STRATA RENEWABLES LTD

GROUND INVESTIGATION REPORT

Report No. SRL444

EDYS1501 PSMP Caerhun and Trefriew Area

Ysgol Gynradd

Dolgarrog Primary School

Issue : Interpretative

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for

Conwy County Borough Council

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1. INTRODUCTION

This report sets out the results of the field work and laboratory testing for a ground investigation carried out by Strata Renewables Limited for Conwy County Borough Council.

The investigation was required in connection with the construction of a new school at the location of the current primary school.

No Desk Study Phase 1 Risk Assessment Report was requested for this assessment.

The object of the investigation was to obtain information on the ground conditions and soil properties for use in the design and construction of foundations on the site and for the initial assessment of the potentially contaminated soil risk.

The ground investigation has been carried out in accordance with the relevant standards for ground investigation. Details of the relevant standards are given in the references to this report.

2. SITE DESCRIPTION

The school is located to the east of the B5106, close to the flood plain of the Conwy River

The investigation was undertaken in the macadam surfaced play area of the school.

The area is generally plat and level.

A review of on-line historical maps shows the road used to be located to the east the current location. The area of the school was in open rough land, trees and scrub.

The school appears first on the map of 1956.

3. SITE GEOLOGY

The published British Geological Survey (BGS) map for Bangor Sheet Number 106 shows the site is underlain by:

Drift Geology.: Glacial Till, Devensian (Boulder Clay)

Bedrock Geology.: Ordovician Conwy Mudstones Formation. Grey mudstones and siltstones with thin, flaggy, cross-bedded and ripple marked sandstones.

4. FIELDWORK

The fieldwork was carried out on 22nd July 2016 and consisted of four dynamically driven, continuously sampled boreholes ranging from 1.7m to 3.0m below the existing ground surface level using an AEC 150 self propelled, tracked dynamic sounding and sampling machine. Samples were recovered in eighty-four mm diameter, 1.00m long plastic liners, which were returned to the laboratory for description, sub-sampling and testing.

A Standard Penetration Test N_{300} type test was undertaken at the end of each sample run in accordance with BS EN ISO 22476-3:2005 (formerly BS 1377 Part 9:1990) as described in Appendix 1.

A dynamic sounding was carried out alongside BH01 and from the base of sampling in BH04, the continuously sampled boreholes to termination depth of 1.625m and 4.9m. Sounding was carried using the Dynamic Probe Super Heavy (DPSH) probe in accordance with BS EN ISO 22476-2:2005 (formerly BS 1377 Part 9:1990), as described in Appendix 1.

During the excavation of the services inspection pit Environmental Soil (ES) samples were recovered at appropriate depth to sample the surface make up. Each ES sample comprise of : 2No 1kg plastic, 1No 250g glass jar and 2No 60ml glass. All the glass jar samples are placed in a cool box with icepack and returned to the laboratory within 24hrs for refrigeration prior to selection for the contamination testing.

Detailed results of the strata met, depths and levels of changes, thickness of strata, samples taken, groundwater observations Continuous Dynamic Sampling $_{N300}$, and the Continuous Dynamic Sounding values from the dynamic penetration tests are given on the borehole record sheets in Appendix 2.1. The detailed results of the Standard Penetration Test (N_{300}) are presented in the table in Appendix 2.2

The positions of the boreholes are given on the Borehole Location Plan in Appendix 4.

A Site Location Plan is given in Appendix 5.

Ground levels at the borehole were not available for the compilation of this report.

Appendix 1 contains statements of the Terminology used in

Soil Descriptions

Standard Penetration Tests
Continuous Dynamic Sounding (Dynamic Probe Super Heavy (DPSH).

5. LABORATORY TESTING

A testing programme was agreed with the project engineer and the tests were carried out as specified by B.S. 1377:1990 Methods of Test for Soils for Civil Engineering Purposes.

The following tests were undertaken:-

Moisture Content	8	Soluble Sulphate Content of Soil	1
Plasticity Index	2	pH Value	1

Derwentside Environmental Testing Services (DETS) carried out chemical contamination tests on seven selected samples.

Comprehensive – Suite 1
Total Metals : As, Cd, Cr, Pb,Hg,Se,Cu,Ni,Zn
Water Soluble Boron (1)
Hexavalent Chromium
Total Cyanide
Free Cyanide
Thiocyanate
Total Sulphate2
Sulphide
Total Sulphur
pH
PAHs - 16 USEPA Priority Pollutants by GC
Phenols

Suite 2 - Speciated Total Petroleum Hydrocarbon (TPH)
Suite 6 - Asbestos

The results of all the geotechnical and the chemical contamination tests are presented in Appendix 3.

6. SUMMARY OF GROUND CONDITIONS

The boreholes, CDSa (continuous dynamic sampling), show the following sequence of strata.

Macadam surfacing	At each borehole, 100mm thick. Sub-base granular fill at BH02 and BH04 200mm and 300mm thick respectively.
Made Ground	Mixed Made Ground of brown sandy gravelly low cobble content Fill. Much slate gravel. Thickness in the range 900mm BH01: Absent at BH02 and BH04. At BH03 the Made Ground is clay fill of dark grey silty peaty organic CLAY with wood pieces and sparse angular gravel of slate.
Glacial Clay	Firm-stiff brown streaked grey fine-medium fine-coarse subangular and subrounded sandy gravelly CLAY. Gravel is some of slate. The clay is of Low Plasticity, see Figure 1. There are cobbles in the soils mass which would result in the termination of the Continuous Dynamic Sample and Continuous Dynamic Sounding. Where the Standard Penetration Test was completed to full penetration the N_{300} values were in the range 17-37. Where the Standard Penetration Test was incomplete the results are 55/30mm (BH02) 50/300mm (BH03) and 50/10mm (BH04). The Standard Penetration Test N_{300} values are presented on Figure 1.

No groundwater was encountered during sampling.

7. GEOTECHNICAL ASSESSMENT

Foundation Assessment

The boreholes show a variable thickness of Made Ground of 0.3m to 1.0m. The Made Ground is variable varying from:

- Mixed clay fill with sand gravel and cobbles
  and
- Crushed limestone granular sub-base
  and
- At BH03 only Dark grey silty peaty organic CLAY with wood pieces and sparse angular gravel of slate.

Underlying the Made Ground is a Cohesive Glacial Till composed of firm and stiff brown slightly fine-medium sandy gravelly CLAY. Gravel is fine-coarse angular mostly slate. Due to the high Standard Penetration Test N values it is assumed that cobbles are present in the soil mass. The small diameter sampling method will not sample where coarse gravel and cobbles are present.

Standard Penetration Test N_{300} values are determined at the end of each 1.0m sample run. The N_{300} values at 1.0m are BH01 17; BH02 37; BH03 50/300mm: 22. The N_{300} values at 2.0m are BH01 21: BH02 18: BH03 (terminated at 1.70m): BH03 50/210mm. N_{300} values at 3.0m are BH02 55:

Continuous Dynamic Sounding Dynamic Probe Super Heavy probing was undertaken from surface at BH01 completed to 1.70m with 25blows/10mm penetration. BH04 probing was continued from the bae of the borehole.

A conventional ground bearing foundation can be adopted with strip or pad foundations at a nominal founding depth or 150mm below the interface with the Made Ground. The Allowable Bearing Capacity at the indicated depth will be 100 kN/m² for strip foundation or 125 kN/m² for isolated pad foundation.

A ground bearing floor slab can be used where the very weak or deleterious materials are encountered. As shown in BH03 silty peaty organic CLAY with wood pieces and sparse angular gravel of slate was found to a depth 100mm. Deeper weak ground may be encountered and when present should be removed and disposed off-site to be replaced with compacted selected granular fill.

No groundwater was encountered during the site works.

We would recommend that all foundation works are promptly protected with blinding concrete or the foundation to prevent weakening in inclement weather.

Concrete in Aggressive Ground

With reference to BRE Special Digest 1 the site should be considered as brownfield with static groundwater.

The testing for sulphates shows low concentration of soluble sulfate in the Made Ground and low sulfate content in the ground water.

Therefore the Site Design Sulphate Class is DS1 and the Aggressive Chemical Environment for Concrete (ACEC) is AC1s.

8. CONTAMINATION ASSESSMENT

CONTAMINATED SOIL

In 2012 the Nation Planning Policy Framework (NPPF) was established and the requirement s for the assessment of contaminated land is given in Section 120 and 121

120. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

121. Planning policies and decisions should also ensure that:

● the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation;

● after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and

● adequate site investigation information, prepared by a competent person, is presented.

The Definition in Part IIA:

2.1 Section 78A(2) defines CONTAMINATED LAND for the purposes of Part IIA as:

"any land which appears to the LOCAL AUTHORITY in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that -

"(a) SIGNIFICANT HARM is being caused or there is a SIGNIFICANT POSSIBILITY of such harm being caused; or

"(b) POLLUTION OF CONTROLLED WATERS is being, or is likely to be, caused".

In assessing the potential risk of environmental impact the CLR 11 (Model Procedures for the management of Land Contamination) Source – Pathway – Receptor Model is followed. In assessing the potential risk of environmental impact the CLR 11 (Model Procedures for the management of Land Contamination) Source – Pathway – Receptor Model is followed.

The assessment of Contaminated Land is Part IIA of the Environmental Protection Act (1990) Contaminated Land Regime and the development controls of the relevant Town and Country Planning acts. EA/DEFRA has produced four reports and assessment software to assist in the assessment of the potential harmful effects of contaminated land to the users of the land and the risk to the general environment. The EA/DEFRA has withdrawn all published SGV (Soil Guidance Values) for certain target compounds and contaminants and these are used for a Generic Risk Assessment. Updated TOX reports have been issued.

In the assessment of the results of testing comparisons to published LQM-CIEH S4ULs, Generic Assessment Criteria from EA published SGV (Soil Guidance Value) for certain target compounds and the AtriskSoil© database of Generic Assessment Criteria's (SVG).

The disposal of construction spoil that is considered waste will need to be assessed in line with current Land Fill regulations. The Landfill (England and Wales) (Amendment) Regulations 2004 have introduced a set of analysis requirements for the classification of waste into

Inert Waste
Non-reactive hazardous Waste
Hazardous Waste.

If excavation spoil is to be taken off site for disposal additional testing for the Waste Acceptance Criteria will be required.

This investigation of contaminated soil must only be considered as the preliminary phase of works where there is an identified contamination hazard. The results of the analyses of a sample can only be relied on as evidence as to what is in the sample and not what may be in the surrounding or adjacent area. Additional works may be necessary to assess the hazard of any contamination on site and the local environmental impact. Additional investigation may be necessary to evaluate the extent and hence volume of any contaminated soil. The assessment of the contaminated soil must take account of the limited access as part of the of the contamination investigation.

This investigation of contaminated soil must only be considered as the preliminary phase of works where there is an identified contamination hazard. The results of the analyses of a sample can only be relied on as evidence as to what is in the sample and not what may be in the surrounding or adjacent area. Additional works may be necessary to assess the hazard of any contamination on site and the local environmental impact. Additional investigation may be necessary to evaluate the extent and hence volume of any contaminated soil. The assessment of the contaminated soil must take account of the limited access as part of the of the contamination investigation.

The full results are attached.

The CLEA assessment model for Residential with Homegrown vegatables has been used for the Tier 1 Assessment.

Human Health Risk Assessment Metals and Inorganics

	BH03 ES1	N = value is not less than GAC	LQM/CIEH S4ULs
	mg/kg	Y = value is less than GAC	
Arsenic	16	Y	37
Barium*	77	Y	
Beryllium	0.4	Y	1.7
Boron (water-soluble)	1.5		290
Cadmium	0.1	Y	11
Chromium III	43	Y	910
Chromium VI	< 1.0	Y	6
Copper	23	Y	2400
Lead	26	Y	200 SP1010 pC4SL
Mercury	< 0.05	Y	1.2
Nickel	24	Y	180
Selenium	< 0.5	Y	250
Vanadium	59	Y	410
Zinc	63	Y	3700
SO4(Total) %	0.04		
Sulphide	28		
Cyanide(Total)	0.1	Y	
Phenols(Mono)	<0.3	Y	380/120
pH	6.4	5-9 *	
Soil Organic Matter %	15		

The results of the metals are all below the LQM/CIEH S4ULs .

The inorganics are all low.

Speciated Poly Aromatic Hydrocarbons

	Maximum	N = value is not less than GAC	6% Soil Organic Matter LQM/CIEH	1% Soil Organic Matter LQM/CIEH
	mg/kg	Y = value is less than GAC		
Naphthalene	< 0.03	Y	13	2.3
Acenaphthylene	< 0.03	Y	920	170
Acenaphthene	< 0.03	Y	1100	210
Fluorene	< 0.03	Y	860	170
Phenanthrene	< 0.03		440	95
Anthracene	< 0.03	Y	11000	2400
Fluoranthene	< 0.03	Y	890	280
Pyrene	< 0.03	Y	2000	620
Benzo(a)Anthracene	0.03	Y	13	7.2
Chrysene	< 0.03	Y	27	15
Benzo(b/k)Fluoranthene	< 0.03	Y	3.7	2.6
	< 0.03	Y	100	77
Benzo(a)Pyrene	< 0.03	Y	3.7	2.2
Indeno(123-cd)Pyrene	< 0.03	Y	41	27
Dibenzo(ah)Anthracene	< 0.03	Y	0.3	0.24
Benzo(ghi)Perylene	< 0.03	Y	350	320
PAH(total)	< 0.10			

All of the results are at or less than the Laboratory Level of Detection.

Asbestos Fibres in Soil

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1036907	BH03 0.10	SOIL	NAD	none	J Woodmansey

NAD= No asbestos fibres detected

Speciated Total Petroleum Hydrocarbons and Benzene Toluene Ethylbenzene and Xylene (BTEX)

	Maximum mg/kg	N = value is not less than GAC Y = value is less than GAC	6% Soil Organic Matter LQM/CIEH	1% Soil Organic Matter LQM/CIEH
Benzene	< 0.01	Y	0.37	0.087
Toluene	< 0.01	Y	660	130
EthylBenzene	< 0.01	Y	260	47
M Xylene	< 0.01	Y	320	59
P Xylene			330	56
O Xylene		Y	310	60
TPH aliphatic C5-C6	< 0.01	Y	160	42
TPH aliphatic C6-C8	< 0.01	Y	530	100
TPH aliphatic C8-C10	< 0.01	Y	150	27
TPH aliphatic C10-C12	< 1.5	Y	760	130
TPH aliphatic C12-C16	< 1.2	Y	4300	1100
TPH aliphatic C16-C21	< 1.5	Y	C16-C35 110000	C16-C35 65000
TPH aliphatic C21-C35	< 3.4	Y		
TPH aromatic C6-C7 (benzene)	< 0.01	Y	300	70
TPH aromatic C7-C8 (toluene)	< 0.01	Y	660	130
TPH aromatic C8-C10	< 0.01	Y	190	34
TPH aromatic C10-C12	< 0.9	Y	380	74
TPH aromatic C12-C16	< 0.5	Y	660	140
TPH aromatic C16-C21	< 0.6	Y	930	260
TPH aromatic C21-C35	< 1.4	Y	1700	1100

Aliphatic C5-C35	< 10
Aromatic C5-C35	< 10
TPH Ali/Aro	< 10

All of the results are at the Laboratory Level of Detection or less.

CONCLUSION

The site of the school was developed from open farmland at the turn of the 20th Century.

The investigation has shown that the area of the investigation is macadam surfaced over granular sub-base fill. Made Ground, relatively thin was encountered at BH03. Test shows that there is low contamination risk.

STANDARD REFERENCES

British Standards Institute 2015, Code of practice for site investigations.

BS EN 1997-2:2007: Eurocode 7. Geotechnical design. Ground investigation and testing

BS EN ISO 22475-1:2006: Geotechnical investigation and testing. Sampling methods and groundwater measurements. Technical principles for execution

BS EN ISO 14688-1:2002: Geotechnical investigation and testing. Identification and classification of soil. Identification and description

BS EN ISO 14688-2:2004: Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification

BS EN ISO 14689-1:2003: Geotechnical investigation and testing. Identification and classification of rock. Identification and description

BS EN ISO 22476-2:2005: Geotechnical investigation and testing. Field testing. Dynamic probing

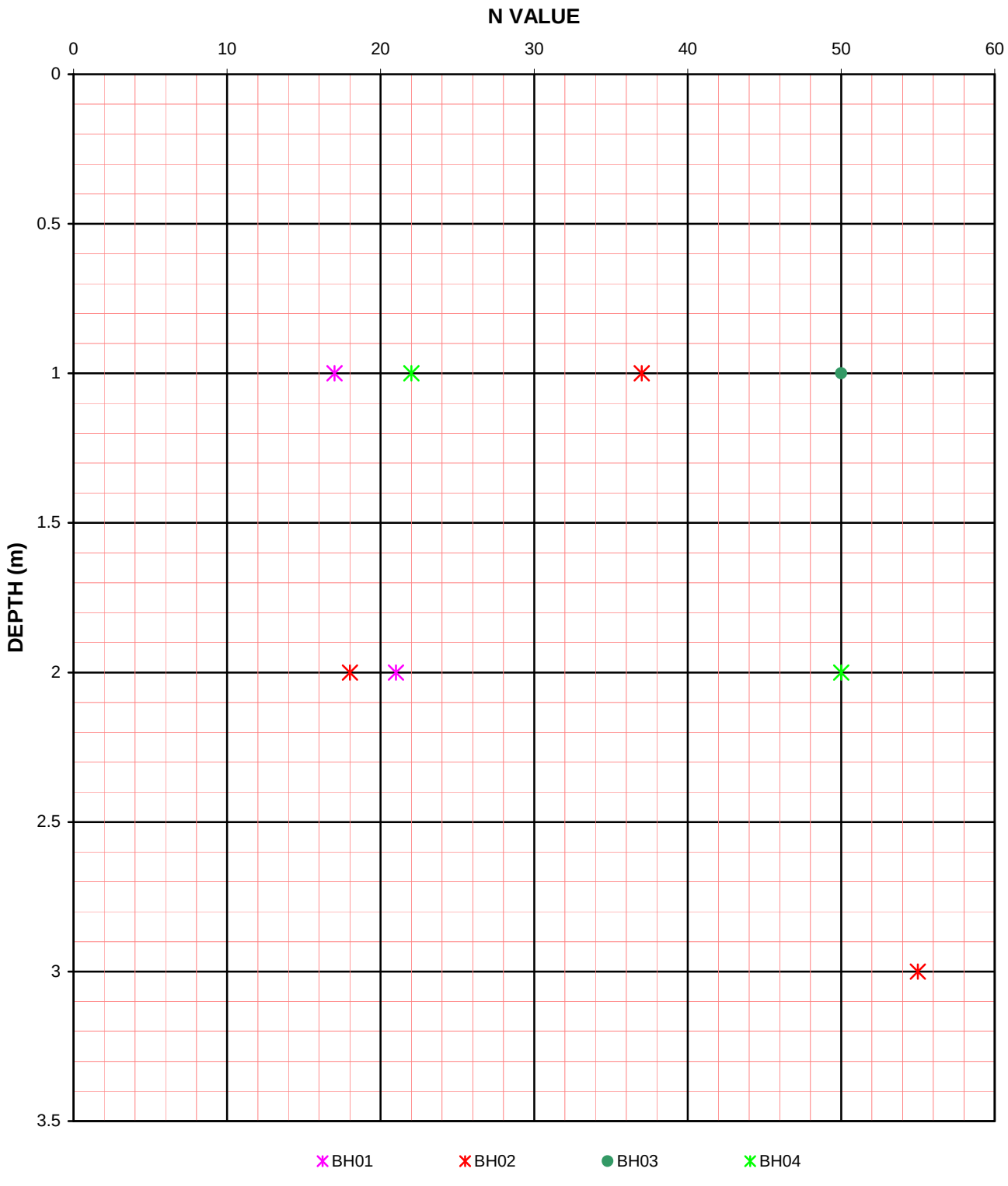
BS EN ISO 22476-3:2005: Geotechnical investigation and testing. Field testing. Standard penetration test

B.S. 1377:1990 Methods of Test for Soils for Civil Engineering Purposes.

FIGURES

LOCATION	**Ysgol Grynradd Dolarrrog**
JOB No	**SRL444**

STANDARD PENETRATION v DEPTH



All boreholes included

FIGURE 1

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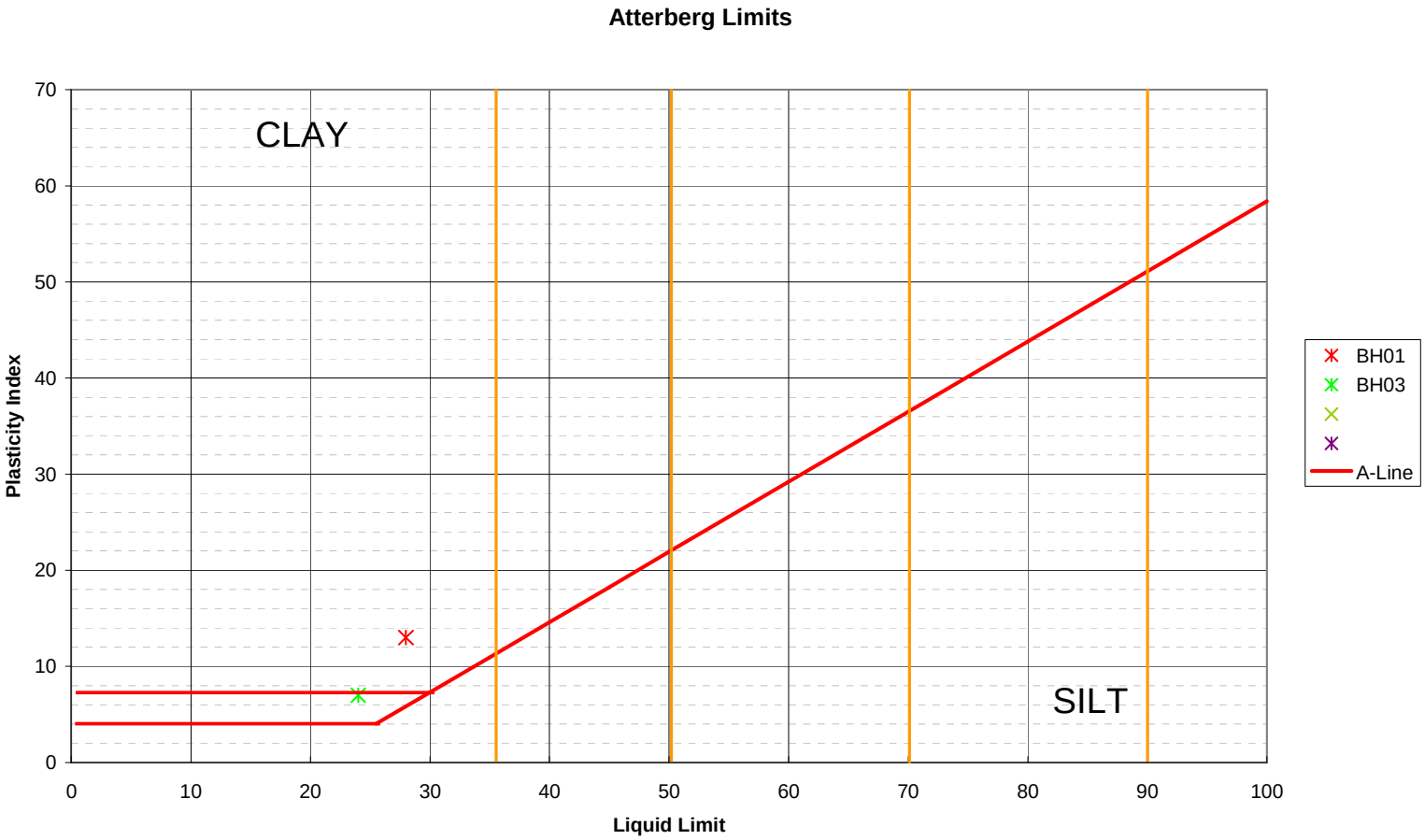
Job No. SRL444



APPENDIX 1 STANDARD STATEMENTS

Terminology used in Soil Descriptions

Standard Penetration Tests

Terminology Used in Soil Descriptions

The procedure and principles given in BS EN ISO 14688 part 1 & 2 and the amended BS 5930 (1999) Revision Section 6 in accordance to have been adopted in producing the soils description contained in this report.
A soil's characteristics are based on the particle size grading of the coarser particles and the plasticity of the finer particles. The classification is therefore based on the following.
While describing a soil the main characteristics should be preferably stated in a standard word order, however the word order can be adjusted if required for clarity.

a) Mass characteristics	b) Material characteristics	c) Stratum Name
1a) Relative density / consistency	1b) Colour	1c) Geological formations, age and type of deposit where possible
2a) Discontinuities	2b) Particle shape, size grading and composition.	
3a) Bedding	3b) Soil name (capital e.g. SAND),based on grading and plasticity.	

Mass Characteristics
Strength scale for fine and coarse soils is as follows:-

Term used for coarse soils	SPT N Values blows/300mm
Very loose	0 to 4
Loose	4 to 10
Medium dense	10 to 30
Dense	30 to 50
Very Dense	over 50

Consistency terms	Consistency description
Very soft	Finger easily pushed in up to 25mm, Exudes between fingers.
Soft	Finger pushed in up to 10mm. Moulds by light finger pressure
Firm	Thumb makes impression easily. Cannot be moulded by fingers rolls in the hand to a 3mm thick thread without breaking or crumbling
Stiff	Can be indented slightly by thumb. Crumbles in rolling a 3mm thick thread but can be remoulded into a lump
Very Stiff	Can be indented by thumb nail. Cannot be moulded but crumbles under pressure
Hard	Can be scratched by thumbnail

Terms based on Measurement for fine soils	Undrained strength kPa
Extremely low	<10
Very low	10 – 20
Low	20 –40
Medium	40 – 75
High	75 – 150
Very high	150 – 300
Extremely high/ Extremely weak mudstone	300 - 600

Relative density of sands and gravel may only be determined by the standard penetration test scale in terms of N-Values, however it should not be used for very coarse soils. The use of empirical relationships between standard penetration test 'N' values and strength of fine soils may also be useful but should not be used to provide strength descriptors on field records.
An undrained strength can be given on the field record when measurement of the undrained shear strength is made in the field by hand vane or in the laboratory by triaxial test.
Silts depending on their grading, may behave either as a coarse soil or fine soil; consistency term (density/strength) shall be used accordingly.

Description of Discontinuities and Beddding.

When describing discontinuities the type should be stated e.g. fissures, faults, shear planes and the spacing detailed as below. Their persistence, openness and surface texture (e.g. rough, smooth, polished, striated) should be described and where possible orientation and trend should be stated.

Discontinuities Scale of spacing	Mean Spacing mm	Other qualifying terms for Discontinuities	Bedding Scale of bedding	Mean Thickness mm	Other qualifying terms for Bedding	
Very Widely	Over 2000	Fissured:- breaks in blocks along unpolished Discontinuities.	Very thickly bedded	Over 2000	Inter bedded	Alternating layers of different types
Widely	2000 to600	Sheared:- breaks in blocks along polished discontinuities.	Thickly bedded	2000 to600	Interlaminated	Prequalified by thickness term if in equal proportions.
Medium	600 to 200		Medium bedded	600 to 200		
Closely	200 to 60		Thinly Bedded	200 to 60		Otherwise thickness of and spacing between subordinate layers defined.
Very Closely	60 to 20	Spacing terms also used for distance between partings, isolated beds or laminae, desiccation cracks roots etc	Very thinly bedded	60 to 20		
Extremely Closely	under 20		Thickly laminated	20 to 6		
			Thinly Laminated	under 6		

Terminology Used in Soil Descriptions - cont.

Material Characteristics of Soils.

Material characteristics refer to those characteristics that can be described from visual and mutual examination of disturbed or undisturbed samples. Characteristics include colour, particle shape, particle grading and particle composition.

Colour

Colour given should be an overall impression. Colour differences can be emphasised separately by the use of terms such as spotted, mottled, streaked or multi-coloured. Details of colours are given below:-
Tertiary descriptor- Light / Dark
Secondary descriptor- Pinkish, reddish, yellowish, orangish, brownish, greenish, bluish, greyish
Primary descriptor- Pink, red, yellow, orange, brown, green, blue, white, grey, black
(Changes due to oxidization, desiccation for example should be noted.)

Particle Shape**:-** The recommended terms to describe particle shape of gravel size or larger particles are as follows

Angularity	Form	Surface texture.	
Very- angular Angular Sub-angular Sub-rounded Rounded Well rounded	Flat / Tubular elongated cubic	rough smooth	The surfaces of the particles may be described for example as etched, pitted, honeycombed or polished

Particle Grading:-Coarse: The distribution of particle sizes within sands and gravel should be described stating predominant size fraction present e.g. fine to medium SAND. Subangular elongated smooth fine gravel. Absence of these adjectives means that they are all present in roughly equal proportion.
Very Coarse: The proportion of cobbles in a boulder deposit (or visa-versa) may be quantified using the terms with a little, with some, or with much; very coarse soils with secondary finer material (coarse and fine soil) should be described likewise e.g. COBBLES with much sandy CLAY.

Finer material (coarse and fine soil) with very coarse secondary fraction should be described as follows

Fraction	Percentage by mass	Term
Boulders	< 5 5 to 20 > 20	Low boulder content Medium boulder content High boulder content
Cobbles	< 10 10 to 20 > 20	Low boulder content Medium boulder content High boulder content

It is recommended that the dominant secondary fraction comes immediately before the principal soil term. To avoid ambiguity, if any of the constituent sizes require qualifying adjectives, these should be added in separate sentences after the main description; such as the estimated percentage proportion or consistency,
e.g.'' Gravelly very clayey SAND. Gravel (10%) is fine of rounded quartz. Clay is firm''.

Principal Soil Type and Secondary Constituents**.**
The soil name is based on particle size of the coarse fraction and/or the plasticity of the fine fraction
The basic soil types and their subdivisions are defined by the range of their particle sizes as shown.

Soil Group.	Particle Size	Principal Soil	Term Before	Principal Term	Term After	Approx. % Secondary Constituent
Very Coarse	>630	LARGE BOULDERS		BOULDER	With a little cobbles Or gravel or sand	<5
	200	BOULDERS			With some sand	5-20
	63	COBBLES		COBBLES	With much boulders	20-50
Coarse Soils (over about 65% Sand and Gravel)	Coarse 20	GRAVEL	Slightly clayey Or silty or sandy (Very gravely*) * or describe as a fine soil depending on assessed engineering behavior	SAND GRAVEL SAND and Gravel	and(sand*) or and (Gravel*)	> 5 5 - 20 >20 about equal proportions
	Medium 6.3					
	Fine 2					
	Coarse 0.63	SAND				
	Medium 0.2					
	Fine 0.063					
			Term Before	**Principal Term**	**Term After**	**Approx. % Secondary Constituent**
Fine Soil Over 35% silt And clay size) t	Coarse 0.02	SILT	Slightly (sandy*) or gravelly	CLAY**		<35
	Medium 0.0063		(Sandy*) or gravelly	Or		35-65
	Fine 0.002	CLAY/SILT CLAY	(Very Sandy*) or gravelly	SILT		>65

* describe as coarse soil depending on assessed engineering behavior. ** Can be silty CLAY or clayey SILT.

Fines soils:- contain 35% or more of fine material (omitting boulder and cobbles)is described as CLAY or SILT depending on the plasticity.
With less than 35% fine material it is described as a coarse material SAND or GRAVEL. The description of plasticity may be carried out using terms provided in BS EN ISO14688-1 2002

The description of 'finer material' is made ignoring the very coarse fraction; descriptions with cumulative proportions of various fractions, excluding cobbles and boulders, exceeding 100% are incorrect.

Coarse soils:-

Very coarse soils:-

For mixtures involving very coarse soils, the principal soil type name in the fine material may also be given in capital letters, e.g. COBBLES with some sandy CLAY

The location of individual cobbles and boulders should be noted on the logs. The term large boulder does not have an upper size limit, so dimension should be stated wherever available.

Minor constituents: where soil contain minor quantities (less than about 10% in fine soil and 1% coarse) which are relevant to geology can be included before the principal soil type using 'slightly micaceous' or 'very shelly' or at the end of description using qualitative terms such as 'rare', ' occasional' or 'frequent', e.g.'SAND with rare gravel size brick fragments'.

Man-made soils: are the soils which are placed by man and can be divided into those composed of reworked natural soils and those composed of man-made materials. 'Fill' is placed in controlled manner, and 'made ground' is placed without strict engineering control. Description of such soils should include following

.

a) Origin of the material	b) Presence of large objects e.g. concrete, mortar etc	c) Presence of voids/ collapsible hollow objects
d) Chemical waste and hazardous substances	e) Organic matter	f) Odours smell
g) Striking colour tints	h) Any dates readable on buried papers etc.	i) Signs of heat or combustion under ground e.g steam emerging from borehole
j) Structure, variability and mention of placement.		

Peat is classified according to the degree of decomposition and condition as given in following table

Organic Soils and Peats:-(see BS 5930. 41.3.6)

Condition	Field Test
Firm	Fibres compressed
Spongy	Very compressed and open structure
Plastic	Can be moulded in hand and smears along fingers

Terms	Decomposition	Remains	Squeeze
Fibrous	Not	Clearly recognizable	Only water no solids
pseudo-fibrous	Moderate	Recognizable	Turbid water < 50% soilds
amorphous	Full	Not recognizable	Paste > 50% solids

Term	Colour	Weight % of dry mass BS EN 14688-2
Slightly organic	Grey	2 - 6
Organic	Dark grey	6 - 20
Very organic	Black	> 20
PEAT: Low density, dark coloured, distinctive odour		

Geological formation, age and type of deposit: is given on the maps of the British Geological Survey or its Antecedents and it should be written with at least capital initial letters. The geological formation should be named where this can be done with confidence (not easy to tell in a particular borehole or exposure).

References:

BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004
BS EN ISO 14688-1 & 2 2002 Geotechnical investigation and testing – Identification and classification of soil
BS 5930:1999 Revision 'Code of Practice for Site Investigation.'
Norbury D.R;, G.H Child and T.W Spink 1986:'A critical Review of Section 8(BS 5930)Soil and Rock Descriptions'. Proc 20th Regional meeting of the Engineering Group of the Geological Society. Site Investigation Practice. Assessing BS5930. Univ of Surrey pp353-369(original proceedings).

Standard Penetration Test

BS EN ISO 22476-3:2005 (formerly BS 1377 Part 9:1990)

The full procedure of carrying out the Standard Penetration Tests (SPT) is given in BS 1377:1990 : Methods of Tests for Soils and Civil Engineering Purposes Test 9:3.

Essentially the tests consists of driving a 50mm external diameter split barrel sampler into the soil using a 65kg hammer dropping 760mm. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration (test drive) below a seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows for the 300mm test drive penetration is recorded on the borehole logs as the N - value.

A full record of the number of blows required to drive the sample at 75mm intervals throughout the total 450mm drive is also tabulated along with the groundwater levels at the time of test.

The test is normally performed on sands, but may also be used in gravels, weak rocks and glacial tills in which case the driving shoe may be replaced by a cone. When attempting the standard penetration tests in very dense materials or weathered bedrock it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

a) Seating Drive - using standard blows the seating drive is a penetration of 150mm or 25 blows whichever is first reached

b) Test Drive - the number of blows required for a further penetration of 300mm. If 300mm cannot be achieved in 50 blows the test can be terminated Record the number of blows per 75mm for both seating and test drives. If either the seating drive or the test drive is terminated before full penetration record the depth of penetration for the 25 blows or 50 blows respectively

c) In soft rock the test drive should be terminated after 100 blows if a penetration of 300mm has not been achieved The N - value obtained from the Standard Penetration Tests may be used to assess the relative density of sands and gravels in accordance with Clause 41.3.2 of BS 5930:1999 : Code of Practice for Site Investigation as follows:

Strength	Blows/300mm		Blows/300mm
Very Loose	0	-	4
Loose	4	-	10
Medium Dense	10	-	30
Dense	30	-	50
Very Dense	Over		50

In soft strata when the sampler assembly is lowered to the bottom of the borehole on the drive rods with the drive assembly on top the sampler may penetrate under self-weight. This initial penetration should be measured and recorded. If the initial penetration exceeds 450mm omit the seating and test drives and report the N value as zero.

Dynamic Probe Super Heavy (DPSH) in accordance with BS EN ISO 22476-2:2005 (formerly BS 1377 Part 9:1990),

The Continuous Dynamic Sounding (dynamic probe method) is a continuous probing of soils with the blows per 100mm (N_{100}) are recorded. The Continuous Dynamic Sounding gives a soil profile.

The table below gives details of the equipment used for the two test methods, i.e. Dynamic Probing Heavy (DPH) and Dynamic Probe Super Heavy (DPSH). The DPSH method equates to the Standard Penetration Test (SPT) and the DPH is the conventional dynamic probe test (DPT).

The test method requires the recording of the blows required to drive the 90º cones and driving rods into the soil over an interval of 100 mm. At the end of each 1.0m rod the torque resistance of the rod shall be measured and recorded.

DPSH Equipment Details

	DPSH	DPH
Driving Mass	63.5 ± 0.5 kg	50 ± 0.5 kg
Standard Drop	750 ± 20 mm	500 ± 10 mm
Anvil diameter	100 < d < 0.5 d mm	100 < d < 0.5 d
Maximum Mass of Anvil and Guide Rod	30 kg	18 kg
Cone Angle	90º Cone	90º Cone
Nominal Area	20 cm²	15 cm²
Cone Base Diameter (New)	50.5 ± 0.5 mm	43.7 ± 0.3 mm
Cone Mantle Length	50.5 ± 2 mm	43.7 ± 1 mm
Cone Taper	11 degrees	11 degrees
Cone Tip Length	25.3 ± 0.4 mm	21.9 ± 0.1 mm
Extension Rods		
Mass of Rod kg/m	8 kg (maximum)	6 kg (maximum)
Diameter	35 mm (maximum)	35 mm (maximum)
Length mm	Up to 2.0 ± 0.1%	Up to 2.0 ± 0.1%

APPENDIX 2 RECORDS OF FIELDWORK

APPENDIX 2.1 Boreholes

STRATA RENEWABLES LTD

Job No.: **SRL444**

Location **Ysgol Grynradd, Dolgarrog**

Client: Conwy County Borough Council Project Ref.:

Borehole No. **BH01**

Equipment and methods **CDSa & CDSo**

Start Date: **22/07/2016** Final Depth: **2.45m**

Drop Height	750mm
Drop Weight Mass	64kg
Cone Diameter	50mm
Casing Diameter	
Casing Depth	

Blows	Penetration mm / blows	N100 - Blows per 100mm	In situ Tests Samples [N300] {Cu}	Top	Bottom	Description	Strata Depth & Thickness m	Reduced Level (m)	Legend
7						Macadam Surfacing	(0.10)		
8						Made Ground composed of brown sandy gravelly Clay Fill with subrounded cobbles (Drillers Description)	0.10		
11							(0.90)		
5									
10									
6									
2									
1									
2									
2			N17 S 1	1.00			1.00		
2			17/300mm		1.45	Stiff brown streaked grey fine-medium sandy gravelly CLAY. Gravel is fine-coarse subangular and subrounded some of slate.			
2									
4									
6									
5							(1.45)		
4									
25	10		N21 S 2	2.00		**Sampling Complete**			
			21/300mm		2.45				
		Continuous Dynamic Sounding Complete					2.45		
						Borehole Complete			

Remarks 1) CAT screen 2) Services inspection pit to 1.0m 3) Sampling terminated at 2.45m misalinged casing 4) Continued with Dynamic Probe Super Heavy to 1.7m

Logged by **NFJ** Drilled by **RC**

Ground level

Co-ordinates:

CDSa-Continuous Dynamic Sampling (84mm diameter 1.0m long). DPSH-Dynamic Probe Super Heavy (BS EN ISO 22476-2:2005)

STRATA RENEWABLES LTD

Job No.: **SRL444**

Location **Ysgol Grynradd, Dolgarrog**

Client: Conwy County Borough Council Project Ref.:

Borehole No. **BH02**

Equipment and methods **CDSa**

Drop Height
Drop Weight Mass
Cone Diameter
Casing Diameter
Casing Depth

Start Date: **22/07/2016** Final Depth: **3.45m**

Blows / Penetration mm / blows / N100 - Blows per 100mm	In situ Tests Samples [N300] {Cu}	Top	Bottom	Description	Strata Depth & Thickness m	Reduced Level (m)	Legend
				Macadam Surfacing	(0.10)		
				Made Ground composed of crushed limestone graded gravel (drillers description)	0.10		
	BS1	0.00			(0.20)		
		0.45		Stiff brown slightly fine-medium sandy gravelly CLAY. Gravel is fine-coarse angular mostly slate.	0.30		
N37 *37/300mm*	S 1	1.00	1.45		(1.50)		
					1.80		
N18 *18/300mm*	S 2	2.00	2.45	Stiff grey fine-medium sandy gravelly CLAY. Gravel is fine-coarse angular and subangular mostly slate			
					(1.20)		
				.. 3.6m brown silty clay pocket.			
N55 *55/30mm*	S 3	3.00	3.45		3.00		
				Very stiff dark grey slightly fine sandy very gravelly CLAY. Gravel is fine-coarse subangular mostly slate. Possible Cobbles	(0.45)		
				.. Pocket of soft grey silty sandy clay.	3.45		
				Sampling Abandoned			

Remarks 1) CAT screen 2) Sampling abandoned at 3.45m 3) Water standing at 2.9m 20 mins after sampling complete

Logged by **NFJ** Drilled by **RC**

Ground level

Co-ordinates:

CDSa-Continuous Dynamic Sampling (84mm diameter 1.0m long). DPSH-Dynamic Probe Super Heavy (BS EN ISO 22476-2:2005)

STRATA RENEWABLES LTD

Job No.: **SRL444**

Location **Ysgol Grynradd, Dolgarrog**

Client: Conwy County Borough Council Project Ref.:

Borehole No. **BH03**

Equipment and methods

Start Date: **22/07/2016** Final Depth: **1.70m**

Drop Height
Drop Weight Mass
Cone Diameter
Casing Diameter
Casing Depth

Blows / Penetration mm / blows — N100 - Blows per 100mm	In situ Tests Samples [N300] {Cu}	Top	Bottom	Description	Strata Depth & Thickness m	Reduced Level (m)	Legend
	ES1	0.05		Macadam Surfacing	(0.10)		
		0.10		Dark grey silty peaty organic CLAY with wood pieces and sparse angular gravel of slate.	0.10		
	V50kPa V	0.30			(0.15)		
				Firm brown streaked grey mottled grey/brown silty CLAY . Sparse subrounded fine-medium gravel	0.25		
					(0.15)		
				Firm brown very gravelly CLAY. Gravel is fine-medium subangular of slate and subrounded fine grained volcanics. Possible Cobbles present	0.40		
	N50 50/300mm	S 1	1.00		(1.30)		
			1.45				
				.. *Possible cobbles*	1.70		
				Sampling Abandoned			

Remarks

Logged by **NFJ** Drilled by **RC**

Ground level

Co-ordinates:

CDSa-Continuous Dynamic Sampling (84mm diameter 1.0m long). DPSH-Dynamic Probe Super Heavy (BS EN ISO 22476-2:2005)

STRATA RENEWABLES LTD

Job No.: **SRL444**

Location **Ysgol Grynradd, Dolgarrog**

Client: Conwy County Borough Council Project Ref.:

Borehole No. **BH04**

Equipment and methods **CDSa & CDSo**

Start Date: **22/07/2016** Final Depth: **4.90m**

Drop Height	750mm
Drop Weight Mass	64kg
Cone Diameter	50mm
Casing Diameter	
Casing Depth	

Blows	Penetration mm / blows	N100 - Blows per 100mm
0		
0		
1		
25		
17		
10		
8		
5		
3		
3		
4		
6		
5		
7		
6		
7		
18		
7		
24		
13		
6		
6		
7		
8		
12		
10		
11	100	

Continuous Dynamic Sounding Complete

In situ Tests Samples [N300] {Cu}		Top	Bottom	Description	Strata Depth & Thickness m	Reduced Level (m)	Legend
				Macadam surfacing	(0.10)		
	ES1	0.01	0.10	Made Ground medium-coarse angular gravel (drillers description)	0.10		
		0.40			(0.30)		
				Firm brown fine-coarse sandy gravelly CLAY. Gravel is fine-medium subangular some slate.	0.40		
					(0.40)		
					0.80		
N22 *22/300mm*	S 1	1.00	1.45	Stiff light brown and grey brown fine-medium sandy gravelly and slightly gravelly CLAY. Gravel is fine-medium subangular some flat of slate.	(0.90)		
					1.70		
N50 *50/210mm*	S 2	2.00	2.00	Stiff dark grey fine-medium sandy gravelly CLAY. Gravel is fine-coarse subangular some flat slate. Obstruction at 2.35m	(0.65)		
					2.35		
				Sampling Abandoned			

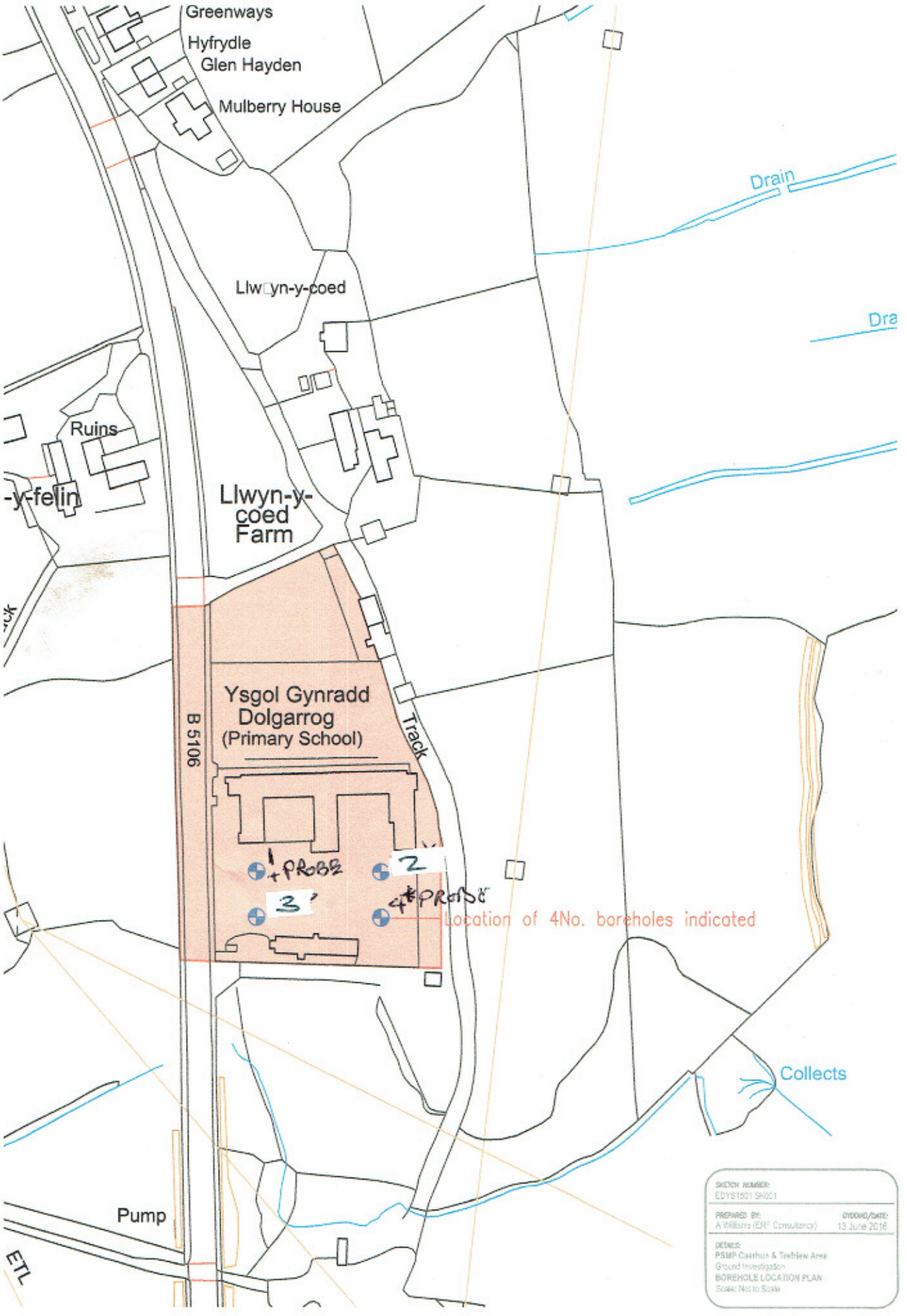
Remarks 1) CAT screen 2) Sampling abandoned at 2.35m 3) Continued by Dynamic Probe Super Heavy. 4) Probing terminated at 4.9m

Logged by **NFJ** Drilled by **RC**

Ground level

Co-ordinates:

CDSa-Continuous Dynamic Sampling (84mm diameter 1.0m long). DPSH-Dynamic Probe Super Heavy (BS EN ISO 22476-2:2005)


Greenways
Hyfrydle
Glen Hayden
Mulberry House
Drain
Llwyn-y-coed
Ruins
-y-felin
Llwyn-y-coed Farm
Ysgol Gynradd Dolgarrog (Primary School)
B 5106
Track
1 PROBE
2
3
4 PROBE
Location of 4No. boreholes indicated
Collects
Pump
ETL
SKETCH NUMBER:
EDYS1601 SK001
PREPARED BY:
A Williams (ER² Consultancy)
DD/DAD/DATE:
13 June 2016
DETAILS:
PSMP Caerhun & Trefriew Area
Ground Investigation
BOREHOLE LOCATION PLAN
Scale: Not to Scale

RECORD SHEET SYMBOL KEY

SAMPLES/TESTS

U	Undisturbed 100mm open tube driven sample (depth records recovered length from start of test). OS-T/W(100mm with liner) ***** Indicates a sample with Nil Recovery {x.xx} indicates the water at the sample depth.
D	Small disturbed sample (depth records the interval of sample).
ES EW	Environmental samples (SOIL/WATER). Small disturbed samples for contamination analysis comprising glass and plastic tubs.
B	Large disturbed sample (Bulk) depth records recorded interval.
S	Standard penetration test (SPT; BS EN ISO 22476-3) recovered as a small disturbed sample. ***** Indicates a sample with Nil Recovery. {x.xx} indicates the water at the sample depth.
C	Solid Cone Penetration test, in rock and coarse granular soils.
W	Water sample.
L	Continuous Dynamic Sample 84mm 1.0m long

FIELD RECORD COLUMN

This column is used to present depth related information of site activity. The column will always show progress, details of water strikes and rises, field records of the SPT test and the Undisturbed sample blows. Other data may be present in this column and details of codes will be given in the remarks box at the bottom of the record sheet page.

Water Level Codes

M1 2.00	Water strike (with sequential number of the strike) recorded depth.
T1 1.90	Temporary rest level after 20 minutes with recorded depth.

Progress Codes

-{07/08/2002}-	Records the date at the depth of the borehole when the borehole takes more than one day to complete. Also indicated on completion. Recorded for start of second day and subsequent shifts.
(TSL 3.00m)	Represents the water rest level at the start of the shift (AM) or the end of the borehole shown with the date of observation.

Field Records

1,2-3,4,5,6	Detailed SPT records for each 75mm test interval (incomplete penetration tests will be recorded showing blows for measured penetration).
[U60]	U100 open tube sampler blows to drive the sampler the full length

ROTARY CORE DRILLING RECORDS

Details of the rock fracture state are given in the Mechanical Log portion of the sheet SCR TCR and RQD are described in BS EN ISO 22475-1 (and BS 5930 Section 44.4.4) If is average fracture spacing over a particular lithology, Where the core is fully broken 0 indicates Non-Intact

MONITORING INSTALLATIONS

Standpipe piezometer or groundwater monitoring wells and water level information may be shown on the standard record sheet or a separate installation sheet. Bentonite seals, filter zones and installation depths are indicated. Details of installation are given in the report.

Legend symbols are those given BS5930:1999 (ISO 710-1-7) but for clarity may only the show major constituent.
Strata descriptions are compiled by visual examination of samples obtained during boring, after BS EN 14689-1:2003 and BS EN ISO 14689-1:2003: Geotechnical investigation and testing. Identification and classification of rock. Identification and description. Laboratory test results where applicable.

APPENDIX 2.2 Detailed Results of Standard Penetration Tests

Client: Conwy County Borough Council

Job No.: SRL444

Site Name: Ysgol Grynradd, Dolgarrog

Detailed SPT Summary

Borehole Number	Depth m	Test Type	Sample Ref	Sample Description	SPT N Value	Depth to water	Depth of casing at test depth	Increment 1		Increment 2		Increment 3		Increment 4		Increment 5		Increment 6		Reported SPT N Value
								Blows (mm)		Blows (mm)		Blows (mm)		Blows (mm)		Blows (mm)		Blows (mm)		
BH01	1.00	S	1	Dark brown with black inclusions silty fine-coarse sandy fine-medium gravelly CLAY. Gravel is subrounded	17		1.00	4		3		4		4		4		5		17/300mm
BH01	2.00	S	2	Dark brown with black inclusions silty fine-coarse sandy fine-medium gravelly CLAY. Gravel is subrounded and flat of slate.	21		2.00	3		6		6		4		5		6		21/300mm
BH02	1.00	S	1	Mid brown silty slightly fine sandy gravelly CLAY. Gravel is fine-coarse subangular some flat slate and dark grey fine grained volcanics.	37		1.00	2		5		5		7		11		14		37/300mm
BH02	2.00	S	2	Grey silty slightly fine sandy gravelly CLAY. Gravel is fine-medium rounded and subangular some slate	18		2.00	4		4		4		5		4		5		18/300mm
BH02	3.00	S	3	Dark grey clayey fine-medium sandy fine-medium angular GRAVEL. Some slate and grey fine grained volcanics	55	2.90	3.00	6		6		9		32		7		7		55/30mm
BH03	1.00	S	1	Brown fine-coarse sandy slightly gravelly CLAY. Gravel is fine-coarse subangular flat some slate	50			2		3		6		10		26		8		50/300mm
BH04	1.00	S	1	Light brown slightly fine-medium sandy gravelly CLAY. Gravel is fine-coarse some of flat slate.	22		1.00	3		6		5		5		6		6		22/300mm
BH04	2.00	S	2	Dark grey fine-medium sandy gravelly CLAY. Gravel fine-coarse subangular some of slate.	50		2.00	4		8		18		17		15	60			50/210mm

Note: See Appendix sheet in the main report for the explanation of the SPT N Value.

APPENDIX 3 LABORATORY TEST RESULTS

APPENDIX 3.1 Summary of Test Results

Client: Conwy Borough Council

Job No: SRL444

Site Name: Ysgol Gynradd Dolgarrog

Date 26/08/2016

Laboratory Test Result Summary

BS 1377:1990:part2
BS EN 17892-1:2014 B.S.1377:1990:part 3

					Classification					Chemical				
Location Number	Sample Type No.	Sample Depth Top m	Sample Depth Bottom m	Description	LL	PL	PI	% Retained 425µm	Water Content %	pH	SO_4 % Total	SO_4 mg/l 2:1 Extract	SO_4 mg/l in Water	Cl_2 %
BH01	S1	1.00	1.45	Brown fine-medium sandy CLAY with fine-coarse angular sub-angular gravel	28	15	13	20	12.8	6.5		65.84		
BH01	S2	2.00	2.45	Brown slightly fine-medium sandy CLAY					11.8					
BH02	S1	1.00	1.45	Brown grey mottled slightly fine sandy CLAY with fine-coarse sub-angular gravel					16.7					
BH02	S2	2.00	2.45	Dark brown grey slightly fine sandy silty CLAY with fineangular sub-angular gravel					12.3					
BH02	S3	3.00	3.45	Dark grey CLAY and fine-coarse angular sub-angular GRAVEL					11.4					
BH03	S1	1.00	1.45	Brown grey fine-medium sandy gravelly CLAY gravel is angular sub-angular	24	17	7	41	10.3	6.5		32.92		
BH04	S1	1.00	1.45	Brown grey mottled fine-medium sandy CLAY with some fine-coarse sub-angular gravel					12.0					
BH04	S2	2.00	2.35	Dark grey slightly fine sandy CLAY with fine-coarse angular sub-angular gravel					10.3					

APPENDIX 3.2 Chemical Contamination Tests

Derwentside Environmental Testing Services

Certificate of Analysis

Certificate Number 16-75656

17-Aug-16

Client Strata Renewables
Jodrell Bank Service Station
Knutsford Road
Cranage
Cheshire
CW4 8HU

Our Reference 16-75656

Client Reference SRL444

Order No CARL-1008

Contract Title Ysgol Gynradd Dolgarrog

Description One Soil sample.

Date Received 11-Aug-16

Date Started 11-Aug-16

Date Completed 17-Aug-16

Test Procedures Identified by prefix DETSn (details on request).

Notes Opinions and interpretations are outside the scope of UKAS accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. Observations and interpretations are outside the scope of ISO 17025. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.

Approved By

Rob Brown
Business Manager

UKAS TESTING
2139

Summary of Chemical Analysis
Soil Samples

Our Ref 16-75656
Client Ref SRL444
Contract Title Ysgol Gynradd Dolgarrog

Lab No	1036907
Sample ID	BH03
Depth	0.10
Other ID	
Sample Type	SOIL
Sampling Date	10/08/16
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	16
Barium	DETSC 2301#	1.5	mg/kg	77
Beryllium	DETSC 2301#	0.2	mg/kg	0.4
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	1.5
Cadmium	DETSC 2301#	0.1	mg/kg	0.1
Chromium	DETSC 2301#	0.15	mg/kg	43
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	23
Lead	DETSC 2301#	0.3	mg/kg	26
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05
Nickel	DETSC 2301#	1	mg/kg	24
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5
Vanadium	DETSC 2301	0.8	mg/kg	59
Zinc	DETSC 2301#	1	mg/kg	63
Inorganics				
pH	DETSC 2008#			6.4
Cyanide, Total	DETSC 2130#	0.1	mg/kg	0.1
Sulphide	DETSC 2024#	10	mg/kg	28
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.04

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Chemical Analysis
Soil Samples

Our Ref 16-75656
Client Ref SRL444
Contract Title Ysgol Gynradd Dolgarrog

Lab No	1036907
Sample ID	BH03
Depth	0.10
Other ID	
Sample Type	SOIL
Sampling Date	10/08/16
Sampling Time	n/s

Test	Method	LOD	Units	
Petroleum Hydrocarbons				
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01
PAHs				
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03
PAH - USEPA 16, Total	DETSC 3303	0.1	mg/kg	< 0.10
Phenols				
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3

Key: * -not accredited. # -MCERTS (accreditation only applies if report carries the MCERTS logo). n/s -not supplied.

Summary of Asbestos Analysis
Soil Samples

Our Ref 16-75656
Client Ref SRL444
Contract Title Ysgol Gynradd Dolgarrog

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1036907	BH03 0.10	SOIL	NAD	none	J Woodmansey

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETSC 1101 using polarised light microscopy in accordance with HSG248 and documented in-house methods. NAD = No Asbestos Detected. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'. Key: * - not included in laboratory scope of accreditation.

Information in Support of the Analytical Results

Our Ref 16-75656
Client Ref SRL444
Contract Ysgol Gynradd Dolgarrog

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1036907	BH03 0.10 SOIL	10/08/16	GJ 250ml, GV x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar V-Vial T-Tub

DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.

Soil Analysis Notes

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425µm sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

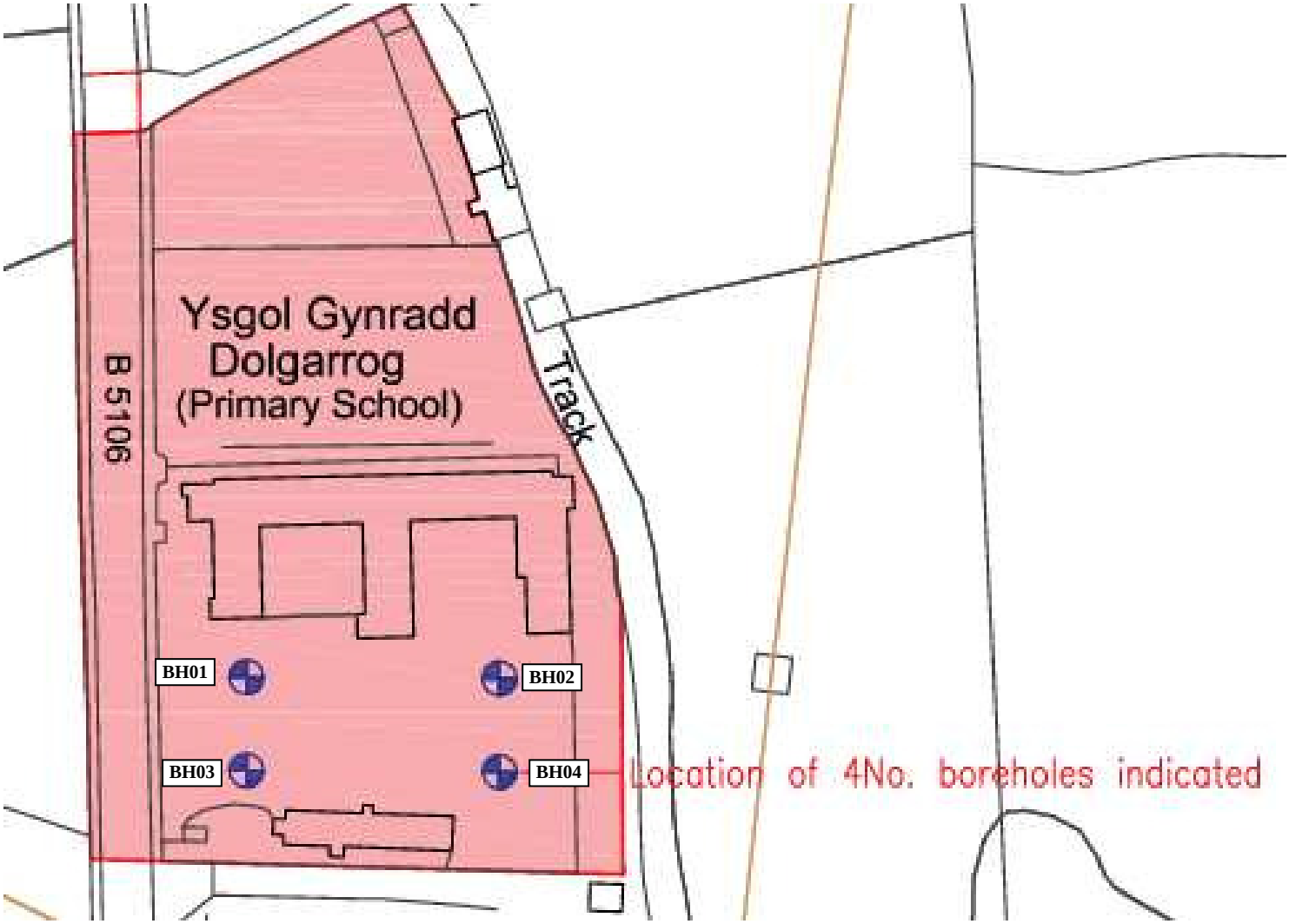
The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28°C +/-2°C.

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

APPENDIX 4 BOREHOLE LOCATION PLAN


Ysgol Gynradd
Dolgarrog
(Primary School)
B 5106
Track
BH01
BH02
BH03
BH04
Location of 4No. boreholes indicated

APPENDIX 5 SITE LOCATION PLAN