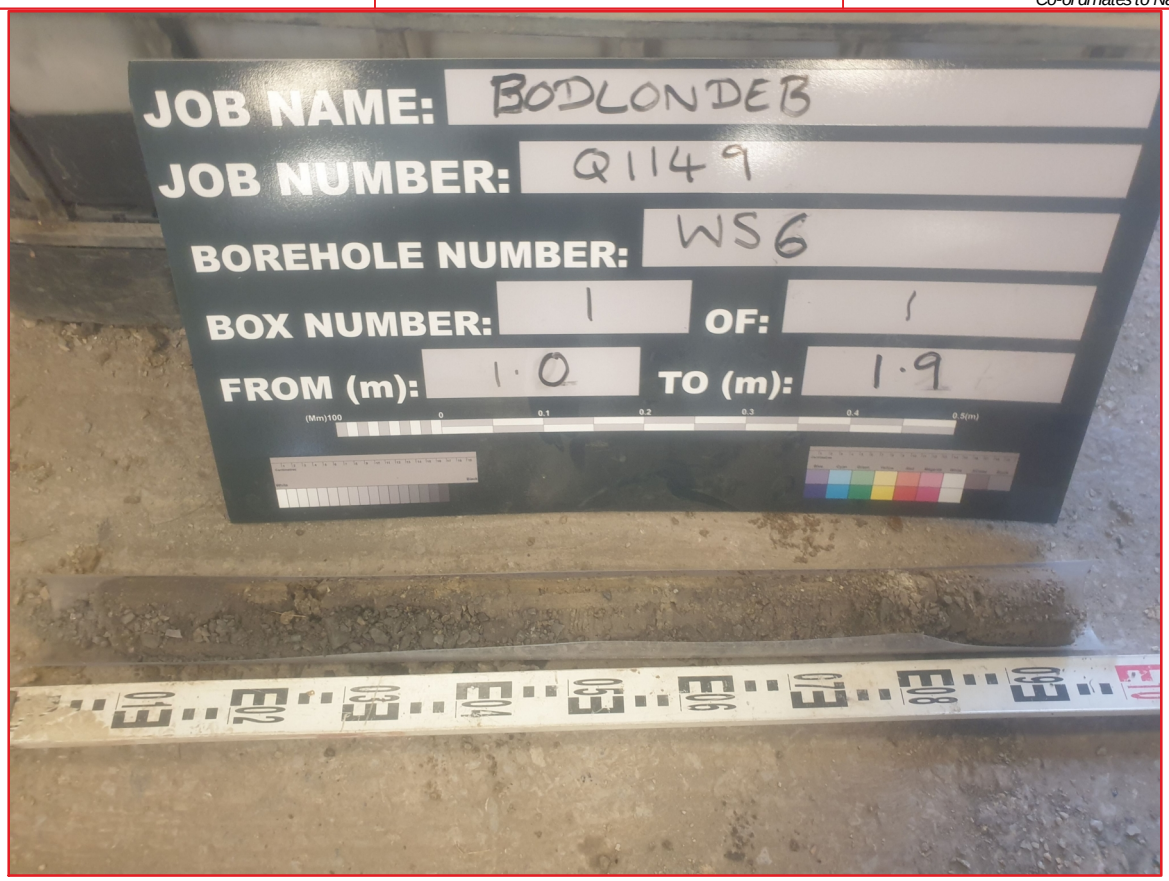
AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Borehole No.
WS6

Dates : 14/6/23 - 14/6/23	Job Number : Q1149	Ground Level : 30.50 m A.O.D. *Level to Ordnance Datum*
Location :	Engineer : Roger Casey Associates	Coordinates: 259203.35 E 280179.76 N *Co-ordinates to National Grid*



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Operator:	Logged By.	Sheet No.	m Per Page	
QGL	A Jones	1 Of 1	2	All measurements in metres unless otherwise stated

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No.

WS7

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 29.30 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259242.46 E
280182.89 N
Co-ordinates to National Grid

Samples		Sample Run		Tests		STRATA				Water
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	
						(0.10)	TOPSOIL: Brown slightly silty slightly gravelly sandy CLAY.			
0.20 - 0.50	B 1					0.10	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		29.20	
0.50	ES 1					(0.70)				
						0.80	Terminated upon refusal		28.50	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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Operator:	Logged By.	Sheet No.	m Per Page	All measurements in metres unless otherwise stated
QGL	A Jones	1 Of 1	4	

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No.

WS8

Dates : 15/6/23 - 15/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.46 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259259.77 E 280179.88 N *Co-ordinates to National Grid*

Samples		Sample Run		Tests		STRATA			
Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
						(0.25)	TARMAC			
						0.25	MADE GROUND: Brown grey clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone with rare brick.		31.21	
0.50 - 1.00	B 1									
0.80	ES 1									
						(1.35)				
1				1.00	SPT (S) 5 (1-2-**2-1-1-1**)					
						1.60	Pale brown silty slightly sandy gravelly CLAY. Gravel is angular to sub angular fine to coarse siltstone.		29.86	
1.70 - 1.80	D 1					(0.30)				
1.80	ES 2									
						1.90	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		29.56	
2 2.00 - 3.00	B 2			2.00	SPT (S) 5 (2-2-**1-2-1-1**)					
						(1.70)				
3 3.00 - 3.60	B 3			3.00	SPT (S) 28 (4-7-**7-5-6-10**)					
						3.60	Terminated upon refusal		27.86	

Equipment / plant used: Dando Terrier

Remarks:

No Groundwater Encountered

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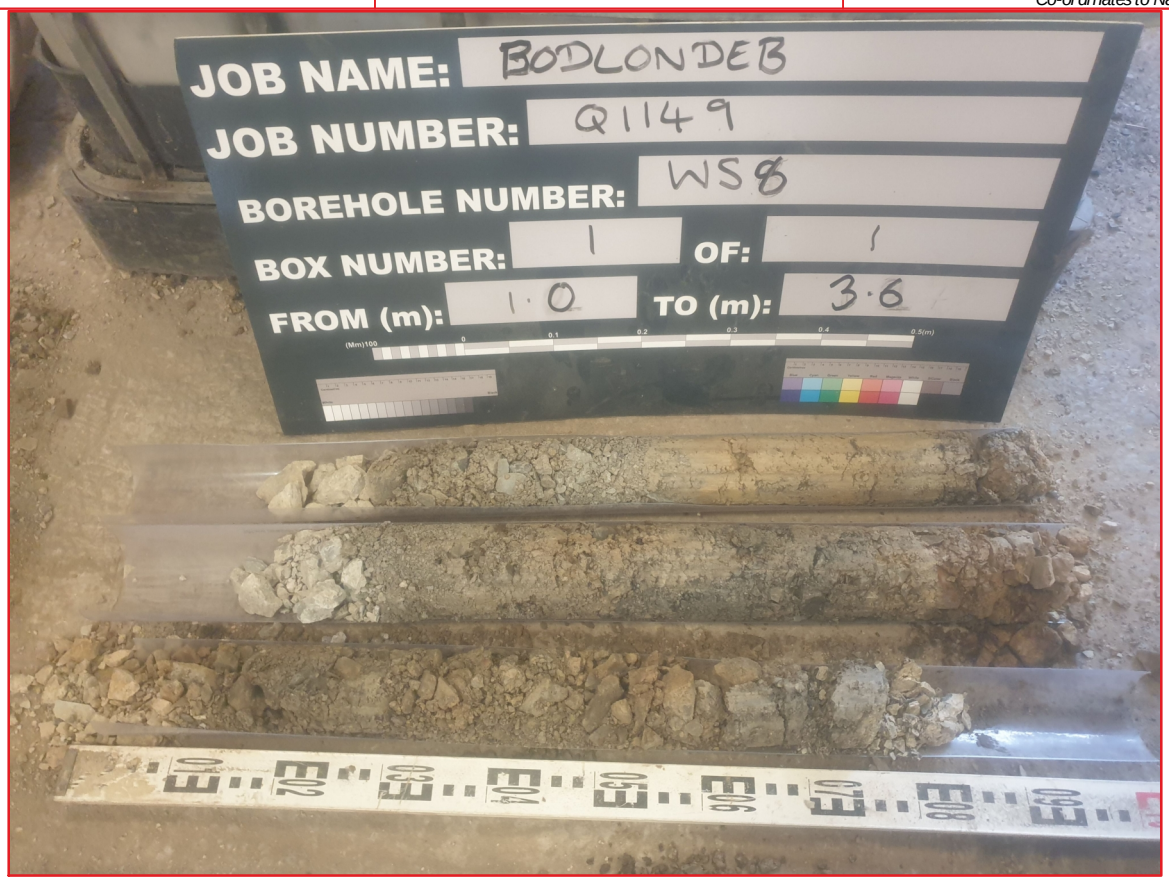
QGL	A Jones	1 Of 1	4		

Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Borehole No. WS8
Dates : 15/6/23 - 15/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.46 m A.O.D. *Level to Ordnance Datum* Coordinates: 259259.77 E 280179.88 N *Co-ordinates to National Grid*



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QGL	A Jones	1 Of 1	2	All measurements in metres unless otherwise stated

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Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No. WS9

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.51 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259260.08 E 280169.06 N *Co-ordinates to National Grid*

	Samples		Sample Run		Tests		STRATA				
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
							(0.25)	TARMAC			
	0.50 - 1.00 0.50	B 1 ES 1					0.25 (1.15)	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (Weathered Rock)		31.26	
1	1.00 - 1.40	B 2			1.00	SPT (S) 19 (2-2-**3-3-5-8**)					
							1.40	Terminated upon refusal		30.11	

Equipment / plant used:

Remarks:

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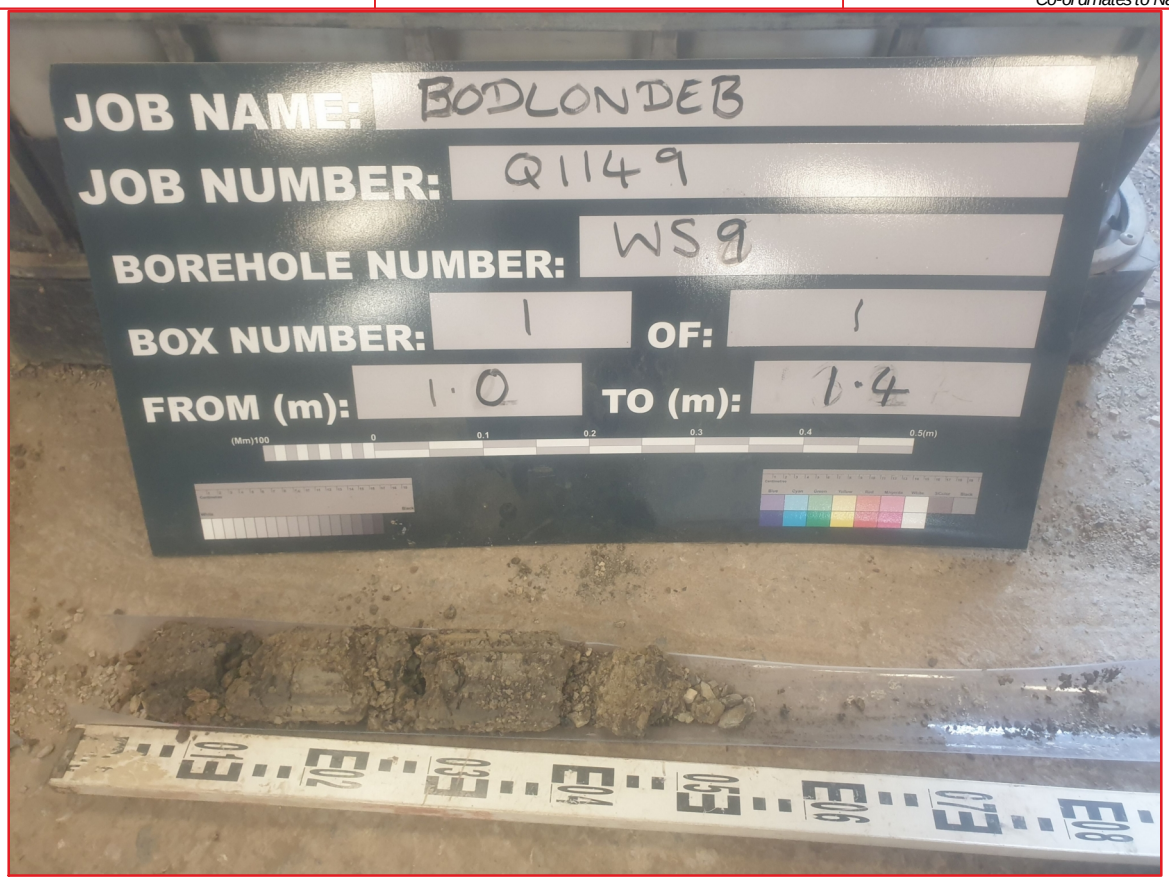
AGS

Contract : Former Bodlondeb Residential Home Client : Wales and West Housing	Borehole No. WS9

Dates : 14/6/23 - 14/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.51 m A.O.D. *Level to Ordnance Datum* Coordinates: 259260.08 E 280169.06 N *Co-ordinates to National Grid*



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Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Window Sample No. WS10

Dates : 15/6/23 - 15/6/23

Location :

Job Number : Q1149

Engineer : Roger Casey Associates

Ground Level : 31.56 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259277.92 E 280160.47 N *Co-ordinates to National Grid*

	Samples		Sample Run		Tests		STRATA				
	Depth	Type No.	Diam. (mm)	Recovery (%)	Depth	SPT & Hand Vane Results	Depth (Thick-ness)	DESCRIPTION	Legend	Red. Level . A.O.D.	Water
							(0.25)	TARMAC			
	0.50 - 1.00 0.50	B 1 ES 1					0.25 (1.15)	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (Weathered Rock)		31.31	
1	1.00 - 1.40	B 2			1.00	SPT (S) 48 (6-9-**8-9-12-19**)					
							1.40	Terminated upon refusal		30.16	

Equipment / plant used:

Remarks:

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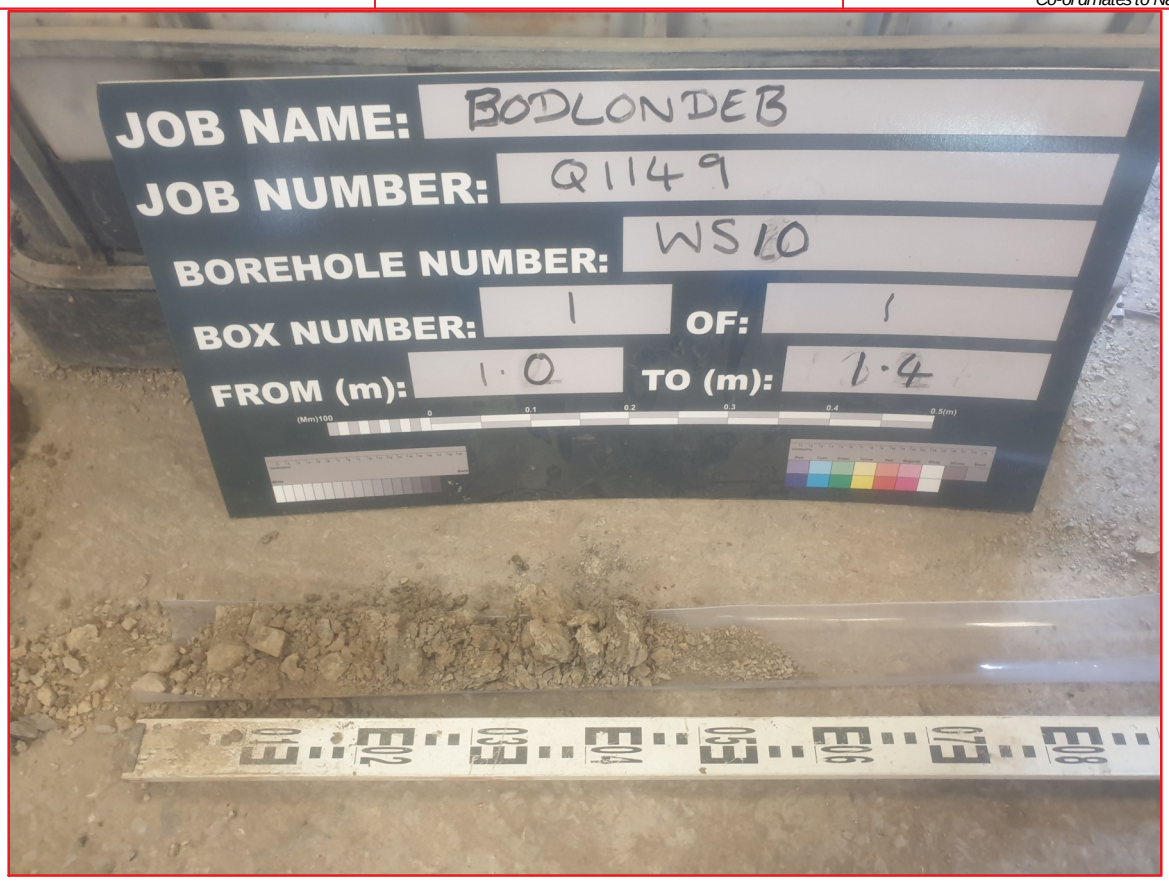
Contract : Former Bodlondeb Residential Home Client : Wales and West Housing	Borehole No. WS10

Dates : 15/6/23 - 15/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.56 m A.O.D. *Level to Ordnance Datum* Coordinates: 259277.92 E 280160.47 N *Co-ordinates to National Grid*



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KEY TO BOREHOLE AND TRIAL PIT LOGS

MATERIAL LEGENDS

 Made Ground	 Topsoil	 Clay
 Gravel	 Sand	 Silt
 Peat	 Boulders	 Cobbles
 Chalk	 Conglomerate	 Volcaniclastic
 Asphalt	 Void	 Mudstone
 Siltstone	 Sandstone	 Limestone
 Ironstone	 Mudstone / Siltstone	 Breccia
 Coal	 Coral	 Bedrock
 Shale	 Gypsum	 Igneous (Coarse Grained)
 Igneous (Fine Grained)	 Igneous (Medium Grained)	 Metamorphic (Coarse Grained)
 Metamorphic (Fine Grained)	 Metamorphic (Medium Grained)	

INSTALLATION / BACKFILL DETAILS

 Arisings	 Concrete	 Bentonite cement grout
 Bentonite seal	 Filter	 Pea Gravel
 Plain pipe	 Slotted pipe	 Piezometer / Standpipe tip

NOTE:
Legend symbols in accordance with BS 5930 (2015)

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KEY TO BOREHOLE AND TRIAL PIT LOGS

m.A.O.D. metres Above Ordnance Datum.

SAMPLE AND TEST TYPES

U	Undisturbed driven tube sample - 102mm diameter, 450mm long.
P	Undisturbed pushed piston sample - 102mm diameter, 1000mm long.
TW	Undisturbed thin walled push in sample - 100mm diameter, 750mm long.
B	Bulk disturbed sample.
BLK	Block Sample
CBR	Heavy duty undisturbed sample - 154 mm diameter (CBR mould).
D	Small disturbed sample.
LB	Large Bulk disturbed sample (for earthworks testing)
C	Core sample
W	Water sample
G	Gas sample
ES	Environmental sample (soil)
j	Jar sample
t	Tub sample
p	Pot sample
s	Small sample
v	Vial sample
S	Standard Penetration Test using split spoon sampler. (See Note).
C	Standard Penetration Test using a solid 60 degree cone. (See Note).

NOTE: Where a single value is quoted this is the N value for 300 mm penetration following a seating drive of 150 mm. Where this full penetration is not achieved the number of blows is quoted for the penetration below the seating drive eg. 63/160 mm.
Where total penetration is less than the seating drive this is indicated by a + and the number of blows for total penetration is quoted eg. +50/75 mm.

HV	Hand Vane Test. Vane undrained shear strength, c_u, quoted in kPa.
V	Borehole Vane Test. Vane undrained shear strength, c_u, quoted in kPa.
FHT/RHT	Falling / Rising Head Permeability Test.

CORE RUN DETAILS

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
FI	Fracture Index. NI - Non intact where > 25 No. per metre length.

WATER COLUMN SYMBOLS

	First water strike, second water strike etc.
	Standing water level after first strike, second strike etc.
	Seepage.

NOTE:
Legend symbols in accordance with BS 5930 (2015)

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APPENDIX III – ENGINEERING GEOLOGIST'S TRIAL PIT LOGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP1

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

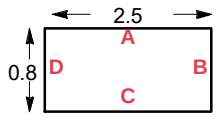
Engineer : Roger Casey Associates

Ground Level : 31.31 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259289.84 E 280157.29 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Strata Legend	Strata Red. Level A.O.D.	WATER
					0.08	Turf over TOPSOIL: Brown slightly clayey slightly sandy sligtly gravelly SILT with many rootlets.			
					0.08	Grey brown slightly clayey slightly sandy GRAVEL with low cobble content of angular siltstone. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		31.23	
	0.30 -	ES1							
	0.50 - 0.80	B1			0.82				
1					0.90	SILTSTONE rock, recovered as Grey brown slightly silty GRAVEL. Gravel is angular Fine to coarse siltstone. (ABERYSTWYTH GRIT FORMATION)		30.41	
	1.50 - 2.00	B2			1.10				
2					2.00	Terminated upon refusal		29.31	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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QGL	A Jones	1 Of 2	4	

AGS

Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Trial Pit No. TP1
Dates : 14/6/23 - 14/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.31 m A.O.D. *Level to Ordnance Datum* Coordinates: 259289.84 E 280157.29 N *Co-ordinates to National Grid*

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP2

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

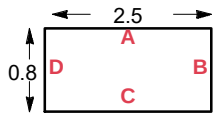
Engineer : Roger Casey Associates

Ground Level : 31.34 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259272.54 E 280165.03 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Strata Legend	Strata Red. Level A.O.D.	WATER
					0.07	Turf over TOPSOIL: Brown slightly clayey slightly sandy sligtly gravelly SILT with many rootlets.			
					0.07	MADE GROUND: Brown clayey slightlky silty slightly sandy GRAVEL with low cobble content of brick. Gravel is angular fien to coarse siltstone, red brick, tile and glass.		31.27	
	0.30 - 0.50	B1							
	0.40 -	ES1			0.73				
					0.80	Brown slightly silty slightly sandy gravelly CLAY. Gravel is angular to sub angular fine to coarse siltstone.		30.54	
1	1.00 - 1.20	B2							
	1.00 -	ES2			0.60				
					1.40	SILTSTONE rock, recovered as Grey brown slightly silty GRAVEL. Gravel is angular fine to coarse siltstone. (ABERYSTWYTH GRIT FORMATION)		29.94	
	1.50 - 2.00	B3			0.60				
2					2.00	Terminated upon refusal		29.34	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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QGL	A Jones	1 Of 2	4	

AGS

Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Trial Pit No. TP2
Dates : 14/6/23 - 14/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.34 m A.O.D. *Level to Ordnance Datum* Coordinates: 259272.54 E 280165.03 N *Co-ordinates to National Grid*

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Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP3

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

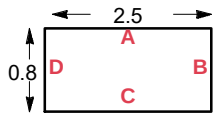
Engineer : Roger Casey Associates

Ground Level : 31.29 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259268.81 E 280175.75 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Legend	Red. Level A.O.D.	WATER
					0.07	Turf over TOPSOIL: Brown slightly clayey slightly sandy sligtly gravelly SILT with many rootlets.		31.22	
	0.30 - 0.60	B1			0.07	MADE GROUND: Brown clayey slightlky silty slightly sandy GRAVEL with low cobble content of brick. Gravel is angular fien to coarse siltstone, red brick, tile and glass.			
	0.50 -	ES1							
1	1.00 -	ES2			1.73				
	1.30 - 1.50	B2							
					1.80	Brown slightly sandy gravelly CLAY. Gravel is angular to sub angular fine to coarse siltstone.		29.49	
2	2.00 - 2.20	B3			0.50				
					2.30	SILTSTONE rock, recovered as Grey brown slightly silty GRAVEL. Gravel is angular fine to coarse siltstone. (ABERYSTWYTH GRIT FORMATION)		28.99	
	2.50 - 3.00	B4			0.70				
3					3.00	Terminated upon refusal		28.29	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Trial Pit No. TP3
Dates : 14/6/23 - 14/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.29 m A.O.D. *Level to Ordnance Datum* Coordinates: 259268.81 E 280175.75 N *Co-ordinates to National Grid*

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP4

Dates : 14/6/23 - 14/6/23

Location :

Job Number : Q1149

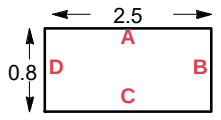
Engineer : Roger Casey Associates

Ground Level : 28.89 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259277.22 E 280179.45 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Strata Legend	Strata Red. Level A.O.D.	WATER
					0.06	Turf over TOPSOIL: Brown slightly clayey slightly sandy sligtly gravelly SILT with many rootlets.		28.83	
					0.06	MADE GROUND: Brown clayey slightlky silty slightly sandy GRAVEL with low cobble content of brick. Gravel is angular fien to coarse siltstone, red brick, tile and glass.			
	0.30 - 0.50	B1							
	0.50 -	ES1			0.84				
1	1.00 - 1.20	B2			0.90	Brown slightly silty slightly sandy GRAVEL. Gravel is angular to sub angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		27.99	
	1.20 -	ES2			0.50				
					1.40	Terminated upon refusal		27.49	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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Contract : Former Bodlondeb Residential Home Client : Wales and West Housing			Trial Pit No. TP4
Dates : 14/6/23 - 14/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 28.89 m A.O.D. *Level to Ordnance Datum*	
		Coordinates: 259277.22 E 280179.45 N *Co-ordinates to National Grid*	

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP5

Dates : 15/6/23 - 15/6/23

Location :

Job Number : Q1149

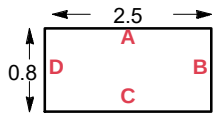
Engineer : Roger Casey Associates

Ground Level : 28.74 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259230.94 E 280185.36 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Strata Legend	Strata Red. Level A.O.D.	WATER
					0.10	MADE GROUND: Grey slightly silty slightly sandy GRAVEL. Gravel is angular to sub angualr fine to coarse sandstone.			
	0.20 - 0.30	B1			0.10			28.64	
	0.20 -	ES1			0.25	MADE ROUND: Grey slightly silty slightly sandy GRAVEL with low cobble content of sandstone and siltstone. Gravel is angular to sub angular fine to coarse siltstone sandstone and brick.			
					0.35	Terram at 0.35mbgl		28.39	
	0.50 - 0.70	B2				Brown slightly sandy gravelly CLAY.			
	0.50 -	ES2			0.45				
					0.80	Grey brown slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (Weatherd Rock)		27.94	
1	1.00 - 1.20	B3			0.70				
					1.50	SILTSTONE rock, recovered as Grey brown slightly silty GRAVEL. Gravel is angular fine to coarse siltstone. (ABERYSTWYTH GRIT FORMATION)		27.24	
	1.80 - 2.00	B4							
2					1.50				
	2.80 - 3.00	B5							
3					3.00	Terminated upon refusal		25.74	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Trial Pit No. TP5
Dates : 15/6/23 - 15/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 28.74 m A.O.D. *Level to Ordnance Datum* Coordinates: 259230.94 E 280185.36 N *Co-ordinates to National Grid*

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Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP6

Dates : 15/6/23 - 15/6/23

Location :

Job Number : Q1149

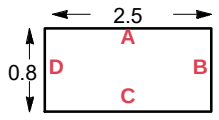
Engineer : Roger Casey Associates

Ground Level : 31.16 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259237.26 E 280174.45 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Legend	Red. Level A.O.D.	WATER
					0.05 (0.05)	Turf over TOPSOIL: Brown slightly clayey slightly sandy slightly gravelly SILT.		31.11	
						MADE ROUND: Grey slightly silty slightly sandy GRAVEL with low cobble content of sandstone and siltstone. Gravel is angular to sub angular fine to coarse siltstone sandstone, brick and tile.			
	0.50 - 0.80	B1			1.00				
	0.50 -	ES1							
1					1.05	Grey brown slightly clayey slightly sandy GRAVEL with low cobble content. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		30.11	
	1.20 -	ES2							
	1.50 - 2.00	B2							
					1.65				
2					2.70 (0.30)	SILTSTONE rock, recovered as Grey brown slightly silty GRAVEL. Gravel is angular fine to coarse siltstone. (ABERYSTWYTH GRIT FORMATION)		28.46	
	2.80 - 3.00	B3							
3					3.00	Terminated upon refusal		28.16	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Trial Pit No. TP6
Dates : 15/6/23 - 15/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.16 m A.O.D. *Level to Ordnance Datum* Coordinates: 259237.26 E 280174.45 N *Co-ordinates to National Grid*

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QGL	A Jones	2 Of 2		All measurements in metres unless otherwise stated

AGS

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP7

Dates : 15/6/23 - 15/6/23

Location :

Job Number : Q1149

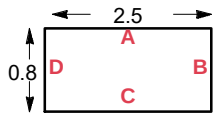
Engineer : Roger Casey Associates

Ground Level : 31.14 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259195.55 E 280176.54 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Strata Legend	Strata Red. Level A.O.D.	WATER
					0.06	Turf over TOPSOIL: Brown slightly clayey slightly sandy slightly gravelly SILT.		31.08	
	0.30 - 0.50	B1			0.06	Pale brown gravelly slightly silty slightly sandy CLAY.			
	0.50 -	ES1			0.74				
1	1.00 - 1.50	2			0.80	Brown slightly silty slightly sandy GRAVEL. Gravel is angular fine to coarse siltstone. (WEATHERED ABERYSTWYTH GRIT FORMATION)		30.34	
					1.20				
2					2.00	Terminated at 2.0mbgl on siltstone rock.		29.14	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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Operator:	Logged By.	Sheet No.	m Per Page	
QGL	A Jones	1 Of 2	4	All measurements in metres unless otherwise stated

AGS

Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Trial Pit No. TP7
Dates : 15/6/23 - 15/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 31.14 m A.O.D. *Level to Ordnance Datum* Coordinates: 259195.55 E 280176.54 N *Co-ordinates to National Grid*

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Operator:	Logged By.	Sheet No.	m Per Page	All measurements in metres unless otherwise stated
QGL	A Jones	2 Of 2		

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Trial Pit No. TP8

Dates : 15/6/23 - 15/6/23

Location :

Job Number : Q1149

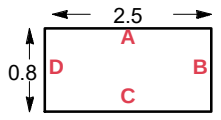
Engineer : Roger Casey Associates

Ground Level : 28.65 m A.O.D. *Level to Ordnance Datum*

Coordinates: 259212.02 E 280194.63 N *Co-ordinates to National Grid*

m B.G.L.	Samples Depth	Samples Type No.	Tests Depth	Tests Test Results	Strata Depth (Thick-ness)	Strata Description	Strata Legend	Strata Red. Level A.O.D.	WATER
					0.08	TARMAC			
	0.10 - 0.20	B1			0.08	MADE GROUND: Brown grey slightly clayey slightly sandy GRAVEL. Gravel is angular fine to coarse angular siltstone. (Re-Worked Natural)		28.57	
	0.20 -	ES1			0.22				
	0.40 - 0.50	B2			0.30	Orange brown slightly sandy gravelly CLAY.		28.35	
	0.50 -	ES2			0.50				
1	1.00 - 1.50	B3			0.80	Brown grey slightly silty slightly sandy gravelly CLAY with low cobble content of siltstone. Gravel is angular to sub angular fine to coarse siltstone.		27.85	
					1.40				
2					2.20			26.45	

PLAN



Groundwater: No Groundwater Encountered

Stability: Stable

Shoring: N/A

Remarks:

Equipment Used: 9 tonne excavator

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Swansea
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Operator:	Logged By.	Sheet No.	m Per Page	
QGL	A Jones	1 Of 2	4	All measurements in metres unless otherwise stated

AGS

Contract : Former Bodlondeb Residential Home Client : Wales and West Housing		Trial Pit No. TP8
Dates : 15/6/23 - 15/6/23 Location :	Job Number : Q1149 Engineer : Roger Casey Associates	Ground Level : 28.65 m A.O.D. *Level to Ordnance Datum* Coordinates: 259212.02 E 280194.63 N *Co-ordinates to National Grid*

KEY TO BOREHOLE AND TRIAL PIT LOGS

MATERIAL LEGENDS

 Made Ground	 Topsoil	 Clay
 Gravel	 Sand	 Silt
 Peat	 Boulders	 Cobbles
 Chalk	 Conglomerate	 Volcaniclastic
 Asphalt	 Void	 Mudstone
 Siltstone	 Sandstone	 Limestone
 Ironstone	 Mudstone / Siltstone	 Breccia
 Coal	 Coral	 Bedrock
 Shale	 Gypsum	 Igneous (Coarse Grained)
 Igneous (Fine Grained)	 Igneous (Medium Grained)	 Metamorphic (Coarse Grained)
 Metamorphic (Fine Grained)	 Metamorphic (Medium Grained)	

INSTALLATION / BACKFILL DETAILS

 Arisings	 Concrete	 Bentonite cement grout
 Bentonite seal	 Filter	 Pea Gravel
 Plain pipe	 Slotted pipe	 Piezometer / Standpipe tip

NOTE:
Legend symbols in accordance with BS 5930 (2015)

Quantum Geotech

KEY TO BOREHOLE AND TRIAL PIT LOGS

m.A.O.D. metres Above Ordnance Datum.

SAMPLE AND TEST TYPES

U	Undisturbed driven tube sample - 102mm diameter, 450mm long.
P	Undisturbed pushed piston sample - 102mm diameter, 1000mm long.
TW	Undisturbed thin walled push in sample - 100mm diameter, 750mm long.
B	Bulk disturbed sample.
BLK	Block Sample
CBR	Heavy duty undisturbed sample - 154 mm diameter (CBR mould).
D	Small disturbed sample.
LB	Large Bulk disturbed sample (for earthworks testing)
C	Core sample
W	Water sample
G	Gas sample
ES	Environmental sample (soil)
j	Jar sample
t	Tub sample
p	Pot sample
s	Small sample
v	Vial sample
S	Standard Penetration Test using split spoon sampler. (See Note).
C	Standard Penetration Test using a solid 60 degree cone. (See Note).

NOTE: Where a single value is quoted this is the N value for 300 mm penetration following a seating drive of 150 mm. Where this full penetration is not achieved the number of blows is quoted for the penetration below the seating drive eg. 63/160 mm.
Where total penetration is less than the seating drive this is indicated by a + and the number of blows for total penetration is quoted eg. +50/75 mm.

HV	Hand Vane Test. Vane undrained shear strength, c_u, quoted in kPa.
V	Borehole Vane Test. Vane undrained shear strength, c_u, quoted in kPa.
FHT/RHT	Falling / Rising Head Permeability Test.

CORE RUN DETAILS

TCR	Total Core Recovery, %
SCR	Solid Core Recovery, %
RQD	Rock Quality Designation, %
FI	Fracture Index. NI - Non intact where > 25 No. per metre length.

WATER COLUMN SYMBOLS

	First water strike, second water strike etc.
	Standing water level after first strike, second strike etc.
	Seepage.

NOTE:
Legend symbols in accordance with BS 5930 (2015)

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APPENDIX IV – SOAKAWAY TEST CERTIFICATES

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP1,1

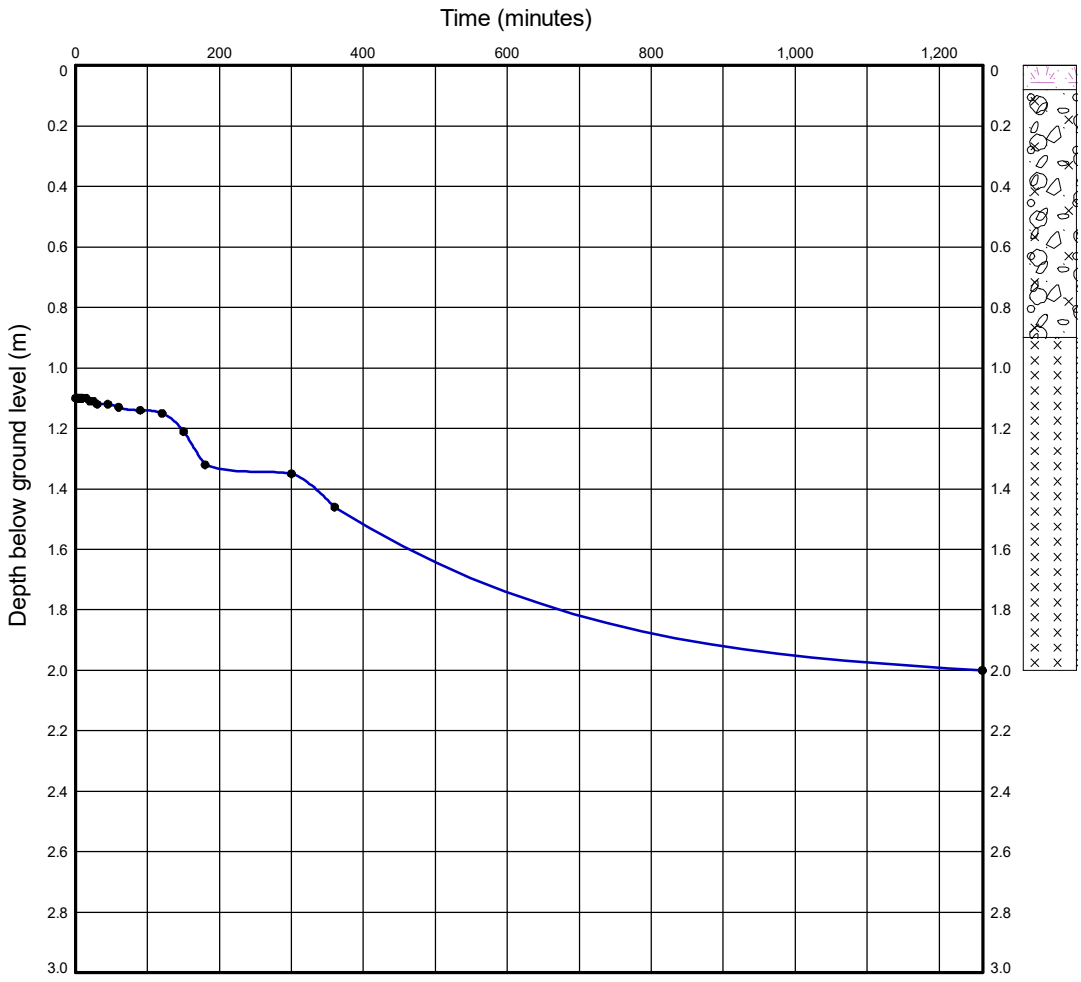
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	1.1
1.0	1.1
2.0	1.1
3.0	1.1
4.0	1.1
5.0	1.1
6.0	1.1
7.0	1.1
8.0	1.1
9.0	1.1
10.0	1.1
15.0	1.1
20.0	1.11
25.0	1.11
30.0	1.12
45.0	1.12
60.0	1.13
90.0	1.14
120.0	1.15
150.0	1.21
180.0	1.32
300.0	1.35
360.0	1.46
1260.0	2

Field Observations from soakaway trial pit



Remarks:

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	2.000 m	V_{p75-25}=	0.450 m^3
Trial Pit Length	2.500 m	a_{p50}=	3.485 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	450.000 minutes
Effective Depth	0.450 m		
Outflow Time	450 mins from 75% to 25% full		

f = 4.7824E-6 m/sec

Quantum

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Date of Test: 14/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 1

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP3,1

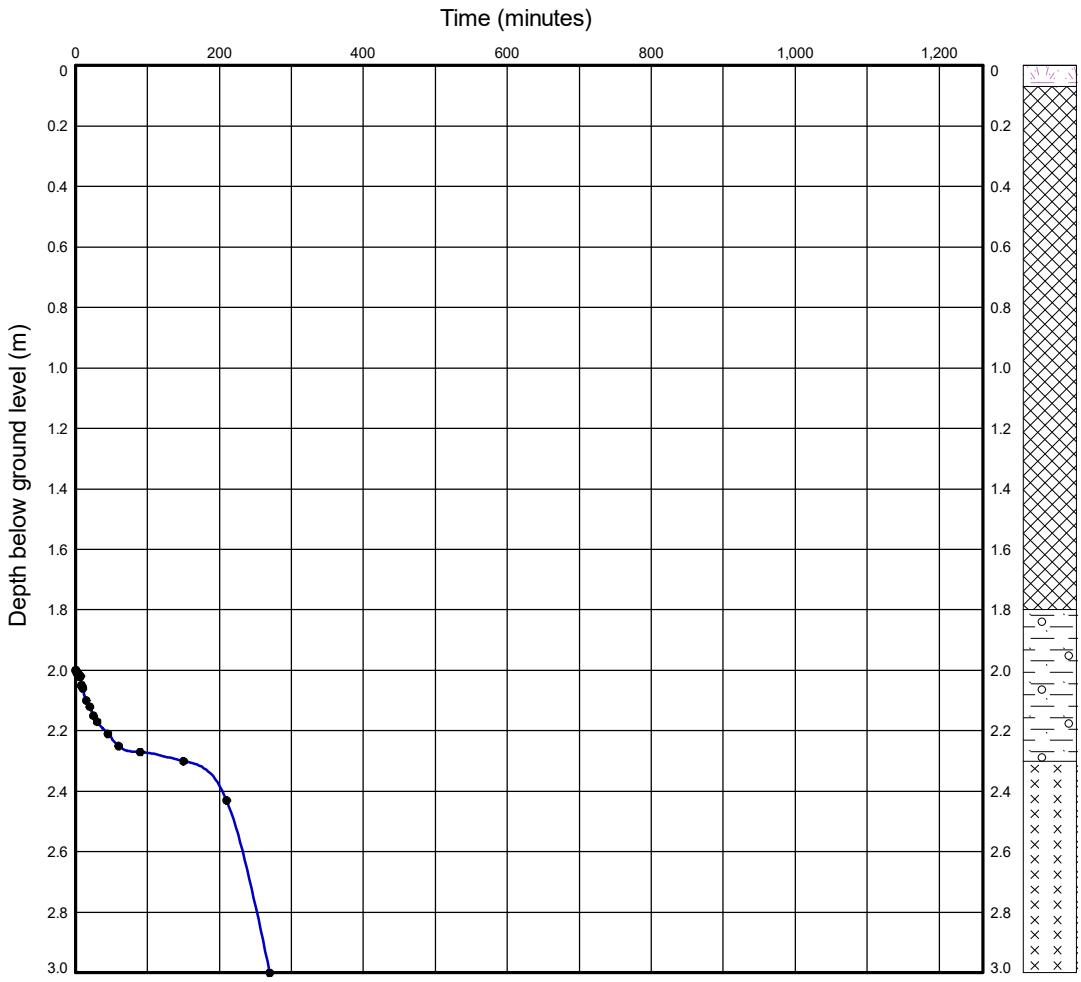
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	2
1.0	2
2.0	2.01
3.0	2.01
4.0	2.01
5.0	2.02
6.0	2.02
7.0	2.02
8.0	2.05
9.0	2.05
10.0	2.06
15.0	2.1
20.0	2.12
25.0	2.15
30.0	2.17
45.0	2.21
60.0	2.25
90.0	2.27
150.0	2.3
210.0	2.43
270.0	3

Field Observations from soakaway trial pit



Remarks:

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	3.000 m	V_{p75-25}=	0.500 m^3
Trial Pit Length	2.500 m	a_{p50}=	3.650 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	190.000 minutes
Effective Depth	0.500 m		
Outflow Time	190 mins from 75% to 25% full		

f = 1.2016E-5 m/sec

Quantum

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Date of Test: 14/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 2

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP3,2

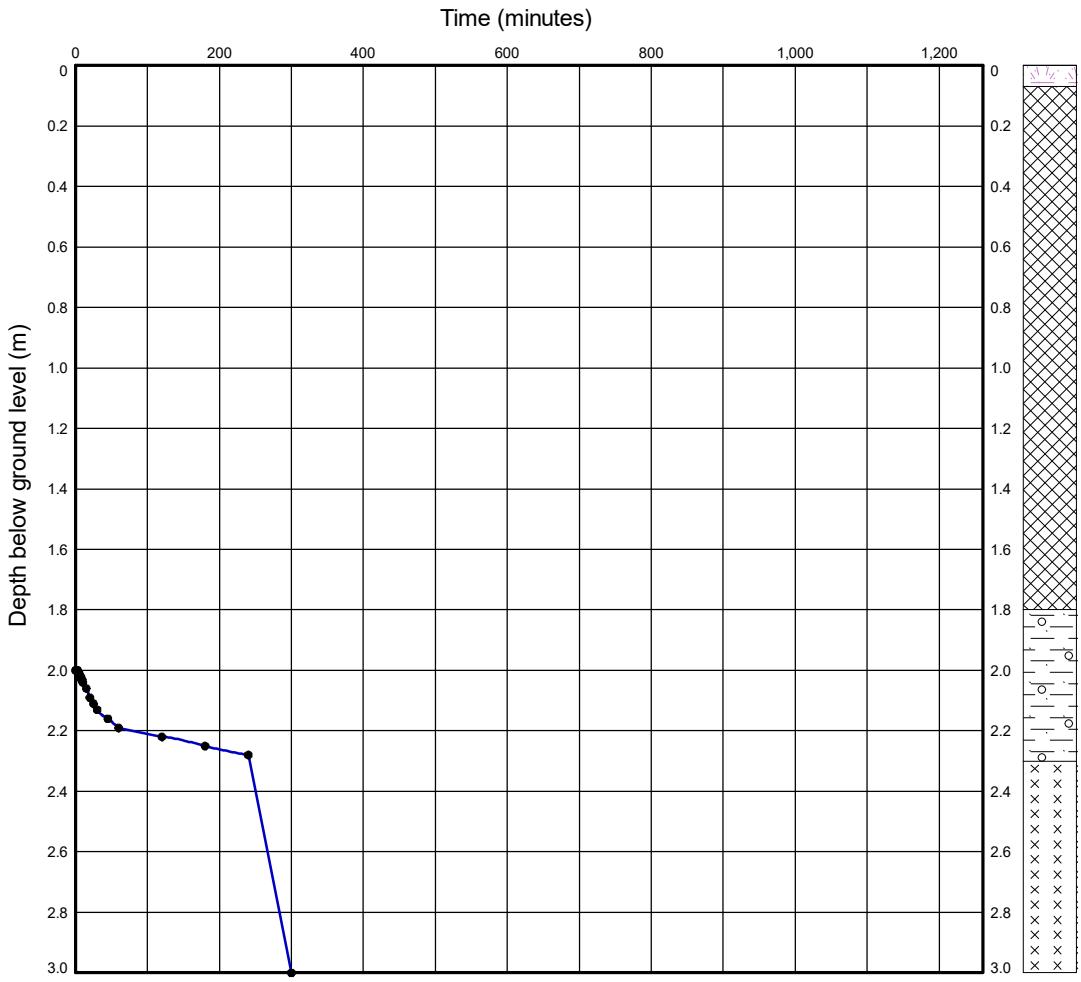
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	2
1.0	2
2.0	2
3.0	2
4.0	2.01
5.0	2.01
6.0	2.02
7.0	2.02
8.0	2.03
9.0	2.03
10.0	2.04
15.0	2.06
20.0	2.09
25.0	2.11
30.0	2.13
45.0	2.16
60.0	2.19
120.0	2.22
180.0	2.25
240.0	2.28
300.0	3

Field Observations from soakaway trial pit



Remarks:

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	3.000 m	V_{p75-25}=	0.500 m^3
Trial Pit Length	2.500 m	a_{p50}=	3.650 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	100.000 minutes
Effective Depth	0.500 m		
Outflow Time	100 mins from 75% to 25% full		

f = 2.2831E-5 m/sec

Quantum

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Date of Test: 15/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 3

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP4,1

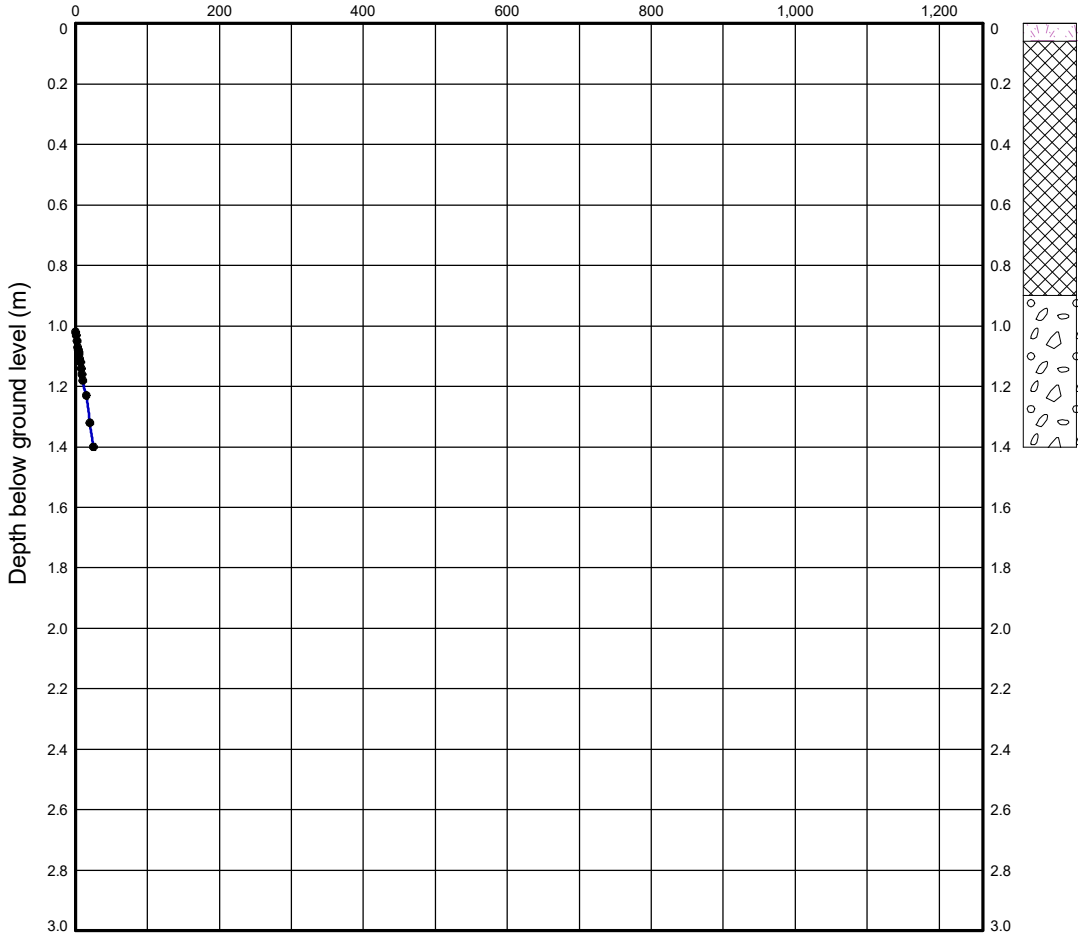
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	1.02
1.0	1.03
2.0	1.05
3.0	1.07
4.0	1.08
5.0	1.09
6.0	1.11
7.0	1.12
8.0	1.14
9.0	1.16
10.0	1.18
15.0	1.23
20.0	1.32
25.0	1.4

Field Observations from soakaway trial pit



Remarks:

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	1.400 m	V_{p75-25}=	0.200 m^3
Trial Pit Length	2.500 m	a_{p50}=	2.660 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	14.000 minutes
Effective Depth	0.200 m		
Outflow Time	14 mins from 75% to 25% full		

f = 8.9509E-5 m/sec

Quantum

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Date of Test: 14/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 4

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP4,2

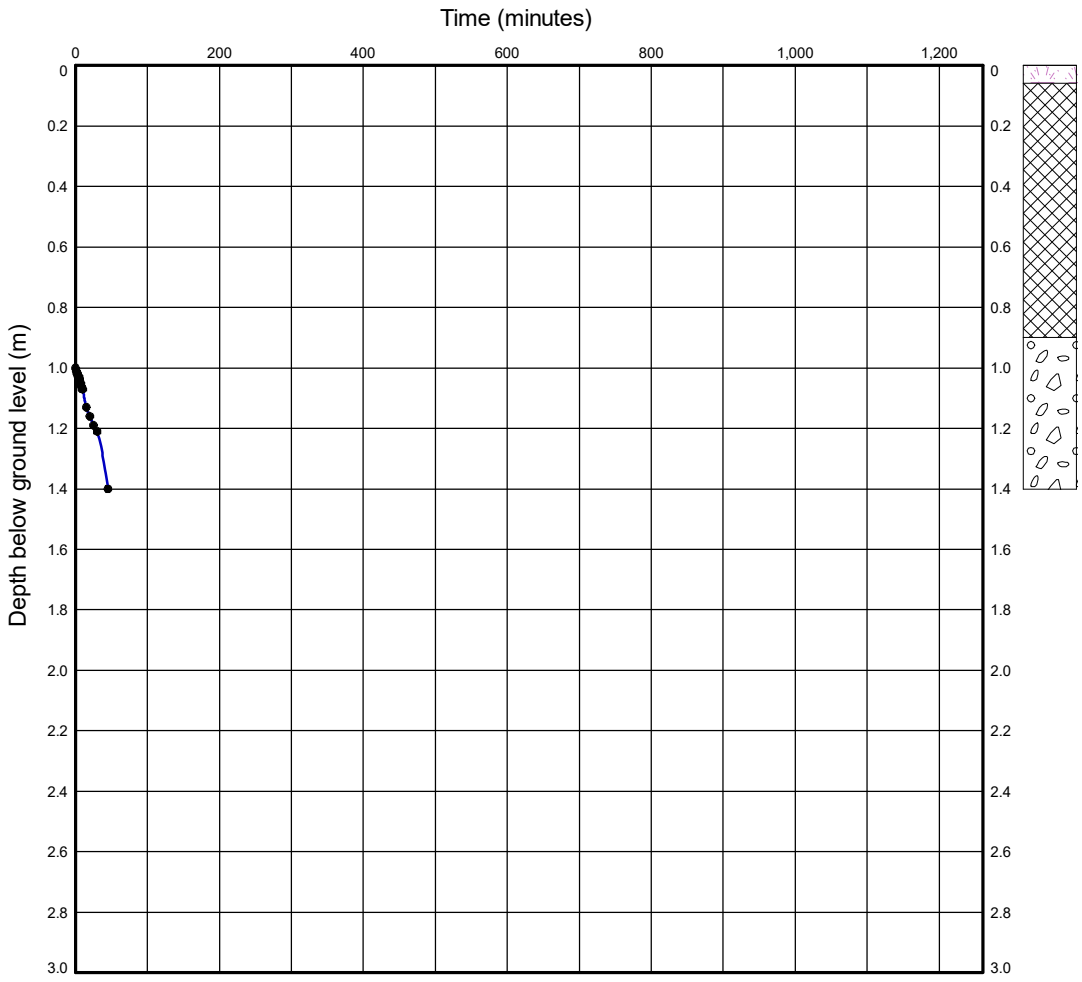
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	1
1.0	1.01
2.0	1.02
3.0	1.02
4.0	1.03
5.0	1.03
6.0	1.04
7.0	1.05
8.0	1.06
9.0	1.07
10.0	1.07
15.0	1.13
20.0	1.16
25.0	1.19
30.0	1.21
45.0	1.4

Field Observations from soakaway trial pit



Remarks:

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	1.400 m	V_{p75-25}=	0.200 m^3
Trial Pit Length	2.500 m	a_{p50}=	2.660 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	26.000 minutes
Effective Depth	0.200 m		
Outflow Time	26 mins from 75% to 25% full		

f = 4.8197E-5 m/sec

Quantum

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Date of Test: 14/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 5

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP4,3

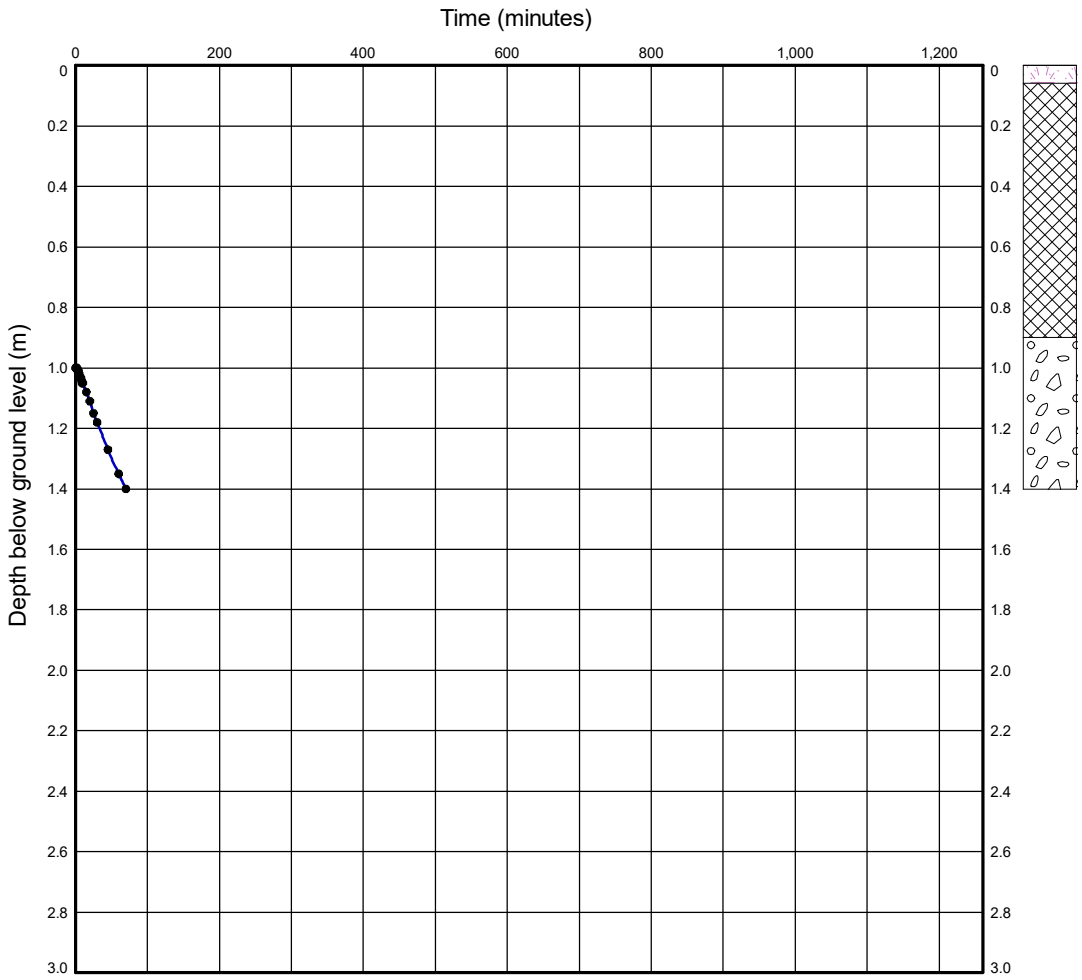
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	1
1.0	1
2.0	1
3.0	1.01
4.0	1.01
5.0	1.02
6.0	1.03
7.0	1.03
8.0	1.04
9.0	1.05
10.0	1.05
15.0	1.08
20.0	1.11
25.0	1.15
30.0	1.18
45.0	1.27
60.0	1.35
70.0	1.4

Field Observations from soakaway trial pit



Remarks:

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	1.400 m	V_{p75-25}=	0.200 m^3
Trial Pit Length	2.500 m	a_{p50}=	2.660 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	30.000 minutes
Effective Depth	0.200 m		
Outflow Time	30 mins from 75% to 25% full		

f = 4.1771E-5 m/sec

Quantum

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Date of Test: 14/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 6

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP6,1

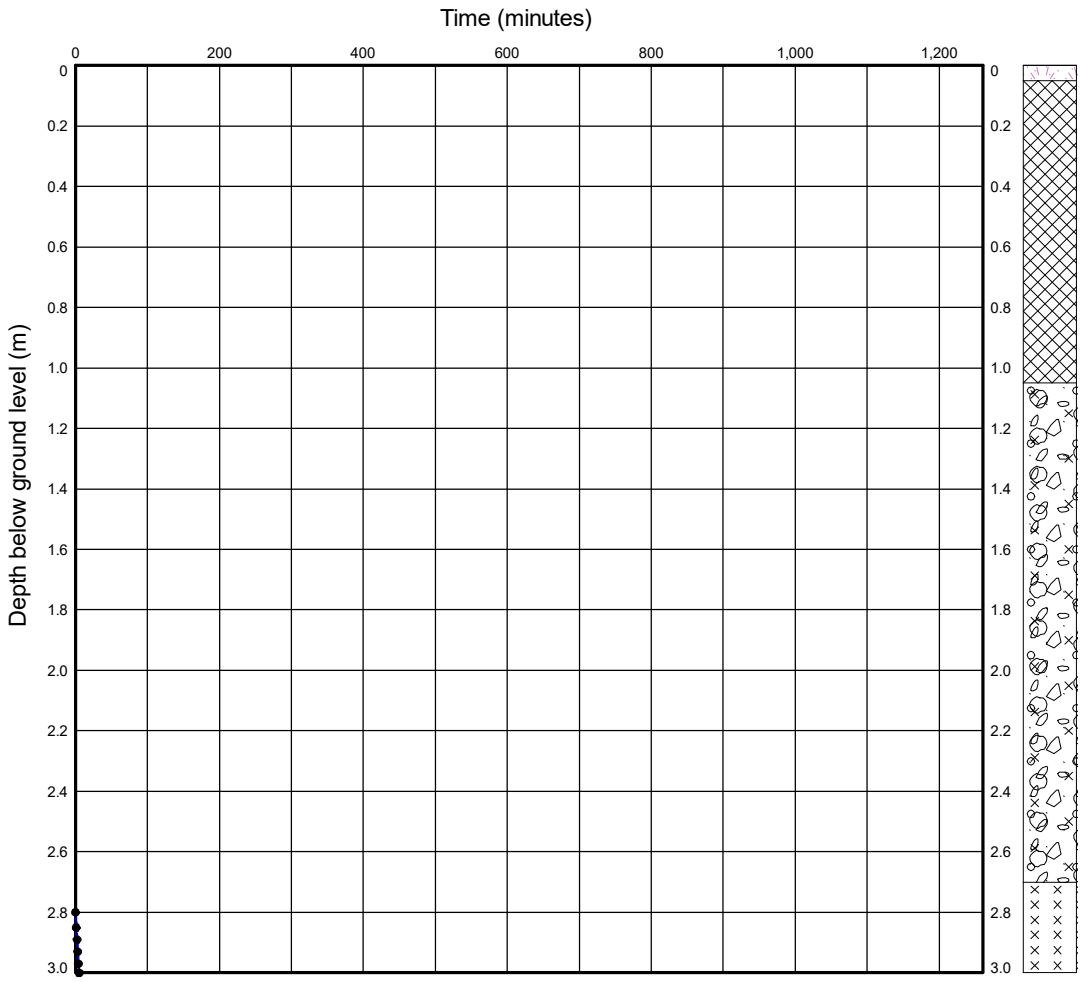
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	2.8
1.0	2.85
2.0	2.89
3.0	2.93
4.0	2.97
5.0	3

Field Observations from soakaway trial pit



Remarks: Unable to raise head of water - 1000l pumped into hole

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	3.000 m	V_{p75-25}=	0.100 m^3
Trial Pit Length	2.500 m	a_{p50}=	2.330 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	2.000 minutes
Effective Depth	0.100 m		
Outflow Time	2 mins from 75% to 25% full		

f = 3.5765E-4 m/sec

Quantum

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Date of Test: 15/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 7

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP6,2

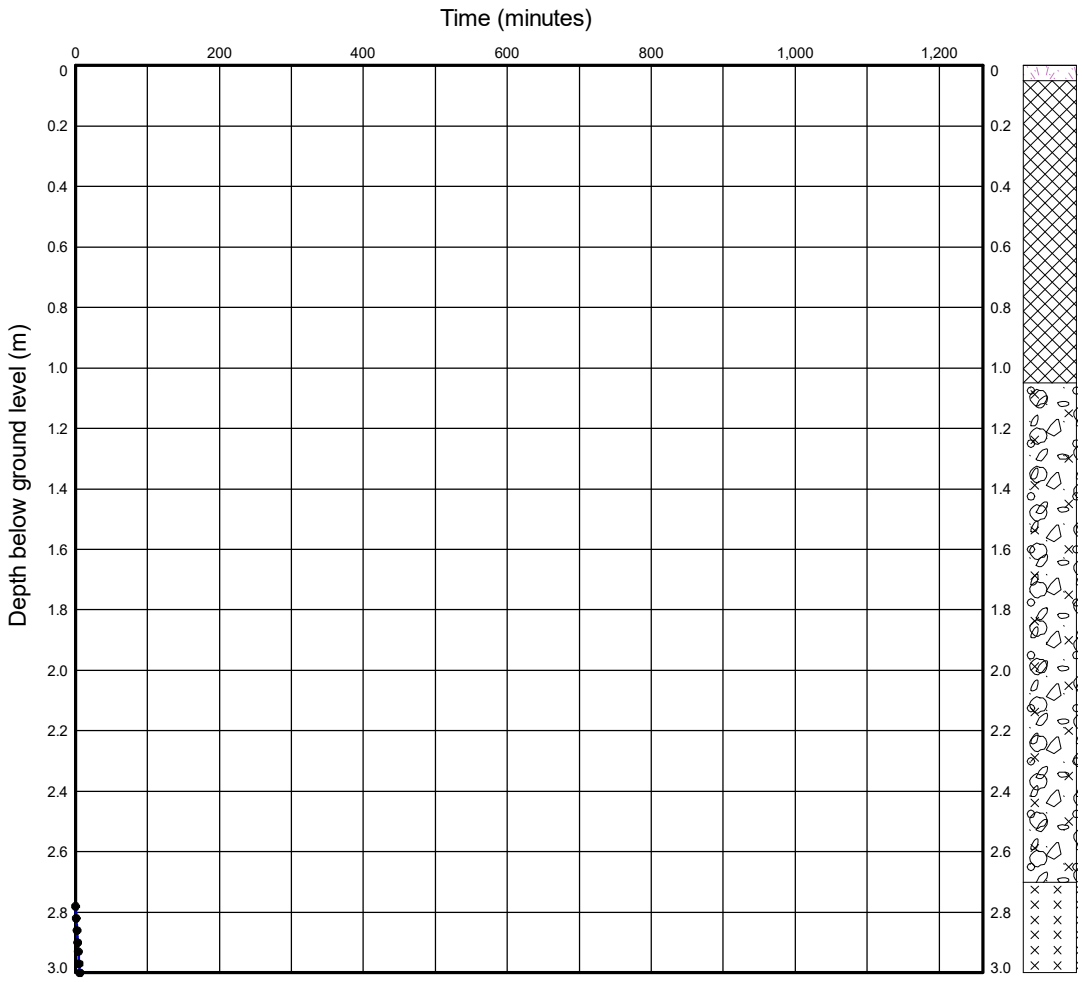
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	2.78
1.0	2.82
2.0	2.86
3.0	2.9
4.0	2.93
5.0	2.97
6.0	3

Field Observations from soakaway trial pit



Remarks: Unable to raise head of water - 1000l pumped into hole

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	3.000 m	V_{p75-25}=	0.100 m^3
Trial Pit Length	2.500 m	a_{p50}=	2.330 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	2.000 minutes
Effective Depth	0.100 m		
Outflow Time	2 mins from 75% to 25% full		

f = 3.5765E-4 m/sec

Quantum

Plas Newydd
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Date of Test: 15/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 8

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP6,3

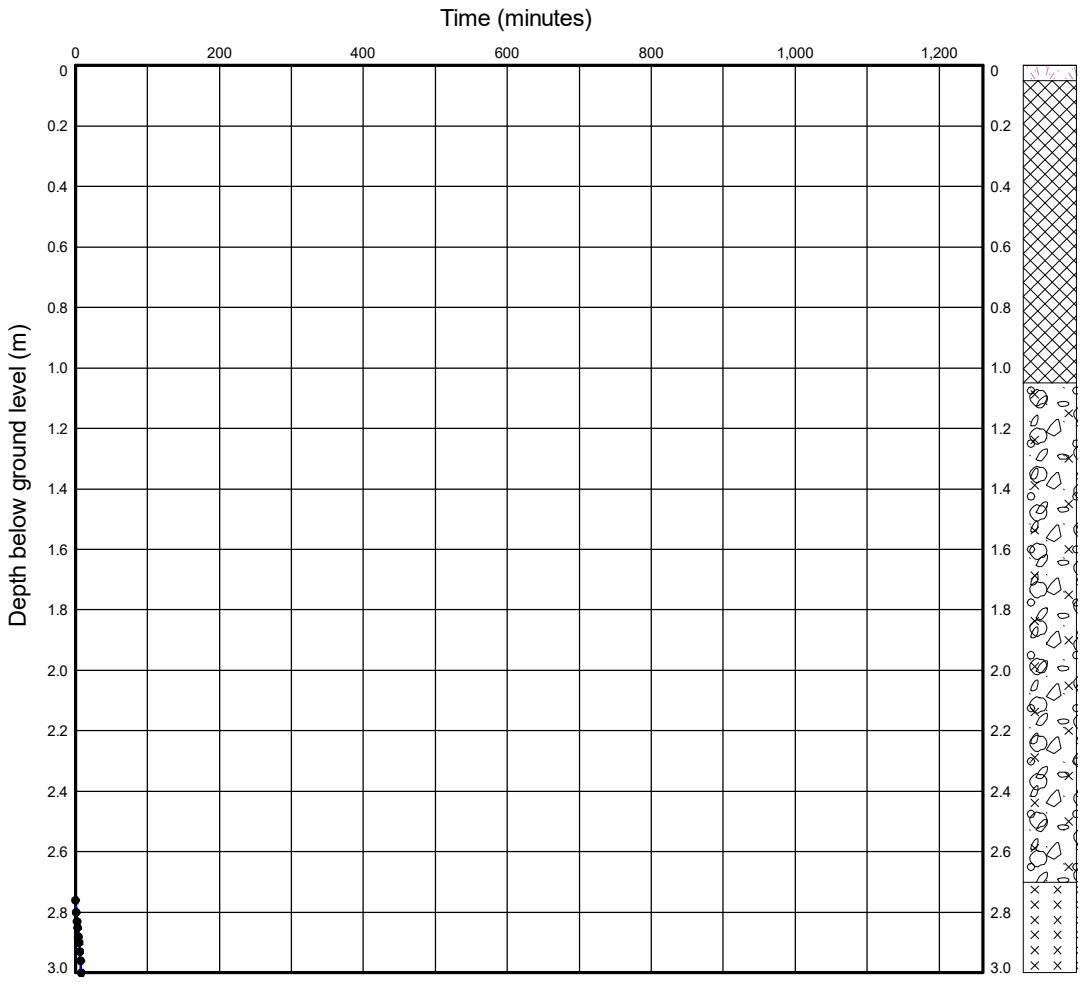
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	2.76
1.0	2.8
2.0	2.83
3.0	2.85
4.0	2.88
5.0	2.9
6.0	2.93
7.0	2.96
8.0	3

Field Observations from soakaway trial pit



Remarks: Unable to raise head of water - 1000l pumped into hole

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	3.000 m	V_{p75-25}=	0.110 m^3
Trial Pit Length	2.500 m	a_{p50}=	2.363 m^2
Trial Pit Width	0.800 m	t_{p75-25}=	2.000 minutes
Effective Depth	0.110 m		
Outflow Time	2 mins from 75% to 25% full		

f = 3.8792E-4 m/sec

Quantum

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Date of Test: 15/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 9

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP7,1

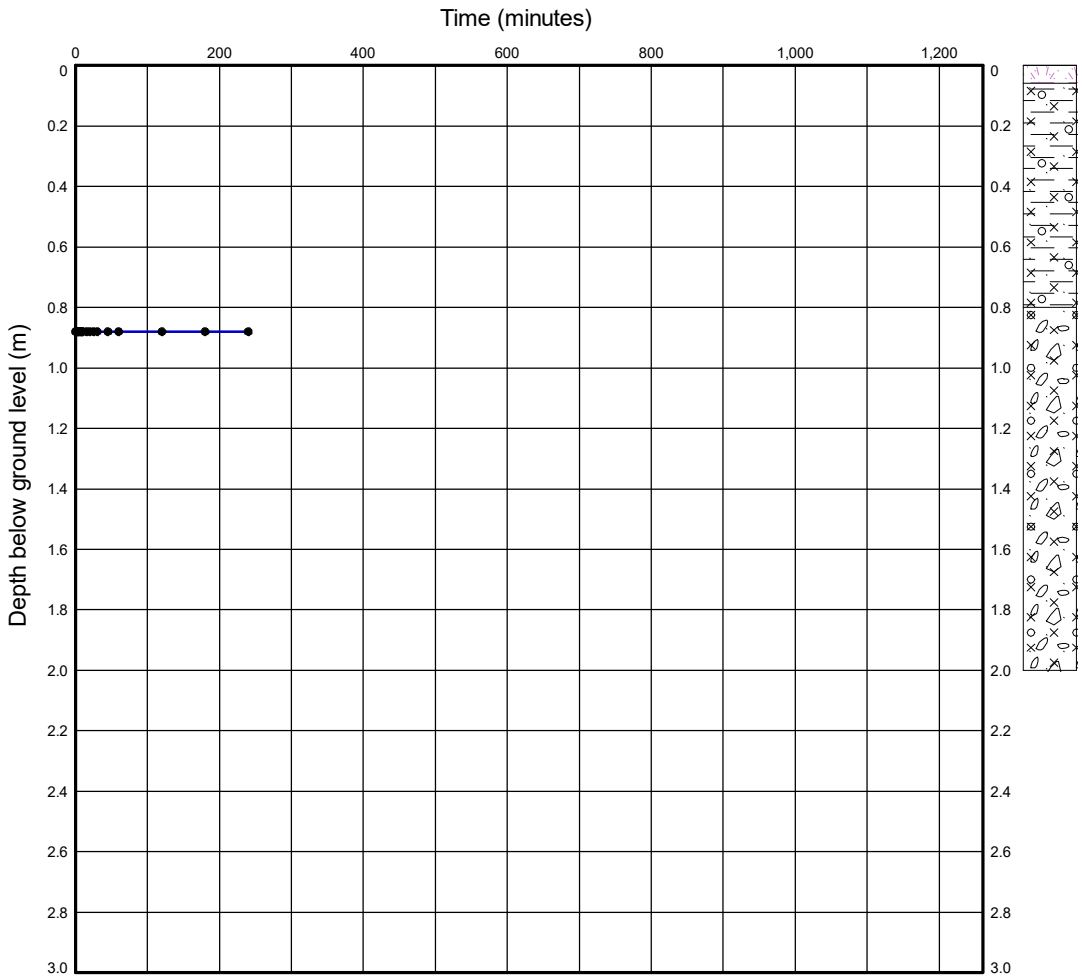
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	0.88
1.0	0.88
2.0	0.88
3.0	0.88
4.0	0.88
5.0	0.88
6.0	0.88
7.0	0.88
8.0	0.88
9.0	0.88
10.0	0.88
15.0	0.88
20.0	0.88
25.0	0.88
30.0	0.88
45.0	0.88
60.0	0.88
120.0	0.88
180.0	0.88
240.0	0.88

Field Observations from soakaway trial pit



Remarks: Insufficient outflow to calculate permeability.

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	2.000 m	V_{p75-25}=	m^3
Trial Pit Length	2.500 m	a_{p50}=	m^2
Trial Pit Width	0.800 m	t_{p75-25}=	minutes
Effective Depth	m		
Outflow Time	mins from 75% to 25% full		

f = m/sec

Quantum

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Swansea
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email: enquiries@quantumgeotechnic.co.uk

Date of Test: 15/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 10

Contract : Former Bodlondeb Residential Home

Client : Wales and West Housing

Point Plotted
TP8,1

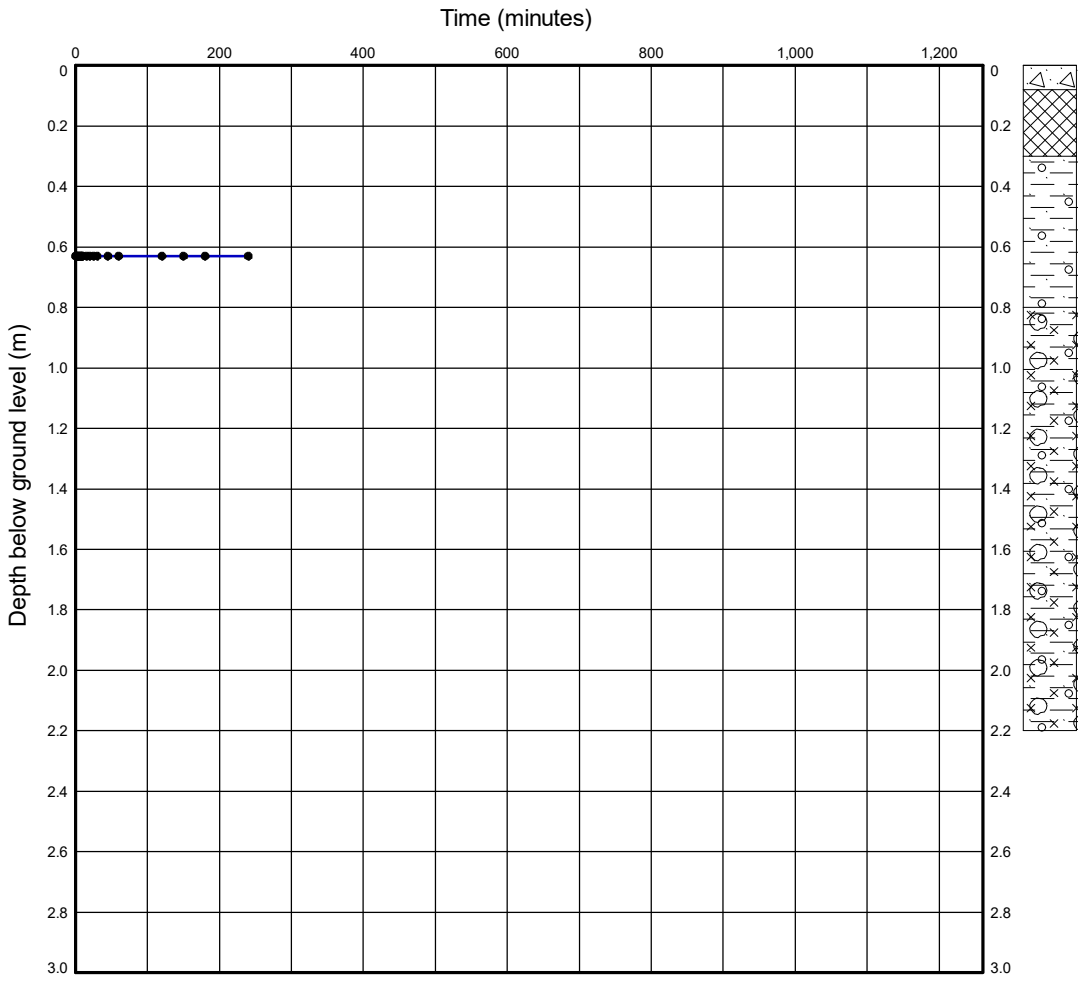
Job Number : Q1149

Engineer : Roger Casey Associates

SOAKAWAY TEST CALCULATION SHEET

Time (Minutes)	Depth of water from ground level (m)
0.0	0.63
1.0	0.63
2.0	0.63
3.0	0.63
4.0	0.63
5.0	0.63
6.0	0.63
7.0	0.63
8.0	0.63
9.0	0.63
10.0	0.63
15.0	0.63
20.0	0.63
25.0	0.63
30.0	0.63
45.0	0.63
60.0	0.63
120.0	0.63
150.0	0.63
180.0	0.63
240.0	0.63

Field Observations from soakaway trial pit



Remarks: Insufficient outflow to calculate permeability

Soakaway test for soil infiltration rate
design method based on BRE Digest 365

Permeability Test on Strata

Trial Pit Depth	2.200	m	V_{p75-25}=	m^3
Trial Pit Length	2.500	m	a_{p50}=	m^2
Trial Pit Width	0.800	m	t_{p75-25}=	minutes
Effective Depth		m		
Outflow Time		mins from 75% to 25% full		

f = m/sec

Quantum

Plas Newydd
Swansea
Tel: 01554744880
Tel:
email: enquiries@quantumgeotechnic.co.uk

Date of Test: 15/06/2023

All measurements in metres unless otherwise stated

Project File: Q1149.GPJ

Figure No. 11

APPENDIX V – GEOTECHNICAL LABORATORY TEST RESULTS

Laboratory Report

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES A PHENNA GROUP COMPANY

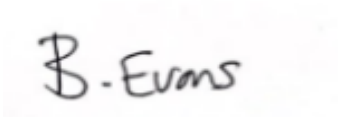
Contract Number: 67451

Client Ref: **Q1149**
Client PO: **Q1149**

Date Received: **03-07-2023**
Date Completed: **11-07-2023**
Report Date: **11-07-2023**

Client: **Quantum Geotechnic Ltd**
Plas Newydd
Llanedi
Pontarddulais
Swansea
SA4 0FQ

This report has been checked and approved by:



Brendan Evans
Office Administrator

Contract Title: **Former Bodlondeb Residential Care Home**
For the attention of: **Phil Darby**

Test Description	Qty
Moisture Content of Soil BS1377 : Part 2 : Clause 3.2 : 1990 - * UKAS	3
4 Point Liquid & Plastic Limit BS 1377:1990 - Part 2 : 4.3 & 5.3 - * UKAS	3
PSD Wet & Dry Sieve method BS 1377:1990 - Part 2 : 9.2 - * UKAS	6
Disposal of samples for job	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
*** - denotes test included in laboratory scope of accreditation**
 # - denotes test carried out by approved contractor
@ - denotes non accredited tests

Approved Signatories:
Brendan Evans (Office Administrator) - Darren Bourne (Quality Senior Technician) - Paul Evans (Director)
Richard John (Quality/Technical Manager) - Shaun Jones (Laboratory manager) - Shaun Thomas (Site Manager)
Wayne Honey (Human Resources/ Health and Safety Manager)

GEO Site & Testing Services Ltd
Units 3-4, Heol Aur, Dafen, Llanelli, Carmarthenshire, Wales SA14 8QN
Tel: 01554 784040 Fax: 01554 784041 info@gstl.co.uk gstl.co.uk

GSTL
GEOTECHNICAL SITE & TESTING LABORATORIES

NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX
(BS 1377:1990 - Part 2 : 4.3 & 5.3)

Contract Number	67451
Project Name	Former Bodlondeb Residential Care Home
Date Tested	04/07/2023

DESCRIPTIONS

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Descriptions
TP7	1	B	0.30	-	0.50	Brown fine to coarse sandy silty/ clayey fine to coarse GRAVEL
WS3	1	B	0.30	-	0.80	Brown fine to coarse sandy fine to coarse gravelly SILT/ CLAY
WS5	2	B	1.00	-	2.00	Grey fine to medium gravelly sandy silty CLAY
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		
				-		

Operator
Aaron Hodge

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	NATURAL MOISTURE, LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX (BS 1377:1990 - Part 2 : 4.3 & 5.3)	
Contract Number	67451	
Project Name	Former Bodlondeb Residential Care Home	
Date Tested	04/07/2023	

Sample/Hole Reference	Sample Number	Sample Type	Depth (m)			Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity index %	Passing 0.425mm %	Remarks
TP7	1	B	0.30	-	0.50	8.1	21	14	7	35	CL Low Plasticity
WS3	1	B	0.30	-	0.80	18	27	20	7	43	CL Low Plasticity
WS5	2	B	1.00	-	2.00	11	38	20	18	85	CI Intermediate Plasticity
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
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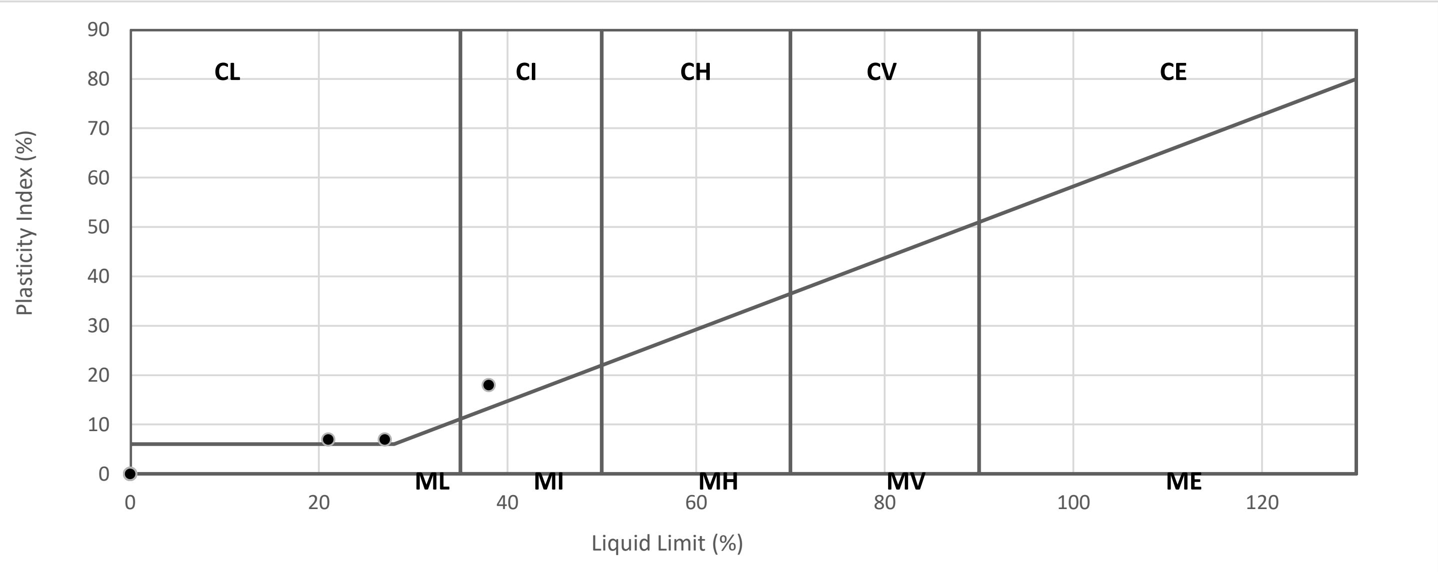
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							
				-							

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

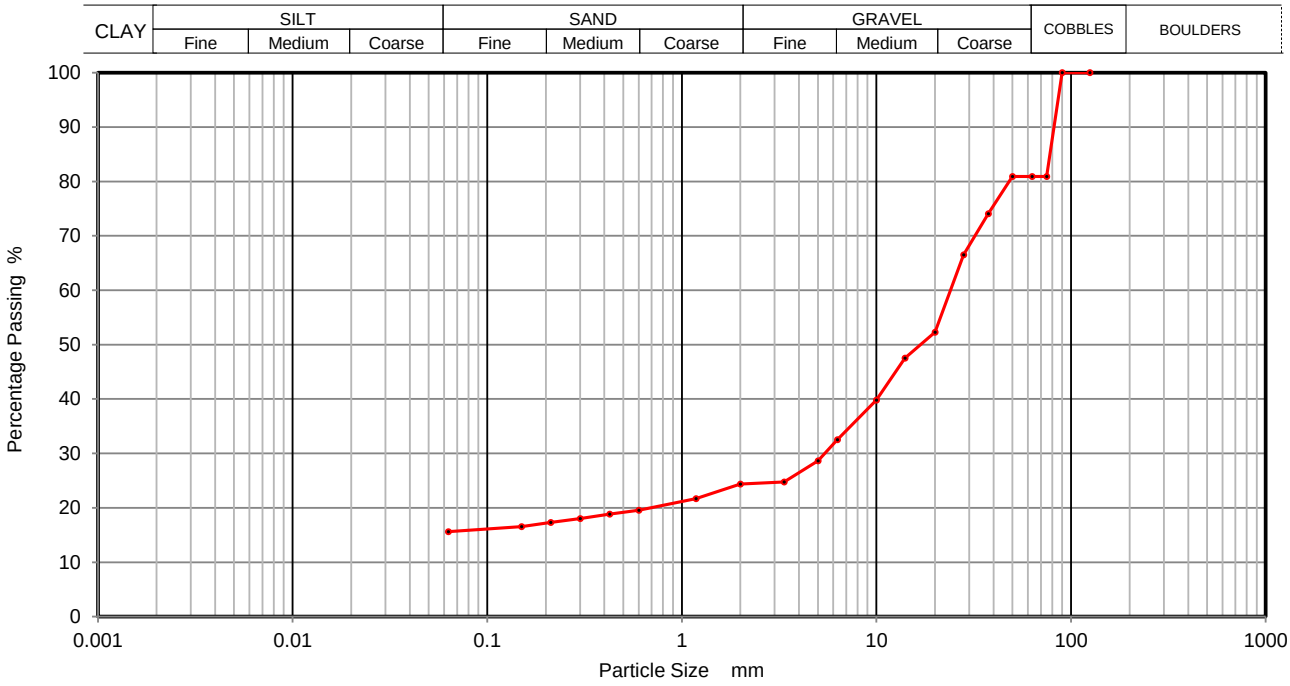
PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION
BS 5930:2015+A1:2020



Operator
Aaron Hodge

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2**	Contract Number	67451
		Borehole/Pit No.	TP6
Project Name	Former Bodlondeb Residential Care Home	Sample No.	1
Soil Description	Brown slightly sandy silty/ clayey fine to coarse GRAVEL with cobbles	Depth Top	0.50
		Depth Base	0.80
Date Tested	07/07/2023	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	81		
63	81		
50	81		
37.5	74		
28	67		
20	52		
14	48		
10	40		
6.3	33		
5	29		
3.35	25		
2	24		
1.18	22		
0.6	20		
0.425	19		
0.3	18		
0.212	17		
0.15	17		
0.063	16		

Sample Proportions	% dry mass
Cobbles	19
Gravel	57
Sand	8
Silt and Clay	16

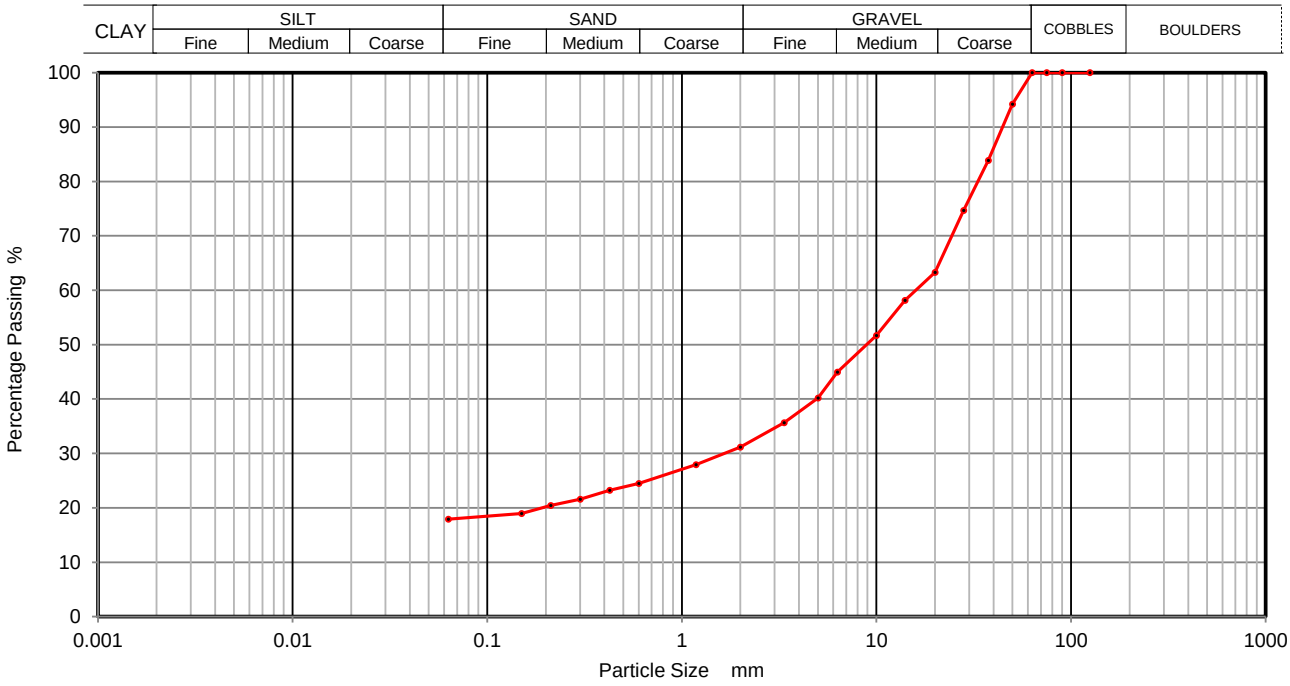
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve, Clause 9.2**	Contract Number	67451
		Borehole/Pit No.	TP6
Project Name	Former Bodlondeb Residential Care Home	Sample No.	2
Soil Description	Brown fine to coarse sandy silty/ clayey fine to coarse GRAVEL	Depth Top	1.50
		Depth Base	2.00
Date Tested	07/07/2023	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	94		
37.5	84		
28	75		
20	63		
14	58		
10	52		
6.3	45		
5	40		
3.35	36		
2	31		
1.18	28		
0.6	24		
0.425	23		
0.3	22		
0.212	20		
0.15	19		
0.063	18		

Sample Proportions	% dry mass
Cobbles	0
Gravel	69
Sand	13
Silt and Clay	18

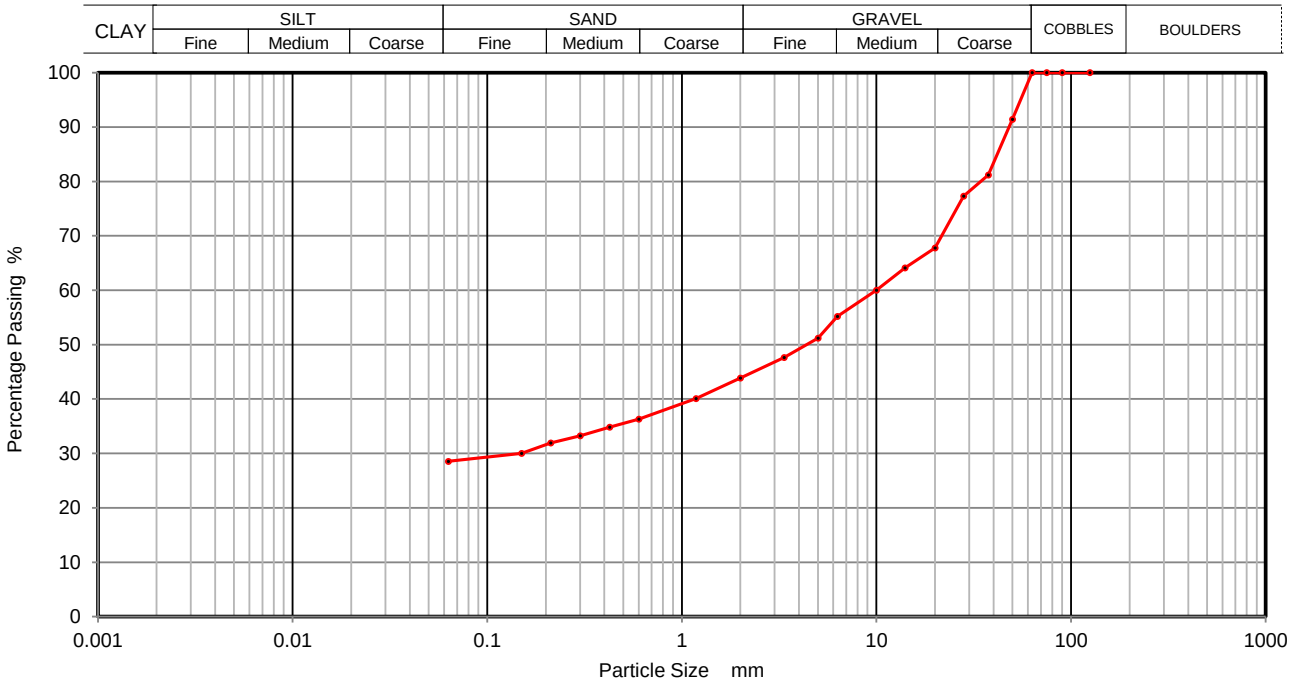
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING
2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve, Clause 9.2**	Contract Number	67451
		Borehole/Pit No.	TP7
Project Name	Former Bodlondeb Residential Care Home	Sample No.	1
Soil Description	Brown fine to coarse sandy silty/ clayey fine to coarse GRAVEL	Depth Top	0.30
		Depth Base	0.50
Date Tested	07/07/2023	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	91		
37.5	81		
28	77		
20	68		
14	64		
10	60		
6.3	55		
5	51		
3.35	48		
2	44		
1.18	40		
0.6	36		
0.425	35		
0.3	33		
0.212	32		
0.15	30		
0.063	29		

Sample Proportions	% dry mass
Cobbles	0
Gravel	56
Sand	15
Silt and Clay	29

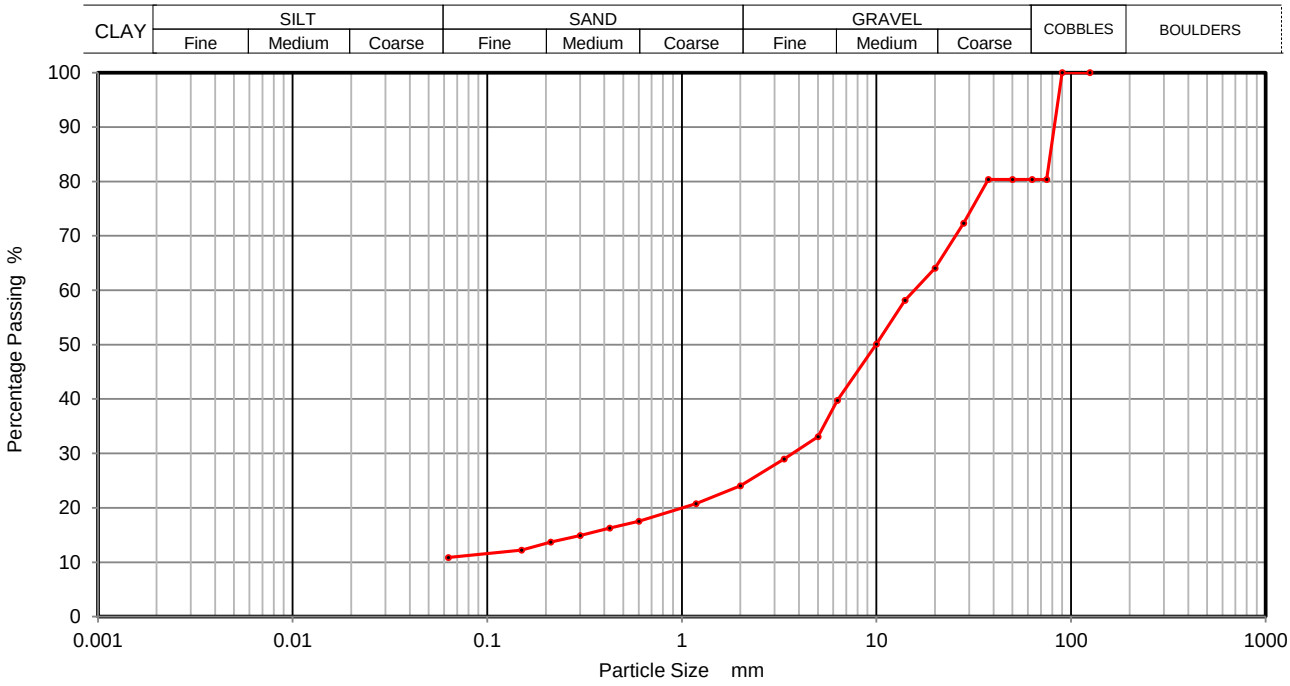
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION BS 1377 Part 2:1990 Wet Sieve, Clause 9.2**	Contract Number	67451
		Borehole/Pit No.	WS1
Project Name	Former Bodlondeb Residential Care Home	Sample No.	2
Soil Description	Brown silty/ clayey fine to coarse sandy fine to coarse GRAVEL with cobbles	Depth Top	1.00
		Depth Base	1.50
Date Tested	07/07/2023	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	80		
63	80		
50	80		
37.5	80		
28	72		
20	64		
14	58		
10	50		
6.3	40		
5	33		
3.35	29		
2	24		
1.18	21		
0.6	18		
0.425	16		
0.3	15		
0.212	14		
0.15	12		
0.063	11		

Sample Proportions	% dry mass
Cobbles	20
Gravel	56
Sand	13
Silt and Clay	11

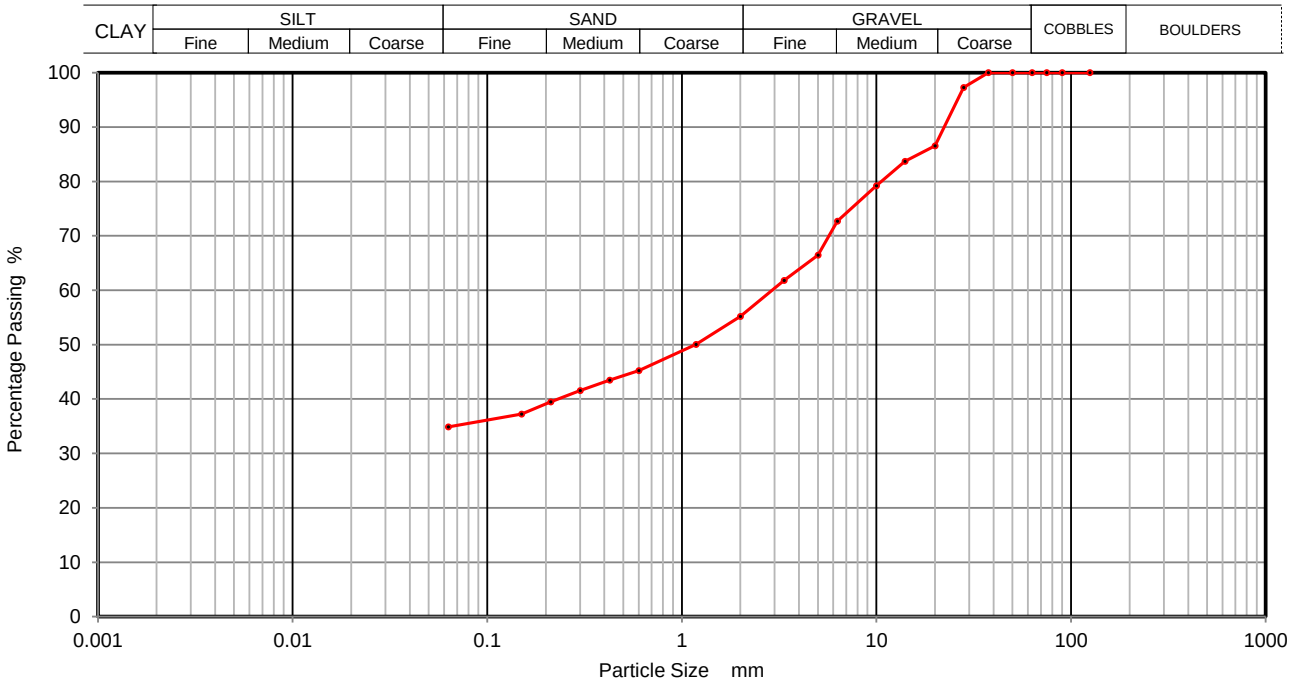
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING 2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve, Clause 9.2**	Contract Number	67451
		Borehole/Pit No.	WS3
Project Name	Former Bodlondeb Residential Care Home	Sample No.	1
Soil Description	Brown fine to coarse sandy fine to coarse gravelly SILT/ CLAY	Depth Top	0.30
		Depth Base	0.80
Date Tested	07/07/2023	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	97		
20	87		
14	84		
10	79		
6.3	73		
5	66		
3.35	62		
2	55		
1.18	50		
0.6	45		
0.425	43		
0.3	42		
0.212	39		
0.15	37		
0.063	35		

Sample Proportions	% dry mass
Cobbles	0
Gravel	45
Sand	20
Silt and Clay	35

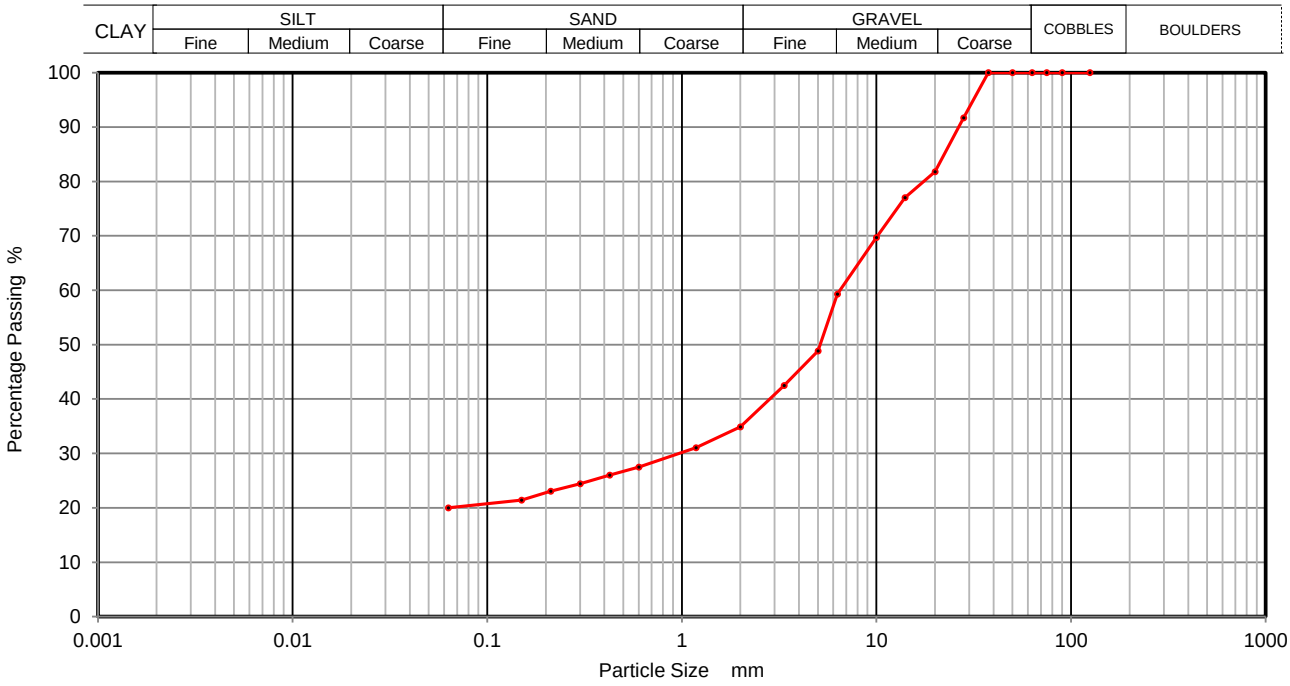
Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING
2788

GSTL GEOTECHNICAL SITE & TESTING LABORATORIES	**PARTICLE SIZE DISTRIBUTION** **BS 1377 Part 2:1990** **Wet Sieve, Clause 9.2**	Contract Number	67451
		Borehole/Pit No.	WS4
Project Name	Former Bodlondeb Residential Care Home	Sample No.	1
Soil Description	Brown fine to coarse sandy silty/ clayey fine to coarse GRAVEL	Depth Top	0.30
		Depth Base	0.50
Date Tested	07/07/2023	Sample Type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	92		
20	82		
14	77		
10	70		
6.3	59		
5	49		
3.35	42		
2	35		
1.18	31		
0.6	27		
0.425	26		
0.3	24		
0.212	23		
0.15	21		
0.063	20		

Sample Proportions	% dry mass
Cobbles	0
Gravel	65
Sand	15
Silt and Clay	20

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Operator
David Edwards

UKAS TESTING
2788

APPENDIX VI – GEOENVIRONMENTAL LABORATORY TEST RESULTS

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

UKAS TESTING
2183

Final Report

Report No.:	23-22341-1
Initial Date of Issue:	11-Jul-2023
Re-Issue Details:	
Client	Quantum Geotechnic Ltd
Client Address:	Plas Newydd Farm Llanedi Pontarddulais Swansea SA4 0FG
Contact(s):	Jim Dennis
Project	Q1149 Former Bodlondeb Residential Care Home

Quotation No.:		**Date Received:**	30-Jun-2023
Order No.:		**Date Instructed:**	30-Jun-2023
No. of Samples:	13		
Turnaround (Wkdays):	7	**Results Due:**	10-Jul-2023
Date Approved:	11-Jul-2023		

Approved By:

Details: Stuart Henderson, Technical Manager

Results - Leachate

Project: Q1149 Former Bodlondeb Residential Care Home

Client: Quantum Geotechnic Ltd				**Chemtest Job No.:**		23-22341	23-22341	23-22341
Quotation No.:				**Chemtest Sample ID.:**		1667179	1667181	1667184
				Sample Location:		TP4	WS1	WS6
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.50	0.30	0.30
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
pH	U	1010	10:1		N/A	8.2	8.0	8.6
Chloride	U	1220	10:1	mg/l	1.0	1.4	1.1	< 1.0
Ammoniacal Nitrogen	U	1220	10:1	mg/l	0.050	0.065	< 0.050	0.065
Cyanide (Total)	U	1300	10:1	mg/l	0.050	< 0.050	< 0.050	< 0.050
Calcium	U	1455	10:1	mg/l	2.00	4.0	3.1	6.3
Hardness	U	1415	10:1	mg/l	15	< 15	< 15	21
Arsenic (Dissolved)	U	1455	10:1	µg/l	0.20	1.7	2.3	2.5
Beryllium (Dissolved)	U	1455	10:1	µg/l	1.00	< 1.0	< 1.0	< 1.0
Cadmium (Dissolved)	U	1455	10:1	µg/l	0.11	< 0.11	0.23	< 0.11
Chromium (Dissolved)	U	1455	10:1	µg/l	0.50	< 0.50	0.66	< 0.50
Copper (Dissolved)	U	1455	10:1	µg/l	0.50	3.1	5.0	5.6
Mercury (Dissolved)	U	1455	10:1	µg/l	0.05	< 0.05	< 0.05	< 0.05
Manganese (Dissolved)	U	1455	10:1	µg/l	0.50	14	36	5.4
Nickel (Dissolved)	U	1455	10:1	µg/l	0.50	0.68	0.62	0.62
Lead (Dissolved)	U	1455	10:1	µg/l	0.50	4.6	16	0.56
Antimony (Dissolved)	U	1455	10:1	µg/l	0.50	0.52	4.3	< 0.50
Selenium (Dissolved)	U	1455	10:1	µg/l	0.50	0.73	< 0.50	< 0.50
Vanadium (Dissolved)	U	1455	10:1	µg/l	0.50	1.5	1.1	0.52
Zinc (Dissolved)	U	1455	10:1	µg/l	2.5	47	34	25
Dissolved Organic Carbon	U	1610	10:1	mg/l	2.0	5.2	5.4	4.6
Total Phenols	U	1920	10:1	mg/l	0.030	< 0.030	< 0.030	< 0.030

Results - Soil

Project: Q1149 Former Bodlondeb Residential Care Home

Client: Quantum Geotechnic Ltd		**Chemtest Job No.:**			23-22341	23-22341	23-22341	23-22341	23-22341	23-22341	23-22341	23-22341	23-22341
Quotation No.:		**Chemtest Sample ID.:**			1667176	1667177	1667178	1667179	1667180	1667181	1667182	1667183	1667184
Order No.:		Client Sample Ref.:											
		Sample Location:			TP1	TP2	TP3	TP4	TP6	WS1	WS3	WS5	WS6
		Sample Type:			SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
		Top Depth (m):			0.30	0.40	0.50	0.50	0.50	0.30	0.50	0.50	0.30
		Asbestos Lab:			DURHAM	DURHAM		DURHAM		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-		-		-	-	-	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	11	8.8	5.7	8.5	9.8	6.1	8.5	6.9	2.1
pH	U	2010		4.0	6.9	7.4		8.1		8.2	8.1	6.8	8.6
pH (2.5:1)	N	2010		4.0			8		6.8			6.6	
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40									
Magnesium (Water Soluble)	N	2120	g/l	0.010			< 0.010		< 0.010			< 0.010	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010			0.031		0.029			0.015	
Chloride (Water Soluble)	U	2220	g/l	0.010			< 0.010		< 0.010			< 0.010	
Nitrate (Water Soluble)	N	2220	g/l	0.010			< 0.010		< 0.010			0.017	
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50		< 0.50		< 0.50	< 0.50	< 0.50	< 0.50
Sulphate (Acid Soluble)	U	2430	%	0.010			0.088		0.037			< 0.010	
Arsenic	U	2455	mg/kg	0.5	12	15		9.9		11	17	12	17
Boron	N	2455	mg/kg	50.00	< 50	< 50		< 50		< 50	< 50	< 50	< 50
Cadmium	U	2455	mg/kg	0.10	< 0.10	0.39		< 0.10		2.0	< 0.10	< 0.10	< 0.10
Chromium	U	2455	mg/kg	0.5	29	23		17		25	43	24	41
Copper	U	2455	mg/kg	0.50	23	42		19		41	31	25	60
Mercury	U	2455	mg/kg	0.05	0.07	0.35		0.10		< 0.05	< 0.05	< 0.05	< 0.05
Nickel	U	2455	mg/kg	0.50	33	24		17		31	48	26	35
Lead	U	2455	mg/kg	0.50	33	240		85		400	15	20	41
Zinc	U	2455	mg/kg	0.50	88	230		80		730	110	63	110
Aliphatic VPH >C5-C6	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05			< 0.05
Aliphatic VPH >C6-C7	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05			< 0.05
Aliphatic VPH >C7-C8	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05			< 0.05
Aliphatic VPH >C6-C8 (Sum)	N	2780	mg/kg	0.10		< 0.10		< 0.10		< 0.10			< 0.10
Total Aliphatic VPH >C5-C10	U	2780	mg/kg	0.25		< 0.25		< 0.25		< 0.25			< 0.25
Aliphatic EPH >C10-C12	U	2690	mg/kg	2.00		< 2.0		3.7		4.5			5.2
Aliphatic VPH >C8-C10	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05			< 0.05
Aliphatic EPH >C12-C16	U	2690	mg/kg	1.00		< 1.0		< 1.0		< 1.0			< 1.0
Aliphatic EPH >C16-C21	U	2690	mg/kg	2.00		< 2.0		< 2.0		< 2.0			< 2.0
Aliphatic EPH >C21-C35	U	2690	mg/kg	3.00		< 3.0		< 3.0		< 3.0			< 3.0
Aliphatic EPH >C35-C40	N	2690	mg/kg	10.00		< 10		< 10		< 10			< 10
Total Aliphatic EPH >C10-C35	U	2690	mg/kg	5.00		< 5.0		5.8		7.3			5.5
Total Aliphatic EPH >C10-C40	N	2690	mg/kg	10.00		< 10		< 10		< 10			< 10
Aromatic VPH >C5-C7	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05			< 0.05
Aromatic VPH >C7-C8	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05			< 0.05

Results - Soil

Project: Q1149 Former Bodlondeb Residential Care Home

Client: Quantum Geotechnic Ltd			**Chemtest Job No.:**		23-22341	23-22341	23-22341	23-22341	23-22341	23-22341	23-22341	23-22341	23-22341
Quotation No.:			**Chemtest Sample ID.:**		1667176	1667177	1667178	1667179	1667180	1667181	1667182	1667183	1667184
Order No.:			Client Sample Ref.:										
			Sample Location:		TP1	TP2	TP3	TP4	TP6	WS1	WS3	WS5	WS6
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.30	0.40	0.50	0.50	0.50	0.30	0.50	0.50	0.30
			Asbestos Lab:		DURHAM	DURHAM		DURHAM		DURHAM	DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic VPH >C8-C10	U	2780	mg/kg	0.05		< 0.05		< 0.05		< 0.05			< 0.05
Total Aromatic VPH >C5-C10	U	2780	mg/kg	0.25		< 0.25		< 0.25		< 0.25			< 0.25
Aromatic EPH >C10-C12	U	2690	mg/kg	1.00		< 1.0		< 1.0		< 1.0			< 1.0
Aromatic EPH >C12-C16	U	2690	mg/kg	1.00		< 1.0		< 1.0		< 1.0			< 1.0
Aromatic EPH >C16-C21	U	2690	mg/kg	2.00		4.2		4.9		4.3			8.9
Aromatic EPH >C21-C35	U	2690	mg/kg	2.00		9.1		17		70			17
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00		< 1.0		< 1.0		37			< 1.0
Total Aromatic EPH >C10-C35	U	2690	mg/kg	5.00		13		21		75			27
Total Aromatic EPH >C10-C40	N	2690	mg/kg	10.00		13		21		110			27
Total VPH >C5-C10	U	2780	mg/kg	0.50		< 0.50		< 0.50		< 0.50			< 0.50
Total EPH >C10-C35	U	2690	mg/kg	10.00		17		27		82			32
Total EPH >C10-C40	N	2690	mg/kg	10.00		17		27		120			32
Organic Matter	U	2625	%	0.40	1.6	4.8		4.3		< 0.40	< 0.40	< 0.40	1.7
Total TPH >C6-C40	U	2670	mg/kg	10	< 10	47		< 10		< 10	< 10	< 10	150
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	0.57		< 0.10		< 0.10	< 0.10	< 0.10	0.55
Anthracene	U	2700	mg/kg	0.10	< 0.10	0.26		< 0.10		< 0.10	< 0.10	< 0.10	0.18
Fluoranthene	U	2700	mg/kg	0.10	< 0.10	0.73		< 0.10		< 0.10	< 0.10	< 0.10	1.4
Pyrene	U	2700	mg/kg	0.10	< 0.10	0.7		< 0.10		< 0.10	< 0.10	< 0.10	2
Benzoanthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	1.7
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	0.73
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	0.67
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	0.36
Benzopyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	0.68
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	2.3		< 2.0		< 2.0	< 2.0	< 2.0	8.3
Total Phenols	U	2920	mg/kg	0.10	< 0.10	< 0.10		< 0.10		< 0.10	< 0.10	< 0.10	< 0.10

Results - Soil

Project: Q1149 Former Bodlondeb Residential Care Home

Client: Quantum Geotechnic Ltd			**Chemtest Job No.:**		23-22341	23-22341	23-22341	23-22341
Quotation No.:			**Chemtest Sample ID.:**		1667185	1667186	1667190	1667199
Order No.:			Client Sample Ref.:				ES2	ES1
			Sample Location:		WS6	WS8	TP5	WS2
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.90	0.80	0.50	0.50
			Asbestos Lab:			DURHAM	DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A		-	-	
Asbestos Identification	U	2192		N/A		No Asbestos Detected	No Asbestos Detected	
Moisture	N	2030	%	0.020	8.0	3.1	5.8	4.1
pH	U	2010		4.0		7.1	8.8	
pH (2.5:1)	N	2010		4.0	6.7	7.3	9	6.8
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40			< 0.40	
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.022	0.028	< 0.010	< 0.010
Total Sulphur	U	2175	%	0.010	0.011	0.45	< 0.010	< 0.010
Chloride (Water Soluble)	U	2220	g/l	0.010	< 0.010	< 0.010	0.044	0.044
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010
Cyanide (Total)	U	2300	mg/kg	0.50		< 0.50	< 0.50	
Sulphate (Acid Soluble)	U	2430	%	0.010	0.01	0.2	< 0.010	< 0.010
Arsenic	U	2455	mg/kg	0.5		33	10	
Boron	N	2455	mg/kg	50.00		< 50		
Cadmium	U	2455	mg/kg	0.10		11	< 0.10	
Chromium	U	2455	mg/kg	0.5		14	23	
Copper	U	2455	mg/kg	0.50		78	25	
Mercury	U	2455	mg/kg	0.05		0.58	< 0.05	
Nickel	U	2455	mg/kg	0.50		22	30	
Lead	U	2455	mg/kg	0.50		71	23	
Zinc	U	2455	mg/kg	0.50		410	91	
Aliphatic VPH >C5-C6	U	2780	mg/kg	0.05		< 0.05		
Aliphatic VPH >C6-C7	U	2780	mg/kg	0.05		< 0.05		
Aliphatic VPH >C7-C8	U	2780	mg/kg	0.05		< 0.05		
Aliphatic VPH >C6-C8 (Sum)	N	2780	mg/kg	0.10		< 0.10		
Total Aliphatic VPH >C5-C10	U	2780	mg/kg	0.25		< 0.25		
Aliphatic EPH >C10-C12	U	2690	mg/kg	2.00		3.4		
Aliphatic VPH >C8-C10	U	2780	mg/kg	0.05		< 0.05		
Aliphatic EPH >C12-C16	U	2690	mg/kg	1.00		< 1.0		
Aliphatic EPH >C16-C21	U	2690	mg/kg	2.00		< 2.0		
Aliphatic EPH >C21-C35	U	2690	mg/kg	3.00		40		
Aliphatic EPH >C35-C40	N	2690	mg/kg	10.00		17		
Total Aliphatic EPH >C10-C35	U	2690	mg/kg	5.00		44		
Total Aliphatic EPH >C10-C40	N	2690	mg/kg	10.00		61		
Aromatic VPH >C5-C7	U	2780	mg/kg	0.05		< 0.05		
Aromatic VPH >C7-C8	U	2780	mg/kg	0.05		< 0.05		

Results - Soil

Project: Q1149 Former Bodlondeb Residential Care Home

Client: Quantum Geotechnic Ltd			**Chemtest Job No.:**		23-22341	23-22341	23-22341	23-22341
Quotation No.:			**Chemtest Sample ID.:**		1667185	1667186	1667190	1667199
Order No.:			Client Sample Ref.:				ES2	ES1
			Sample Location:		WS6	WS8	TP5	WS2
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.90	0.80	0.50	0.50
			Asbestos Lab:			DURHAM	DURHAM	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Aromatic VPH >C8-C10	U	2780	mg/kg	0.05		< 0.05		
Total Aromatic VPH >C5-C10	U	2780	mg/kg	0.25		< 0.25		
Aromatic EPH >C10-C12	U	2690	mg/kg	1.00		< 1.0		
Aromatic EPH >C12-C16	U	2690	mg/kg	1.00		< 1.0		
Aromatic EPH >C16-C21	U	2690	mg/kg	2.00		3.6		
Aromatic EPH >C21-C35	U	2690	mg/kg	2.00		73		
Aromatic EPH >C35-C40	N	2690	mg/kg	1.00		45		
Total Aromatic EPH >C10-C35	U	2690	mg/kg	5.00		78		
Total Aromatic EPH >C10-C40	N	2690	mg/kg	10.00		120		
Total VPH >C5-C10	U	2780	mg/kg	0.50		< 0.50		
Total EPH >C10-C35	U	2690	mg/kg	10.00		120		
Total EPH >C10-C40	N	2690	mg/kg	10.00		180		
Organic Matter	U	2625	%	0.40		0.83	< 0.40	
Total TPH >C6-C40	U	2670	mg/kg	10		74	< 10	
Naphthalene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Acenaphthylene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Acenaphthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Fluorene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Phenanthrene	U	2700	mg/kg	0.10		0.58	< 0.10	
Anthracene	U	2700	mg/kg	0.10		0.23	< 0.10	
Fluoranthene	U	2700	mg/kg	0.10		0.4	< 0.10	
Pyrene	U	2700	mg/kg	0.10		0.46	< 0.10	
Benzoanthracene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Chrysene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Benzo[b]fluoranthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Benzo[k]fluoranthene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Benzopyrene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10		< 0.10	< 0.10	
Total Of 16 PAH's	U	2700	mg/kg	2.0		< 2.0	< 2.0	
Total Phenols	U	2920	mg/kg	0.10		< 0.10	< 0.10	

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1415	Cations in Waters by ICP-MS	Sodium; Potassium; Calcium; Magnesium	Direct determination by inductively coupled plasma - mass spectrometry (ICP-MS).
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
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
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2455	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2690	EPH A/A Split	Aliphatics: >C10–C12, >C12–C16, >C16–C21, >C21– C35, >C35– C40 Aromatics: >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C40	Acetone/Heptane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenz[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)

Test Methods

SOP	Title	Parameters included	Method summary
2780	VPH A/A Split	Aliphatics: >C5–C6, >C6–C7,>C7–C8,>C8-C10 Aromatics: >C5–C7,>C7-C8,>C8–C10	Water extraction / Headspace GCxGC FID detection
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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

APPENDIX VII – GROUND GAS / WATER MONITORING RECORDS

LANDGAS & GROUNDWATER MONITORING RECORD SHEET

Project Name:	Bodlondeb Residential Home
Project No.:	Q1149
BH/TP No.:	WS10
Instruments Used:	Water Dip Meter Probe, GA2000 Gas Anaylser

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
31.56	A	50mm	1.40	0.4-1.4

Pipe	Date	Time (24hrs)	Atmos Pressure mBar	Differential Well Pressure mBar	Flow L/hr	CH_4 %	CO_2 %	O_2 %	CO ppm	H_2S ppm	Water Level		HoleDepth		Local Weather		Remarks
											mbgl	mAOD	mbgl	mAOD	Recent	Current	
A	21.06.23	11:00	1014	0.02	-0.3	0.0	2.0	19.4	0	0	Dry		1.53	30.03	Sunny	Sunny	
A	29.06.23	10:45	1017	0.00	0.0	0.0	1.9	19.9	0	0	Dry		1.53	30.03	Sunny	Sunny	
A	13.07.23	13:00	0..9	-0.01	0.0	0.0	1.6	19.9	0	0	Dry		1.53	30.03	Sunny	Sunny	

LANDGAS & GROUNDWATER MONITORING RECORD SHEET

Project Name:	Bodlondeb Residential Home
Project No.:	Q1149
BH/TP No.:	WS8
Instruments Used:	Water Dip Meter Probe, GA2000 Gas Anaylser

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
31.46	A	50mm	3.60	0.6-3.6

Pipe	Date	Time (24hrs)	Atmos Pressure mBar	Differential Well Pressure mBar	Flow L/hr	CH_4 %	CO_2 %	O_2 %	CO ppm	H_2S ppm	Water Level		HoleDepth		Local Weather		Remarks
											mbgl	mAOD	mbgl	mAOD	Recent	Current	
A	21.06.23	11:10	1014	0.02	-0.2	0.0	0.2	20.6	0	0	Dry		3.70	27.76	Sunny	Sunny	
A	29.06.23	10:55	1017	0.00	0.0	0.0	0.1	20.4	0	0	Dry		3.70	27.76	Sunny	Sunny	
A	13.07.23	13:10	1009	-0.01	0.0	0.0	0.1	21.2	0	0	Dry		3.70	27.76	Sunny	Sunny	

LANDGAS & GROUNDWATER MONITORING RECORD SHEET

Project Name:	Bodlondeb Residential Home
Project No.:	Q1149
BH/TP No.:	WS5
Instruments Used:	Water Dip Meter Probe, GA2000 Gas Anaylser

Installation Date:				
GL (mAOD)	Pipe	Type	Installation Depth (mbgl)	Response Zone (mbgl)
31.46	A	50mm	2.70	0.5-2.7

Pipe	Date	Time (24hrs)	Atmos Pressure mBar	Differential Well Pressure mBar	Flow L/hr	CH_4 %	CO_2 %	O_2 %	CO ppm	H_2S ppm	Water Level		HoleDepth		Local Weather		Remarks
											mbgl	mAOD	mbgl	mAOD	Recent	Current	
A	21.06.23	11:20	1014	0.02	0.0	0.0	0.1	20.4	0	0	Dry		2.79	28.67	Sunny	Sunny	
A	29.06.23	11:00	1017	0.00	0.0	0.0	0.1	20.8	0	0	Dry		2.79	28.67	Sunny	Sunny	
A	13.07.23	13:20	1009	-0.01	0.1	0.0	0.8	20.3	0	0	Dry		2.79	28.67	Sunny	Sunny	

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