



GROUND INVESTIGATION REPORT

Report No – SRL164

Bonc Wen,

Rhosllannerchrugog

Issue : Final Report

Issue Date 27th April 2015:

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REPORT NO – SRL 147

Bonc Wen, Rhosllannerchrugog

for

North Wales Housing Association

requested by

Datrys Design Engineering

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CONTENTS

1.	INTRODUCTION	1
2.	SITE DESCRIPTION	2
3.	SITE GEOLOGY	7
4.	FIELDWORK	7
5.	LABORATORY TESTING	10
6.	SUMMARY OF GROUND CONDITIONS	11

STANDARD REFERENCES

APPENDICES

APPENDIX 1	STANDARD STATEMENTS
	Terminology used in Soil Descriptions
	Standard Penetration Tests
APPENDIX 2	RECORDS OF FIELDWORK
APPENDIX 2.1	Boreholes
APPENDIX 2.2	Detailed Results of Standard Penetration Tests
APPENDIX 2.3	Machine Excavated Trial Pits
APPENDIX 2.4	CBR test results
APPENDIX 2.5	BRE 365 Soakaway results
APPENDIX 2.6	Gas Monitoring results
APPENDIX 3	LABORATORY TEST RESULTS
APPENDIX 3.1	Summary of Test Results
APPENDIX 3.2	Triaxial Test Results
APPENDIX 3.3	Particle Size Distribution Results
APPENDIX 3.4	Chemical Contamination Results
APPENDIX 4	BOREHOLE LOCATION PLAN
APPENDIX 5	SITE LOCATION PLAN

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 North Wales Housing Association at the request of Datrys Design Engineering.

The works were carried out under the instruction given in relation with reference no. 14186.

A phase 1 desk study has been prepared by Datrys dated September 2014 and should be read in context with this report.

This report has been devised to generally comply with the relevant principles and requirements of a range of guidance including:

- Part IIA of the Environment Protection Act, 1990;
- Guide for Developers` prepared by the Welsh Local Government Association & Environment Agency Wales 2012
- Contaminated Land (England) (Amendment) Regulations 2012 and Contaminated Land Statutory Guidance (DEFRA, April 2012);
- National Planning Policy Framework (HCA, March 2012);
- BS5930:1999 +A2:2010: "Code of practice for site investigations";
- BS10175: 2011 +A1:2013 "Investigation of Potentially Contaminated Sites - Code of Practice";
- DEFRA/Environment Agency (2004) Report CLR11 "Model Procedures for the Management of Land Contamination";
- Environment Agency (2011) Report GPLC1 "Guiding Principles for Land Contamination";
- Environment Agency (2013) Report GP3 "Groundwater protection: Principles and Practice" Version 1.1.

2. Development Proposals

At the time of the report, the proposed development for the site is understood to comprise:

- 4No. 2 bed Terraced residential properties
- 5No 3 bed residential properties (4no terraced and 1 detached);
- All dwellings with associated gardens;
- parking and open space soft landscaping

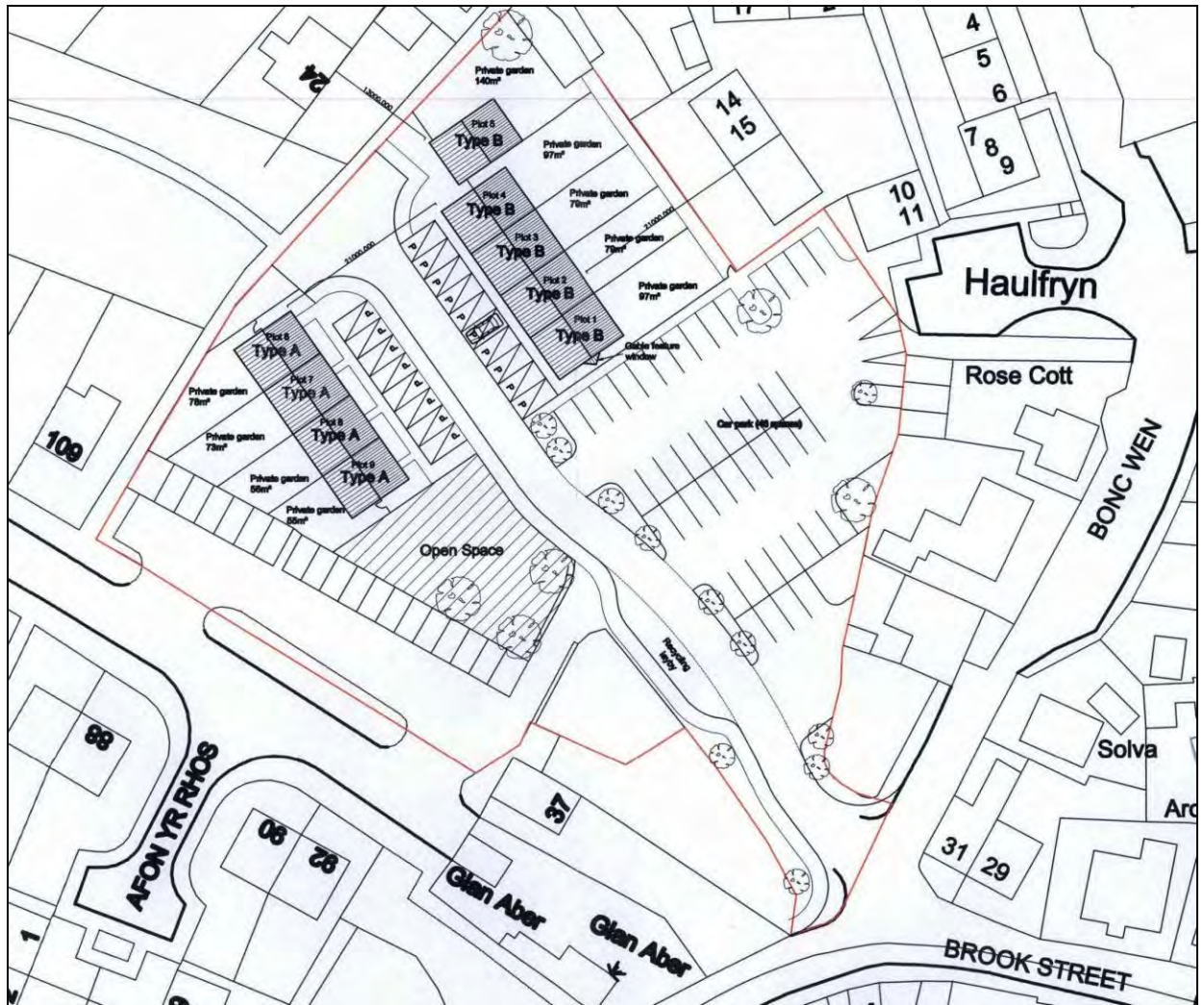


Figure 1: Proposed Development Plan

3. PLANNING STATUS & REQUIREMENTS

The site has been granted outline planning permission by Wrexham Borough Council (permission number P/2010/0243).

There are planning conditions relating to ground conditions and potential contaminated land which require to be discharged.

Condition 4

Development shall not begin on site until a scheme to deal with potential contamination at the site has been submitted to and approved in writing by the Local Planning Authority. This scheme shall include a phased investigation approach to identify the extent of contamination and any measures required to remediate the site, including post-development monitoring. Where remediation works are required, the development shall not be occupied / used until a validation report to show that the works have been satisfactorily carried out has been submitted to and approved in writing by the Local Planning Authority.

The National Planning Policy Framework (NPPF, 2012) has twelve core land-use planning principles, two of which directly relate to the potential for pollution and contaminated land:

- *Requirement to “contribute to conserving and enhancing the natural environment and reducing pollution” and setting out of a preference for developments to be on land of “lesser environmental value”; and*
- *“encourage the effective use of land by re-using land that has been previously developed (brownfield land), providing that it is not of high environmental value.”.*

In accordance with the core principles of NPPF, Paragraph 109 clarifies that enhancing the natural environment includes:

- *“preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability; and*
- *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.”.*

Paragraph 121 of NPPF states that planning policies and decisions for developments 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.”*

This report has been prepared and authorised by staff that are competent as defined in the NPPF.

4. SITE DESCRIPTION

The site is located in a residential area in Rhosllannerchrugog, North Wales. Currently the site is a car park located to the west of Bonc Wen at grid reference 329008, 346372.



Figure 2: Google Earth 2009 image



Figure 3: Site Location Plan

The car park is relatively flat and is surrounded by residential properties to the north and east. The slab from the demolished community centre still remains in situ to the north of the car park. There are two grassed areas along the western and southern boundary. There is a small flat bin holding area along the southern boundary of the car park. The ground level slopes significantly to the south of the car park.

Figure 4: Current site photos



Southern boundary



Looking north



5. SITE GEOLOGY

The published British Geological Survey (BGS) map shows the site is underlain by:

- Drift Geology – Glacial Till – Diamicton (Glacial Clay) - Superficial Deposits formed up to 2 million years ago in the Quaternary Period.
- Bedrock Geology – Carboniferous Pennine Lower Coal Measures Formation and Pennine Middle Coal Measures Formation.

6. SITE HISTORY

Historically the Rhos Branch of the Great Western Railway (GWR) ran through the site. In addition, the remaining part of the site was a railway goods yard, which had a number of sidings and related buildings. The railway line and yard were demolished and removed between 1959 and 1989. The site was redeveloped with a car park and a community centre. The old station house remained in the SW corner of the site.

The site also bordered an old gas works along the southern boundary.

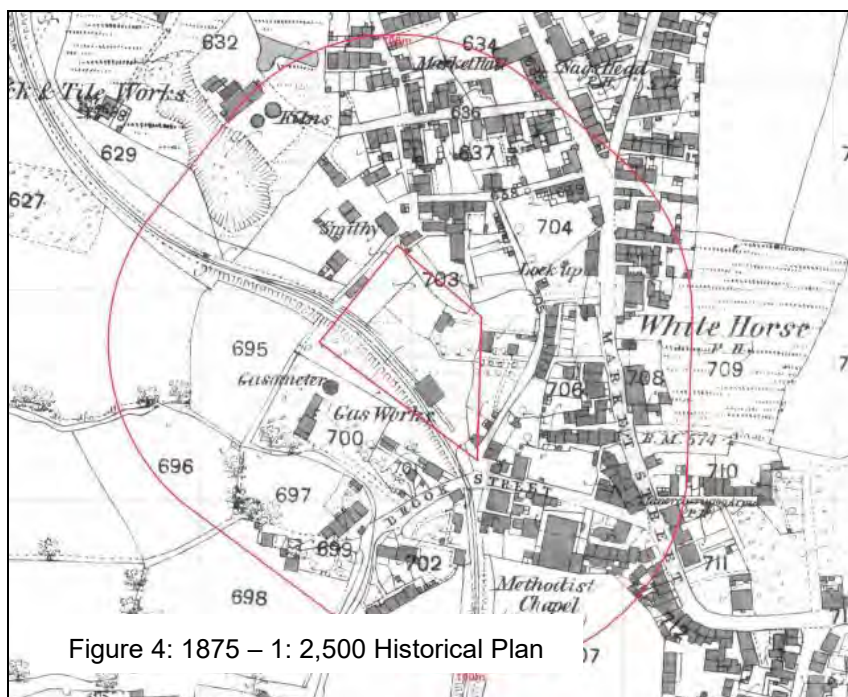


Figure 4: 1875 – 1:2,500 Historical Plan

7. FIELDWORK

The fieldwork was carried out during the period between 10th February and 3rd March 2015. The investigation comprised the following fieldwork scope:

- Four cable percussive boreholes using 150 mm diameter casing and tools;
- Three Rotary Cored boreholes using water flush
- Fifteen Continuous Dynamic Sounding boreholes (Super Heavy (BS1377 Part 9 Test 3.2)
- Nine trial pits using a JCB 3CX hydraulic excavator; 2 trial pits used for soakaway tests;
- Three Soakaway Tests
- California Bearing Ratio (CBR) tests at four locations using Clegg Impact Hammer
- sampling and testing of soils;
- description of the ground encountered in accordance with BS5930:1999+A2 (2010) "Code of Practice for Site Investigations;"

The position of the boreholes and trial pits are given on the exploratory hole Plan in Appendix 4.

A Site Location Plan is given in Appendix 5.

Cable Percussion

Four 150mm diameter cable percussive boreholes were carried out to depths varying from 10.1m (BH4) and 13.4m (BH2) below the existing ground surface level using shell, clay cutter and light cable percussion techniques. A CAT services screen was undertaken followed by a hand excavated services pit.

Undisturbed 100mm diameter samples were taken in the cohesive strata (OS-T/W-100mm with liner). Standard penetration tests were carried out, in accordance with BS EN ISO 22476-3:2005 (formerly BS 1377 Part 9:1990), in the granular strata. Selected disturbed samples and bulk samples were also taken and together with the samples from the standard penetration tests returned to our laboratory for inspection and testing as appropriate. Groundwater samples were obtained where ground conditions allowed.

Detailed results of the strata encountered, depths and levels of changes, thickness of strata, samples taken, groundwater observations and standard penetration test (SPT) are given on the borehole record sheets in Appendix 2.1. The detailed results of the Standard Penetration Test (SPT) are presented in the table in Appendix 2.2.

Rotary Coring

On completion of the cable percussive boreholes, three of the four boreholes (BH1, BH3 and BH4) were continued by Comacchio 305 rotary rig and were completed at 19.7m, 22.9 and 24.1m respectively. The boreholes were cored using 90mm diamond core and water/air flush. This work was carried out in accordance with The Coal Authority Permission to Enter or Disturb Coal Authority Mining Interests Permit Reference Number 10038 and the “Guidance on Managing the Risk of Hazardous Gases when Drilling or Piling Near Coal. Version 1 (March 2012).” Monitoring wells were installed on completion. Rock samples were logged in accordance with EN 14689-1:2003.

Gas and groundwater monitoring wells were installed on completion of all four boreholes. Five visits have been carried out to date to monitoring gas and groundwater and the results are shown in Appendix 2.6.

Continuous Dynamic Sounding

Fifteen Continuous Dynamic Sounding holes were carried out over the whole site varying in depth from 3.15m to 9.5m below existing ground level. The sounding was carried out using an AEC 150 self-propelled, tracked dynamic sounding and sampling machine, using the Dynamic Probe Super Heavy (DPSH) probe in accordance with BS EN ISO 22476-2:2005 (formerly BS 1377 Part 9:1990).

Trial Pits

Nine machine excavated trial pits were carried out ranging from 2.0m to 2.6m below existing ground level. Selected disturbed samples and bulk samples were taken and returned to our laboratory for testing as appropriate.

Three trial pits (TP1, TP2 and TP4) were used to carry out permeability tests in accordance with the BRE Digest 365:2005. Soakaway Test carried out in TP1 and TP2 both failed as the water level did not measurably drop over 3 hours.

In situ California Bearing Ratio (CBR) tests were carried out at five locations (TC01 to TC05). Tests were carried out at various depths within each hole and the results are given in Appendix 2.4. The test carried out at 0.1m in TC04 was abandoned due to the underlying material unsuitable for test. A test was carried out at 0.9m.

The soakaway Test carried out in TP4 was dry before test began. Some of the loose made ground above 1.00 metre depth fell into the pit during the 1st filling. This was cleared out before the 2nd filling. Three tests were carried out in TP4 and the results are given in Appendix 2.5.

8. 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:-

Table 1: Summary of Geotechnical Testing					
pH Value	7	Sulphate Content of Water	1	Soluble Sulphate Content of Soil	6
Chloride Content	6	Moisture Content	2	Liquid & Plastic Limit Tests	9
Undrained Triaxial Tests	5	Particle Size Distribution	14		

Derwentside Environmental Testing Services (DETS) carried out chemical contamination tests on 25No selected samples.

Table 2: Suites of Analysis for Soil and Water Samples		
Determinand	Soil Suite 1	Soil Suite 2
Number of Samples	15	10
Index Tests		
Asbestos Screen	✓	✓
pH	✓	✓
Metals		
As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn (all totals)	✓	✓
Boron (water soluble on soil samples)	✓	✓
Inorganics		
Cyanide - Total	✓	✓
Sulphate (Total)	✓	✓
Sulphide	✓	✓
Organics		
Phenols - Total (monohydric)	✓	✓
Organic Matter	-	✓
PAH (Speciated USEPA 16)	✓	✓
TPH (C ₈ to C ₃₆) Speciation	-	✓
Mineral Oil (C ₁₀ to C ₄₀)	-	✓
Benzene, Toluene, Ethyl Benzene, Xylenes (BTEX);	-	✓
Volatile Organic Compounds (VOCs) and Chlorinated Solvents	-	✓
Semi Volatile Organic Compounds (SVOCs)	-	✓

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

9. SUMMARY OF GROUND CONDITIONS

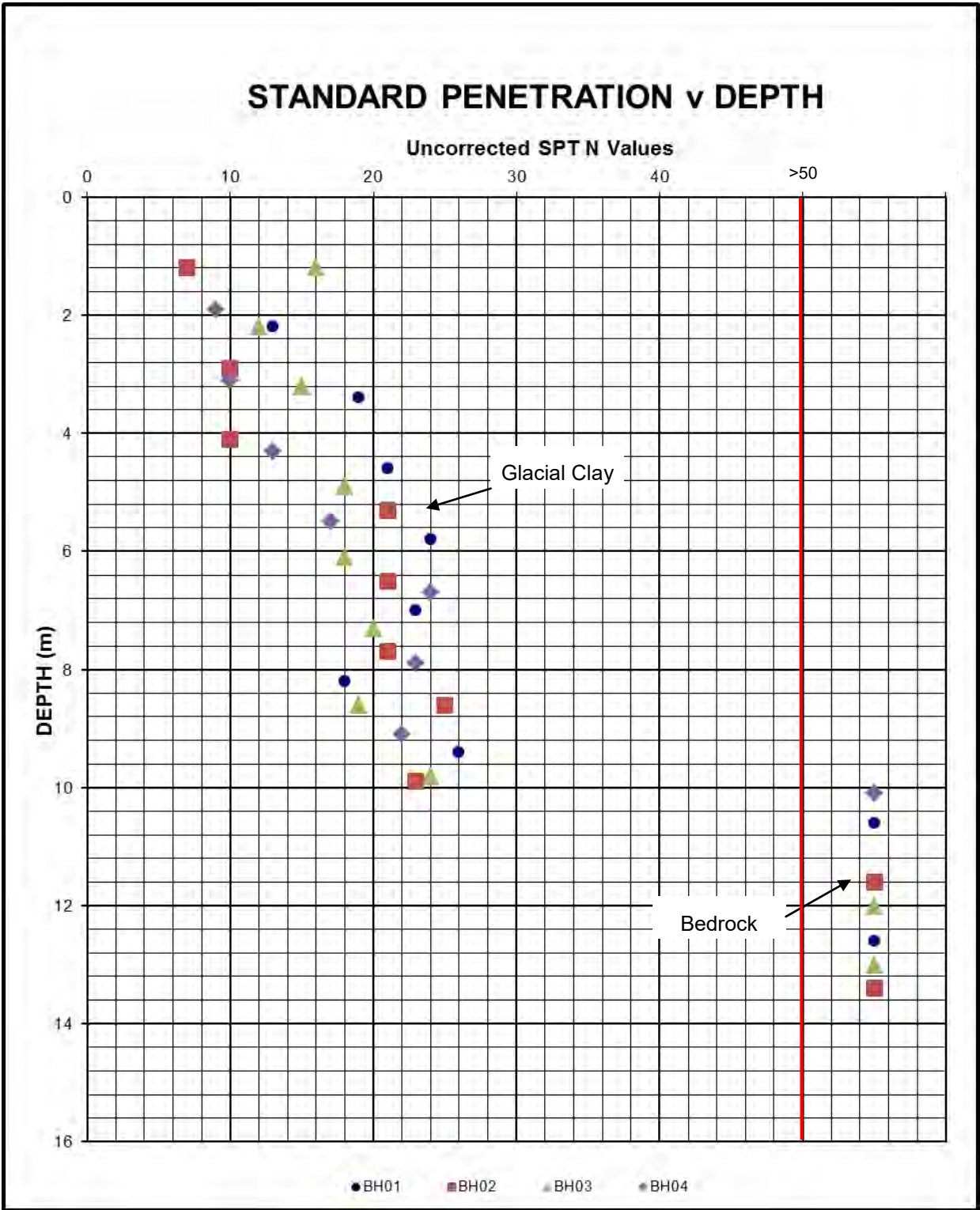
The fieldwork has shown the following sequence of strata.

Made Ground	The Made Ground ranges in thickness from 1.2m to 3.7m and generally consists of macadam /concrete and grey fine-coarse limestone gravel fill to 0.5m overlying black fine to coarse sand and fine to coarse gravel sized ash to 1.5m overlying black grey slightly sandy gravelly clay. SPT N values range from 7 to 16 generally increasing with depth.
Glacial Till	The stratum is generally stiff becoming very stiff brown grey mottled slightly sandy slightly gravelly clay, gravel is fine to coarse, sub-angular, tabular, sub-rounded, mudstone, sandstone and coal. Standard Penetration Test N values range from 10 to 26. Undrained Cohesion values from the triaxial tests range from 56kPa to 274kPa.
Carboniferous Coal Measures	Extremely weak to weak grey weathered thinly laminated mudstone with zones recovered as weathered clay and fracture zones. Bedding is 90degrees to core axis, clayey, smooth, planar. Jointing is sub-vertical, orange, clean, planar, smooth. Interbedded within the Mudstone there are weak to medium strong grey fine to medium grained sandstone and siltstone units generally less than 1m thick. Evidence of turbidite origin e.g. flute cast, cross bedding structures were noted within these deposits.
Coal	BH3 and BH4 encountered coal seams. See below for summary.

Table 2: Summary of Coal Seam Units

BH Number	Stratum Depth (mBGL)		Stratum Description
BH03	20.00	20.50	Black bright COAL - bedding 90degrees to core axis
	20.50	20.70	Soft grey CLAY - SEATEARTH
	20.70	21.03	Black bright COAL
	21.03	21.40	Soft becoming stiff grey CLAY - SEATEARTH
	21.40	21.80	Black bright COAL
BH04	16.60	17.00	Extremely weak black clayey carbonaceous MUDSTONE with COAL
	17.00	17.10	Soft brown CLAY - SEATEARTH
	17.10	17.30	Black bright COAL
	17.30	17.60	Soft brown CLAY - SEATEARTH
	17.60	17.90	Extremely weak grey MUDSTONE
	17.90	18.25	Black bright COAL
	18.25	20.20	Extremely weak grey highly weathered friable clayey MUDSTONE - SEATEARTH
	22.17	22.50	Black bright COAL
	22.50	22.60	Black carbonaceous clayey friable MUDSTONE
	22.60	24.10	No returns - Possible worked Coal Seam

Standard Penetration Tests (SPT) were carried out at regular intervals in all four boreholes within the drift deposits and to prove rockhead. A summary of the uncorrected SPT N values vs depth are summarised in the graph below.



The observation of groundwater conditions are given in the following tables.

No groundwater was encountered during the cable percussion or rotary boreholes.

Table 3 – Trial Pit Water Conditions

TP Number	Comments
TP1	Water ingress at 0.40m from under the slab of the former building, reduced to slow trickle after 15mins
TP2	Dry
TP3	Very slow water entries below the concrete-0.2m
TP4	Dry
TC1	Slow localised water entry at 1.30m
TC2	Slow to medium water entries at 2.20m
TC3	Dry
TC4	Dry
TC5	Dry

Table 4 –Water Conditions in Monitoring wells

Well Number	Date / Time	Water Depth (m)	Tip Depth (m)
BH1	03/02/2015 12:15	14.40	17.70
	16/03/2015 08:00	14.00	17.50
	22/03/2015 09:00	14.40	17.50
	28/03/2015 09:00	14.17	17.50
	11/04/2015 15:00	14.40	17.50
	23/04/2015 11:30	17.50 (wet)	17.50
BH2	03/03/2015 13:00	1.37	3.43
	22/03/2015 09:50	1.39	3.45
	28/03/2015 09:10	1.35	3.45
	11/04/2015 15:30	1.40	3.45
	16/03/2015 08:45	1.37	3.43
	23/04/2015 12:00	1.40	3.45
BH3	03/03/2015 13:45	20.80	21.20
	16/03/2015 09:30	20.79	21.00
	22/03/2015 10:40	20.80	21.05
	28/03/2015 09:20	20.82	21.00
	11/04/2015 14:00	20.80	21.00
	23/04/2015 12:30	20.82	21.00
BH4	09/03/2015 14:30	17.90	23.00
	16/03/2015 10:45	17.89	22.90
	22/03/2015 11:30	17.92	23.00
	28/03/2015 09:30	18.12	23.00
	11/04/2015 14:30	18.20	23.00
	23/04/2015 13:00	18.30	23.00

STANDARD REFERENCES

British Standards Institute (1999) BS 5930:1999, Code of practice for site investigations. Incorporating Amendment No. 2:2010 as partially replaced by:

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.

Department for Environment, Food and Rural Affairs and the Environment Agency : 2004: Contaminated Land Report 11 (CLR11): Model Procedures for the Management of Land Contamination. Sept 2004

Department for Environment, Food and Rural Affairs : 2012: Contaminated Land Statutory Guidance, April 2012

Statutory Instruments: 2012: Health and Safety. The Control of Asbestos Regulations 2012. No. 262 coming into force 6th April 2012



APPENDICIES



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	Consistency terms	Consistency description	Terms based on Measurement for fine soils	Undrained strength kPa
Very loose	0 to 4	Very soft	Finger easily pushed in up to 25mm, Exudes between fingers.	Extremely low	<10
Loose	4 to 10	Soft	Finger pushed in up to 10mm. Moulds by light finger pressure	Very low	10 – 20
Medium dense	10 to 30	Firm	Thumb makes impression easily. Cannot be moulded by fingers rolls in the hand to a 3mm thick thread without breaking or crumbling	Low	20 – 40
Dense	30 to 50	Stiff	Can be indented slightly by thumb. Crumbles in rolling a 3mm thick thread but can be remoulded into a lump	Medium	40 – 75
Very Dense	over 50	Very Stiff	Can be indented by thumb nail. Cannot be moulded but crumbles under pressure	High	75 – 150
		Hard	Can be scratched by thumbnail	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 Bedding.

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 to 600	Sheared:- breaks in blocks along polished discontinuities.	Thickly bedded	2000 to 600	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	
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	Otherwise thickness of and spacing between subordinate layers defined.
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	Flat / Tubular	rough	The surfaces of the particles may be described for example as etched, pitted, honeycombed or polished
Sub-angular	elongated	smooth	
Sub-rounded	cubic		
Rounded			
Well rounded			

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	Low boulder content
	5 to 20	Medium boulder content
	> 20	High boulder content
Cobbles	< 10	Low boulder content
	10 to 20	Medium boulder content
	> 20	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 BOULDERS COBBLES		BOULDER	With a little cobbles Or gravel or sand	<5
	200				With some sand	5-20
	63		COBBLES	With much boulders	20-50	
	Coarse 20	GRAVEL	Slightly clayey Or silty or sandy (Very gravelly*)	SAND GRAVEL		> 5 5 - 20 >20
Medium 6.3	* or describe as a fine soil depending on assessed engineering behavior		SAND and Gravel	and(sand*) or and (Gravel*)	about equal proportions	
Fine 2						
Coarse 0.63		SAND				
Medium 0.2						
Fine 0.063						
Coarse Soils (over about 65% Sand and Gravel)			Term Before	Principal Term	Term After	Approx. % Secondary Constituent
	Coarse 0.02	SILT	Slightly (sandy*) or gravelly	CLAY** Or SILT		<35
	Medium 0.0063		(Sandy*) or gravelly			35-65
	Fine 0.002		(Very Sandy*) or gravelly			>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	Terms	Decomposition	Remains	Squeeze	Term	Colour	Weight % of dry mass BS EN 14688-2
Firm	Fibres compressed	Fibrous	Not	Clearly recognizable	Only water no solids	Slightly organic	Grey	2 - 6
Spongy	Very compressed and open structure	pseudo-fibrous	Moderate	Recognizable	Turbid water < 50% solids	Organic	Dark grey	6 - 20
Plastic	Can be moulded in hand and smears along fingers	amorphous	Full	Not recognizable	Paste > 50% solids	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).

Engineering Classification of Rock Cores

Rocks are generally described in accordance with the principles of Section 8 of BS 5930 (1999), with the exception of the description of the weathered state, which adheres to the scheme first outlined in the Quarterly Journal of Engineering Geology (QJEG) (1972) as recommended by Norbury et al (1984). The classification is therefore based on the following:

1. Scale of Weathering of Rock Cores

Term	Description
Fresh	Parent rock showing no discoloration, loss of strength or an other weathering effect.
Slightly Weathered	Rock may be slightly discoloured, particularly adjacent to discontinuities, which may be open and will have slightly discoloured surfaces; the intact rock is not noticeably weaker than the fresh rock
Moderately Weathered	Rock is discoloured; discontinuities may be open and will have discoloured surfaces with alteration starting to penetrate inwards; intact rock is noticeably weaker, as determined in the field, than the fresh rock. (The ratio of original rock to weathered rock is estimated where possible)
Highly Weathered	Rock is discoloured; discontinuities may be open and will have discoloured surfaces and the original fabric of the rock may be altered. Alteration penetrates deeply inwards, but core-stones are still present. (The ratio of original rock to weathered rock is estimated where possible)
Completely Weathered	Rock is discoloured and changed to a soil but original fabric is mainly preserved There may be occasional small corestones. The property of the soil depends in part on the nature of the parent rock
Residual Soil	Rock is discoloured and completely changed to a soil in which the original rock fabric is completely destroyed

2. Scale of Strength

Term	Uniaxial Compressive Strength Range
(MN/m ²)	
Very Weak	< 1.25 -
Weak	1.25 - 5
Moderately Weak	5 - 12.5
Moderately Strong	12.5 - 50
Strong	50 - 100
Very Strong	100 - 200
Extremely Strong	> 200

3. Structure/Discontinuity Plane Spacing

Structure e.g. Bedding , Cleavage	Discontinuity E.g. Joint, Fissure	Spacing
Very thickly	Very Widely (jointed)	> 2m
Thickly (bedded)	Widely (jointed)	0.6 - 2m
Medium (bedded)	Medium (jointed)	0.2m - 0.6m
Thinly bedded	Closely (jointed)	60mm - 200mm
Very thinly (bedded)	Very closely (jointed)	20mm - 60mm
Laminated	Extremely	6mm - 20mm
Thinly Laminated		> 6mm

4. Description of Discontinuities

4.1 When describing discontinuities the type should be stated e.g. joint, fissure, fault, vein etc. and the spacing as detailed above should be recorded

4.2 The presence or absence of fill material should be recorded as follows:

Description	Definition
Clean	No fracture infill material
Stained	Colouration of rock only. No recognisable infill material
Filled or partially filled	Fracture filled with recognisable infill material (which should be described e.g. clay gypsum etc.)

4.3 The joint roughness should be described as follows:

Description	Definition
Smooth	Appears smooth and is essentially smooth to the touch May be slickensided
Slightly Rough	Asperities on the fracture surfaces are visible and may be distinctly felt.
Medium Rough	Asperities on the fracture surfaces are visible and fracture surface abrasive.
Rough	Large angular asperities can be seen. Some ridges and high side angle steps evident.
Very Rough	Near vertical steps can occur on the fracture surfaces.

5. Fracture State

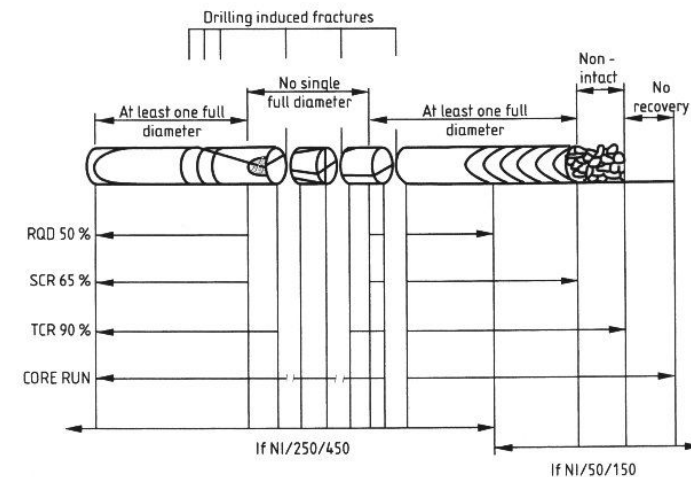
Fracture state is measured in accordance with the terms detailed in Fig. 29.2.3 B5930:1981 and is further clarified using the definition of solid core, detailed by Norbury et al (1984) as follows:

- Core Run - Length of discrete drill run over which core is recovered.
- Solid core - core with at least one full diameter (but not necessarily a full circumference) between two natural fractures. By this definition core that has a single set of inclined fractures would have a solid core recovery of 100%. Where there are two or more sets of non-parallel fractures, only sections of the core in which the fractures actually intersect are excluded from the solid core.

Based on these definitions the following terms are defined:-

Term	Abbreviation	Definition
Total Core Recovery	TCR (%)	The percentage of core recovered (both solid and non intact) to the total length of core run.
Solid Core Recovery	SCR (%)	The percentage ratio of the solid core recovered (having a full core diameter) to the total core run.
Rock Quality Designation	RQD %	The total length of solid core pieces greater than 100mm between natural fractures expressed as a percentage of total length of core.
Fracture Spacing	If (mm)	The average length of solid core pieces between natural fractures over core length of reasonably uniform characteristics, not core runs. The term Non Intact (NI) is used when the core is fragmented

The above terms may be related to the details contained in the following diagram for clarification.



NOTE All features shown are natural discontinuities unless stated otherwise.

6. Rock Classification Symbols

The symbols used on the borehole log and sections follow the recommendations of Tables 11 and 12 of B55930:1981.

7. Alternative Classifications.

Where a different approach to the rock classification than those detailed in B55930:1999, has been adopted for a particular rock type (e.g. Mercia Mudstone) a full description of the system used with reference sources is included in the text.

8. References

B55930:1999 'Code of Practice for Site Investigation'
QJEG:1972 'The Preparation of Maps and Plans in Terms of Engineering Geology' Vol. 5 No. 4. Norbury Dr. G.H. Child and T.W. Spink 'A critical review of Section 8, B55930:1981 Soil and Rock Description'. Proc. 20~ Regional Meeting of the Engineering Group of the Geological Society. "Site Investigation Practice: Assessing B55930" Univ. of Surrey, pp 353-369 (Original Proceeding).

Standard Penetration Tests

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:

Term	SPT N - values : blows/300mm Penetration
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.

Continuous Dynamic Sounding

Dynamic Probe Resistance Using a 90° Cone BS1377 Part 9 Test 3.2

Table 1, Page 22 gives details of the equipment used for the two test methods, i.e. DPH (dynamic probing heavy) and DPSH (dynamic probing super heavy). 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 90° 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 mm
Maximum Mass of Anvil and Guide Rod	30 kg	18 kg
90° 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





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.

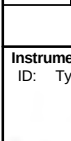
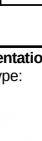
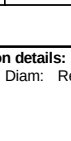
Strata descriptions are compiled by visual examination of samples obtained during boring, after BS EN 14689-1:2003 and BS EN ISO 14689-1:2003: Geotechnical investigation and testing. Identification and classification of rock. Identification and description. Laboratory test results where applicable.

TerraConsult		Borehole Log				Borehole no: BH01			
						Sheet 1 of 2			
Personnel: Drilled by: Logged by: Checked by:		Equipment & methods: Plant: Dando/Comacchio305 Method: Cable percussion/rotary Flush: Water		Hole diameter & casing depths: Dia (mm): to: Casing depth: 6.00 12.60		Coordinates & level: UK National Grid 328993.08mE 346403.17mN		Dates: Start: 23/02/2015 End: 03/03/2015 Backfilled: 03/03/2015	
Backfill/Well Inst.		Water-strikes	Legend	Level Depth (Thickness)	Stratum Description	Progress, Casing & Water Data Date Casing Time Water		Samples & In Situ Testing Depth Type & No. Results	
				(0.20) 0.20	MADE GROUND: Concrete				
				(0.25) 0.45	MADE GROUND: Medium to coarse limestone GRAVEL				
				(0.75) 1.20	MADE GROUND: Dark grey slightly fine sandy CLAY			0.50 ES1	
								1.00 ES2	
					Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, sub-angular, sub-rounded, sandstone, mudstone, coal	Dry 1.50 - 1.95		U1 55 blows	
				(2.60) 1.70		Dry 2.00 2.20 2.20 2.20		D1 ES3 S S1 N=13 (2,3/3,4,3,3)	
						Dry 2.70 - 3.15		U2 70 blows	
						Dry 3.30 3.40 - 3.85 3.40		D4 S S2 N=19 (3,3/4,5,5,5)	
				3.80	Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, sub-angular, sub-rounded, sandstone, mudstone, coal, gritstone, granite	Dry 3.90 - 4.35		U3 120 blows	
						Dry 4.50 4.60 - 5.05 4.60		D5 S S3 N=21 (3,4/4,5,6,6)	
						Dry 5.10 - 5.55		U4 110 blows	
						Dry 5.60 5.80 - 6.25 5.80		D6 S S4 N=24 (4,4/5,6,7,6)	
						Dry 6.30 - 6.75		U5 110 blows	
						Dry 6.80 7.00 - 7.45 7.00		D7 S S5 N=23 (4,5/6,5,6,6)	
						Dry 7.50 - 7.95		U6 110 blows	
				(8.70) 6.00		Dry 8.00 8.20 - 8.65 8.20		D8 S S6 N=18 (3,5/4,5,4,5)	
						Dry 8.70 - 9.15		U7 105 blows	
						Dry 9.30 9.40 - 9.85 9.40		D9 S S7 N=26 (4,4/5,6,9,6)	
						Dry 9.90 - 10.35		U8 115 blows	
				Continued next sheet		Casing Date	Water Time	Depth	Type & No. Results
Instrumentation details: ID: Type: Diam: Remarks: P101 - - P201 - -		General remarks: 18.20 to 19.70m Loss of flush at 18.2m - unable to case. BH Terminated		Groundwater entries: Struck: Rose to: Rate of (20 mins) inflow: Depth sealed: No Groundwater Encountered		Chiselling: From: to: Duration (min): Tool:			
AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk		Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering							

TerraConsult		Borehole Log				Borehole no: BH01		Sheet 2 of 2	
Personnel: Drilled by: Logged by: Checked by:		Equipment & methods: Plant: Dando/Comacchio305 Method: Cable percussion/rotary Flush: Water		Hole diameter & casing depths: Dia (mm): to: Casing depth: 6.00 12.60		Coordinates & level: UK National Grid 328993.08mE 346403.17mN		Dates: Start: 23/02/2015 End: 03/03/2015 Backfilled: 03/03/2015	
Backfill/ Well Inst.	Water- strikes	Legend	Level Depth (Thickness)	Stratum Description	Progress, Casing & Water Data		Samples & In Situ Testing		
					Date Casing	Time Water	Depth Core run	Type & No.	Results
			(0.10) 12.50 12.60 (1.30) 13.90 (0.50) 14.40 (0.40) 14.80 (1.64) 16.44 (0.89) 17.33 (2.37) 19.70	Very stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, sub-angular, sub-rounded, sandstone, mudstone, coal, gritstone, granite	6.00	Dry	10.40 10.60 - 11.05 10.60	D10 S S8	N=75 (6,9,16,23,27)
						11.10	D11		
					Dry	11.50 - 11.95	U9	140 blows	
						12.00	D12		
					Dry	12.60 - 12.76 12.60	S S9	100 (25/100)	
						12.90 - 14.40	89 0 0		
						14.40 - 15.60	87 30 0		
						15.60 - 17.10	102 24 24		
						17.10 - 18.30	90 34 0		
						18.30 - 19.70	103 0 0		
				Exploratory hole ends at 19.70 m					
				Casing Date	Water Time	Core run Depth	TCR SCR ROD	If	Results
Instrumentation details: ID: Type: Diam: Remarks: P101 - - P201 - -				General remarks: 18.20 to 19.70m Loss of flush at 18.2m - unable to case. BH Terminated		Groundwater entries: Struck: Rose to: Rate of Depth (20 mins) inflow: sealed: No Groundwater Encountered		Chiselling: From: to: Duration (min): Tool:	
 Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk				Project: Bonc Wen, Rhoslanerchrugog Project No: SRL-164 Client: Datrys Design Engineering					

TerraConsult		Borehole Log				Borehole no: BH02		Sheet 1 of 2		
Personnel: Drilled by: Logged by: Checked by:		Equipment & methods: Plant: Dando/Comacchio305 Method: Light cable percussion Flush: Water		Hole diameter & casing depths: Dia (mm): to: Casing depth: 6.20		Coordinates & level: UK National Grid 329009.01mE 346387.03mN		Dates: Start: 18/02/2015 End: 19/02/2015 Backfilled: 19/02/2015		
SPT Hammer details:										
Backfill/ Well Inst.	Water- strikes	Legend	Level Depth (Thickness)	Stratum Description	Progress, Casing & Water Data		Samples & In Situ Testing			
					Date Casing	Time Water	Depth	Type & No.	Results	
			(0.10) 0.10	MADE GROUND: Macadam						
			(0.40)	MADE GROUND: Graded Granular Fill - Limestone						
			0.50	MADE GROUND: Black fine-coarse sandy fine-coarse GRAVEL sized ash/cinder			0.50	ES1		
			(1.10)				1.00	ES2		
							1.20 - 1.65	S	N=7 (1,1/2,1,2,2)	
							1.20	S1		
			1.60	MADE GROUND: Black slightly sandy ashy CLAY. Gravel is fine-coarse ash occasional brick						
			(0.70)				2.00	ES3		
			2.30	Stiff orange brown grey mottled slightly sandy slightly gravelly CLAY with occasional sandstone cobble. Gravel is fine-coarse, sub-angular, sub-rounded sandstone, quartzite			2.20 - 2.65	U1	50 blows	
							2.70	D1		
			(1.70)				2.90 - 3.35	S	N=10 (2,2/2,1,3,4)	
							2.90	S2		
							3.00	ES4		
							3.40 - 3.85	U2	140 blows	
							3.90	D2		
			4.00	Stiff becoming very stiff brown grey fissured slightly sandy slightly gravelly CLAY with occasional sandstone cobble. Gravel is fine-coarse, sub-angular, sub-rounded sandstone, quartzite			4.10 - 4.55	S	N=10 (1,2/2,2,3,3)	
							4.10	S3		
							4.60 - 5.05	U3	100 blows	
							5.10	D3		
							5.20	Dry	5.30 - 5.75	S
						5.30	S4			
				5.80 - 6.25	U4	100 blows				
				6.20	Dry	6.40	D4			
						6.50 - 6.95	S	N=21 (3,3/4,5,6,6)		
						6.50	S5			
				7.00 - 7.45	U5	100 blows				
				7.50	D5					
				6.20	Dry	7.70 - 8.15	S	N=21 (2,4/5,4,5,7)		
						7.70	S6			
				8.20 - 8.65	U6	150 blows				
				6.20	Dry	8.60 - 9.05	S	N=25 (8,4/5,5,6,9)		
						8.60	S7			
				9.20 - 9.65	U7	100 blows				
				9.70	D6					
				6.20	Dry	9.90 - 10.35	S	N=23 (3,4/5,6,6,6)		
Continued next sheet				Casing Date	Water Time	Depth	Type & No.	Results		
Instrumentation details: ID: Type: Diam: Remarks:				General remarks:			Groundwater entries: Struck: Rose to: Rate of Depth (20 mins) inflow: sealed: No Groundwater Encountered		Chiselling: From: to: Duration (min): Tool:	
Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk				Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering						

Personnel:	Equipment & methods:	Hole diameter & casing depths:	Coordinates & level:	Dates:
Drilled by:	Plant: Dando/Comacchio305	Dia (mm): to: Casing depth: 6.20	UK National Grid	Start: 18/02/2015
Logged by:	Method: Light cable percussion		329009.01mE 346387.03mN	End: 19/02/2015
Checked by:	Fluid: Water SPT Hammer details:		-	Backfilled: 19/02/2015

Backfill/ Well Inst.	Water- strikes	Legend	Level	Depth (Thickness)	Stratum Description	Progress, Casing & Water Data		Samples & In Situ Testing											
						Date Casing	Time Water	Depth	Type & No.	Results									
				10.70	Stiff becoming very stiff brown grey fissured slightly sandy slightly gravelly CLAY with occasional sandstone cobble. Gravel is fine-coarse , sub-angular, sub-rounded sandstone, quartzite	Dry	9.90	S8	120 blows										
					Very stiff grey, black, brown slightly friable slightly sandy gravelly CLAY with occasional cobble. Gravel is fine-coarse, flat, sub-angular mudstone, coal														
			(2.30)																
			(0.57)	Extremely weak black slightly friable carbonaceous MUDSTONE	Dry	13.00 - 13.45	U9	100 blows											
			13.57	Exploratory hole ends at 13.57 m	Dry	13.40 - 13.57	D10 S S10	100 (25,- for 0mm/100,- for 0mm)											
					Casing Date	Water Time	Depth	Type & No.	Results										
Instrumentation details: ID: Type: Diam: Remarks:					General remarks:					Groundwater entries: Struck: Rose to: Rate of Depth (20 mins) inflow: sealed: No Groundwater Encountered					Chiselling: From: to: Duration (min): Tool:				

AGS Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue:
Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk

Project: **Bonc Wen, Rhosllanerchrugog**
Project No: **SRL-164**
Client: **Datrys Design Engineering**

TerraConsult		Borehole Log				Borehole no: BH03		Sheet 1 of 3																			
Personnel: Drilled by: Logged by: Checked by:		Equipment & methods: Plant: Dando/Comacchio305 Method: Light cable percussion Flush: Water		Hole diameter & casing depths: Dia (mm): to: Casing depth: 7.50 18.00		Coordinates & level: UK National Grid 328991.20mE 346353.54mN		Dates: Start: 10/02/2015 End: 27/02/2015 Backfilled: 27/02/2015																			
Backfill/ Well Inst.		Water- strikes		Legend		Level		Depth		Stratum Description		Progress, Casing & Water Data		Samples & In Situ Testing													
						(Thickness)						Date Casing		Time Water		Depth		Type & No.		Results							
						(0.50)		MADE GROUND: Fine to coarse GRAVEL sized concrete and brick with fine-coarse sand matrix and cinder fragments								0.20		ES1									
						0.50		MADE GROUND: Brown fine-coarse SAND and fine-medium GRAVEL sized brick, concrete, cinder with lime waste and clay pockets								0.40 0.50		D4 ES2									
						(1.00)										0.80 1.00		D5 ES3									
						1.50		MADE GROUND: Black and grey ashy slightly sandy CLAY and medium-coarse yellow sandstone GRAVEL		1.20		Dry		1.20 - 1.65 1.20		S S1		N=16 (2,4/5,4,3,4)									
						(0.90)												1.70		D6							
						2.40		MADE GROUND: Grey fine-coarse sandy fine-coarse angular mudstone GRAVEL		1.70		Dry		2.20 - 2.65 2.20		S S2		N=12 (3,3/2,3,4,3)									
						(1.30)												2.70		D7							
																		3.00		ES5							
																		3.20		Dry		3.20 - 3.65 3.20		S S3		N=15 (3,5/4,4,3,4)	
						3.70		Stiff becoming very stiff orange brown grey mottled slightly sandy slightly gravelly CLAY. Gravel is fine-coarse, sub-angular, sub-rounded, flat, sandstone, mudstone, coal										3.70		D8							
																		4.00		ES6							
																		Dry		4.20 - 4.65		U1		102 blows			
																		4.70		Dry		4.90 - 5.35 4.90		S S4		N=18 (2,3/5,4,5,4)	
																		5.20		D10							
																		Dry		5.40 - 5.85		U2		85 blows			
																		5.90		D11							
																		6.00		Dry		6.10 - 6.55 6.10		S S5		N=18 (6,3/4,4,5,5)	
						(5.50)										6.50		D12		85 blows							
												Dry		6.60 - 7.05		U3											
																7.10		D13		N=20 (3,3/4,5,6,5)							
												7.20		Dry		7.30 - 7.75 7.30		S S6									
																7.80		D14		82 blows							
												Dry		7.90 - 8.35		U4											
																8.50		D15		N=19 (2,4/4,4,5,6)							
												7.50		Dry		8.60 - 9.05 8.60		S S7									
																9.00		D16		100 blows							
												Dry		9.10 - 9.55		U5											
						9.20		Very stiff grey brown sandy slightly gravelly friable CLAY. Gravel is fine-coarse, sandstone, mudstone and coal								9.60		D17		N=24 (3,4/6,6,5,7)							
												7.50		Dry		9.80 - 10.25 9.80		S S8									
								Continued next sheet				Casing Date		Water Time		Depth		Type & No.		Results							
Instrumentation details: ID: Type: Diam: Remarks: P101 - - P201 - -								General remarks: 17.90 to 18.50m Loss of returns / flush - cased to 18m				Groundwater entries: Struck: Rose to: Rate of Depth (20 mins) inflow: sealed: No Groundwater Encountered				Chiselling: From: to: Duration (min): Tool:											
AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk								Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering																			

TerraConsult

Borehole Log

Borehole no:
BH03

Sheet 2 of 3

Personnel:
Drilled by:
Logged by:
Checked by:

Equipment & methods:
Plant: Dando/Comacchio305
Method: Light cable percussion
Flush: Water
SPT Hammer details:

Hole diameter & casing depths:
Dia (mm): to: Casing depth:
7.50
18.00

Coordinates & level:
UK National Grid
328991.20mE 346353.54mN
-

Dates:
Start: 10/02/2015
End: 27/02/2015
Backfilled: 27/02/2015

Backfill/ Well Inst.	Water- strikes	Legend	Level Depth (Thickness)	Stratum Description	Progress, Casing & Water Data		Samples & In Situ Testing			
					Date Casing	Time Water	Depth Core run	Type & No.	Results	
			(2.70)	Very stiff grey brown sandy slightly gravelly friable CLAY. Gravel is fine-coarse, sandstone, mudstone and coal			10.30 Dry10.50 - 10.95	D18 U6	110 blows	
					11.10		D19			
			11.90 (0.30)	Extremely weak completely weathered orange and white fine-medium grained SANDSTONE	7.50	Dry12.00 - 12.34 12.00	S S9	100 (12,11/21,42,37 for 40mm)		
			12.20	Extremely weak highly weathered grey MUDSTONE		12.50	D20			
			(1.00)							
					7.50	Dry13.00 - 13.10 13.00	S S10	100 (25 for 40mm/100 for 55mm)		
			13.20	Extremely weak grey weathered thinly laminated MUDSTONE. Bedding is clayey, deconstructed with brown pelite pebbles		13.20 - 14.20	100 11 0			
			13.85	Medium strong to strong light grey and grey thickly laminated fine-medium SANDSTONE with occasional fracture zones. Discontinuity sets - Bedding is 90degrees to core axis, clean, smooth, planar. Jointing is sub-vertical, orange, clean, planar, smooth		14.20 - 14.90	129 41 24			
			14.50	Medium strong dark grey silty thickly laminated MUDSTONE. Discontinuity sets - Bedding is 90degrees to core axis, clean, smooth, planar. Jointing is sub-vertical, orange, clean, planar, smooth						
			(1.20)							
			15.70	Medium strong light grey and dark grey SILTSTONE with slump structures. Discontinuity sets - Bedding is 85-90degrees to core axis, clean, smooth, planar. Jointing is sub-vertical to 20degrees, orange, clean, planar, smooth		14.90 - 16.40	92 25 7			
			(0.70)							
			16.40	Weak grey slightly weathered laminated MUDSTONE with zones recovered as clay and gravel. Discontinuity sets - Bedding is 90degrees to core axis, clean, smooth, planar. Jointing is sub-vertical, orange, clean, planar, smooth		16.40 - 17.90	100 23 8			
			(1.50)							
			17.90	No returns - Possible worked Coal Seam		17.90 - 18.50	0 0 0			
(0.60)										
18.50	Extremely weak grey weathered MUDSTONE with zones recovered as clay and clayey Gravel		18.50 - 19.50	100 0 0						
(1.50)			19.50 - 19.90	100 0 0						
Continued next sheet				Casing Date	Water Time	Core run Depth	TCR SCR ROD	If	Results	
Instrumentation details: ID: Type: Diam: Remarks: P101 - - P201 - -				General remarks: 17.90 to 18.50m Loss of returns / flush - cased to 18m			Groundwater entries: Struck: Rose to: Rate of Depth: sealed: (20 mins) inflow: No Groundwater Encountered		Chiselling: From: to: Duration (min): Tool:	
AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk				Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering						

Backfilled: 27/02/2015

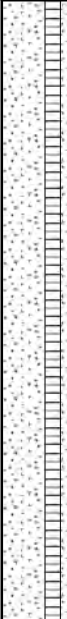
 Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk	Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering	
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TerraConsult		Borehole Log				Borehole no: BH04		Sheet 1 of 3											
Personnel: Drilled by: Logged by: Checked by:		Equipment & methods: Plant: Dando/Comacchio305 Method: Light cable percussion Flush: Water		Hole diameter & casing depths: Dia (mm): to: Casing depth: 9.20 17.50		Coordinates & level: UK National Grid 328961.56mE 346377.90mN		Dates: Start: 16/02/2015 End: 23/02/2015 Backfilled: 25/02/2015											
Backfill/ Well Inst.		Water- strikes		Legend		Level Depth (Thickness)		Stratum Description		Progress, Casing & Water Data		Samples & In Situ Testing							
										Date Casing		Time Water		Depth		Type & No.		Results	
						(0.40)		MADE GROUND: Brick and concrete demolition material						0.20		ES1			
						0.40		MADE GROUND: Brown fine-coarse GRAVEL of sandstone, coal, brick with sandy clay pockets						0.50		ES2			
						(0.30)		MADE GROUND: Grey/dark grey sandy slightly gravelly CLAY. Gravel is fine-coarse, sub-angular, brick, cinder, glass, sandstone						1.00		ES3			
						(1.30)				Dry		1.20 - 1.65		U1		28 blows			
												1.70		Dry		1.90 - 2.35		S	
						2.00		MADE GROUND: Grey and orange slightly clayey slightly sandy fine-coarse flat, sub-angular Mudstone GRAVEL				1.90		S1		N=9 (1,2/2,2,3,2)			
						(1.10)				Dry		2.40 - 2.85		U2		51 blows			
												2.90		D5					
						3.10		MADE GROUND: Firm orange brown slightly sandy slightly gravelly CLAY. Gravel is fine-medium sub-angular, cinder, coal, sandstone		Dry		3.10 - 3.55		S		N=10 (2,2/2,3,2,3)			
						(0.50)						3.10		S2					
						3.60		Stiff brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, sub-angular, sub-rounded, sandstone, occasional coal		Dry		3.60 - 4.05		U3		60 blows			
												4.00		ES6					
												4.10		D6					
										Dry		4.30 - 4.75		S		N=13 (2,3/3,4,3,3)			
												4.30		S3					
										Dry		4.80 - 5.25		U4		75 blows			
												5.30		D7					
										Dry		5.50 - 5.95		S		N=17 (3,3/4,5,4,4)			
												5.50		S4					
										Dry		6.00 - 6.45		U5		110 blows			
												6.50		D8					
						(6.20)				Dry		6.70 - 7.15		S		N=24 (2,5/5,5,7,7)			
												6.70		S5					
										Dry		7.20 - 7.65		U6		100 blows			
												7.80		D9					
										Dry		7.90 - 8.35		S		N=23 (2,4/5,6,6,6)			
												7.90		S6					
										Dry		8.40 - 8.85		U7		100 blows			
												8.90		D10					
										Dry		9.10 - 9.55		S		N=22 (2,3/5,5,6,6)			
												9.10		S7					
										Dry		9.60 - 10.05		U8		150 blows			
						9.80													
						(0.30)													
								Continued next sheet		Casing Date		Water Time		Depth		Type & No.		Results	
								General remarks: 15.00 to 15.30m Complete loss of flush - cased to 15.3m		Groundwater entries: Struck: Rose to: Rate of Depth (20 mins) inflow: sealed: No Groundwater Encountered		Chiselling: From: to: Duration (min): Tool:							
								Instrumentation details: ID: Type: Diam: Remarks: P101 - - P201 - -											
								Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering											
								Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk											

Personnel:	Equipment & methods:	Hole diameter & casing depths:	Coordinates & level:	Dates:
Drilled by:	Plant: Dando/Comacchio305	Dia (mm): to: Casing depth:	UK National Grid	Start: 16/02/2015
Logged by:	Method: Light cable percussion	9.20	328961.56mE 346377.90mN	End: 23/02/2015
Checked by:	Flush: Water SPT Hammer details:	17.50	-	Backfilled: 25/02/2015

Backfill/ Well Inst.	Water- strikes	Legend	Level/ Depth (Thickness)	Stratum Description	Progress, Casing & Water Data		Samples & In Situ Testing						
					Date Casing	Time Water	Depth Core run	Type & No.	Results				
			10.10	Extremely weak orange fine-medium grained SANDSTONE	9.20	Dry	10.00	D11	100 (21.5 for 15mm/46,54 for 50mm)				
			(0.43)	Weak weathered orange brown thinly laminated fine to medium SANDSTONE. Bedding is 70degrees, clayey, rough. Jointing is sub-vertical, clayey			10.10 - 10.32	S					
			10.53				10.10	100S8					
			(0.17)	Extremely weak slightly weathered brown clayey MUDSTONE			10.10 - 10.70	0					
			10.70					0					
			(0.90)	Extremely weak grey slightly weathered thinly laminated MUDSTONE. Discontinuity sets - bedding is 85-90degrees to core axis, clean, smooth, planar. Jointing is sub-vertical, clean, smooth, planar									
			11.60				10.70 - 12.20	99 0 0					
			(1.33)	12.20m - 12.70m: ..highly fractured Mudstone									
			12.93				12.20 - 12.70	100 0 0					
				Extremely weak grey slightly weathered thinly laminated MUDSTONE with clayey fracture zones. Discontinuity sets - bedding is 85-90degrees to core axis, clean, smooth, planar. Jointing is sub-vertical, clean, smooth, planar									
							12.70 - 14.00	92 6 0					
							14.00 - 14.50	116 24 24					
			(3.67)	14.50m: with occasional brown strong Siltstone pebbles									
							14.50 - 15.50	95 22 0					
							15.50 - 17.00	93 0 0					
			16.60	Extremely weak black clayey carbonaceous MUDSTONE with COAL									
			(0.10)	Soft brown CLAY - SEATEARTH									
			(0.20)	Black bright COAL			17.00 - 17.50	60 0 0					
			17.30	Soft brown CLAY - SEATEARTH									
			(0.30)	Extremely weak grey MUDSTONE			17.50 - 17.90	75 0 0					
17.60													
(0.35)	Black bright COAL												
17.90													
18.25	Extremely weak grey highly weathered friable clayey MUDSTONE - SEATEARTH	17.90 - 19.40	100 0 0										
(1.95)		19.40 - 20.20	125 0 0										
Continued next sheet					Casing Date	Water Time	Core run Depth	TCR SCR ROD	If	Results			
Instrumentation details: ID: Type: Diam: Remarks:					General remarks: 15.00 to 15.30m Complete loss of flush - cased to 15.3m					Groundwater entries: Struck: Rose to: Rate of Depth (20 mins) inflow: sealed: No Groundwater Encountered		Chiselling: From: to: Duration (min): Tool:	
P101 - - P201 - -													

Personnel:	Equipment & methods:	Hole diameter & casing depths:	Coordinates & level:	Dates:
Drilled by:	Plant: Dando/Comacchio305	Dia (mm): to: Casing depth:	UK National Grid	Start: 16/02/2015
Logged by:	Method: Light cable percussion	9.20	328961.56mE 346377.90mN	End: 23/02/2015
Checked by:	Flush: Water SPT Hammer details:	17.50	-	Backfilled: 25/02/2015

Backfill/ Well Inst.	Water- strikes	Legend	Level	Depth	Stratum Description	Progress, Casing & Water Data		Rotary Coring									
						Date Casing	Time Water	Depth Core run	TCR SCR ROD	If	Results						
				20.20	Extremely weak grey highly weathered friable clayey MUDSTONE - SEATEARTH			20.20 - 21.70	98 14 0								
				(0.70)	Weak grey slightly weathered laminated MUDSTONE with zones recovered as clay. Discontinuity sets - Bedding is 90degrees to core axis, clean, smooth, planar.												
				20.90	Extremely weak grey weathered friable clayey MUDSTONE												
				(1.27)													
				22.17	Black bright COAL												
				(0.33)													
				(0.10)22.50	Black carbonaceous clayey friable MUDSTONE			21.70 - 22.60	100 0 0								
				22.60	No returns - Possible worked Coal Seam												
				(1.50)													
				24.10	Exploratory hole ends at 24.10 m			22.60 - 24.10	0 0 0								
						Casing Date	Water Time	Core run Depth	TCR SCR ROD	If	Results						
Instrumentation details: ID: Type: Diam: Remarks:						General remarks: 15.00 to 15.30m Complete loss of flush - cased to 15.3m											
P101 - - P201 - -						Groundwater entries: Struck: Rose to: Rate of Depth (20 mins) inflow: sealed: No Groundwater Encountered						Chiselling: From: to: Duration (min): Tool:					

AGS Notes: For explanation of symbols and abbreviations see key sheet.
All depths are reduced levels in metres.

Log issue:
Scale: 1:50 (c) TerraConsult. www.terraconsult.co.uk

Project: **Bonc Wen, Rhosllanerchrugog**
Project No: **SRL-164**
Client: **Datrys Design Engineering**

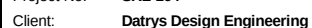
Backfilled: 18/02/2015

Client: **Datrys Design Engineering**

Start:	18/02/2015
End:	18/02/2015
Backfilled:	18/02/2015

[illegible]

Notes:



TerraConsult		Dynamic Probe Log			Probe no: C			
Personnel: Operator:		Equipment & methods: Method: Continuous dynamic sounding			Coordinates & level: UK National Grid 329013.69mE 346392.34mN			
Checked by:		Plant: AC150			SPT Hammer details:			
					Dates: Start: 17/02/2015 End: 17/02/2015 Backfilled: 17/02/2015			
Backfill/ Inst.	Water- strikes	Depth (m)	Blows per 100mm	Torque (Nm)	Level (m)	Blow Count	Depth Related Remarks	
						10 20 30 40 50		
		0	0 3 2 1					
		1	1 0 0 0					
		1.00	1 0 1 2					
		2	2 1 2 2					
		2.00	3 6 7 2					
		3	4 5 5 5					
		3.00	7 6 8 8					
		4	13 8 6 9					
		4.00	9 6 8 10					
		5	7 6 8 11					
		5.00	8 5 6 7					
		6	8 7 7 8					
		6.00	7 6 12 9					
		7	16 10 8 11					
		7.00	10 8 10 12					
		8	10 10 11 12					
		8.00	11 7 12 13					
		9	18 16 17 19					
		10	20					
Groundwater entries: Struck: Rose to: Rate of inflow: No Groundwater Encountered		Notes: Test type: DP Rod diameter (mm): 50 Rod mass (kg/m): 8.00 Cone diameter (mm): - Cone angle (deg): - Fall height (mm): 750 Hammer mass (kg): 63.50 Cone tip abandoned at (mBGL): - Test carried out in accordance with: Dynamic Probe Super heavy (DPSH) Notes:						
Instrumentation details: ID: Type: Diam: Remarks:		Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering						
AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50		(c) TerraConsult www.terraconsult.co.uk						

Backfilled: 18/02/2015

Client: **Datrys Design Engineering**

Backfilled: 17/02/2015

Client: **Datrys Design Engineering**

TerraConsult		Dynamic Probe Log			Probe no: F		
					Sheet 1 of 1		
Personnel: Operator:		Equipment & methods: Method: Continuous dynamic sounding			Coordinates & level: UK National Grid 329005.21mE 346385.97mN		
Checked by:		Plant: AC150			SPT Hammer details:		
					Dates: Start: 17/02/2015 End: 17/02/2015 Backfilled: 17/02/2015		
Backfill/ Inst.	Water- strikes	Depth (m)	Blows per 100mm	Torque (Nm)	Level (m)	Blow Count	Depth Related Remarks
						10 20 30 40 50	
		0	0				
			3				
			2				
			1				
		1.00	1				
			3				
			3				
			5				
			1				
			3				
		2.00	0				
			1				
			0				
			1				
			0				
			1				
		3.00	2				
			2				
			2				
			4				
			4				
			4				
			5				
		4.00	7				
			7				
			5				
			8				
			6				
			7				
			7				
		5.00	12				
			11				
			13				
			12				
			12				
			14				
			14				
			15				
			14				
		6.00	21				
			16				
			12				
			12				
			9				
			12				
			11				
		7.00	12				
			8				
			13				
			12				
			12				
			14				
			10				
			11				
			11				
			9				
		8.00	11				
			10				
			13				
			14				
			15				
			16				
			17				
			16				
			13				
			19				
			15				
			20				
			20				
Groundwater entries: Struck: Rose to: Rate of inflow: No Groundwater Encountered		Notes: Test type: DP Fall height (mm): 750 Rod diameter (mm): 50 Hammer mass (kg): 63.50 Rod mass (kg/m): 8.00 Cone tip abandoned at (mBGL): - Cone diameter (mm): - Test carried out in accordance with: Dynamic Probe Super heavy (DPSH) Cone angle (deg): - Notes:					
Instrumentation details: ID: Type: Diam: Remarks:		Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering					
AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50		(c) TerraConsult www.terraconsult.co.uk					

TerraConsult		Dynamic Probe Log			Probe no: G			
					Sheet 1 of 2			
Personnel:		Equipment & methods:			Coordinates & level:			
Operator:		Method: Continuous dynamic sounding			UK National Grid			
Checked by:		Plant: AC150			328979.78mE 346397.12mN			
		SPT Hammer details:			-			
Dates:								
Start: 17/02/2015								
End: 17/02/2015								
Backfilled: 17/02/2015								
Backfill/Inst.	Water-strikes	Depth (m)	Blows per 100mm	Torque (Nm)	Level (m)	Blow Count	Depth Related Remarks	
						10 20 30 40 50		
		0	0					
		1	0					
		2	0					
		3	0					
		4	0					
		5	0					
		6	0					
		7	0					
		8	0					
		9	0					
		10	0					
		11	0					
		12	0					
		13	0					
		14	0					
		15	0					
		16	0					
		17	0					
		18	0					
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		20	0					
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		44	0					
		45	0					
		46	0					
		47	0					
		48	0					
		49	0					
		50	0					
Groundwater entries:		Notes:						
Struck: Rose to: Rate of inflow:		Test type: DP						
No Groundwater Encountered		Fall height (mm): 750						
		Rod diameter (mm): 50						
		Hammer mass (kg): 63.50						
		Rod mass (kg/m): 8.00						
		Cone tip abandoned at (mBGL): -						
Instrumentation details:		Cone diameter (mm): -						
ID: Type: Diam: Remarks:		Test carried out in accordance with: Dynamic Probe Super heavy (DPSH)						
		Cone angle (deg): -						
		Notes:						
AGS Notes: For explanation of symbols and abbreviations see key sheet.		Project: Bonc Wen, Rhosllanerchrugog						
All depths are reduced levels in metres.		Project No: SRL-164						
Log issue:		Client: Datrys Design Engineering						
Scale: 1:50								

Backfilled: 17/02/2015



TerraConsult		Dynamic Probe Log			Probe no: H			
					Sheet 1 of 1			
Personnel: Operator:		Equipment & methods: Method: Continuous dynamic sounding			Coordinates & level: UK National Grid 328994.57mE 346377.30mN			
Checked by:		Plant: AC150			SPT Hammer details:			
					Dates: Start: 17/02/2015 End: 17/02/2015 Backfilled: 17/02/2015			
Backfill/ Inst.	Water- strikes	Depth (m)	Blows per 100mm	Torque (Nm)	Level (m)	Blow Count	Depth Related Remarks	
						10 20 30 40 50		
		0	0 4 3 2					
		1	3 3 2 3					
		1.00	2 2 3 2 3					
		2	2 3 5 1 0					
		2.00	0 0 1 7 3					
		3	2 2 2 3 1					
		3.00	2 2 3 4 4					
		4	8 10 5 4 6					
		4.00	4 5 7 7 8					
		5	10 8 9 6 10					
		5.00	5 12 10 8 9					
		6	9 9 10 9 10					
		6.00	8 13 13 13 16					
		7	15 14 14 11 11					
		7.00	12 16 16 11 12					
		8	12 12 13 10 10					
		8.00	10 13 11 13 13					
			22					
Groundwater entries: Struck: Rose to: Rate of inflow: No Groundwater Encountered		Notes: Test type: DP Fall height (mm): 750 Rod diameter (mm): 50 Hammer mass (kg): 63.50 Rod mass (kg/m): 8.00 Cone tip abandoned at (mBGL): - Cone diameter (mm): - Test carried out in accordance with: Dynamic Probe Super heavy (DPSH) Cone angle (deg): - Notes:						
Instrumentation details: ID: Type: Diam: Remarks:		Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering						
AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50		(c) TerraConsult www.terraconsult.co.uk						

TerraConsult		Dynamic Probe Log			Probe no: I			
Personnel: Operator:		Equipment & methods: Method: Continuous dynamic sounding			Coordinates & level: UK National Grid 328967.10mE 346389.43mN			
Checked by:		Plant: AC150			SPT Hammer details:			
					Dates: Start: 18/02/2015 End: 18/02/2015 Backfilled: 18/02/2015			
Backfill/ Inst.	Water- strikes	Depth (m)	Blows per 100mm	Torque (Nm)	Level (m)	Blow Count	Depth Related Remarks	
						10 20 30 40 50		
		0	3 7 6 5					
		0.5	3 4 2 2					
		1.0	1 1 1 1					
		1.5	3 6 6 5					
		2.0	1 1 0 1					
		2.5	1 2 1 2					
		3.0	3 3 3 5					
		3.5	4 8 5 5					
		4.0	6 9 11 12					
		4.5	11 13 13 12					
		5.0	10 12 15 18					
		5.5	12 13 15 12					
		6.0	7 10 11 12					
		6.5	12 12 14 12					
		7.0	10 10 12 12					
		7.5	14 14 13 10					
		8.0	11 12 14 15					
		8.5	13 15 15 18					
		9.0						
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Backfilled: 18/02/2015

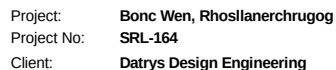
TerraConsult		Dynamic Probe Log			Probe no: K			
Personnel:		Equipment & methods:			Coordinates & level:			
Operator:		Method: Continuous dynamic sounding			UK National Grid			
Checked by:		Plant: AC150			328957.78mE 346373.93mN			
		SPT Hammer details:			Dates:			
					Start: 18/02/2015			
					End: 18/02/2015			
					Backfilled: 18/02/2015			
Backfill/Inst.	Water-strikes	Depth (m)	Blows per 100mm	Torque (Nm)	Level (m)	Blow Count	Depth Related Remarks	
						10 20 30 40 50		
		2	2					
			2					
			3					
			2					
			3					
			2					
			3					
			4					
			3					
			4					
			6					
			4					
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			11					
			13					
			16					
			14					
			17					
			20					
			20					
Groundwater entries:			Notes:					
Struck: Rose to: Rate of inflow:			Test type: DP					
No Groundwater Encountered			Fall height (mm): 750					
			Rod diameter (mm): 50					
			Hammer mass (kg): 63.50					
			Rod mass (kg/m): 8.00					
			Cone tip abandoned at (mBGL): -					
Instrumentation details:			Cone diameter (mm): -					
ID: Type: Diam: Remarks:			Test carried out in accordance with: Dynamic Probe Super heavy (DPSH)					
			Cone angle (deg): -					
			Notes:					
AGS Notes: For explanation of symbols and abbreviations see key sheet.			Project: Bonc Wen, Rhosllanerchrugog					
All depths are reduced levels in metres.			Project No: SRL-164					
Log issue:			Client: Datrys Design Engineering					
Scale: 1:50								

TerraConsult		Dynamic Probe Log				Probe no: L	
Personnel: Operator:		Equipment & methods: Method: Continuous dynamic sounding			Coordinates & level: UK National Grid		Dates: Start: - End: - Backfilled: -
Checked by:		Plant: AC150			SPT Hammer details:		
Backfill/ Inst.	Water- strikes	Depth (m)	Blows per 100mm	Torque (Nm)	Level (m)	Blow Count	Depth Related Remarks
						10 20 30 40 50	
		1	1				
		0	8				
		1.00	5				
			3				
		2.00	3				
			5				
		3.00	8				
			20				
		4.00					
		5.00					
		6.00					
		7.00					
		8.00					
Groundwater entries: Struck: Rose to: Rate of inflow: No Groundwater Encountered		Notes: Test type: DP Fall height (mm): 750 Rod diameter (mm): 50 Hammer mass (kg): 63.50 Rod mass (kg/m): 8.00 Cone tip abandoned at (mBGL): - Cone diameter (mm): - Test carried out in accordance with: Dynamic Probe Super heavy (DPSH) Cone angle (deg): - Notes:					
Instrumentation details: ID: Type: Diam: Remarks:							
AGS Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50		Project: Bonc Wen, Rhosllanerchrugog Project No: SRL-164 Client: Datrys Design Engineering					

Start:	10/02/2015
End:	10/02/2015
Backfilled:	10/02/2015

[illegible]

Notes:



Personnel:	Equipment & methods:		Coordinates & level:	Dates:
Operator:	Method: Continuous dynamic sounding		UK National Grid	Start: 10/02/2015
Checked by:	Plant: AC150	SPT Hammer details:	328991.20mE 346353.54mN	End: 10/02/2015
			-	Backfilled: 10/02/2015

[illegible]

Groundwater entries: Struck: Rose to: Rate of inflow: No Groundwater Encountered	Notes: Test type: DP Fall height (mm): 750 Rod diameter (mm): 50 Hammer mass (kg): 63.50 Rod mass (kg/m): 8.00 Cone tip abandoned at (mBGL): -		
Instrumentation details: ID: Type: Diam: Remarks:	Cone diameter (mm): - Test carried out in accordance with: Dynamic Probe Super heavy (DPSH) Cone angle (deg): - Notes:		
 Notes: For explanation of symbols and abbreviations see key sheet. All depths are reduced levels in metres. Log issue: Scale: 1:50	Project: Bonc Wen, Rhoslanerchrugog Project No: SRL-164 Client: Datrys Design Engineering		

Backfilled: 17/02/2015

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APPENDIX 2.2 Detailed Results of Standard Penetration Tests



Client: Datrys

Job No.: 158

Site Name: Bonc Wen, Rhosllanechrugog, Wrexham



Detailed SPT Summary

Borehole Number	Depth m	Test Type	SPT N Value	Depth to water	Depth of casing	Increment 1		Increment 2		Increment 3		Increment 4		Increment 5		Increment 6		Extrapolated SPT N Value
						Blows (mm)		Blows (mm)		Blows (mm)		Blows (mm)		Blows (mm)		Blows (mm)		
BH01	2.20	S	13	Dry	1.70	2		3		3		4		3		3		
BH01	3.40	S	19	Dry	3.40	3		3		4		5		5		5		
BH01	4.60	S	21	Dry	3.80	3		4		4		5		6		6		
BH01	5.80	S	24	Dry	4.70	4		4		5		6		7		6		
BH01	7.00	S	23	Dry	5.60	4		5		6		5		6		6		
BH01	8.20	S	18	Dry	6.00	3		5		4		5		4		5		
BH01	9.40	S	26	Dry	6.00	4		4		5		6		9		6		
BH01	10.60	S	75	Dry	6.00	6		9		9		16		23		27		
BH01	12.60	S	185	Dry	6.00	25				100	85							353
BH02	1.20	S	7	Dry	1.20	1		1		2		1		2		2		
BH02	2.90	S	10	Dry	1.70	2		2		2		1		3		4		
BH02	4.10	S	10	Dry	3.20	1		2		2		2		3		3		
BH02	5.30	S	21	Dry	5.20	2		3		4		5		6		6		
BH02	6.50	S	21	Dry	6.20	3		3		4		5		6		6		
BH02	7.70	S	21	Dry	6.20	2		4		5		4		5		7		
BH02	8.60	S	25	Dry	6.20	8		4		5		5		6		9		
BH02	9.90	S	23	Dry	6.20	3		4		5		6		6		6		
BH02	11.60	S	55	Dry	6.20	7		7		14		14		15		12		
BH02	13.40	S	185	Dry	6.20	25	80			100	85							353
BH03	1.20	S	16	Dry	1.20	2		4		5		4		3		4		
BH03	2.20	S	12	Dry	1.70	3		3		2		3		4		3		
BH03	3.20	S	15	Dry	3.20	3		5		4		4		3		4		
BH03	4.90	S	18	Dry	4.70	2		3		5		4		5		4		
BH03	6.10	S	18	Dry	6.00	6		3		4		4		5		5		
BH03	7.30	S	20	Dry	7.20	3		3		4		5		6		5		
BH03	8.60	S	19	Dry	7.50	2		4		4		4		5		6		
BH03	9.80	S	24	Dry	7.50	3		4		6		6		5		7		
BH03	12.00	S	100	Dry	7.50	12		11		21		42		37				
BH03	13.00	S	155	Dry	7.50	25	40			100	55							545
BH04	1.90	S	9	Dry	1.70	1		2		2		2		3		2		
BH04	3.10	S	10	Dry	3.00	2		2		2		3		2		3		
BH04	4.30	S	13	Dry	4.20	2		3		3		4		3		3		
BH04	5.50	S	17	Dry	5.20	3		3		4		5		4		4		
BH04	6.70	S	24	Dry	5.60	2		5		5		5		7		7		
BH04	7.90	S	23	Dry	7.50	2		4		5		6		6		6		
BH04	9.10	S	22	Dry	7.70	2		3		5		5		6		6		
BH04	10.10	S	150	Dry	9.20	21		5	15	46		54	50					240

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

APPENDIX 2.3 Machine Excavated Trial Pits



Trial Pit Log

TerraConsult

Personnel: Logged by: Date logged: Checked by:		Equipment & methods: Method: Mechanically excavated Plant: JCB Shoring:		Dimensions: Width: Length: Orientation: Bearing =	Coordinates & level: Grid: Easting: 328973.57m Northing: 346388.16m Level:	Dates: Start: End:
--	--	---	--	---	---	---------------------------------

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.30)	MADE GROUND: Macadam-0.07m over light brown, pink, grey fine GRAVEL with clay and sand			
			0.30 (0.40)	MADE GROUND: Black, pink fine-coarse gravel sized ASH, with gravel, clay and bricks			
			0.70 (0.30)	MADE GROUND: Stiff grey, light grey slightly sandy slightly gravelly CLAY. Gravel is fine-coarse, subangular, mudstone, occasional coal	0.60	ES1	
			1.00 (0.50)	MADE GROUND: Very soft black, grey silty CLAY with shell fragments and inter mixed black silt and ash, slight foetid odour	0.90	D1	
			1.50 (0.30)	Soft light brown, cream, silty gravelly CLAY. Gravel is fine-coarse, subangular	1.30 1.30	W1 ES2	
			1.80 (0.20)	Soft to firm light brown grey slightly gravelly CLAY with occasional cobbles. Gravel is fine-coarse, subangular, subrounded	1.80		43
			2.00 (0.20)	Firm light brown grey slightly gravelly CLAY with occasional cobbles. Gravel is fine-coarse, subangular, subrounded			
			2.20 (0.40)	Firm to stiff light brown grey slightly gravelly CLAY with occasional silty sand pockets. Gravel is fine-coarse, subangular, subrounded	2.20		58
			2.60	----- Trial pit terminated at 2.60m			
					Depth	Type & No	Results
Groundwater entries: Struck: Rose to: Inflow rate:				Depth related remarks: From - to: Remarks:		General remarks: Weather: Stability: Remarks: Termination:	
 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: Scale: 1:25				Project: Project No: SRL-164 Client:		Exploratory position reference: TC01 Sheet 1 of 1	

TerraConsult

Personnel:	Equipment & methods:	Dimensions:	Coordinates & level:	Dates:
Logged by:	Method: Mechanically excavated	Width:	Grid:	Start:
Date logged:		Length:	Easting: 328986.79m	End:
Checked by:	Plant: JCB	Orientation:	Northing: 346376.07m	
	Shoring:	Bearing =	Level:	

TerraConsult

RECORD PHOTOGRAPHS



Trial Pit Log

TerraConsult

Personnel: Logged by: Date logged: Checked by:		Equipment & methods: Method: Mechanically excavated Plant: JCB Shoring:		Dimensions: Width: Length: Orientation: Bearing =	Coordinates & level: Grid: Easting: 328997.01m Northing: 346364.70m Level:	Dates: Start: End:
--	--	---	--	---	---	---------------------------------

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.40)	MADE GROUND: Macadam-0.08m over light brown fine-coarse subangular GRAVEL	0.50	ES1	
			0.40 (0.20)	MADE GROUND: Black, purple, orange brown fine-coarse gravel sized ASH with some broken bricks, whole bricks and gravel			
			0.60 (0.70)	MADE GROUND: Brown, purple, red, black fine-coarse gravel sized ASH with a small amount of broken bricks and mudstone gravel			
			1.30 (0.50)	MADE GROUND: Light grey clayey mudstone subangular to angular flat fine-coarse GRAVEL			
			1.80 (0.40)	MADE GROUND: Dark grey light grey orange brown stained fine-coarse flat, subangular, angular Mudstone GRAVEL with occasional cobbles, fine to medium coal and carbonaceous material			
			2.20	----- Trial pit terminated at 2.20m -----			
					Depth	Type & No	Results
Groundwater entries: Struck: Rose to: Inflow rate:				Depth related remarks: From - to: Remarks:		General remarks: Weather: Stability: Remarks: Termination:	
 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: Scale: 1:25				Project: Project No: SRL-164 Client:		Exploratory position reference: TC03 Sheet 1 of 1	

RECORD PHOTOGRAPHS



Trial Pit Log

TerraConsult

Personnel: Logged by: Date logged: Checked by:		Equipment & methods: Method: Mechanically excavated Plant: JCB Shoring:		Dimensions: Width: Length: Orientation: Bearing =		Coordinates & level: Grid: Easting: 329010.24m Northing: 346347.11m Level:		Dates: Start: End:	
--	--	---	--	---	--	---	--	---------------------------------	--

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.40)	MADE GROUND: Macadam-0.08m over light brown fine-coarse subangular GRAVEL	0.50	ES1	
			0.40 (0.40)	MADE GROUND: Black, orangey brown, purple fine-coarse gravel sized ASH with a large amount of broken and whole bricks, some broken slate and gravel			
			0.80 (0.50)	MADE GROUND: Black, brown, purple fine-coarse gravel sized ASH with occasional broken and whole bricks, fine to medium coal and carbonaceous material			
			1.30 (0.70)	MADE GROUND: Light grey clayey mudstone subangular to angular, flat fine-coarse Gravel			
			2.00	Trial pit terminated at 2.00m			
					Depth	Type & No	Results
Groundwater entries: Struck: Rose to: Inflow rate:				Depth related remarks: From - to: Remarks:		General remarks: Weather: Stability: Remarks: Termination:	

RECORD PHOTOGRAPHS



Trial Pit Log

TerraConsult

Personnel: Logged by: Date logged: Checked by:		Equipment & methods: Method: Mechanically excavated Plant: JCB Shoring:		Dimensions: Width: Length: Orientation: Bearing =	Coordinates & level: Grid: Easting: 329021.48m Northing: 346332.62m Level:	Dates: Start: End:
--	--	---	--	---	---	---------------------------------

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.40)	MADE GROUND: Macadam-0.07m over Grey brown fine-coarse subangular GRAVEL	0.50	ES1	
			0.40 (0.20)	MADE GROUND: Black, grey fine-coarse gravel sized ASH with broken bricks, whole bricks, gravel and rare broken glass			
			0.60 (0.15)	MADE GROUND: Black purple fine-coarse gravel sized ASH with some gravel, broken slate and occasional broken brick			
			0.75 (0.55)	MADE GROUND: Purple, brown fine-coarse gravel sized ASH with some gravel, slate and mudstone cobbles			
			1.30 (0.40)	MADE GROUND: Light brown fine-coarse gravel sized ASH, mortar, coarse gravel and cobbles of sandstone and mudstone, broken bricks and whole bricks			
			1.70 (0.40)	MADE GROUND: Light brown coarse GRAVEL and cobbles of sandstone, clay, mortar and sand			
			2.10	Trial pit terminated at 2.10m			
					Depth	Type & No	Results
Groundwater entries: Struck: Rose to: Inflow rate:				Depth related remarks: From - to: Remarks:		General remarks: Weather: Stability: Remarks: Termination:	
 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: Scale: 1:25				Project: Project No: SRL-164 Client:		Exploratory position reference: TC05 Sheet 1 of 1	

RECORD PHOTOGRAPHS



TerraConsult

Personnel:	Equipment & methods:	Dimensions:	Coordinates & level:	Dates:
Logged by:	Method: Mechanically excavated	Width:	Grid:	Start:
Date logged:		Length:	Easting: 328995.97m	End:
Checked by:	Plant: JCB	Orientation:	Northing: 346408.73m	
	Shoring:	Bearing =	Level:	

TerraConsult

RECORD PHOTOGRAPHS



TerraConsult

Personnel:	Equipment & methods:	Dimensions:	Coordinates & level:	Dates:
Logged by:	Method: Mechanically excavated	Width:	Grid:	Start:
Date logged:		Length:	Easting: 329011.95m	End:
Checked by:	Plant: JCB	Orientation:	Northing: 346391.00m	
	Shoring:	Bearing =	Level:	

TP02

RECORD PHOTOGRAPHS



Trial Pit Log

TerraConsult

Personnel: Logged by: Date logged: Checked by:		Equipment & methods: Method: Mechanically excavated Plant: JCB Shoring:		Dimensions: Width: Length: Orientation: Bearing =		Coordinates & level: Grid: Easting: 328990.98m Northing: 346391.85m Level:		Dates: Start: End:	
--	--	---	--	---	--	---	--	---------------------------------	--

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.20)	MADE GROUND: Reinforced CONCRETE with layer of visqueen			
			0.20 (0.30)	MADE GROUND: Light brown fine to coarse subangular GRAVEL			
			0.50 (0.10)	MADE GROUND: Black, orange, grey gravelly CLAY. Gravel is fine-coarse, ash and mudstone, subangular	0.55	ES1	
			0.60 (0.15)	MADE GROUND: Firm to stiff grey gravelly CLAY. Gravel is broken brick and fine coal			
			0.75 (0.55)	MADE GROUND: Black, grey clayey mudstone subangular GRAVEL with occasional medium to coarse coal	1.00	ES2	
			1.30 (0.30)	Soft greenish brown silty CLAY with some organic material			
			1.60 (0.25)	Soft light brown grey silty slightly gravelly CLAY. Gravel is fine to medium, subangular	1.70 1.70	D1	28
			1.85 (0.15)	Soft to firm light brown grey silty slightly gravelly CLAY. Gravel is fine to medium, subangular	1.90		70
			2.00 (0.20)	Firm light brown grey silty slightly gravelly CLAY. Gravel is fine to coarse, subangular, subrounded			
			2.20 (0.40)	Firm to stiff light brown grey slightly silty, slightly gravelly CLAY with carbonaceous material	2.40	D2	
			2.60	----- Trial pit terminated at 2.60m			
					Depth	Type & No	Results
Groundwater entries: Struck: Rose to: Inflow rate:				Depth related remarks: From - to: Remarks:		General remarks: Weather: Stability: Remarks: Termination:	
 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: Scale: 1:25				Project: Project No: SRL-164 Client:		Exploratory position reference: TP03 Sheet 1 of 1	

RECORD PHOTOGRAPHS



TerraConsult

Personnel:	Equipment & methods:	Dimensions:	Coordinates & level:	Dates:
Logged by:	Method: Mechanically excavated	Width:	Grid:	Start:
Date logged:		Length:	Easting: 928971.39m	End:
Checked by:	Plant: JCB	Orientation:	Northing: 346362.67m	
	Shoring:	Bearing =	Level:	

TerraConsult

RECORD PHOTOGRAPHS



APPENDIX 2.4 CBR test results



Client: Datrys

Job No.: SRL164

Site Name: Bonc Wen

SRL

Field Test Result - CBR Value by Clegg Hammer

Location Number	Test No.	Sample Depth Top m	Description	IV Readings					CIV	Correlated CBR Value % CBR=(0.24(IV)+1)²
				Drop No. 1	Drop No. 2	Drop No. 3	Drop No. 4	Drop No. 5		
TC01	1	0.60	MADEGROUND (Ash, gravel,clay and brick)	13	12	15	16	15	16	23
TC01	2	0.90	Stiff grey CLAY with fine-coarse sub-angular gravel	11	12	12	13	13	13	17
TC02	1	0.70	MADEGROUND (Ash, gravel,clay and brick)	5	6	6	6	7	6	6
TC02	2	1.00	MADEGROUND (Ash, gravel,clay and brick)	10	11	12	12	12	12	15
TC03	1	0.60	MADEGROUND (Ash, gravel,clay and brick)	7	9	10	10	11	11	13
TC03	2	0.90	MADEGROUND (Ash, gravel,clay and brick)	4	5	5	6	6	6	6
TC04	1		MADEGROUND (Ash, and large bricks, slate and coarse gravel)	Material Unsuitable For Testing						
TC04	2	0.90	MADEGROUND (Ash, gravel,clay and brick)	8	10	11	12	12	12	15
TC05	1	0.40	MADEGROUND (Ash, gravel,clay and brick)	7	10	12	13	15	13	17
TC05	2	0.60	MADEGROUND (Ash, gravel,clay and brick)	10	13	14	15	15	15	21
TC05	3	0.90	MADEGROUND (Ash, gravel,clay and brick)	12	13	13	13	13	13	17

APPENDIX 2.5 BRE 365 Soakaway results





Strata Renewables Limited

Ground Investigation
Laboratory Testing
Plant and Rig Maintenance

Jodrell Bank Service Station
Knutsford Road
Cranage
Crewe

CW4 8HU
Tel 01606 834637

Registered No.7891028

Fax 01606 836657
e.mail: mailbox@stratarenewables.co.uk

Date: 3rd March 2015
Our Reference: CW164

Datrys
Yr Aelwyd
3-5 Church Street
Caernarfon
LL55 1SW

For the attention of Niel Williams

Dear Sirs

Re: Bonc Wen, Rhosllannerchrugog

3 No. soakaway tests were attempted at the above site and the results are set out below:-

TP4 was dry before the start of the soakaway tests. Three tests were carried out in TP4. During the first test loose made ground above 1.00 metre depth fell into the pit. This was cleared out before the 2nd filling.

Stratum Encountered

0.30 – 1.40m Loose black, purple mudstone gravel, ashes, some broken brick, fine to medium coal, carbonaceous material and rootlets to 5mm, (gravel sub angular) Made Ground.

1.40 – 2.00m Loose to Medium Dense grey very gravelly clay with some coarse gravel and cobbles of mudstone, fine to medium coal and lenses of black ashes, (gravel sub angular flat) Made Ground.

2.00 – 2.50m Dense grey very gravelly clay with some coarse gravel and cobble of mudstone, fine to medium coal and lenses of black ashes, (gravel sub angular flat) Made Ground.

TP4 Test No	Pit Length (m)	Pit Width (m)	75% Depth	25% Depth	Empty Depth (m)	Water at Start of test (m)	75% Time	25% Time	Soil infiltration rate, f = m/sec
Test 1	3.00	0.70	1.73	2.18	2.40	1.50	1.2min	14min	2.28×10^{-4}
Test 2	3.00	0.70	2.06	2.29	2.40	1.94	70min	200min	1.62×10^{-5}
Test 3	3.00	0.70	1.86	2.22	2.40	1.68	15min	225min	1.27×10^{-5}

Soakaway Test TP1 and TP2 both failed as the water level did not measurably drop over 3 hours.
See trial pit logs for soil descriptions.

APPENDIX 2.6 Gas Monitoring results



Client: Datrys

Job No.: SRL164

Site Name: Bonc Wen, Rhosllanecrugog, Wrexham



Gas Monitoring Readings:

Well Number	Date / Time	CH4 %	CO2 %	O2 %	Hexane %	% of Lower Explosive Limit	Peak CH4 %	Peak CO2 %	Min O2 %	Atmospheric Pressure mBar	Relative Pressure mBar	COppm Carbon monoxide	Photo Ionisation Detector (organic vapour)	H2Sppm Hydrogen Sulphide	Flow l/hr	Water Depth (m)	Tip Depth (m)	Remarks	Operator
BH1	03/02/2015 12:15	0.0	0.0	20.3	0.013	0	0	0	20.3	996	0	66	1	25	0	14.40	17.70	8°C - Overcast	JFRI
BH1	16/03/2015 08:00	0.0	0.0	18.7	0.014	0	0	0	18.7	1004	-2.4	1324	1	410	-4.5	14.00	17.50	5°C - Overcast and drizzle After zeroing, flow rate increased from -7.7 l/hr to -4.5 l/hr over a 2 minute period. Upon removal of monitoring tube atmospheric air being sucked in was audible for a few seconds	JFRI
BH1	22/03/2015 09:00	0.0	0.0	16.7	0.011	0	0	0	16.7	1007	0	1118	1	380	0	14.40	17.50	7°C - Sunny and clear skies	JFRI
BH1	28/03/2015 09:00	0.0	0.0	14.6	0.01	0	0	0	14.6	983	0	600	N/A	220	0	14.17	17.50	13°C - Very windy	JFRI
BH1	11/04/2015 15:00	0.1	0.0	10.2	0.01	2	0	0	10.2	994	-20	120	1	40	-4.5	14.40	17.50	12°C - Sunny	JFRI
BH1	23/04/2015 11:30	0.1	0.0	7.5	N/A	1	0.1	0.1	7.4	1001	0.07	5	N/A	0	N/A	17.50	17.50	15°C - Sunny	JFRI
BH2	03/03/2015 13:00	0.0	0.4	19.9	0.012	0	0	0.4	19.9	993	0	10	1	0	0	1.37	3.43	8°C - Raining	JFRI
BH2	22/03/2015 09:50	0.0	0.3	20	0.01	0	0	0.3	20.0	1005	0	0	1	0	0	1.39	3.45	7°C - Sunny and clear skies	JFRI
BH2	28/03/2015 09:10	0.0	0.1	20.1	0.009	0	0	0.5	20.1	981	0	0	N/A	0	0	1.35	3.45	13°C - Overcast	JFRI
BH2	11/04/2015 15:30	0.0	0.2	20.3	0.008	0	0	0.6	19.8	996	0	0	1	0	0	1.40	3.45	12°C - Sunny	JFRI
BH2	16/03/2015 08:45	0.0	0.3	19.5	0.011	0	0	0.3	19.5	1002	0	10	1	0	0	1.37	3.43	5°C - Overcast and drizzle	JFRI
BH2	23/04/2015 12:00	0.0	0.1	19.4	N/A	0	0	1.3	18.0	1001	0.08	5	N/A	0	N/A	1.40	3.45	15°C - Sunny	JFRI
BH3	03/03/2015 13:45	0.0	0.8	15.5	0.013	0	0	0.8	15.5	993	0	0	1	0	0	20.80	21.20	8°C - Raining	JFRI
BH3	16/03/2015 09:30	0.0	0.8	15.8	0.011	0	0	0.8	15.8	1002	0	0	1	0	0.1	20.79	21.00	5°C - Overcast and drizzle	JFRI
BH3	22/03/2015 10:40	0.0	0.8	13.1	0.009	0	0	0.8	13.1	1007	0	0	1	0	0	20.80	21.05	7°C - Sunny and clear skies	JFRI
BH3	28/03/2015 09:20	0.0	0.8	13.3	0.008	0	0	0.8	13.3	981	0	0	N/A	0	0	20.82	21.00	13°C - Light showers	JFRI
BH3	11/04/2015 14:00	0.1	0.3	20.3	0.008	2	0	0.3	20.3	998	-48	0	1	0	-7.5	20.80	21.00	12°C - Sunny	JFRI
BH3	23/04/2015 12:30	0.0	0.1	17.7	N/A	0	0	0.2	17.7	1001	0.23	0	N/A	0	N/A	20.82	21.00	15°C - Sunny	JFRI
BH4	09/03/2015 14:30	0.0	0.3	18.9	0.013	0	0	0.4	18.9	992	0	35	1	0	0	17.90	23.00	8°C - Raining	JFRI
BH4	16/03/2015 10:45	0.0	0.5	15.9	0.011	0	0	0.5	15.9	1002	0	10	1	0	0.1	17.89	22.90	5°C - Overcast and drizzle	JFRI
BH4	22/03/2015 11:30	0.0	0.6	14.3	0.01	0	0	0.6	14.3	1007	0	0	1	0	0	17.92	23.00	7°C - Sunny and clear skies	JFRI
BH4	28/03/2015 09:30	0.0	0.9	11.9	0.009	0	0	0.9	11.9	980	0	0	N/A	0	0	18.12	23.00	13°C - Light showers	JFRI
BH4	11/04/2015 14:30	0.0	0.8	18.5	0.008	0	0	0.8	18.5	995	-48	0	1	0	-8.2	18.20	23.00	12°C - Sunny	JFRI
BH4	23/04/2015 13:00	0.0	1.3	9.4	N/A	0	0	1.4	9.4	1001	0.41	6	N/A	0	N/A	18.30	23.00	15°C - Sunny	JFRI

APPENDIX 3 LABORATORY TEST RESULTS



APPENDIX 3.1 Summary of Test Results



Client: Datrys

Job No.: SRL164

Site Name: Bonc Wen



Laboratory Test Result Summary

					Classification					Triaxial Compression								Chemical					Additional			
Location Number	Sample Type No.	Sample Depth Top m	Sample Depth Bottom m	Description	LL	PL	PI	% Retained 425µm	Moisture Content %	Bulk Density Mg/m³	Dry Density Mg/m³	Test Type	Specimen Diameter mm	Specimen Length mm	Lateral Pressure {Deviator Stress} kPa	Cohesion Intercept kPa	Friction Angle	Cu kPa	pH	SO₄ % Total	SO₄ mg/l 2:1 Extract	SO₄ mg/l in Water	Cl₂ %	Grading	Oedometer Hand Pene.	Others
TP03	D 1	1.70		Light brown grey mottled fine sandy silty CLAY with a little fine-coarse sub-angular gravel	35	20	15	6	24															✓		
TP03	D 2	2.40		Light brown grey fine-medium sandy silty CLAY with a little fine-coarse sub-angular gravel	36	20	16	15	17										6.6		24.69			✓		
TC01	D 1	0.90		Grey fine to coarse angular sub-angular MUDSTONE																				✓		
TC01	W 1	1.30		GROUNDWATER															6.9		32.92		0.005			
TC02	D 1	1.05		Grey MUDSTONE	Non-Plastic				8.9															✓		
BH01	D 3	2.00		Brown fine-coarse sandy silty CLAY with some fine-coarse sub-angular gravel	30	17	13	9.0	17															✓		
BH01	U 2	2.70	3.15	Very high strength brown grey mottled fine-medium sandy silty CLAY with some fin-coarse sub-rounded sub-angular gravel	29	16	13	13	13	2.240	1.980	UU	200	102	25 50 100 {419 441 496}	140	19	221	7.4		49.38		0.008	✓		
BH01	U 3	3.90	4.35	Brown fine-coarse sandy silty CLAY with some fine-coarse sub-angular sub-rounded gravel	26	15	11	5.1	10															✓		
BH02	U 1	2.20	2.65	Medium strength light brown grey mottled fine-medium sandy silty CLAY with a little fin-coarse sub-angular gravel	46	18	28	2.0	25	2.130	1.700	UU	200	102	25 50 100 {104 111 117}	42	8	56	6.2		49.38		0.008	✓		
BH02	U 4	5.80	6.25	Very high strength brown fine-coarse sandy CLAY with fine-coarse sub-angular gravel	24	12	12	3	10	2.320	2.100	UU	200	102	60 120 240 {515 548 606}	187	14	274	6.9		28.80		0.011	✓		
BH03	D 6	1.70		MADEGROUND (Black slightly clayey fine-coarse ash, brick and angular sub-angular gravel)																				✓		

Client: Datrys

Job No.: SRL164

Site Name: Bonc Wen



Laboratory Test Result Summary

					Classification					Triaxial Compression								Chemical					Additional			
Location Number	Sample Type No.	Sample Depth Top m	Sample Depth Bottom m	Description	LL	PL	PI	% Retained 425µm	Moisture Content %	Bulk Density Mg/m³	Dry Density Mg/m³	Test Type	Specimen Diameter mm	Specimen Length mm	Lateral Pressure {Deviator Stress} kPa	Cohesion Intercept kPa	Friction Angle	Cu kPa	pH	SO₄ % Total	SO₄ mg/l 2:1 Extract	SO₄ mg/l in Water	Cl₂ %	Grading	Oedometer Hand Pene.	Others
BH03	U 1	4.20	4.65	High strength brown grey mottled fine-coarse sandy silty CLAY with fine-coarse sub-angular sub-rounded gravel	24	12	12	5.5	14	2.260	1.970	UU	200	102	40 80 160 {183 215 252}	55	17	108	7.1		41.15		0.008	✓		
BH04	U 1	1.20	1.65	Black brown slightly clayey fine-coarse angular flat MUDSTONE and COAL																				✓		
BH04	U 2	2.40	2.85	Light greyish brown fine-coarse sandy CLAY with fine-coarse angular flat mudstone gravel																				✓		
BH04	U 3	3.60	4.05	High strength brown grey mottled fine-coarse sandy silty CLAY with a little sub-rounded gravel	26	15	11	12	14	2.340	2.060	UU	200	102	35 70 140 {167 181 200}	65	96	91	6.9				0.008	✓		

APPENDIX 3.2 Triaxial Test Results



Undrained Shear Strength in Triaxial Compression without measurement of Pore Pressure (Quick Undrained)



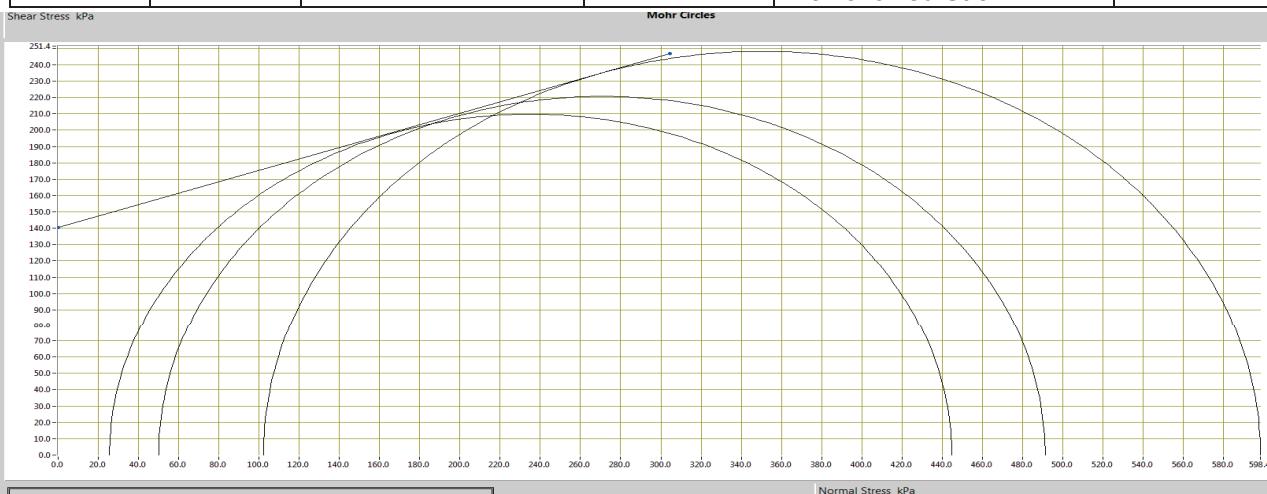
Client	Datrys	Lab Ref	150
Project	Bonc Wen	Job	SRL164
Borehole	BH01	Sample	U2

Test & Sample Details			
Standard	BS 1377 : Part 7 : Clause 9	Sample Depth	2.70 m
Sample Type	Undisturbed sample - open drive	Particle Density	2.65 Mg/m ³
Sample Description	Very high strength brown grey mottled fine-medium sandy silty CLAY with fine-coarse sub-rounded sub-angular gravel	Lab. Temperature	19.5 deg.C
Variations from Procedure	None		

Specimen Details			
Specimen Reference	A1	Stage Reference	1
Depth within Sample	250.00 mm	Description	Gravelly CLAY
Initial Height	200.00 mm	Orientation within Sample	Vertical
Preparation		Initial Diameter	102.00 mm
Initial Bulk Density	2.24 Mg/m ³	Initial Moisture Content*	13.4 %
Initial Dry Density	1.98 Mg/m ³	Membrane Thickness	0.00 mm
Comments			

* Calculated from initial and dry weights of whole specimen

All Stages Conditions at Failure					
Ref	Cell Pressure	Max. Corrected Deviator Stress	Cumulative Strain	Mode of Failure	Shear Strength
Stage1	25.6kPa	419kPa	9.05%	Max Deviator Stress or Max allowed Strain	210kPa
Stage2	50.1kPa	441kPa	10.59%	Max Deviator Stress or Max allowed Strain	221kPa
Stage3	102.2kPa	496kPa	16.20%	Max Deviator Stress or Max allowed Strain	248kPa



Shear Strength Properties

Angle of Shear Resistance: 19.26 Degrees

Cohesion: 140.45 kPa

Undrained Shear Strength in Triaxial Compression without measurement of Pore Pressure (Quick Undrained)



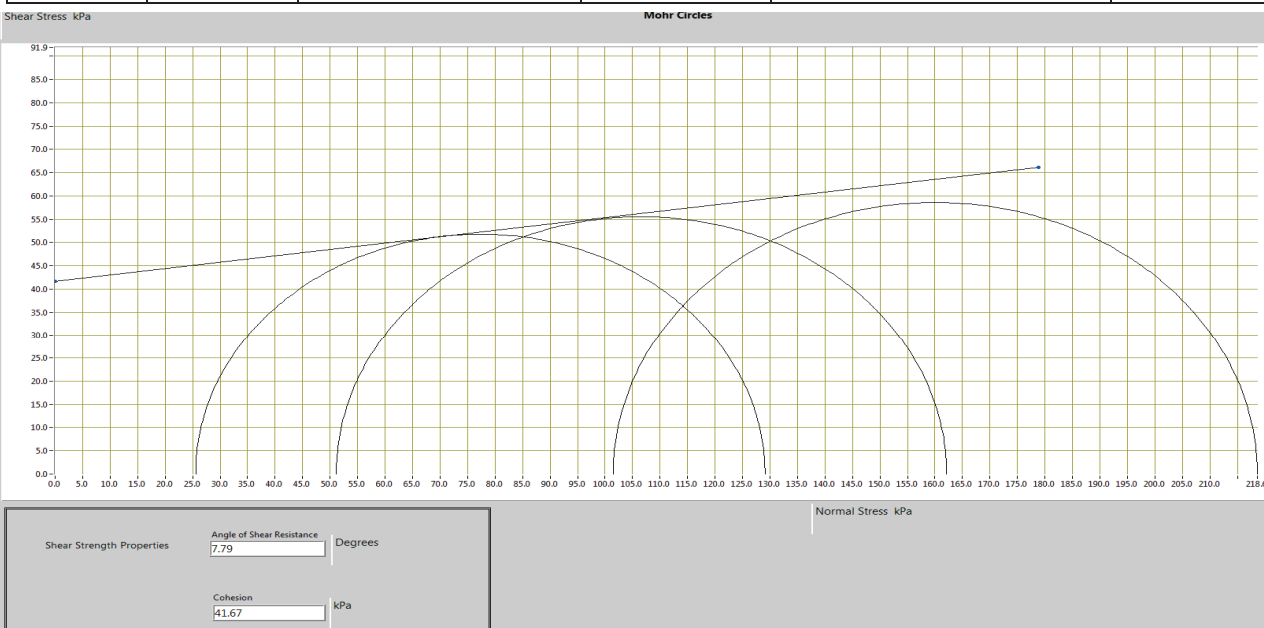
Client	Datrys	Lab Ref	74
Project	Bonc Wen	Job	SRL164
Borehole	BH02	Sample	U1

Test & Sample Details			
Standard	BS 1377 : Part 7 : Clause 9	Sample Depth	2.20 m
Sample Type	Undisturbed sample - open drive	Particle Density	2.65 Mg/m3
Sample Description	Medium strength light brown grey mottled fine-medium sandy silty CLAY	Lab. Temperature	18.5 deg.C
Variations from Procedure	None		

Specimen Details			
Specimen Reference	A1	Stage Reference	1
Depth within Sample	250.00 mm	Description	CLAY
Initial Height	200.00 mm	Orientation within Sample	Vertical
Preparation		Initial Diameter	102.00 mm
Initial Bulk Density	2.13 Mg/m3	Initial Moisture Content*	25.4 %
Initial Dry Density	1.70 Mg/m3	Membrane Thickness	0.00 mm
Comments			

* Calculated from initial and dry weights of whole specimen

All Stages Conditions at Failure					
Ref	Cell Pressure	Max. Corrected Deviator Stress	Cumulative Strain	Mode of Failure	Shear Strength
Stage1	25.6kPa	104kPa	11.69%	Max Deviator Stress or Max allowed Strain	52kPa
Stage2	51.1kPa	111kPa	14.26%	Max Deviator Stress or Max allowed Strain	56kPa
Stage3	101.5kPa	117kPa	15.79%	Max Deviator Stress or Max allowed Strain	59kPa



Undrained Shear Strength in Triaxial Compression without measurement of Pore Pressure (Quick Undrained)



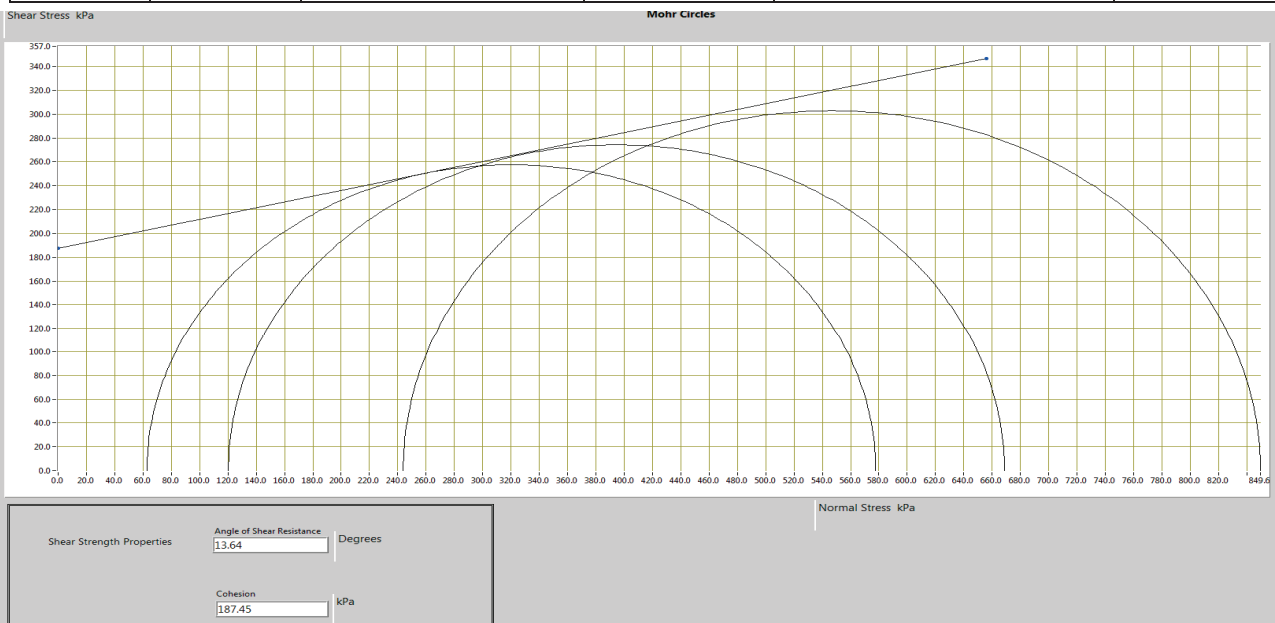
Client	Datrys	Lab Ref	83
Project	Bonc Wen	Job	SRL164
Borehole	BH02	Sample	U4

Test & Sample Details			
Standard	BS 1377 : Part 7 : Clause 9	Sample Depth	5.80 m
Sample Type	Undisturbed sample - open drive	Particle Density	2.65 Mg/m ³
Sample Description	Very high strength brown fine-coarse sandy CLAY with fine-coarse sub-angular gravel	Lab. Temperature	18.5 deg.C
Variations from Procedure	None		

Specimen Details			
Specimen Reference	A1	Stage Reference	1
Depth within Sample	250.00 mm	Description	CLAY
Initial Height	200.00 mm	Orientation within Sample	Vertical
Preparation		Initial Diameter	102.00 mm
Initial Bulk Density	2.32 Mg/m ³	Initial Moisture Content*	10.5 %
Initial Dry Density	2.10 Mg/m ³	Membrane Thickness	0.00 mm
Comments			

* Calculated from initial and dry weights of whole specimen

All Stages Conditions at Failure					
Ref	Cell Pressure	Max. Corrected Deviator Stress	Cumulative Strain	Mode of Failure	Shear Strength
Stage1	62.8kPa	515kPa	12.53%	Max Deviator Stress or Max allowed Strain	257kPa
Stage2	120.3kPa	548kPa	14.61%	Max Deviator Stress or Max allowed Strain	274kPa
Stage3	243.9kPa	606kPa	18.17%	Max Deviator Stress or Max allowed Strain	303kPa



Undrained Shear Strength in Triaxial Compression without measurement of Pore Pressure (Quick Undrained)



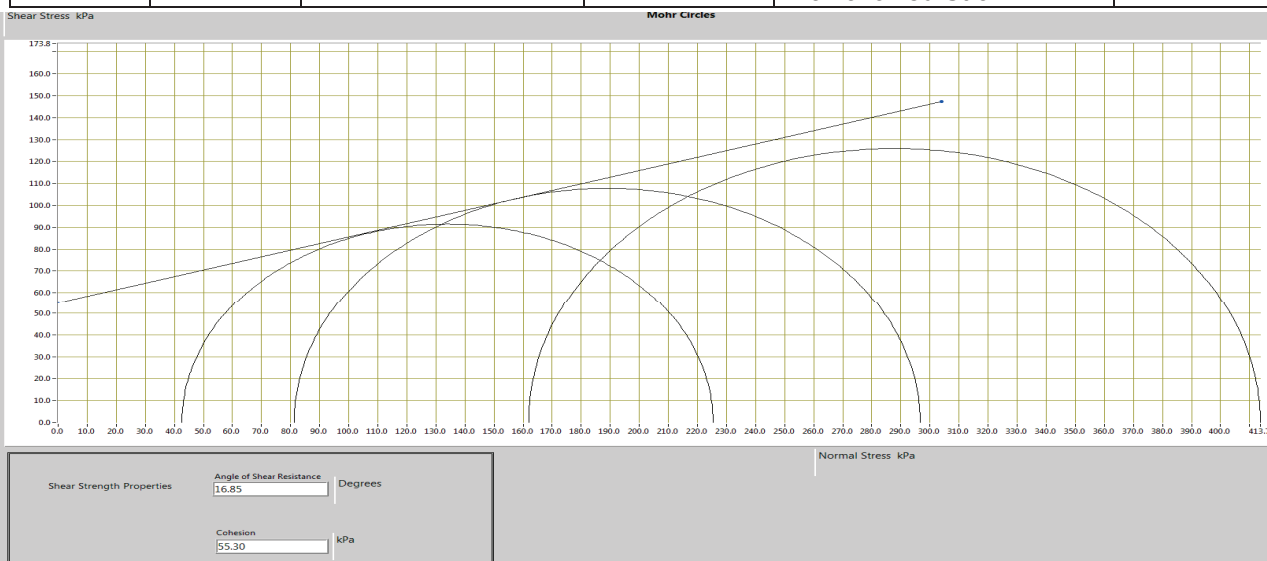
Client	Datrys	Lab Ref	15
Project	Bonc Wen	Job	SRL164
Borehole	BH03	Sample	U1

Test & Sample Details			
Standard	BS 1377 : Part 7 : Clause 9	Sample Depth	4.20 m
Sample Type	Undisturbed sample - open drive	Particle Density	2.65 Mg/m ³
Sample Description	High strength brown grey fissured fine-coarse sandy silty CLAY with fin-coarse sub-rounded sub-angular gravel	Lab. Temperature	20.0 deg.C
Variations from Procedure	None		

Specimen Details			
Specimen Reference	A1	Stage Reference	1
Depth within Sample	250.00 mm	Description	gravelly clay
Initial Height	200.00 mm	Orientation within Sample	Vertical
Preparation		Initial Diameter	102.00 mm
Initial Bulk Density	2.26 Mg/m ³	Initial Moisture Content*	14.3 %
Initial Dry Density	1.97 Mg/m ³	Membrane Thickness	0.00 mm
Comments			

* Calculated from initial and dry weights of whole specimen

All Stages Conditions at Failure					
Ref	Cell Pressure	Max. Corrected Deviator Stress	Cumulative Strain	Mode of Failure	Shear Strength
Stage1	42.6kPa	183kPa	8.08%	Max Deviator Stress or Max allowed Strain	91kPa
Stage2	81.3kPa	215kPa	11.17%	Max Deviator Stress or Max allowed Strain	108kPa
Stage3	161.9kPa	252kPa	14.74%	Max Deviator Stress or Max allowed Strain	126kPa



Undrained Shear Strength in Triaxial Compression without measurement of Pore Pressure (Quick Undrained)



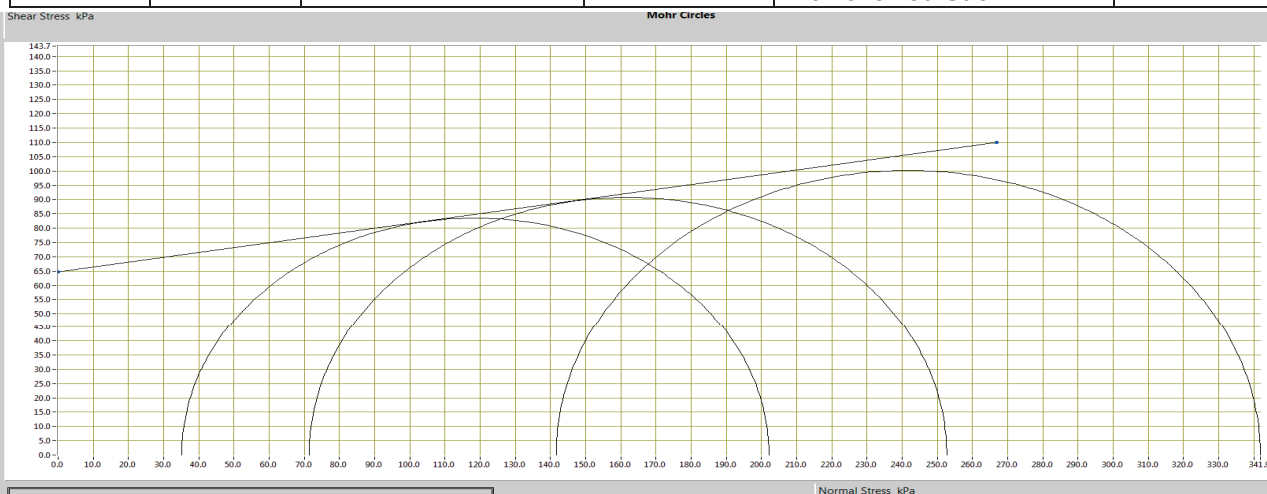
Client	Datrys	Lab Ref	51
Project	Bonc Wen	Job	SRL164
Borehole	BH04	Sample	U3

Test & Sample Details			
Standard	BS 1377 : Part 7 : Clause 9	Sample Depth	3.60 m
Sample Type	Undisturbed sample - open drive	Particle Density	2.65 Mg/m ³
Sample Description	High strength light brown grey mottled fine-coarse sandy silty CLAY with a little fine-coarse sub-rounded gravel	Lab. Temperature	19.5 deg.C
Variations from Procedure	None		

Specimen Details			
Specimen Reference	A1	Stage Reference	1
Depth within Sample	3.60 mm	Description	CLAY
Initial Height	200.00 mm	Orientation within Sample	Vertical
Preparation		Initial Diameter	102.00 mm
Initial Bulk Density	2.34 Mg/m ³	Initial Moisture Content*	13.7 %
Initial Dry Density	2.06 Mg/m ³	Membrane Thickness	0.00 mm
Comments			

* Calculated from initial and dry weights of whole specimen

All Stages Conditions at Failure					
Ref	Cell Pressure	Max. Corrected Deviator Stress	Cumulative Strain	Mode of Failure	Shear Strength
Stage1	35.1kPa	167kPa	12.21%	Max Deviator Stress or Max allowed Strain	84kPa
Stage2	71.4kPa	181kPa	14.76%	Max Deviator Stress or Max allowed Strain	91kPa
Stage3	141.6kPa	200kPa	17.88%	Max Deviator Stress or Max allowed Strain	100kPa



Shear Strength Properties

Angle of Shear Resistance: 9.63 Degrees

Cohesion: 64.72 kPa

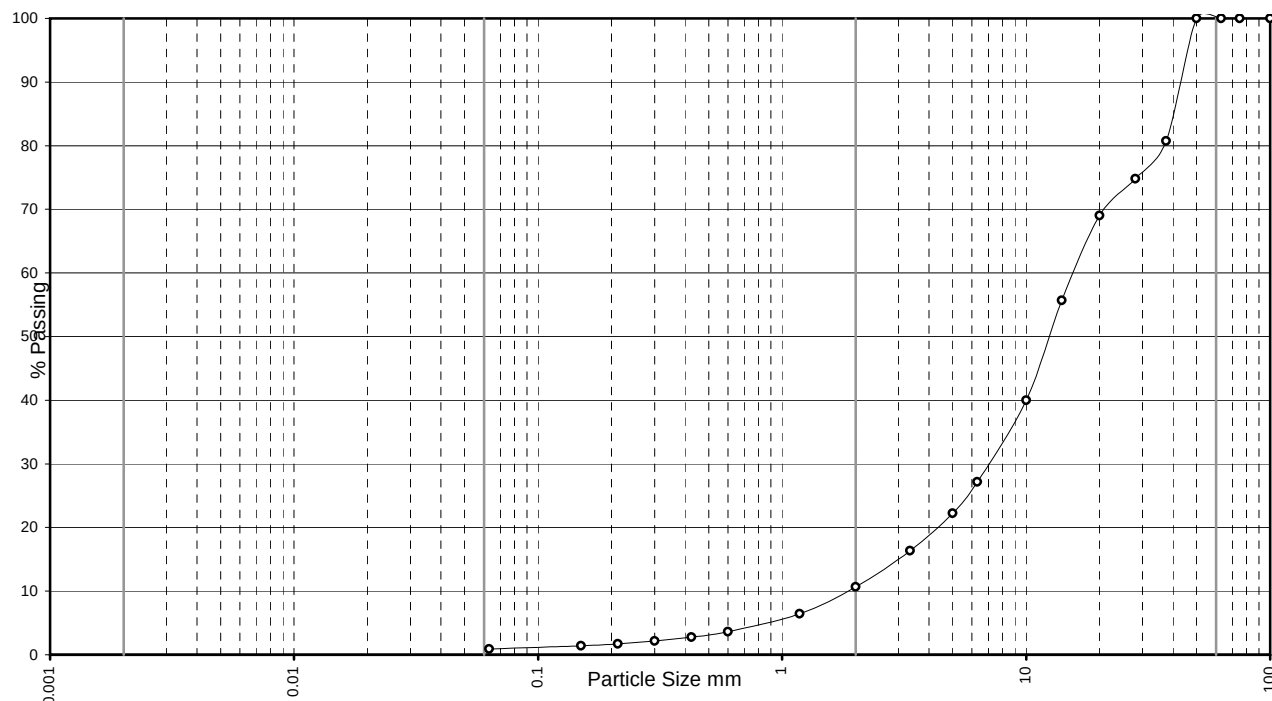
APPENDIX 3.3 Particle Size Distribution Results



Site: Bonc Wen

Borehole No TC01 Sample D 1 Depth: 0.90 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	
	0.002	0.006	0.02	0.06	0.2	0.6	2.0	6.0	20	60

SAMPLE DESCRIPTION

Grey fine to coarse angular sub-angular MUDSTONE

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	81
28	75
20	69
14	56
10	40
6.30	27
5	22

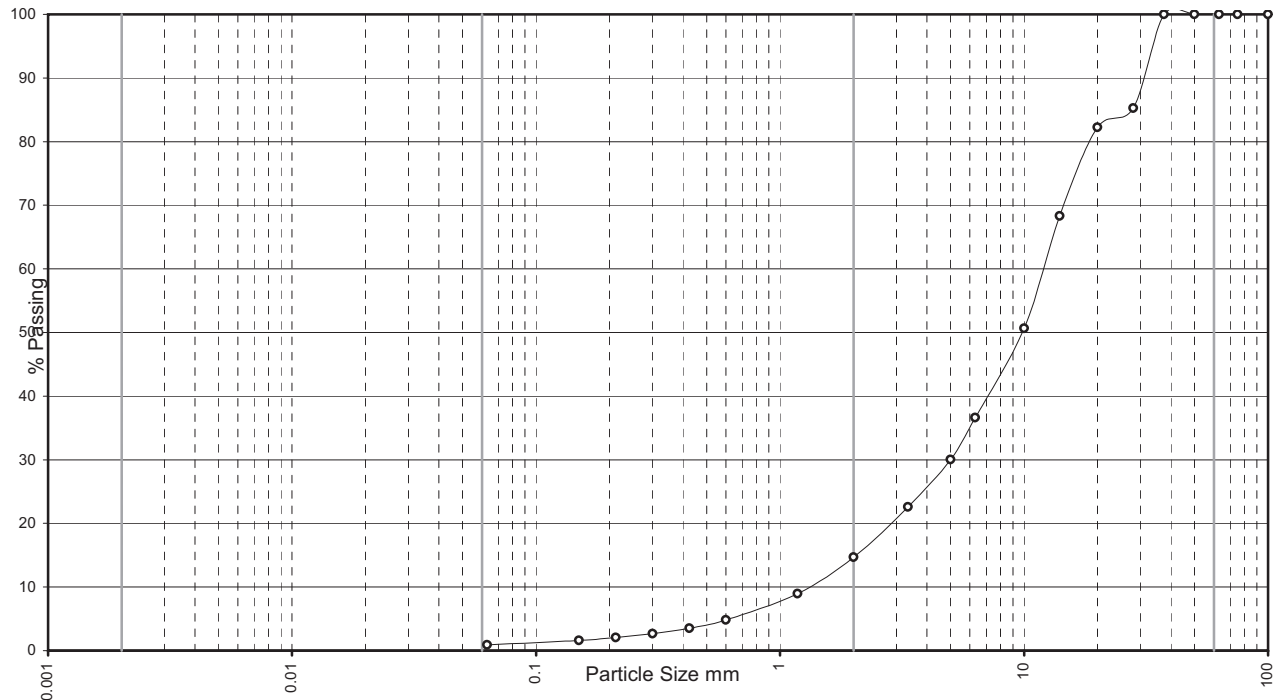
Sieve Size mm	% Passing
3.35	16
2	11
1.18	6
0.6	4
0.425	3
0.3	2
0.212	2
0.15	1
0.063	1

Cobbles	
Gravel	89
Sand	10
Silt/Clay	1

Site: Bonc Wen

Borehole No TC02 Sample D 1 Depth: 1.05 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Grey fine to coarse angular sub-angular MUDSTONE

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	100
28	85
20	82
14	68
10	51
6.30	37
5	30

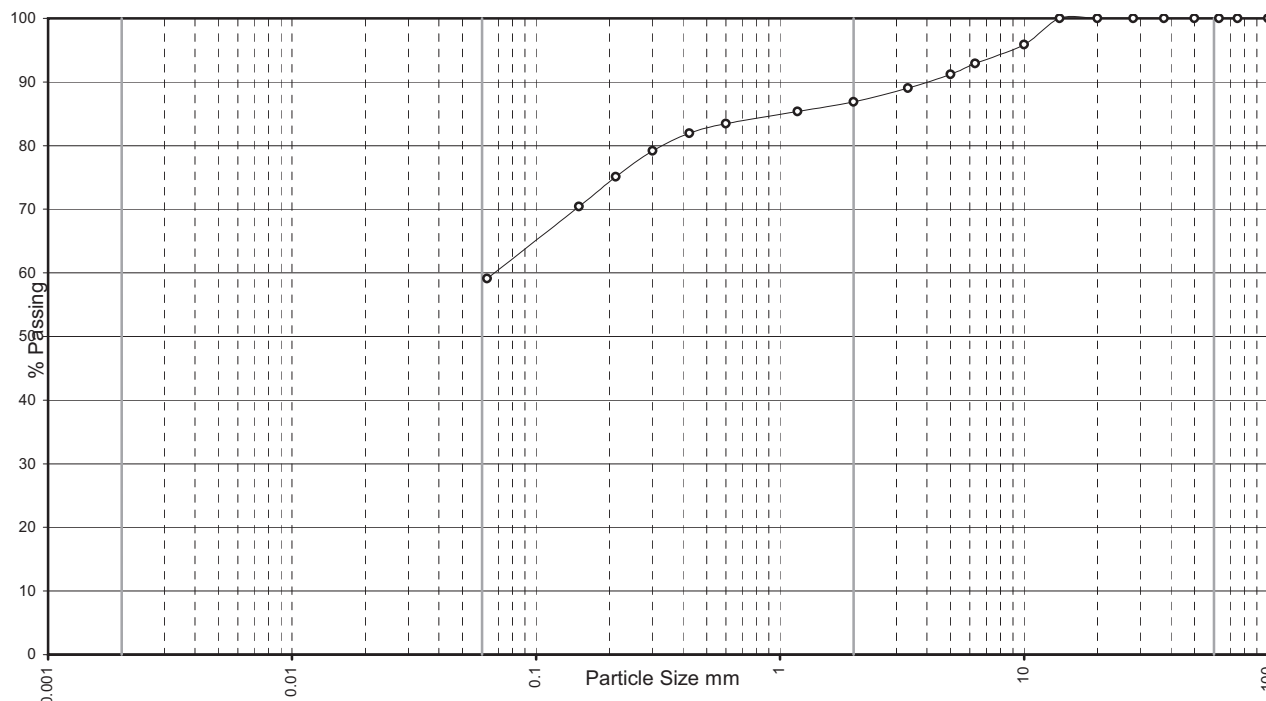
Sieve Size mm	% Passing
3.35	23
2	15
1.18	9
0.6	5
0.425	4
0.3	3
0.212	2
0.15	2
0.063	1

Cobbles	
Gravel	85
Sand	14
Silt/Clay	1

Site: Bonc Wen

Borehole No TP03 Sample D 1 Depth: 1.70 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Light brown grey mottled fine-coarse sandy CLAY with a little fine-coarse sub-angular gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	100
28	100
20	100
14	100
10	96
6.30	93
5	91

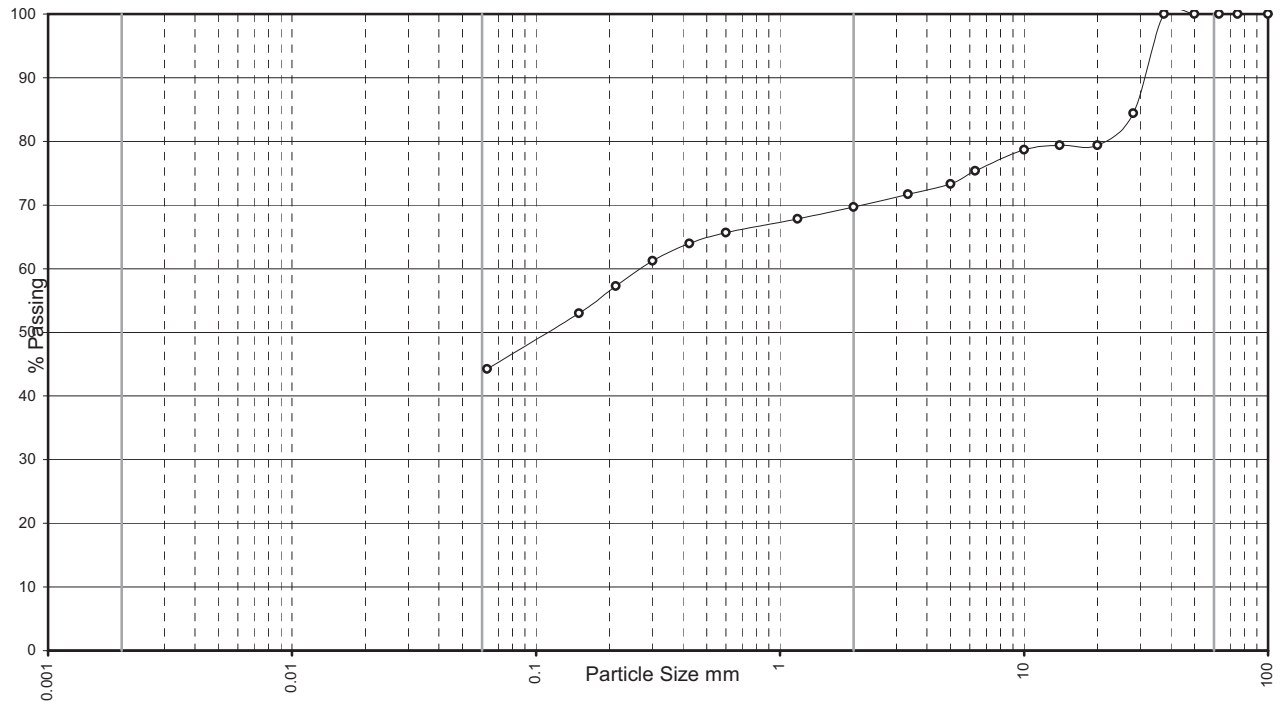
Sieve Size mm	% Passing
3.35	89
2	87
1.18	85
0.6	83
0.425	82
0.3	79
0.212	75
0.15	70
0.063	59

Cobbles	
Gravel	13
Sand	28
Silt/Clay	59

Site: Bonc Wen

Borehole No BH01 Sample D 3 Depth: 2.00 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Brown fine-coarse sandy silty CLAY with some fine-coarse sub-angular gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	100
28	84
20	79
14	79
10	79
6.30	75
5	73

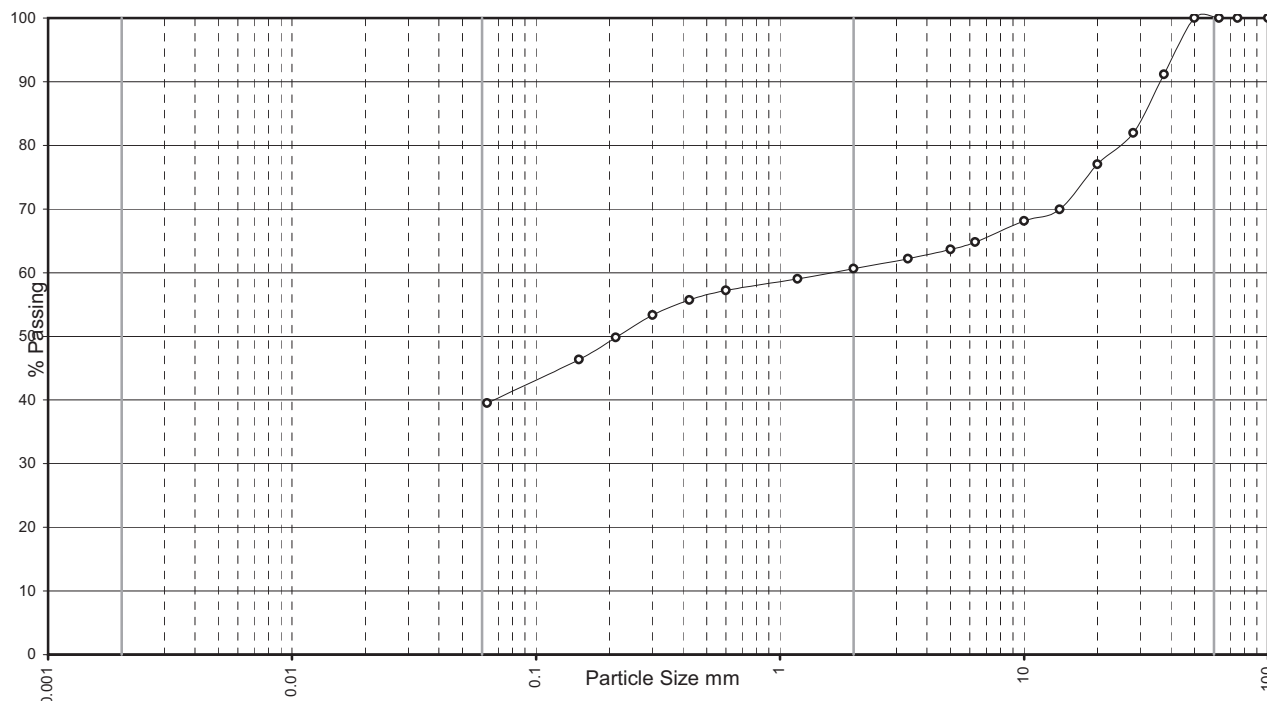
Sieve Size mm	% Passing
3.35	72
2	70
1.18	68
0.6	66
0.425	64
0.3	61
0.212	57
0.15	53
0.063	44

Cobbles	
Gravel	30
Sand	25
Silt/Clay	44

Site: Bonc Wen

Borehole No BH01 Sample U 2 Depth: 2.70 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Brown fine-coarse sandy silty CLAY with some fine-coarse sub-angular gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	91
28	82
20	77
14	70
10	68
6.30	65
5	64

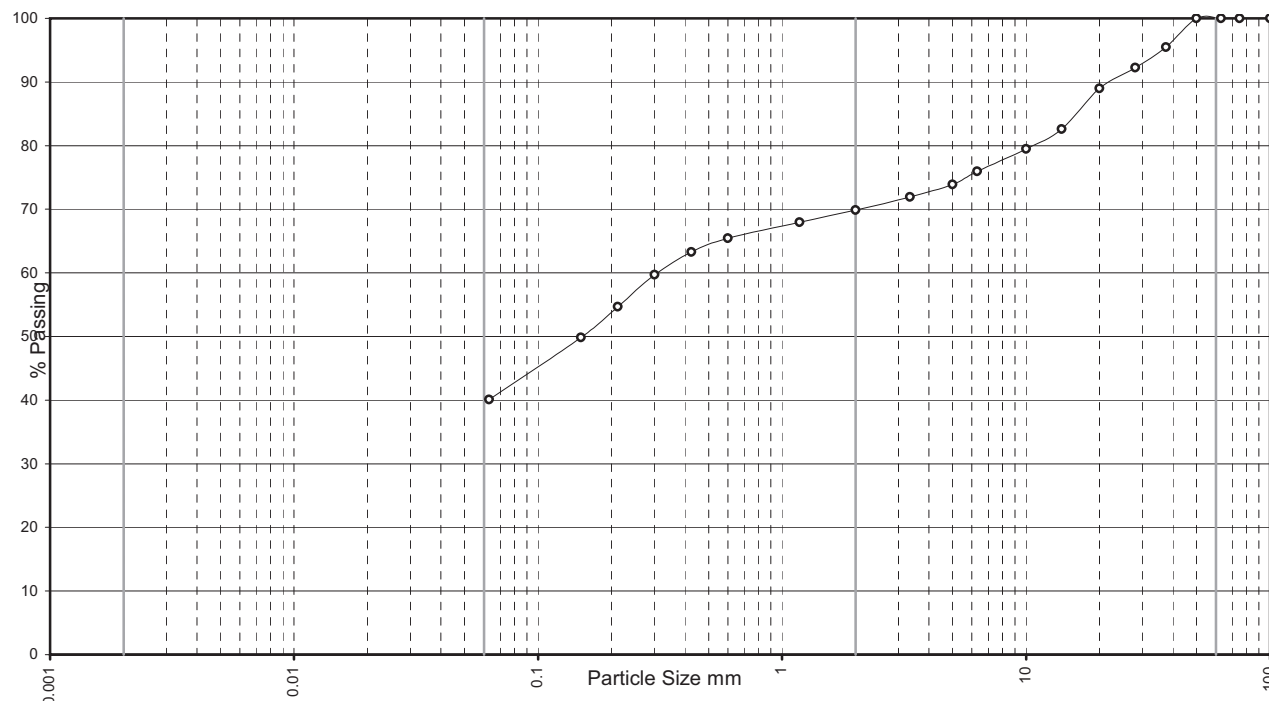
Sieve Size mm	% Passing
3.35	62
2	61
1.18	59
0.6	57
0.425	56
0.3	53
0.212	50
0.15	46
0.063	40

Cobbles	
Gravel	39
Sand	21
Silt/Clay	40

Site: Bonc Wen

Borehole No BH01 Sample U 3 Depth: 3.90 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Brown fine-coarse sandy silty CLAY with some fine-coarse sub-angular sub-rounded gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	95
28	92
20	89
14	83
10	79
6.30	76
5	74

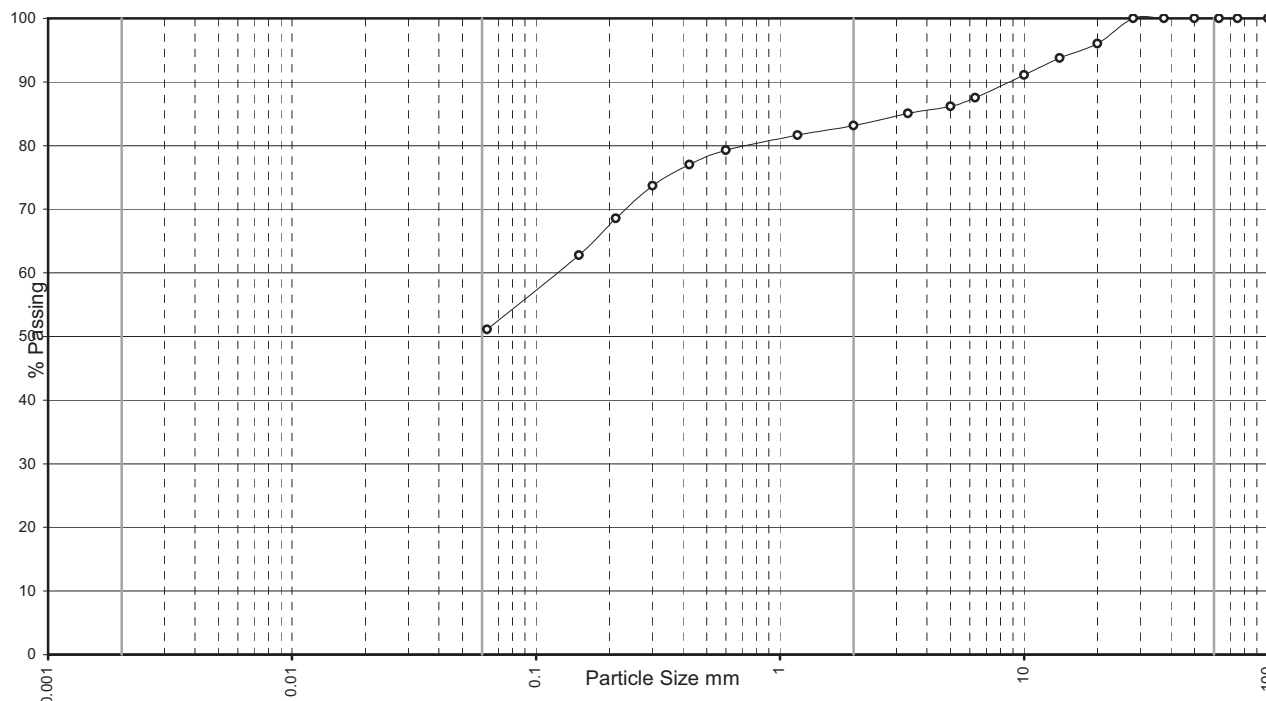
Sieve Size mm	% Passing
3.35	72
2	70
1.18	68
0.6	65
0.425	63
0.3	60
0.212	55
0.15	50
0.063	40

Cobbles	
Gravel	30
Sand	30
Silt/Clay	40

Site: Bonc Wen

Borehole No BH02 Sample U 1 Depth: 2.20 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Light brown grey mottled fine-coarse sandy silty CLAY with a little fine-coarse sub-angular gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	100
28	100
20	96
14	94
10	91
6.30	88
5	86

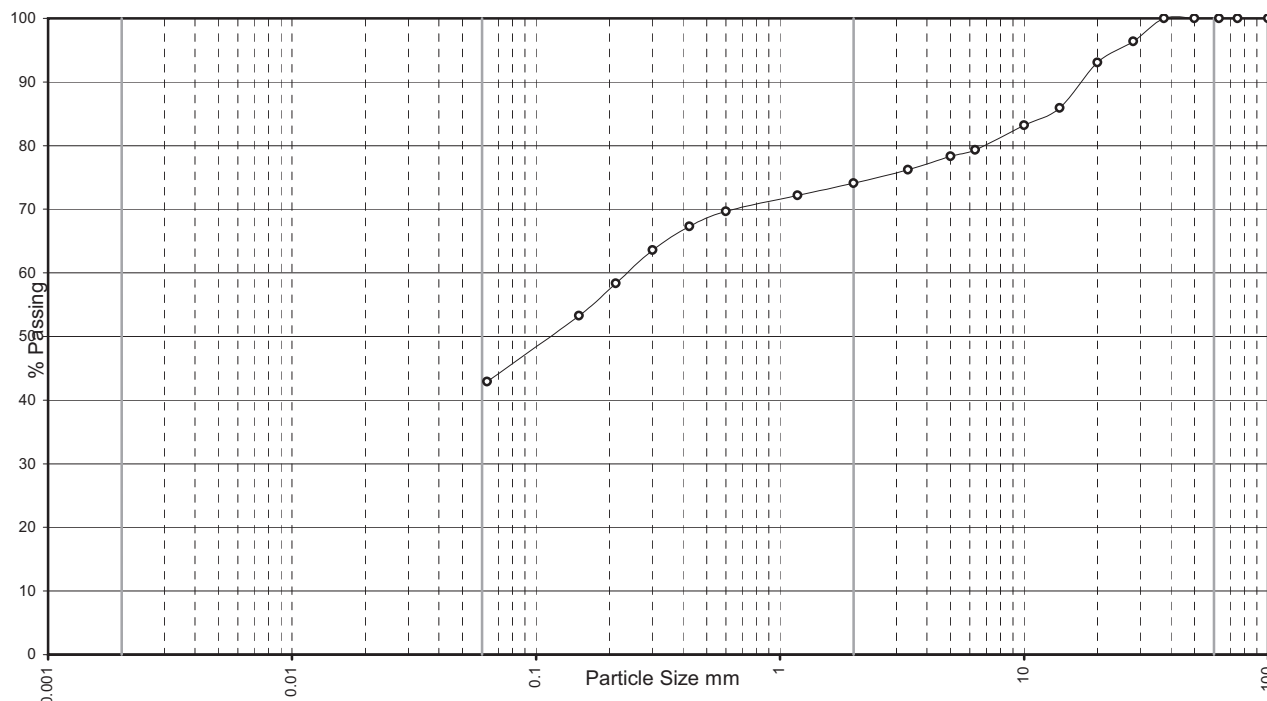
Sieve Size mm	% Passing
3.35	85
2	83
1.18	82
0.6	79
0.425	77
0.3	74
0.212	69
0.15	63
0.063	51

Cobbles	
Gravel	17
Sand	32
Silt/Clay	51

Site: Bonc Wen

Borehole No BH04 Sample U 3 Depth: 3.60 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Light brown grey mottled fine-coarse sandy CLAY with a little fine-coarse sub-rounded gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	100
28	96
20	93
14	86
10	83
6.30	79
5	78

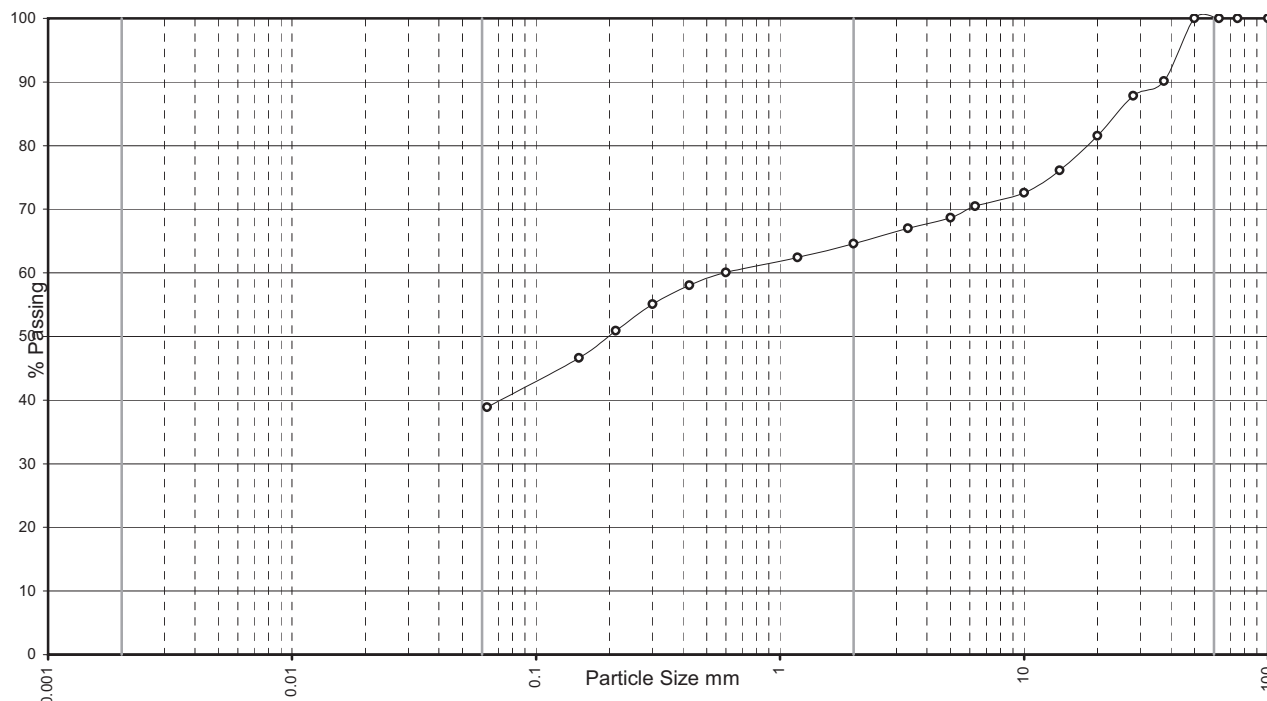
Sieve Size mm	% Passing
3.35	76
2	74
1.18	72
0.6	70
0.425	67
0.3	64
0.212	58
0.15	53
0.063	43

Cobbles	
Gravel	26
Sand	31
Silt/Clay	43

Site: Bonc Wen

Borehole No BH02 Sample U 4 Depth: 5.80 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Brown fine-coarse sandy silty CLAY with some fine-coarse sub-angular gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	90
28	88
20	82
14	76
10	73
6.30	70
5	69

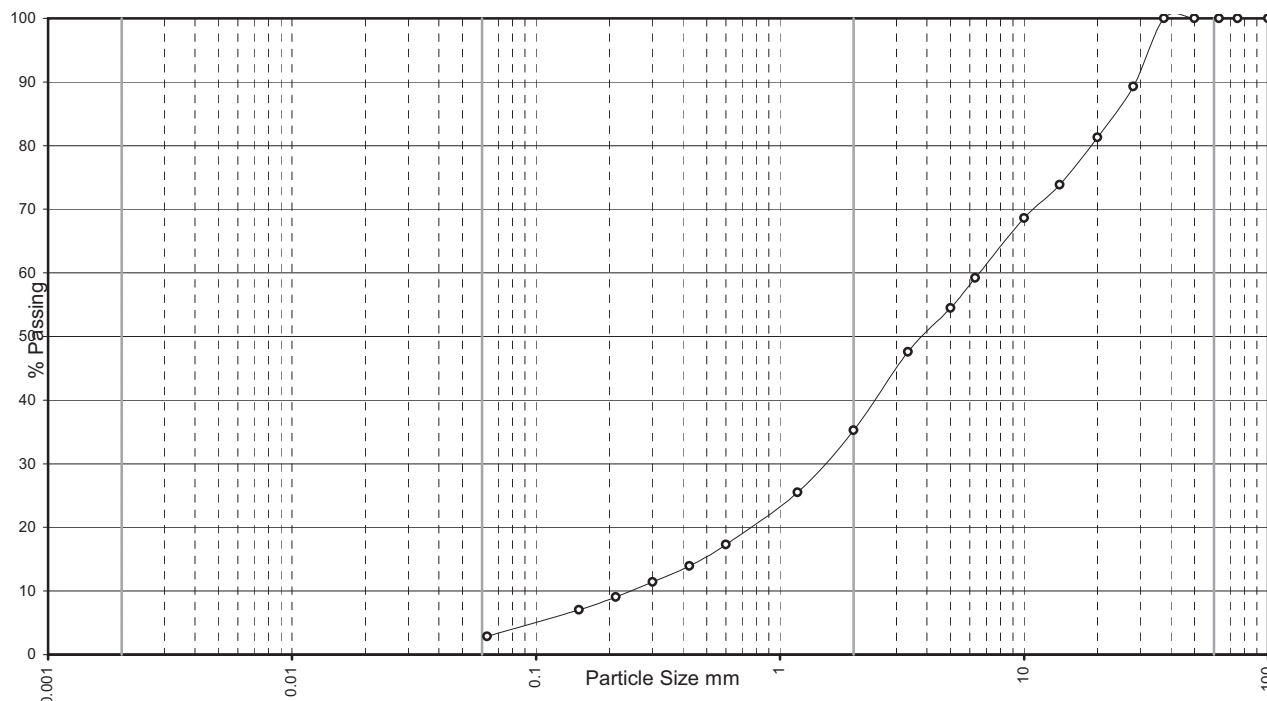
Sieve Size mm	% Passing
3.35	67
2	65
1.18	62
0.6	60
0.425	58
0.3	55
0.212	51
0.15	47
0.063	39

Cobbles	
Gravel	35
Sand	26
Silt/Clay	39

Site: Bonc Wen

Borehole No BH03 Sample D 6 Depth: 1.70 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

MADEGROUND (Black slightly clayey fine-coarse ash, brick and angular sub-angular gravel)

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	100
28	89
20	81
14	74
10	69
6.30	59
5	54

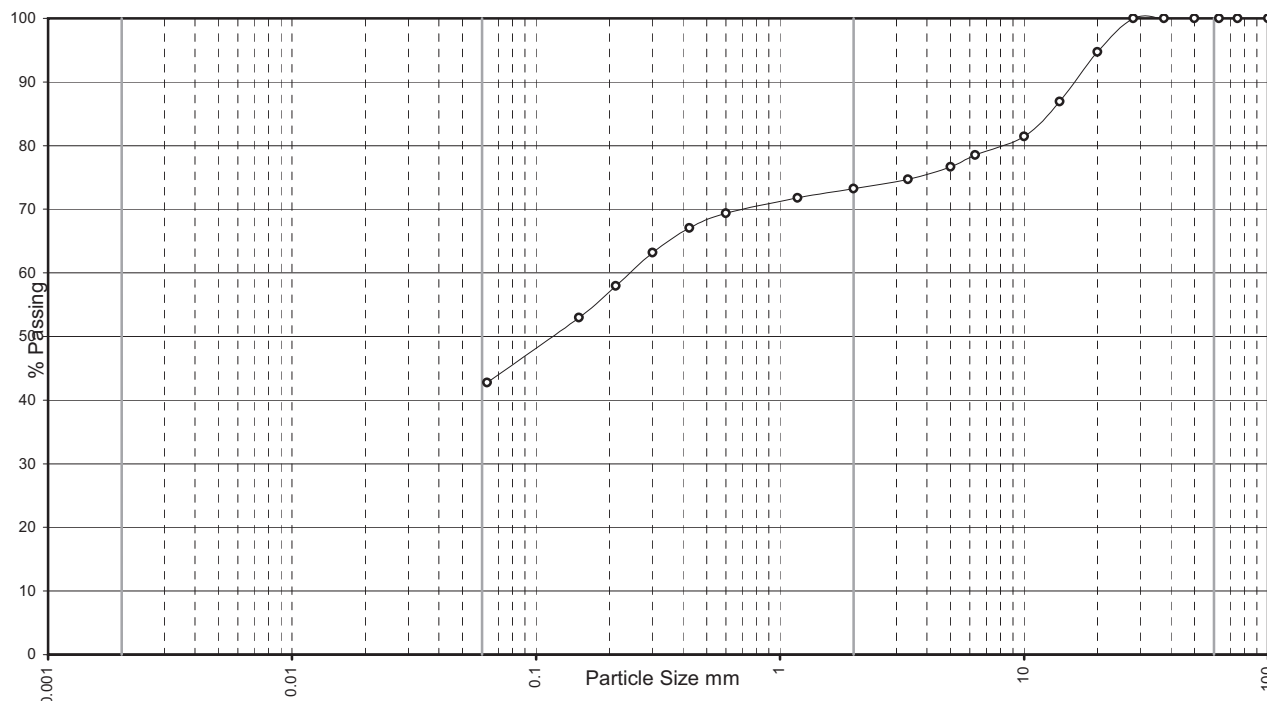
Sieve Size mm	% Passing
3.35	48
2	35
1.18	26
0.6	17
0.425	14
0.3	11
0.212	9
0.15	7
0.063	3

Cobbles	
Gravel	65
Sand	32
Silt/Clay	3

Site: Bonc Wen

Borehole No BH03 Sample U 1 Depth: 4.20 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Brown fine-coarse sandy silty CLAY with some fine-coarse sub-angular sub-rounded gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	100
28	100
20	95
14	87
10	81
6.30	79
5	77

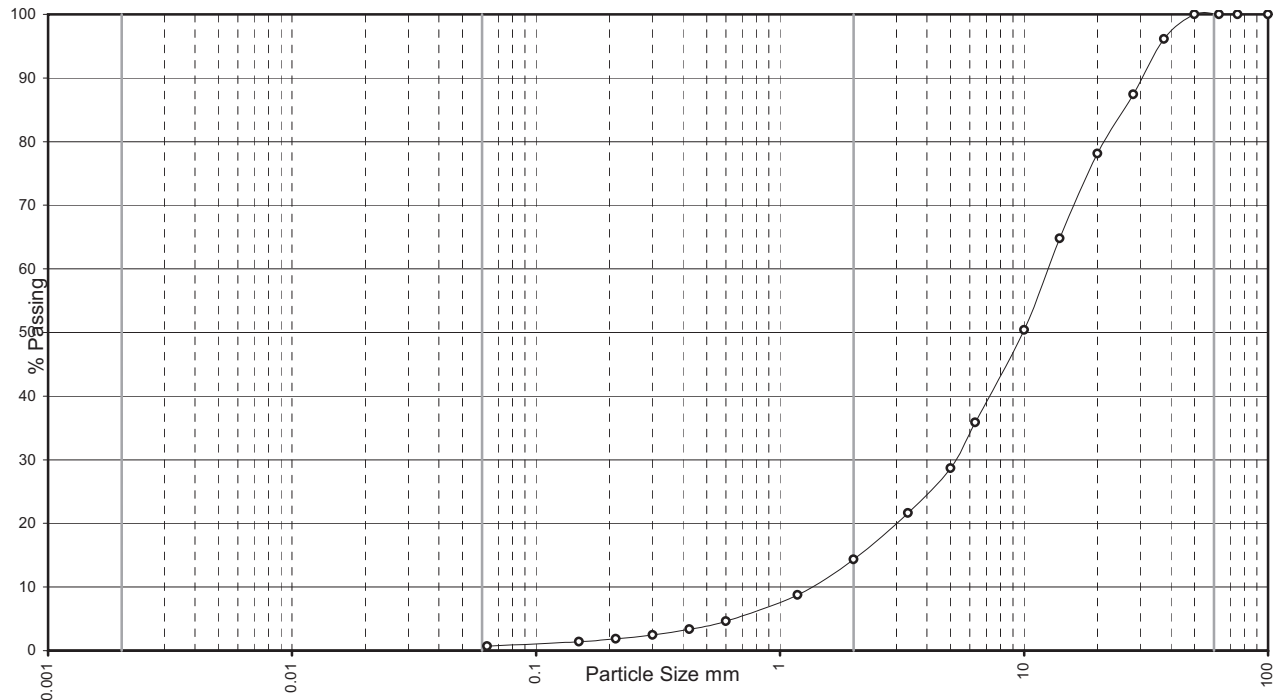
Sieve Size mm	% Passing
3.35	75
2	73
1.18	72
0.6	69
0.425	67
0.3	63
0.212	58
0.15	53
0.063	43

Cobbles	
Gravel	27
Sand	30
Silt/Clay	43

Site: Bonc Wen

Borehole No BH04 Sample U 1 Depth: 1.20 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Black brown slightly clayey fine-coarse angular flat MUDSTONE and COAL

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	100
38	96
28	87
20	78
14	65
10	50
6.30	36
5	29

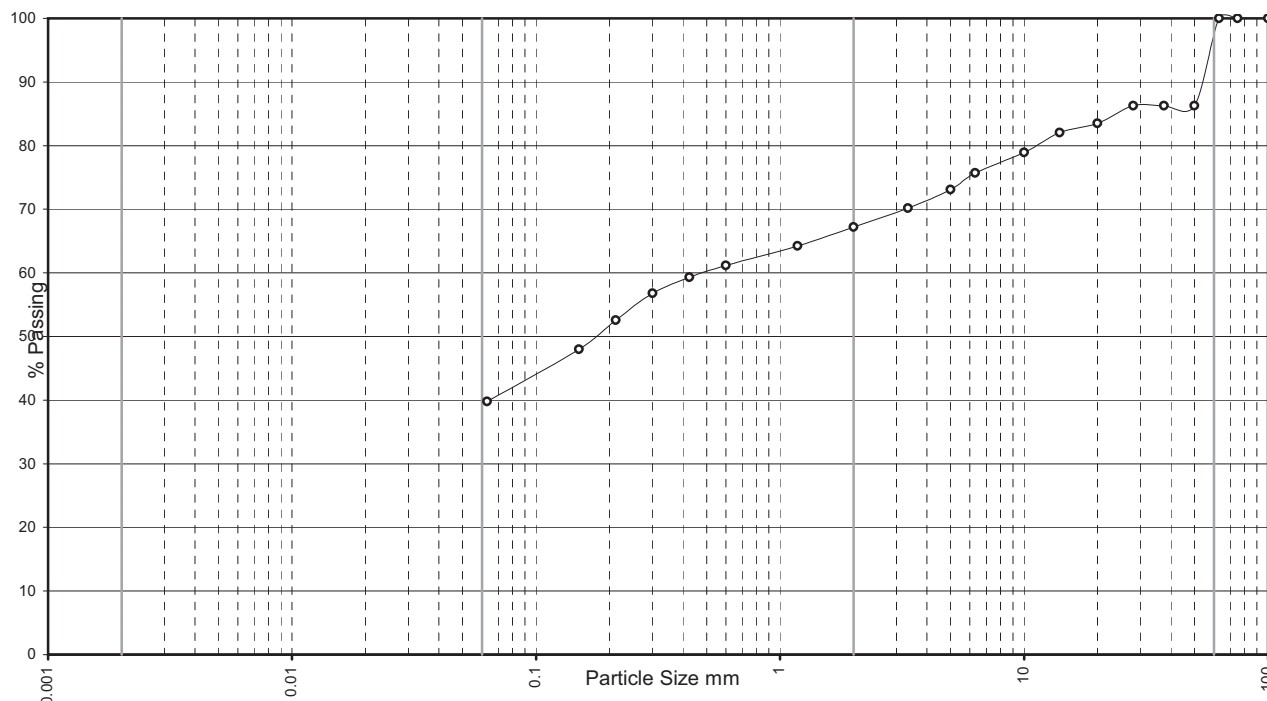
Sieve Size mm	% Passing
3.35	22
2	14
1.18	9
0.6	5
0.425	3
0.3	2
0.212	2
0.15	1
0.063	1

Cobbles	
Gravel	86
Sand	14
Silt/Clay	1

Site: Bonc Wen

Borehole No BH04 Sample U 2 Depth: 2.40 m

Particle Size Distribution BS1377 :1990 Part 2
Test 9.2 Wet Sieving, 9.4 Sedimentation - Pipette Method



CLAY	SILT			SAND			GRAVEL			COBBLES
	Fine 0.002	Medium 0.006	Coarse 0.02	Fine 0.06	Medium 0.2	Coarse 0.6	Fine 2.0	Medium 6.0	Coarse 20	

SAMPLE DESCRIPTION

Light greyish brown fine-coarse sandy CLAY with fine-coarse angular flat mudstone gravel

Sieve Size mm	% Passing
125	100
100	100
75	100
63	100
50	86
38	86
28	86
20	84
14	82
10	79
6.30	76
5	73

Sieve Size mm	% Passing
3.35	70
2	67
1.18	64
0.6	61
0.425	59
0.3	57
0.212	53
0.15	48
0.063	40

Cobbles	
Gravel	33
Sand	27
Silt/Clay	40

APPENDIX 3.4 Chemical Contamination Results





Certificate of Analysis

Certificate Number 15-29428

23-Mar-15

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

Our Reference 15-29428

Client Reference SRL164

Contract Title Bonc Wen

Description 10 Soil samples.

Date Received 11-Mar-15

Date Started 11-Mar-15

Date Completed 23-Mar-15

Test Procedures Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.

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

A handwritten signature in black ink, appearing to read 'Rob Brown'.

Rob Brown
Business Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428
 Client Ref SRL164
 Contract Title Bonc Wen

Lab No	781167	781168	781169	781170	781171	781172
Sample ID	TC 02	TC 01	TP 01	TP 02	TP 02	TP 03
Depth	0.90	1.30	0.50	0.30	0.80	0.55
Other ID						
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	11	10	19	30	20	8.9
Barium	DETSC 2301#	1.5	mg/kg	76	75	100	90	93	58
Beryllium	DETSC 2301#	0.2	mg/kg	1.2	1.2	1.0	0.8	1.6	1.0
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.2	1.5	0.4	0.8	0.7	0.7
Cadmium	DETSC 2301#	0.1	mg/kg	18	19	1.5	2.2	2.2	2.8
Chromium	DETSC 2301#	0.15	mg/kg	13	13	17	37	15	16
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	27	25	38	47	49	31
Lead	DETSC 2301#	0.3	mg/kg	190	95	550	130	160	23
Mercury	DETSC 2325#	0.05	mg/kg	0.07	< 0.05	0.08	0.06	0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	19	20	19	38	31	26
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	0.6	0.9	0.7	< 0.5
Vanadium	DETSC 2301	0.8	mg/kg	24	24	29	43	28	49
Zinc	DETSC 2301#	1	mg/kg	1200	1100	980	280	390	100
Inorganics									
pH	DETSC 2008#			8.6	7.2	7.8	8.0	7.6	7.9
Cyanide total	DETSC 2130#	0.1	mg/kg	0.1	0.2	0.2	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	8.8	7.2	7.4	15	10	2.4
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	260	25	58	25	22	38
Sulphide	DETSC 2024#	10	mg/kg	20	28	52	64	60	24
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.25	0.05	0.09	0.09	0.08	0.03
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	3.5	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	3.1	< 1.4	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781167	781168	781169	781170	781171	781172
Sample ID	TC 02	TC 01	TP 01	TP 02	TP 02	TP 03
Depth	0.90	1.30	0.50	0.30	0.80	0.55
Other ID						
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
PAHs									
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	0.15	< 0.03	< 0.03	0.07	< 0.03	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	0.16	< 0.03	< 0.03	0.07	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	0.71	< 0.03	< 0.03	0.09	< 0.03	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	0.76	< 0.03	< 0.03	0.08	< 0.03	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	0.25	< 0.03	< 0.03	0.03	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	0.32	< 0.03	< 0.03	0.04	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	0.33	< 0.03	< 0.03	0.04	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	0.12	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	0.22	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	0.12	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	0.12	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	3.3	< 0.10	< 0.10	0.42	< 0.10	< 0.10
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4	0.4	0.4	< 0.3	0.6	< 0.3

Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428
 Client Ref SRL164
 Contract Title Bonc Wen

Lab No	781167	781168	781169	781170	781171	781172
Sample ID	TC 02	TC 01	TP 01	TP 02	TP 02	TP 03
Depth	0.90	1.30	0.50	0.30	0.80	0.55
Other ID						
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
VOCs									
Vinyl Chloride	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
trans-1,3-dichloropropene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
m+p-Xylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
o-Xylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromoform	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Bromobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-chlorotoluene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4-chlorotoluene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781167	781168	781169	781170	781171	781172
Sample ID	TC 02	TC 01	TP 01	TP 02	TP 02	TP 03
Depth	0.90	1.30	0.50	0.30	0.80	0.55
Other ID						
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
sec-butylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
SVOCs									
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781167	781168	781169	781170	781171	781172
Sample ID	TC 02	TC 01	TP 01	TP 02	TP 02	TP 03
Depth	0.90	1.30	0.50	0.30	0.80	0.55
Other ID						
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781173	781174	781175	781176
Sample ID	TP03	TP04	TP04	TP04
Depth	1.00	0.30	1.00	1.75
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Metals							
Arsenic	DETSC 2301#	0.2	mg/kg	9.3	7.5	13	79
Barium	DETSC 2301#	1.5	mg/kg	83	37	74	56
Beryllium	DETSC 2301#	0.2	mg/kg	1.1	0.9	1.5	0.8
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	0.8	0.6	1.1	1.7
Cadmium	DETSC 2301#	0.1	mg/kg	0.7	0.6	0.7	0.6
Chromium	DETSC 2301#	0.15	mg/kg	11	15	10	16
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	35	30	44	26
Lead	DETSC 2301#	0.3	mg/kg	41	18	39	53
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	< 0.05	< 0.05	0.07
Nickel	DETSC 2301#	1	mg/kg	29	33	27	18
Selenium	DETSC 2301#	0.5	mg/kg	1.5	< 0.5	0.6	1.7
Vanadium	DETSC 2301	0.8	mg/kg	15	12	18	25
Zinc	DETSC 2301#	1	mg/kg	130	110	110	45
Inorganics							
pH	DETSC 2008#			8.0	8.0	7.9	5.1
Cyanide total	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	14	1.3	11	15
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	110	10	49	68
Sulphide	DETSC 2024#	10	mg/kg	36	40	48	40
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.05	0.01	0.07	0.48
Petroleum Hydrocarbons							
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2	< 1.2	< 1.2	< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5	< 1.5	< 1.5	< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4	< 3.4	< 3.4	< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01	0.10	0.06	0.35
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9	< 0.9	< 0.9	< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6	< 0.6	< 0.6	< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4	< 1.4	< 1.4	< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
TPH Ali/Aro	DETSC 3072*	10	mg/kg	< 10	< 10	< 10	< 10
Benzene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3321#	0.01	mg/kg	< 0.01	0.01	< 0.01	0.06

Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781173	781174	781175	781176
Sample ID	TP03	TP04	TP04	TP04
Depth	1.00	0.30	1.00	1.75
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Toluene	DETSC 3321#	0.01	mg/kg	< 0.01	< 0.01	< 0.01	0.01
Xylene	DETSC 3321#	0.01	mg/kg	< 0.01	0.09	0.05	0.28
PAHs							
Naphthalene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Acenaphthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluorene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Phenanthrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.05	< 0.03
Anthracene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.05	< 0.03
Pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	0.05	< 0.03
Benzo(a)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Chrysene	DETSC 3303	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(b)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(k)fluoranthene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(a)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Benzo(g,h,i)perylene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Dibenzo(a,h)anthracene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Indeno(1,2,3-c,d)pyrene	DETSC 3303#	0.03	mg/kg	< 0.03	< 0.03	< 0.03	< 0.03
Total PAH - USEPA 16	DETSC 3303	0.1	mg/kg	< 0.10	< 0.10	0.14	< 0.10
Phenols							
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	0.5

Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781173	781174	781175	781176
Sample ID	TP03	TP04	TP04	TP04
Depth	1.00	0.30	1.00	1.75
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
VOCs							
Vinyl Chloride	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1 Dichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Trans-1,2-dichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Cis-1,2-dichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
2,2-dichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Bromochloromethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chloroform	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1-trichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1-dichloropropene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Carbon tetrachloride	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Benzene	DETSC 3431*	0.01	mg/kg	< 0.01	0.10	0.03	0.11
1,2-dichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Trichloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dibromomethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Bromodichloromethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
cis-1,3-dichloropropene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Toluene	DETSC 3431*	0.01	mg/kg	< 0.01	0.01	0.03	2.1
trans-1,3-dichloropropene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1,2-trichloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Tetrachloroethylene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,3-dichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Dibromochloromethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromoethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Chlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,1,1,2-tetrachloroethane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Ethylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	0.21	0.02	3.5
m+p-Xylene	DETSC 3431*	0.01	mg/kg	< 0.01	0.33	0.09	11
o-Xylene	DETSC 3431*	0.01	mg/kg	< 0.01	0.16	0.04	< 0.01
Styrene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	0.01	0.61
Bromoform	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Isopropylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	0.03	0.02	0.75
Bromobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
n-propylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	0.02	< 0.01	0.54
2-chlorotoluene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,3,5-trimethylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	0.20	0.12	6.4
4-chlorotoluene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Tert-butylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trimethylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	0.48	0.17	12

Summary of Chemical Analysis

Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781173	781174	781175	781176
Sample ID	TP03	TP04	TP04	TP04
Depth	1.00	0.30	1.00	1.75
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
sec-butylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
p-isopropyltoluene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	0.02	0.59
1,3-dichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,4-dichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
n-butylbenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	1.1
1,2-dichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2-dibromo-3-chloropropane	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2,4-trichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
Hexachlorobutadiene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
1,2,3-trichlorobenzene	DETSC 3431*	0.01	mg/kg	< 0.01	< 0.01	< 0.01	< 0.01
SVOCs							
Phenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Aniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Chlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Benzyl Alcohol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-chloroisopropyl)ether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
3&4-Methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dimethylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bis-(dichloroethoxy)methane	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
1,2,4-Trichlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Chloro-3-methylphenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Methylnaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorocyclopentadiene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4,6-Trichlorophenol	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4,5-Trichlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Chloronaphthalene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,4-Dinitrotoluene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
3-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzofuran	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,6-Dinitrotoluene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,3,4,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Diethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Chlorophenylphenylether	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Nitroaniline	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2-Methyl-4,6-Dinitrophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Diphenylamine	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
4-Bromophenylphenylether	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Hexachlorobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1

Summary of Chemical Analysis Soil Samples

Our Ref 15-29428

Client Ref SRL164

Contract Title Bonc Wen

Lab No	781173	781174	781175	781176
Sample ID	TP03	TP04	TP04	TP04
Depth	1.00	0.30	1.00	1.75
Other ID				
Sample Type	ES	ES	ES	ES
Sampling Date	09/03/15	09/03/15	09/03/15	09/03/15
Sampling Time	n/s	n/s	n/s	n/s

Test	Method	LOD	Units				
Pentachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-butylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Butylbenzylphthalate	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Bis(2-ethylhexyl)phthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Di-n-octylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
1,4-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Dimethylphthalate	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
1,3-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
1,2-Dinitrobenzene	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
2,3,5,6-Tetrachlorophenol	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Azobenzene	DETSC 3433	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1
Carbazole	DETSC 3433*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1

Summary of Asbestos Analysis

Soil Samples

Our Ref 15-29428
 Client Ref SRL164
 Contract Title Bonc Wen

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
781167	TC 02 0.90	SOIL	NAD	none	Colin Patrick
781168	TC 01 1.30	SOIL	NAD	none	Colin Patrick
781169	TP 01 0.50	SOIL	NAD	none	Colin Patrick
781170	TP 02 0.30	SOIL	NAD	none	Colin Patrick
781171	TP 02 0.80	SOIL	NAD	none	Colin Patrick
781172	TP 03 0.55	SOIL	NAD	none	Colin Patrick
781173	TP03 1.00	SOIL	NAD	none	Colin Patrick
781174	TP04 0.30	SOIL	NAD	none	Colin Patrick
781175	TP04 1.00	SOIL	NAD	none	Colin Patrick
781176	TP04 1.75	SOIL	NAD	none	Colin Patrick

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 15-29428
Client Ref SRL164
Contract Bonc Wen

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
781167	TC 02 0.90 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781168	TC 01 1.30 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781169	TP 01 0.50 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781170	TP 02 0.30 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781171	TP 02 0.80 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781172	TP 03 0.55 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781173	TP03 1.00 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781174	TP04 0.30 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781175	TP04 1.00 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
781176	TP04 1.75 SOIL	09/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		

Key: G-Glass P-Plastic J-Jar 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 and/or inappropriate containers 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



Certificate of Analysis

Certificate Number 15-31488-1

22-Apr-15

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

Our Reference 15-31488-1

Client Reference SRL164

Contract Title Bonc Wen

Description 15 Soil samples.

Date Received 02-Apr-15

Date Started 02-Apr-15

Date Completed 22-Apr-15

Test Procedures Identified by prefix DETSn (details on request), Asbestos Analysis DETSC 1101.

Notes **This report supersedes 15-31488, Extra Testing**

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

A handwritten signature in black ink, appearing to read 'Rob Brown'.

Rob Brown
Business Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 15-31488-1

Client Ref SRL164

Contract Title Bonc Wen

Lab No	792680	792681	792682	792683	792684	792685
Sample ID	BH2	BH2	BH2	BH3	BH3	BH3
Depth	1.00	2.00	3.00	0.50	2.00	3.00
Other ID	2	3	4	2	4	5
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	31/03/15	31/03/15	31/03/15	31/03/15	31/03/15	31/03/15
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	9.2	9.6	4.1	15	7.8	5.8
Barium	DETSC 2301#	1.5	mg/kg	54	69	43	200	110	72
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	0.8	0.4	1.6	1.2	1.2
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	0.7	1.6	0.8	1.5	1.6	1.3
Cadmium	DETSC 2301#	0.1	mg/kg	0.7	0.6	0.3	1.3	0.8	1.4
Chromium	DETSC 2301#	0.15	mg/kg	11	13	10	38	17	12
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	19	20	10	46	16	23
Lead	DETSC 2301#	0.3	mg/kg	42	47	25	96	32	24
Mercury	DETSC 2325#	0.05	mg/kg	0.06	0.05	< 0.05	0.18	< 0.05	< 0.05
Nickel	DETSC 2301#	1	mg/kg	14	13	11	29	22	23
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301	0.8	mg/kg	18	22	9.9	53	26	16
Zinc	DETSC 2301#	1	mg/kg	90	69	21	280	75	150
Inorganics									
pH	DETSC 2008#			8.1	7.7	7.4	11.5	11.8	11.2
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.3	0.1	0.2	< 0.1	< 0.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	24	170	110	390	80	260
Sulphide	DETSC 2024#	10	mg/kg	56	76	48	140	150	310
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.07	0.10	0.05	0.50	0.26	0.22
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.2	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.9	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	1.9	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	12	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	3.7	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	14	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	13	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	4.3	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	4.4	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	3.2	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	2.3	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	4.6	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	2.5	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.5	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	2.6	< 0.1	< 0.1
PAH	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	71	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis

Soil Samples

Our Ref 15-31488-1

Client Ref SRL164

Contract Title Bonc Wen

Lab No	792686	792687	792688	792689	792690	792691
Sample ID	BH4	BH4	BH4	BH4	BH4	BHY1
Depth	0.20	0.50	1.00	2.00	3.00	1.00
Other ID	1	2	3	4	5	2
Sample Type	ES	ES	ES	ES	ES	ES
Sampling Date	31/03/15	31/03/15	31/03/15	31/03/15	31/03/15	31/03/15
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	9.7	7.2	30	16	12	7.5
Barium	DETSC 2301#	1.5	mg/kg	120	210	250	190	150	100
Beryllium	DETSC 2301#	0.2	mg/kg	1.0	1.5	1.6	1.6	1.2	0.5
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.2	1.4	1.1	1.2	0.8	0.6
Cadmium	DETSC 2301#	0.1	mg/kg	1.4	2.4	4.5	1.3	1.4	0.7
Chromium	DETSC 2301#	0.15	mg/kg	19	22	31	38	17	13
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	30	31	58	46	43	16
Lead	DETSC 2301#	0.3	mg/kg	87	230	580	94	140	61
Mercury	DETSC 2325#	0.05	mg/kg	0.08	0.08	0.07	0.08	0.06	< 0.05
Nickel	DETSC 2301#	1	mg/kg	24	26	44	28	29	21
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301	0.8	mg/kg	25	46	50	51	18	12
Zinc	DETSC 2301#	1	mg/kg	300	700	1400	280	1000	50
Inorganics									
pH	DETSC 2008#			10.8	9.0	10.0	9.6	7.2	8.3
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	1400	1400	950	1300	320	41
Sulphide	DETSC 2024#	10	mg/kg	64	120	400	110	60	12
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.55	0.37	0.58	0.39	0.15	0.02
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 1.0	< 0.1	0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	0.2	< 1.0	< 0.1	0.3	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	0.2	< 1.0	< 0.1	0.2	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	0.3	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	1.6	2.2	0.4	0.2	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	0.6	< 1.0	0.2	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	3.4	4.5	1.2	0.4	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	3.0	4.0	1.1	0.4	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	1.6	< 1.0	0.7	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	1.4	< 1.0	0.5	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	1.1	< 1.0	0.5	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.8	< 1.0	0.4	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	1.7	< 1.0	0.7	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	0.8	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.7	< 1.0	< 0.1	< 0.1	< 0.1	< 0.1
PAH	DETSC 3301	1.6	mg/kg	18	< 16.0	5.7	1.7	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3	1.8	0.5	< 0.3	< 0.3	< 0.3

Summary of Chemical Analysis

Soil Samples

Our Ref 15-31488-1

Client Ref SRL164

Contract Title Bonc Wen

Lab No	792692	792693	792694
Sample ID	BH1	TC 01	TC 02
Depth	2.00	0.60	0.60
Other ID	3	1	1
Sample Type	ES	ES	ES
Sampling Date	31/03/15	31/03/15	31/03/15
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg	7.0	7.6	7.7
Barium	DETSC 2301#	1.5	mg/kg	75	210	110
Beryllium	DETSC 2301#	0.2	mg/kg	0.7	1.5	0.6
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	1.1	1.2	1.4
Cadmium	DETSC 2301#	0.1	mg/kg	0.7	2.7	0.8
Chromium	DETSC 2301#	0.15	mg/kg	14	22	13
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	15	35	17
Lead	DETSC 2301#	0.3	mg/kg	42	330	110
Mercury	DETSC 2325#	0.05	mg/kg	< 0.05	0.23	0.12
Nickel	DETSC 2301#	1	mg/kg	17	26	21
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5
Vanadium	DETSC 2301	0.8	mg/kg	15	45	13
Zinc	DETSC 2301#	1	mg/kg	44	860	90
Inorganics						
pH	DETSC 2008#			10.3	7.4	9.5
Cyanide Total	DETSC 2130#	0.1	mg/kg	< 0.1	0.1	0.2
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	310	550	220
Sulphide	DETSC 2024#	10	mg/kg	48	260	860
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.12	0.21	0.41
PAHs						
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	0.2	0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	0.3	0.3
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	1.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	0.4	1.9
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	2.1	11
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.8	4.4
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	3.9	23
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	4.3	18
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	1.9	7.7
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	2.1	7.7
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	1.2	5.0
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	0.8	3.0
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	2.1	6.7
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	1.3	4.0
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	0.6	1.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	0.9	3.5
PAH	DETSC 3301	1.6	mg/kg	< 1.6	23	98
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.3	< 0.3	< 0.3

Summary of Asbestos Analysis

Soil Samples

Our Ref 15-31488-1
 Client Ref SRL164
 Contract Title Bonc Wen

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
792680	BH2 2 1.00	SOIL	NAD	none	J Woodmansey
792681	BH2 3 2.00	SOIL	NAD	none	J Woodmansey
792682	BH2 4 3.00	SOIL	NAD	none	J Woodmansey
792683	BH3 2 0.50	SOIL	NAD	none	J Woodmansey
792684	BH3 4 2.00	SOIL	NAD	none	J Woodmansey
792685	BH3 5 3.00	SOIL	NAD	none	J Woodmansey
792686	BH4 1 0.20	SOIL	NAD	none	J Woodmansey
792687	BH4 2 0.50	SOIL	NAD	none	J Woodmansey
792688	BH4 3 1.00	SOIL	NAD	none	J Woodmansey
792689	BH4 4 2.00	SOIL	NAD	none	J Woodmansey
792690	BH4 5 3.00	SOIL	NAD	none	J Woodmansey
792691	BHY1 2 1.00	SOIL	NAD	none	J Woodmansey
792692	BH1 3 2.00	SOIL	NAD	none	J Woodmansey
792693	TC 01 1 0.60	SOIL	NAD	none	J Woodmansey
792694	TC 02 1 0.60	SOIL	Chrysotile	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.

Summary of Asbestos Quantification Analysis

Soil Samples

Our Ref 15-31488-1

Client Ref SRL164

Contract Title Bonc Wen

Lab No	792694
Sample ID	TC 02
Depth	0.60
Other ID	1
Sample Type	SOIL
Sampling Date	31/03/15
Sampling Time	

Test	Method	Units	
Total Mass% Asbestos (a+b+c)	DETSC 1102	Mass %	< 0.001
Gravimetric Quantification (a)	DETSC 1102	Mass %	na
Detailed Gravimetric Quantification (b)	DETSC 1102	Mass %	<0.001
Quantification by PCOM (c)	DETSC 1102	Mass %	na
Potentially Respirable Fibres (d)	DETSC 1102	Fibres/g	na
Breakdown of Gravimetric Analysis (a)			
Mass of Sample		g	67.04
ACMs present*		type	
Mass of ACM in sample		g	
% ACM by mass		%	
% asbestos in ACM		%	
% asbestos in sample		%	
Breakdown of Detailed Gravimetric Analysis (b)			
% Amphibole bundles in sample		Mass %	na
% Serpentine bundles in sample		Mass %	<0.001
Breakdown of PCOM Analysis (c)			
% Amphibole fibres in sample		Mass %	na
% Serpentine fibres in sample		Mass %	na
Breakdown of Potentially Respirable Fibre Analysis (d)			
Amphibole fibres		Fibres/g	na
Chrysotile fibres		Fibres/g	na

* Denotes test or material description outside of UKAS accreditation.
 % asbestos in Asbestos Containing Materials (ACMs) is determined by
 by reference to HSG 264.
 Recommended sample size for quantification is approximately 1kg
 # denotes deviating sample

Information in Support of the Analytical Results

Our Ref 15-31488-1
Client Ref SRL164
Contract Bonc Wen

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
792680	BH2 1.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792681	BH2 2.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792682	BH2 3.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792683	BH3 0.50 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792684	BH3 2.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792685	BH3 3.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792686	BH4 0.20 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792687	BH4 0.50 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792688	BH4 1.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792689	BH4 2.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792690	BH4 3.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792691	BHY1 1.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792692	BH1 2.00 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792693	TC 01 0.60 SOIL	31/03/15	GJ 250ml, GJ 60ml x2, PT 1L x2		
792694	TC 02 0.60 SOIL	31/03/15	PT 1L x2		Naphthalene, PAH FID

Key: G-Glass P-Plastic J-Jar 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 and/or inappropriate containers 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.

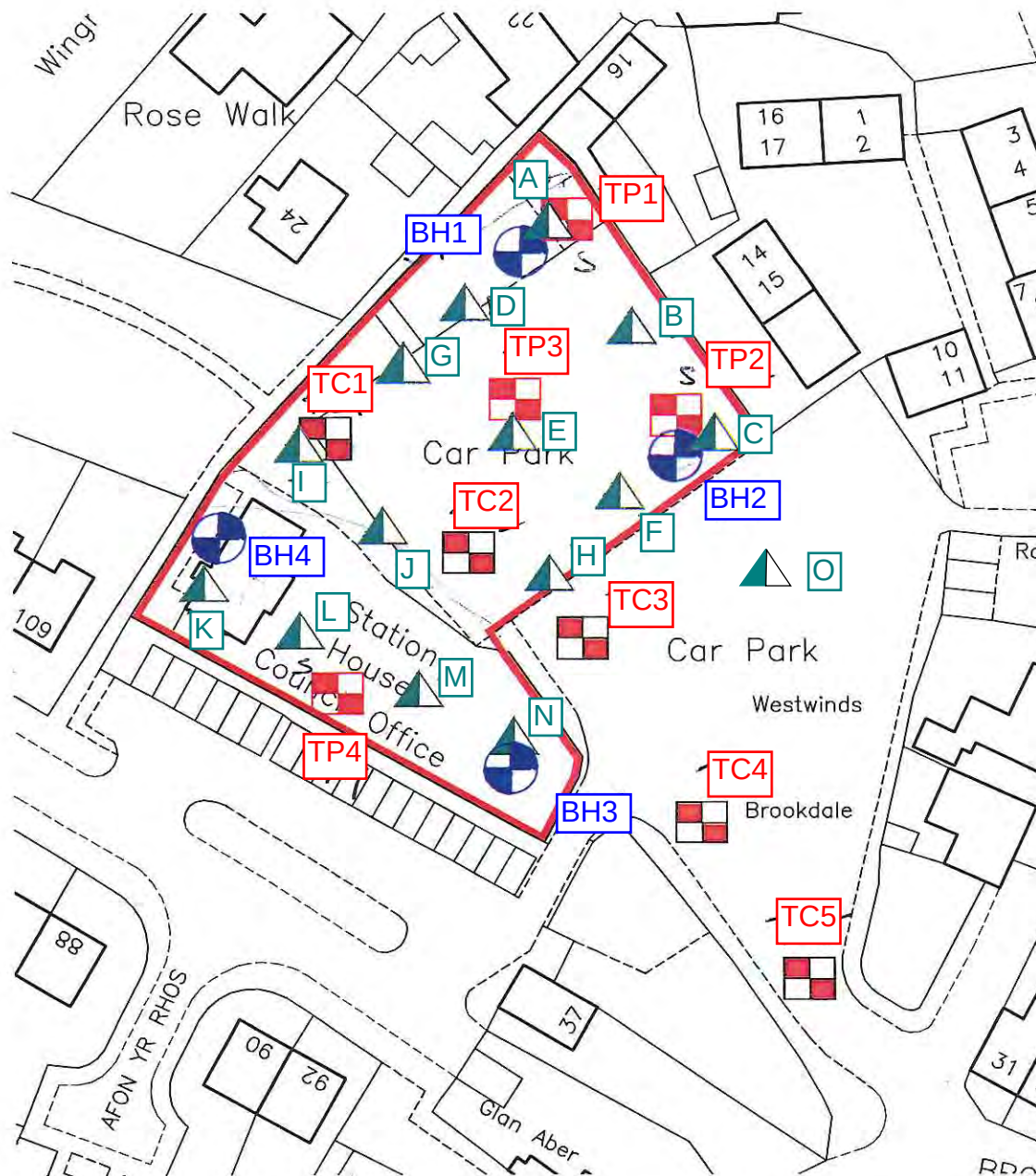
Disposal

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





Ground Investigation



Trial Pit



Dynamic Probe



Borehole



Trial Pit + CBR

TITLE

Site investigation

PROJECT

Bonc Wen,
Rhosllanerchugog



Yr Awdurdod
o'r Gogledd Cymru
Cymru
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Telephone
Fax
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Internet

Job No.	14186	DATE	2/2/2015	SCALE	N/A
ACAD Ref.	-	CHECKED		PASSED	
DRAWN	NHW	DRG No.	14186/SI	REV	

APPENDIX 5 SITE LOCATION PLAN.



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SRL