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1. INTRODUCTION

1.1. Brief

This report presents the geotechnical interpretation of the ground investigation at Lytham Road as part of the EBN High School programme for Manchester City Council. This report makes use of the findings of a ground investigation designed and supervised by Ramboll and confirms the findings of the Robson Liddle 2015 ground investigation. This report also informs the design and construction of the proposed development, and identifies any mitigation measures or remediation that may be required to reduce the potential risks from the current ground condition.

Ramboll undertook a combined geotechnical and contaminated land ground investigation at the site in March 2016, in order to acquire the necessary information required to make an assessment of the underlying ground conditions.

This report discusses the findings of the geotechnical elements of the ground investigation and provides recommendations relating to the potential risks and constraints associated with the ground conditions that are relevant to the redevelopment of the site. It does not contain information relating to the ground contamination elements of the ground investigation; interpretation of the ground contamination aspects of the ground investigation are discussed in Ramboll (2016) *EBN High Schools – Lytham Rd., Manchester – Ground Contamination Interpretative Report* (Report Ref. 1620001457-LR-INT).

The following reports were prepared specifically for the site and should be read in conjunction with this report:

- Ramboll (2016) *EBN High Schools – Lytham Rd, Manchester – Contaminated Land and Geotechnical Desk Study Report* (Report Ref. 1620001457-DS), Ramboll, February 2016; and
- Ramboll (2016) *EBN High Schools – Lytham Rd., Manchester – Ground Contamination Interpretative Report* (Report Ref. 1620001457-LR-INT), Ramboll, April 2016.

1.2. Scope and Objectives of Report

The scope of this report includes the determination of the geotechnical aspects of the proposed development and to establish the basis for future foundation design and analysis. The report is based on information derived from interpretation of the ground investigation works undertaken by Ramboll during March 2016. This report has been written to satisfy the following objectives:

- To summarise the ground investigation and its findings;
- To interpret the ground conditions encountered; and
- To provide ground models and characteristic values of geotechnical parameters for the design of foundations based on the available factual information.

1.3. Constraints and Limitations

The information presented within this report is based on observations made on site during inspections of the ground investigation activities through the period of works and on borehole logs, ground water monitoring data and laboratory test reports.

This report has been prepared for the exclusive use of Laing O'Rourke for the purpose of assisting them in evaluating the site in the context of the proposed development. This report should not be used in whole or part by any third parties without the express permission of Ramboll UK in writing.

Ramboll UK has endeavoured to assess all available information during this appraisal. The report summarises information from a number of external sources and Ramboll cannot offer any guarantees or warranties for the completeness or accuracy of information relied upon.

The ground investigation has been undertaken using a number of exploratory holes located at positions determined from information obtained on the site history, current site use, proposed location of development works, the likely ground conditions and the current standards at the time the work was undertaken. Since the ground conditions are only known in detail at each exploratory hole location the ground conditions between holes have been interpolated. The actual nature of the ground may differ from our interpretation. The extent of the ground investigation carried out was to provide an overview of ground conditions on site and was limited to boreholes.

The proposed geotechnical design options and recommendations summarised in this report relate to details of the proposed development at the time of writing the report. Any substantial changes to the proposed design may require a reassessment of the implications of the risks identified and a review of the geotechnical design options.

Ramboll UK does not accept responsibility for the design of any elements that have incorporated assumptions stated within this report where the responsibility for the design of such elements lies with a third party.

It should be noted that although every effort has been made to ensure the accuracy of the data obtained from the investigation, the possibility exists for variations in ground and groundwater conditions between and around the exploratory hole locations. In addition, groundwater levels are likely to vary seasonally and with changes in weather conditions.

2. SITE SETTING

2.1. Site Location

The site is located approximately 5 km southeast of Manchester city centre at coordinates 386560, 394400, and postal address Lytham Road, Manchester, M14 6PL. The site is approximately 3.21 Ha in area and is roughly rectangular in shape, except for a railway line that forms the eastern site boundary, cutting across the southeast corner of the rectangle and forming a trapezoidal shape.

A Site Location Plan is presented as Fig. 1.

2.2. Site Description

The ground level varies between approximately 48 mAOD to 46 mAOD across the site. The site is a former recreation ground, which is currently disused, with a former cricket pitch in the centre of the site and former tennis courts along the western site boundary. During the investigation the perimeter of the site was overgrown with mature trees, shrubs and rank vegetation, although much of this was cleared in the days following the ground investigation.

The majority of the site comprises rough grassland with areas of localised surface water flooding observed at the time of the ground investigation. Parts of the site were observed to suffer badly from rutting under the weight of certain vehicles used during the ground investigation, indicating very soft surface ground conditions.

The northern site boundary was heavily vegetated with shrubs, mature trees and rank vegetation.

The eastern site boundary is a mass of dense vegetation including brambles leading up to the railway embankment. There is a lighting column supporting flood lights in the north-eastern area of the site; it is not known if these lights are in good working order. There is a telecommunications mast on site which appears to be in good condition. There is also a plant room associated with the telecommunications mast along the eastern site boundary which is fenced-off from the rest of the site and locked. To the south of the plant room are brick built structures approximately 1.0m in height. The nature of these structures is currently unknown.

There are relict foundations and hardstanding associated with the former pavilion structure in the south-eastern part of the site.

The southern site boundary is defined by a palisade type fence, the remains of a hedge, and by rank vegetation.

There are brick/concrete/wooden structures in the south-western corner of the site which appear to have been used as changing rooms. They are in disrepair and no longer in use.

The tennis courts in the west of the site are no longer visible apart from the net up-stands. There is evidence of fly tipping along the western site boundary including old beds, general household rubbish, chairs, plastic sledge and garden pots, kitchen cupboard doors, *etc.* These items appear to have been tipped from the adjacent residential properties (although this is not proven).

The site is bounded to the north by semi-detached residential properties on 4 No. Cul-de-sac streets that run north-south off Old Hall Lane further to the north; to the east by the railway line and embankment structure; to the south by Lytham Road with Birchfields

Primary School beyond; and to the west by semi-detached residential properties along Birchfield Road.

A Site Layout Plan is presented in Fig. 2 in Appendix A.

2.3. Proposed Development

The development proposals comprise the clearance of the existing structures and overgrown vegetation and construction of a new three-storey high school development and sports hall with associated parking, sports pitches, outdoor curriculum spaces, hard landscaped areas and soft landscaped areas with potential habitat/growing spaces.

3. GROUND INVESTIGATION

3.1. Design

The ground investigation was designed by Ramboll UK to investigate the ground and groundwater conditions of the site. The scope of the ground investigation was determined based on the preliminary qualitative risk assessment, the proposed development, the available desk study information, and on the findings of the Robson Liddle 2015 ground investigation.

3.2. Ground Investigation Activities

The ground investigation was undertaken in general accordance with:

- BS 5930 (1999) Code of Practice for Ground Investigation;
- BS1377 Methods of test for Soils for Civil Engineering Purposes;
- BS 10175:2011 (2011) Investigation of Potentially Contaminated Sites – Code of Practice; and
- BS EN 1997-2:2007 (2007) Eurocode 7 – Geotechnical Design – Ground Investigation and Testing.

The ground investigation comprised the following items of fieldwork:

- Twelve windowless sampler boreholes to maximum depth 5.45 mbgl;
- Two cable percussion boreholes to maximum depth 9.45 mbgl;
- Eighteen hand-dug pits to maximum depth 0.80 mbgl;
- Three soakaway tests undertaken in machine-excavated trial pits to maximum depth 3.40 mbgl;
- Soil sampling for subsequent chemical and geotechnical laboratory analysis;
- Logging of soils to BS5930;
- *In situ* geotechnical testing (SPTs), disturbed and undisturbed (U100) samples from cable percussion boreholes; hand-held shear vane tests were also undertaken on suitable material in shallow machine-excavated pits;
- Installation of two cable percussion boreholes and six windowless sampler boreholes with combined groundwater/ground gas monitoring standpipes;
- Surveying of exploratory hole positions;
- Six rounds of groundwater level and ground gas monitoring, the first of which included groundwater sampling for subsequent laboratory analysis; and
- Interpretative reporting.

The ground investigation was undertaken over three days, between 7th and 9th March 2016. The investigation was supervised full time and boreholes were logged and sampled for subsequent laboratory chemical and/or geotechnical analyses by a qualified and experienced Ramboll Environ consultant; trial pits were logged and sampled by a qualified representative from TerraConsult Ltd., under the supervision of the Ramboll Environ engineer.

An Exploratory Hole Location Plan is presented in Appendix A, and exploratory hole logs are presented in Appendix B.

3.3. Sampling and in situ Testing

Bulk and disturbed samples of Made Ground and natural deposits were recovered from the exploratory holes for description and laboratory chemical and/or geotechnical analyses.

Standard penetration tests (SPTs) and undisturbed (U100) samples were undertaken at a range of depths in natural deposits during the advancement of cable percussion boreholes. Hand-held shear vane tests were also undertaken in suitable natural deposits in shallow machine-excavated pits.

Three soakaway tests were undertaken in accordance with BRE *Digest 365 Soakaway Design in SP201, SP202 and SP203*.

3.4. Geotechnical Laboratory Testing

Bulk, disturbed and undisturbed (U100) samples recovered from the two cable percussion boreholes were scheduled by a qualified and experienced Ramboll geotechnical engineer for geotechnical laboratory analysis at Professional Soils Laboratory in Doncaster. The following tests were scheduled on a selection of the samples:

- Moisture content;
- Liquid limit, plastic limit and plasticity index;
- Particle size distribution by wet sieving;
- Sedimentation by hydrometer;
- One-dimensional consolidation properties; and
- Undrained strength in triaxial compression.

The results of the geotechnical laboratory analyses and soakaway tests are presented in Appendix C.

3.5. Groundwater Monitoring

Groundwater monitoring standpipes were installed in the two cable percussion boreholes (BH201 and BH202) and dual purpose ground gas and groundwater monitoring standpipes were installed in six of the windowless sampler boreholes (WS201, WS203, WS205, WS206, WS208 and WS211).

Groundwater monitoring records are presented in Appendix D.

4. GROUND AND GROUNDWATER CONDITIONS

4.1. General Stratigraphy

Boreholes carried out on the site revealed Made Ground followed by natural Clay overlying Mudstone. A summary of the geological strata encountered during the ground investigation is presented in Table 4.1. Borehole logs are presented in Appendix B.

Table 4.1 Summary of Geology Encountered During Ground Investigation

Stratum	Depth of Top of Stratum [mbgl]	Level of Top of Stratum [m AOD]	Thickness [m]
Made Ground (cohesive and granular)	0	+47.94 to +46.10	0.2 to 0.9
Clay	0.2 to 0.9	+47.59 to +45.66	7.5 to 8.15
Sand	0.6 to 4.0	+46.74 to +42.52	0.08 to 0.7
Mudstone	7.8 to 8.9	+38.39 to +37.84	0.65 (proven)

The following report sections provide descriptions and design parameters derived from the in-situ and laboratory testing conducted during and after the Ground Investigation.

4.2. Made Ground

Made Ground was encountered in all exploratory holes on site but in summary, was dominated by three main types: Asphalt hardstanding at the surface of the windowless sampler boreholes in the area of the former tennis courts (WS201, WS202 and WS203), with a gravel sub-base of limestone, tarmac, cinder/clinker and slag; sandy gravelly CLAY or SILT/CLAY in the majority of holes with gravel of sandstone, siltstone, quartzite, porcelain, concrete, brick, clinker, ash, tile, glass and coal; and GRAVEL of either cinder/clinker, slag, ash, burnt shale with occasional sub-angular to sub-rounded cobbles of slag, brick and cinder/clinker, or predominantly of burnt shale, rarely of siltstone, and sandstone with rare fragments of porcelain.

Made Ground was typically encountered from ground surface to a depth of approximately 0.30-0.50 mbgl, but was locally deeper in a limited number of exploratory holes, with the deepest Made Ground recorded to a depth of 0.90 mbgl in WS211 and to 0.75 mbgl in BH202 and WS207. Other exploratory holes in which Made Ground was encountered to a depth that was greater than that typically encountered were WS212 (0.55 mbgl), WS203 and WS206 (0.60 mbgl). The area around WS206 and WS207 was that in which locally deeper Made Ground was also encountered in the Robson Liddle 2015 ground investigation. Made Ground was encountered to a depth that was less than that typically encountered in HP216 (0.20 mbgl) and SP203 (0.25 mbgl).

4.3. Natural Clay Deposits (Devensian Till)

Natural Clay was dominated by firm to stiff red-brown, brown, grey-brown and pale grey slightly sandy slightly gravelly CLAY with sub-angular to rounded fine to coarse gravel of sandstone, siltstone, mudstone, quartzite, rarely of coal. Other natural soils included a soft to firm grey, orange, pale grey and orange-brown slightly sandy slightly gravelly CLAY with angular to sub-rounded fine and medium gravel of sandstone, siltstone, mudstone, quartzite, rarely of coal, slate/shale and with rare pockets of firm pseudo-fibrous PEAT.

Other similarly clayey natural soils were also encountered, varying slightly from the descriptions above, as well as orange-brown and dark brown clayey fine and medium SAND that was encountered in a limited number of exploratory holes, either as discrete strata (WS205 2.90-3.60 mbgl and 4.00-4.70 mbgl, WS206 0.60-0.90 mbgl, HP210 0.47-0.55 mbgl) or as narrow lenses or pockets in clayey strata (BH201 2.50-7.10 mbgl, WS203 from 4.60 mbgl, WS204 3.20-4.00 mbgl, WS205 1.40-1.80 mbgl).

4.3.1. Classification

Natural moisture content in the Clay varies from 11% to 33%. Atterburg Limits were calculated for six samples and all samples were classified to be either clay of low or intermediate plasticity. The plasticity indices of six soil samples of the natural clay strata ranged from 15% to 18%, with the percentage of soil <425µm ranging from 83% to 92%. Modified plasticity indices were ranged from 12% to 16%. On the basis of the modified plasticity index, the clay would therefore be considered to be of low volume change potential with respect to NHBC Chapter 4.2 'Building Near Trees' (NHBC, 2016).

The Robson Liddle (2015) ground investigation identified the clay to be of low to medium volume change potential based on modified plasticity indices ranged from 14% to 29%. An average modified plasticity index of 18% can be adopted from the investigation and the clay would be considered of low volume change potential.

4.3.2. Undrained Shear Strength

Uncorrected SPT N values in the natural Clay ranged from 12 to 36 and there is a distinct increase in SPT N value with depth, Figure E1 in Appendix E, therefore design values can be expressed as a function of depth using the following formula;

$$\text{SPT } N = 12 + 3.0z$$

where $z = 0$ at 45.0 mAOD and increases with depth, in metres, below that level.

No direct measurements of effective strength parameters of the cohesive soils were undertaken during the ground investigation. A characteristic value of the effective angle of shearing resistance (ϕ') has been derived using the relationship between Plasticity Index (PI) and ϕ' of BS 8002:2015:

$$c'_k = 0 \text{ kN/m}^2 \text{ and } \phi'_k = 28^\circ$$

Undrained shear strength in the Clay can be approximated from the SPT results using the equation;

$$c_u = f1 \times N$$

[CIRIA Report 143, Standard Penetration Test (SPT): Methods and Use, 1995].

where $f1$ can be taken as 4.5 for the glacial Clay giving c_u in the range of 54 kN/m² to 162 kN/m².

Six undrained shear strength in triaxial compression tests were carried out on samples of the Clay. The undrained shear strength values ranged between 42 kN/m² to 143 kN/m².

Eighteen sets of hand shear vane tests were carried out at shallow depth in trial pits. The undrained shear strength values ranged between 70 kN/m² to 113 kN/m². The Robson

Liddle (2015) ground investigation reported a similar range, from 57 kN/m² to 120 kN/m², of hand shear vane test results for the Clay.

In order to determine a characteristic value (or design line), an undrained strength versus level plot has been produced using the undrained shear strength values obtained from the methods above and is presented in Figure E2 in Appendix E. The characteristic undrained strength is represented by the following formula;

$$c_u = 75 + 6.0z \text{ kN/m}^2$$

where $z = 0$ at 47 mAOD and increases with depth in metres below that level.

4.3.3. Stiffness Parameter

A value for undrained Young's Modulus (E_u) can be found from

$$E_u = 600 \times c_u, [\text{Tomlinson 2001}]$$

Therefore, undrained Young's Modulus is represented by the following equation;

$$E_u = 45,000 + 3,600z \text{ kN/m}^2$$

where $z = 0$ at 47.0 mAOD and increases with depth in metres below that level, Figure E3 in Appendix E.

Effective Young's Modulus is found from the equation, $E' = 0.6 \times E_u$ [Tomlinson 2001]. Therefore drained Young's Modulus is given by the following expression:

$$E' = 27,000 + 2,160z \text{ kN/m}^2$$

where $z = 0$ at 47.0 mAOD and increases with depth in metres below that level.

4.3.4. Volume Compressibility

The coefficient of volume compressibility (m_v), defined as the volume change per unit increase in effective stress, is not constant but depends on the stress range over which it is calculated. For the purposes of design the stress range has been provisionally based on a stress increment of 100 kN/m² in excess of the effective overburden pressure of the in-situ soil at the depth of sampling.

Six one dimensional consolidation tests were carried out on the Clay samples. Five stages (four stages increasing pressure and one decreasing pressure) of consolidation on each sample were undertaken with a range of increasing pressure from 15 kPa to 240 kPa. The coefficients of volume compressibility on increasing pressure ranged from 0.063 m²/MN to 0.730 m²/MN and on decreasing pressure were ranged from 0.01 m²/MN to 0.058 m²/MN, Figure E4 in Appendix E.

The coefficient of volume compressibility is reported for the pressure range which covers;

$$q' + 100 \text{ kN/m}^2$$

where, q' is the initial effective stress at the mid-point of each sub-layer.

The volume compressibility results can be interpreted with depths as follow;

Glacial Clay between 0 mbgl and 2.0 mbgl:	$m_v = 0.135 \text{ m}^2/\text{MN}$
Glacial Clay between 2.0 mbgl and 4.0 mbgl:	$m_v = 0.131 \text{ m}^2/\text{MN}$
Glacial Clay between 4.0 mbgl and 5.5 mbgl:	$m_v = 0.127 \text{ m}^2/\text{MN}$
Glacial Clay between 5.5 mbgl and 6.0 mbgl:	$m_v = 0.099 \text{ m}^2/\text{MN}$
Glacial Clay below 6 mbgl:	$m_v = 0.097 \text{ m}^2/\text{MN}$

4.3.5. Coefficient of Consolidation

The coefficient of consolidation (c_v), defined as the rate of volume change, can be used with the coefficient of volume compressibility to assess the proportion of volume change over a period of time. For an applied stress comparable to 100 kN/m^2 in addition to the effective overburden pressure of the in-situ soil at the depth of sampling, the corresponding c_v values for the Clay range from $2.0 \text{ m}^2/\text{year}$ to $24.4 \text{ m}^2/\text{year}$, with an average of $6.8 \text{ m}^2/\text{year}$ and a standard deviation of $5.9 \text{ m}^2/\text{year}$. The c_v values obtained from the oedometer test show considerably high scatters of the data, possibly due to the variable composition in the clay material. For design purposes, the average c_v of $6.8 \text{ m}^2/\text{year}$ is considered appropriate.

4.4. Solid Geology

Solid geology comprising very stiff to hard red-brown MUDSTONE was encountered in the deeper cable percussion boreholes at depths of 7.80 mbgl (BH201) and 8.90 mbgl (BH202).

4.5. Groundwater

Groundwater was encountered in a limited number of exploratory holes during the ground investigation as strikes, or more commonly as slight seepages, as detailed in Table 4.2 below.

Table 4.2 Summary of Groundwater encountered during Ground Investigation

Borehole No.	Description	Depth struck (mbgl)	Level struck (mAOD)
HP201	Groundwater seepage	0.38	45.72
WS202	Groundwater seepage	0.40	45.77
WS203	Groundwater seepage	0.40	45.86
WS205	Groundwater strike	2.90	43.62
	Groundwater strike	4.00	42.52
WS206	Groundwater seepage	0.90	46.31
WS207	Groundwater seepage	1.00	46.26

Six rounds of groundwater monitoring were undertaken on 21st and 30th March and on 7th 15th, 22nd and 27th April 2016 to provide an indication of groundwater depth at the site.

Groundwater monitoring records are presented in Appendix D. The results of the six rounds of groundwater level monitoring are summarised in Table 4.3 below.

Table 4.3 Groundwater Levels in Standpipes

Borehole No.	Strata	Standpipe Response Zone (mbgl)	Depth to Groundwater (mbgl)	Groundwater Level (mAOD)
BH201	Gravelly CLAY / slightly sandy slightly gravelly CLAY / very gravelly CLAY	2.0 - 8.0	0.7 - 0.9	45.3 - 45.4
BH202	Gravelly CLAY / sandy gravelly CLAY	3.0 - 9.0	3.2 - 3.3	43.4 - 43.5
WS201	Gravelly CLAY	2.0 - 5.0	0.9 - 1.1	45.0 - 45.2
WS203	Slightly gravelly CLAY / gravelly CLAY / slightly sandy slightly gravelly CLAY	2.0 - 5.0	1.5 - 1.6	44.7 - 44.7
WS205	Slightly sandy CLAY / slightly sandy slightly gravelly CLAY / fine and medium SAND / gravelly CLAY	1.0 - 4.0	0.3 - 0.6	45.9 - 46.3
WS206	Slightly sandy slightly gravelly CLAY with pockets pseudo-fibrous PEAT / slightly sandy slightly gravelly CLAY	1.0 - 5.0	0.5 - 0.6	46.6 - 46.7
WS208	Slightly sandy slightly gravelly CLAY	1.5 - 4.5	0.5 - 1.2	46.0 - 46.7
WS211	Slightly sandy slightly gravelly CLAY	2.0 - 5.0	0.6 - 1.2	46.1 - 46.6

The groundwater level monitoring undertaken in the deeper boreholes (BH201 and BH202) indicates that groundwater levels typically vary between 43.40 mAOD and 45.25 mAOD, although the difference is considered more likely to be caused by variations in local ground conditions, and particularly to the depth at which the filter packs were installed, rather than to any more significant characteristic of the shallow groundwater regime on site. Groundwater levels in the shallow boreholes (WS201, WS203, WS205, WS206, WS208 and WS211) are considered more likely to reflect slowly infiltrating surface water, rather than shallow aquifer conditions. The filter pack to BH202 was installed slightly deeper than that to BH201 and is therefore considered to be the borehole most likely to represent true shallow groundwater levels, whereas the filter pack to BH201 starts at 2.00 mbgl and is therefore considered more likely to be influenced by infiltrating surface water.

The groundwater level monitoring indicates that the hydraulic gradient falls from east to west across the site by approx. 2 m, but is considered more likely to reflect local variations in topography, rather than any significant regional groundwater flow, but may also reflect groundwater flow direction.

The Environment Agency classifies the Devensian Till as an Unproductive Aquifer. The underlying Halesowen Formation and Etruria Formation are classified as Secondary A Aquifers and the Collyhurst Sandstone Formation in the very SW corner of the site is classified as a Principal Aquifer. It is possible that groundwater levels recorded in BH202 are representative of the Secondary A Aquifer of the Halesowen Formation, but is considered more likely to represent the Unproductive Aquifer of the Devensian Till, along with all the other boreholes.

5. AGGRESSIVITY OF THE GROUND

Chemical analysis of the soil underlying the site was undertaken to establish the ground aggressivity to buried concrete. Sulphate and pH tests were carried out on soil samples from Made Ground, and natural Clay layers.

The range of chemical analysis results for pH and water soluble sulphate content (2:1 water extract as SO₄) of the sols presented in Table 5.1.

Table 5.1 pH and Sulphate results

Stratum	Depth of sample [mbgl]	BH ID	pH	Water soluble sulphate content (2:1 extract as SO ₄) [mg/l]
Made Ground	0.1	BH201	6.35	20
	0.1	BH202	4.8	10
	0.1	SP203	5.61	20
	0.1	HP206	5.28	10
	0.1	HP208	4.83	10
	0.1	HP209	5.26	10
	0.1	HP217	5.35	10
	0.1	WS208	5.19	30
	0.1	WS209	5.31	10
	0.15	HP201	5.36	10
	0.15	HP207	5.4	10
	0.15	HP210	5.25	10
	0.15	HP212	5.02	10
	0.15	HP216	6.78	200
	0.15	HP218	5.29	10
	0.15	WS202	7.85	30
	0.15	WS210	4.87	10
	0.2	SP201	6.29	10
	0.2	HP204	5.26	20
	0.2	HP211	5.99	30
	0.2	HP215	5.29	20
	0.2	WS204	5.71	10
	0.2	WS206	6.3	40
	0.2	WS212	6.46	10
	0.25	HP214	5.34	10
	0.25	WS203	7.69	130
	0.3	SP202	5.82	10
	0.3	HP203	5.07	20
	0.3	HP205	5.44	20
	0.3	HP213	5.22	10
	0.3	WS202	7.48	70
	0.35	HP208	6.16	10
	0.35	HP217	6.63	20
	0.4	HP209	6.12	10
	0.4	WS205	5.7	10
	0.4	WS208	5.9	30
	0.45	WS201	7.62	50
	0.6	WS207	6.72	90
	0.6	WS211	7.54	150
Clay	0.4	HP201	7.01	10
	0.45	HP215	6.09	10
	0.5	BH201	7.34	30
	0.5	WS204	6.18	10
	0.8	SP202	7.93	20
	0.8	WS206	6.26	60

	1.0	WS211	7.55	20
	1.1	BH202	6.91	10
	1.3	WS201	7.96	10
	1.5	WS204	7.5	10
	1.5	WS207	7.05	30
	1.7	WS211	7.92	10
	3.2	SP203	8.47	10

In order to determine the ACEC class of concrete required the pH and Sulphate tests have been interpreted following the guidelines given for brownfield in BRE Special Digest 1.

For each of the strata, the characteristic values for pH and sulphate concentration have been determined.

Thirty-nine samples were tested in the Made Ground and the results were analysed, a range of pH from 5.0 to 6.7 were adopted. The results (Table 5.1) place the Made Ground within Design Sulphate Class DS-1 and the Aggressive Chemical Environment for Concrete (ACEC) AC-3z assuming mobile water conditions.

Thirteen samples were tested in the natural clay and the results were analysed, a range of pH from 6.5 to 8.0 were adopted. The results place the natural Clay within Design Sulphate Class DS-1 and the Aggressive Chemical Environment for Concrete (ACEC) AC-1 assuming mobile water conditions.

6. EQUILIBRIUM CBR VALUES

Equilibrium CBR values for various materials for poor and good construction conditions are given in Highways England (2009) Interim Advice Note 73/06 'Design Guidance for Road Pavement Foundations' produced by the Highways England and these are summarised in Table 6.1 assuming high water table and that the foundations may be wetted by ground water during their life.

Table 6.1 Typical CBR Values

Soil Type	PI (%)	Thin ¹	Thick ²
		Equilibrium CBR (%)	
Heavy clay	40 – 70	2 – 2.5	2 – 3
Silty clay	30	3	4
Sandy clay	10 – 20	3 – 4	5-6
Silt	-	1	1
¹ A thick layered construction is a depth to subgrade of 1200 mm.			
² A thin layered construction is a depth to subgrade of 300 mm.			

The near surface soils are predominantly clays. With an average plasticity index of 18% of the clay and considering thin subgrade layer to be constructed, from the Table 6.1 it is recommended that a design CBR of 3% is adopted for the natural clay.

7. PRELIMINARY FOUNDATION DESIGN OPTION

The following section presents a summary of the development with regard to preliminary foundation solutions.

The design bearing resistance of the Glacial Clay has been calculated following Eurocode 7.

Following recommendations set out in Eurocode 7, for both undrained soil condition and drained soil condition the gross design bearing resistances have been calculated.

Based on the available information, the bearing capacity of the Glacial Clay is summarised in Table 7.1 and in Table 7.2 by design approach.

Table 7.1 Bearing Resistance of Glacial Clay in Undrained Soil Condition

Foundation Formation Level [mAOD]	Strip Foundation Bearing Resistance [kN/m ²]		Square Pad Bearing Resistance [kN/m ²]	
	DA1-1	DA1-2	DA1-1	DA1-2
47.0	375	250	450	300
46.0	400	275	475	350
45.0	450	325	525	375

Table 7.2 Bearing Resistance of Glacial Clay in Drained Soil Condition

Foundation Formation Level [mAOD]	Strip Foundation Bearing Resistance [kN/m ²]			Square Pad Bearing Resistance [kN/m ²]		
	Strip Size [m]	DA1-1	DA1-2	Pad Size [m x m]	DA1-1	DA1-2
47.0	0.45	120	67	1.2 x 1.2	191	100
	0.60	132	72	1.5 x 1.5	206	107
	0.75	143	77	2.0 x 2.0	232	118
46.0	0.45	180	102	1.2 x 1.2	278	149
	0.60	191	107	1.5 x 1.5	293	155
	0.75	202	112	2.0 x 2.0	318	167
45.0	0.45	327	189	1.2 x 1.2	494	270
	0.60	338	194	1.5 x 1.5	509	276
	0.75	349	199	2.0 x 2.0	535	288

The glacial clay is potentially shrinkable (low volume change potential) and therefore foundations will need to be constructed at a suitable depth, and have precautions adopted within the influence zone of existing, proposed or felled trees, in accordance with NHBC 2016 chapter 4.2.

Due to the low volume change potential of the clay, based on our experience designing foundation on glacial clay and observation of existing ground bearing slabs in the vicinity it is considered that ground bearing floor slabs will be suitable.

Although settlements are likely to be less than 25mm, a settlement analysis will be completed once foundation loads are available, and will be included within the Geotechnical Design Report.

8. SOAKAWAY TEST ASSESSMENT

Soakaway tests were undertaken in accordance with BRE Digest DG 365:2016 in natural Clay. Soakaway tests were carried out in three trial pits (SP201, SP202 and SP203) in order to determine the natural drainage potential of the ground exposed in the base and sides of the trial pit. The test results indicate that infiltration rates were minimal or non-existent, and calculations of infiltration rate were irrelevant. In conclusion, soakaway drainage is not considered to be appropriate due to the very low permeability of soils near the ground surface.

The results of the soakaway testing are presented in Appendix C.

9. SUMMARY OF GEOTECHNICAL PARAMETERS

The ground investigation revealed the ground strata consist of Made Ground followed by natural Clay with pockets of sand overlying Mudstone. A summary of the geological strata encountered during the ground investigation is presented in Table 9.1.

Table 9.1 Summary of Geology Encountered During Ground Investigation

Stratum	Level of Top of Stratum [m AOD]	Thickness [m]
Made Ground	+47.94 to +46.10	0.2 to 0.9
Clay	+47.59 to +45.66	7.5 to 8.15
Sand	+46.74 to +42.52	0.08 to 0.7
Mudstone	+38.39 to +37.84	0.65 (proven)

Characteristic strength and stiffness parameters for the Clay assessed in Section 4.3 are summarised in Table 9.2 and Table 9.3.

Table 9.2 Summary of Clay Strength Parameters

Stratum	Moist Bulk Weight, γ_m [kN/m ³]	Effective Stress Parameters		Undrained Shear Strength, C_u [kN/m ²]
		Effective Cohesion, c' [kN/m ²]	Effective Angle of Friction, ϕ' [°]	
Clay	20	0	28	$75 + 6z^1$
¹ $z = 0$ at 47 mAOD and increases with depth in metres below that level				

Table 9.3 Summary of Clay Stiffness Parameters

Stratum	Undrained Young's Modulus, E_u [kN/m ²]	Drained Young's Modulus, E' [kN/m ²]	Coefficient of Volume Compressibility, m_v [m ² /MN]	Coefficient of Consolidation, C_v [m ² /year]
Clay	$45,000 + 3,600z^1$	$27,000 + 2,160z^1$	0.135 (0-2.0 mbgl) 0.131 (2.0-4.0 mbgl) 0.127 (4.0-5.5 mbgl) 0.099 (5.5-6.0 mbgl) 0.097 (below 6 mbgl)	6.8
¹ $z = 0$ at 47 mAOD and increases with depth in metres below that level				

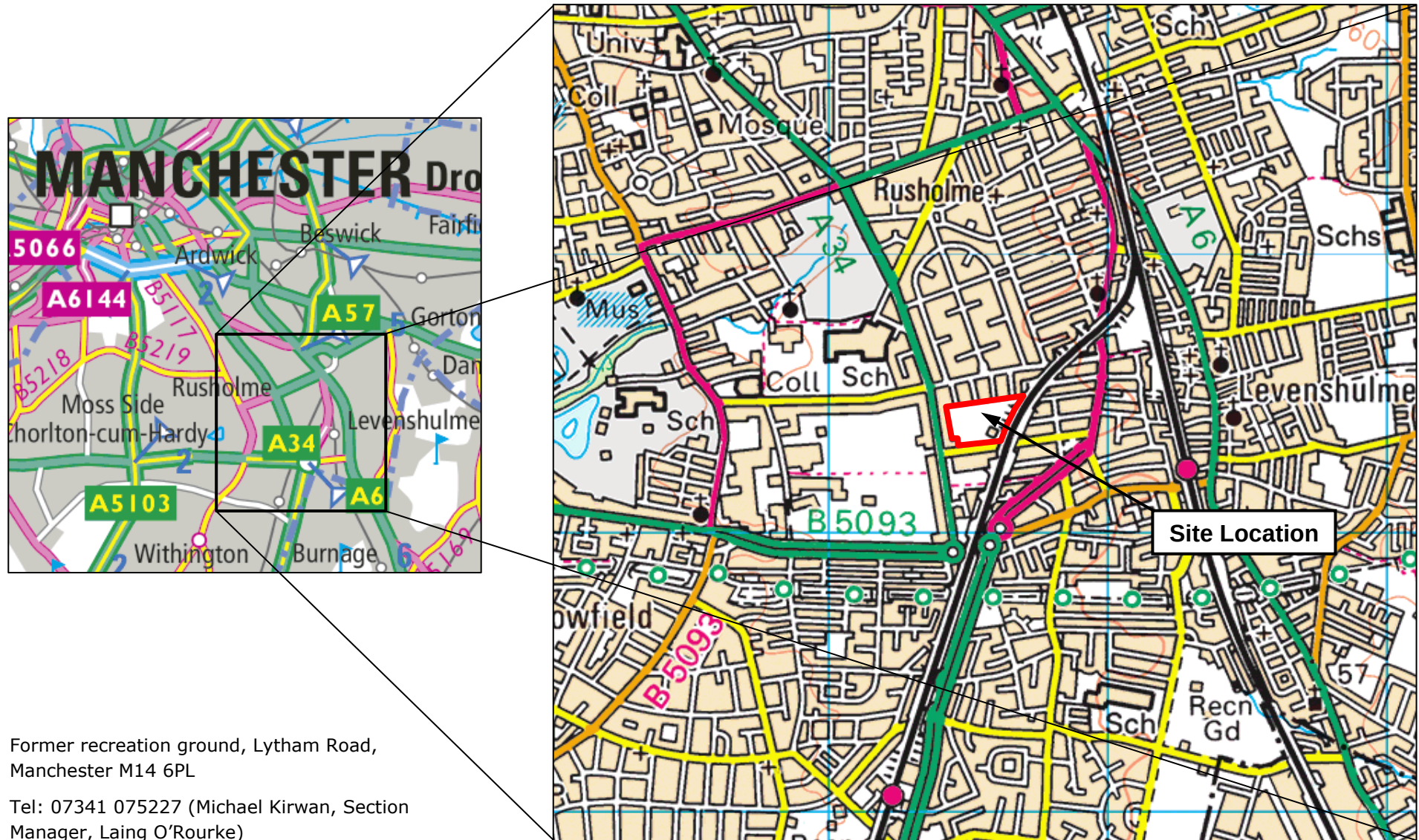
10. REFERENCES

- BS1377 Methods of test for Soils for Civil Engineering Purposes
- BS 8002:2015 *Code of practice for Earth Retaining Structures*.
- BS EN 1997-1-2004 Eurocode7, *Geotechnical Design*.
- BS EN 1997-2-20110 Eurocode7, *Ground Investigation and Testing*.
- BSI (2015), BS 5930:2015. *Code of practice for site investigations*.
- BRE Digest DG 365:2016. *Soakaway Design*.
- BRE (2005), BRE Special Digest 1. *Concrete in Aggressive Ground*.
- BSI (1998). BS 8004:1986. *Code of practice for Foundations*.
- CIRIA (1995), Report 143. *The Standard Penetration Test (SPT): Methods and Use*.
- Highways England (2009), IAN 73/06. *Design Guidance for Road Pavement Foundations*.
- NHBC Standards (2016) Chapter 4.2 'Building Near Trees'
- Ramboll (2016) *EBN High Schools – Lytham Rd, Manchester – Contaminated Land and Geotechnical Desk Study Report* (Report Ref. 1620001457-DS), Ramboll, February 2016.
- Ramboll (2016) *EBN High Schools – Lytham Rd., Manchester – Ground Contamination Interpretative Report* (Report Ref. 1620001457-LR-INT), Ramboll, April 2016.
- Robson Liddle (2015), *Lytham Road Manchester Ground Investigation Report*, Report no. 12-12-16-1-1163/GIR1, 3rd December 2015.
- Stroud M.A. (1974). *The Standard Penetration Test in Insensitive Clays and Soft Rocks*. Proc. European Symposium on Penetration Testing (ESOPT I).
- Stroud M.A. and Butler F.G. (1975). *The Standard Penetration Test and the Engineering Properties of Glacial Materials*. CIRIA Report C143.
- Stroud M.A. (1989). *The Standard Penetration Test – Its Applications and Interpretation*. Proc. ICE Conference on Penetration Testing in the UK, Birmingham.
- Tomlinson, M.J. (2001). *Foundation Design and Construction* (7th edition).

APPENDIX A: DRAWINGS

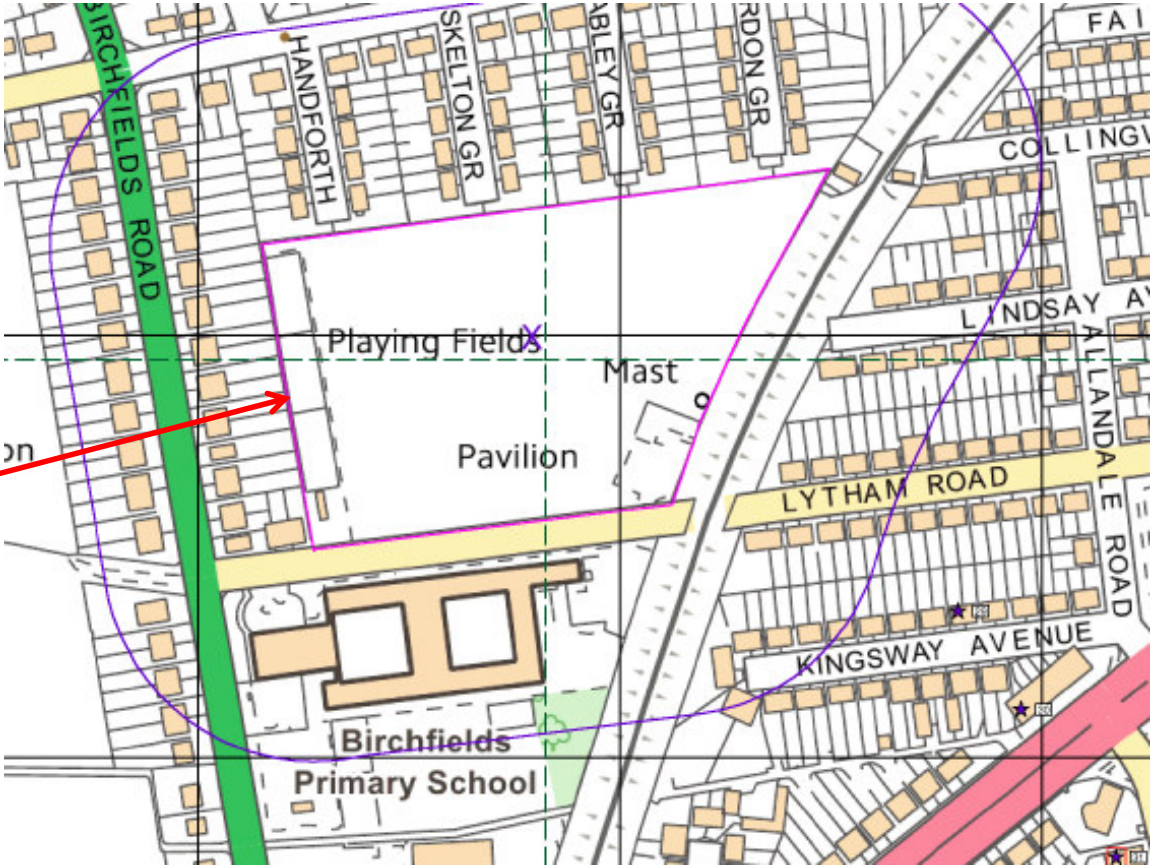
EBN HIGH SCHOOLS – LYTHAM RD., MANCHESTER
GEOTECHNICAL INTERPRETATIVE REPORT

FIGURE 1: SITE LOCATION PLAN



KEY

Site
Boundary



RAMBOLL ENVIRON

Halsbury House,
21 The Calls, Leeds, LS2 7EH
leeds@ramboll.co.uk
T: 0113 204 2880

Project: EBN High Schools - Lytham Road,
Manchester

Title: Site Layout Plan

Status:

Description:

Date: Feb 16

Scale: NTS

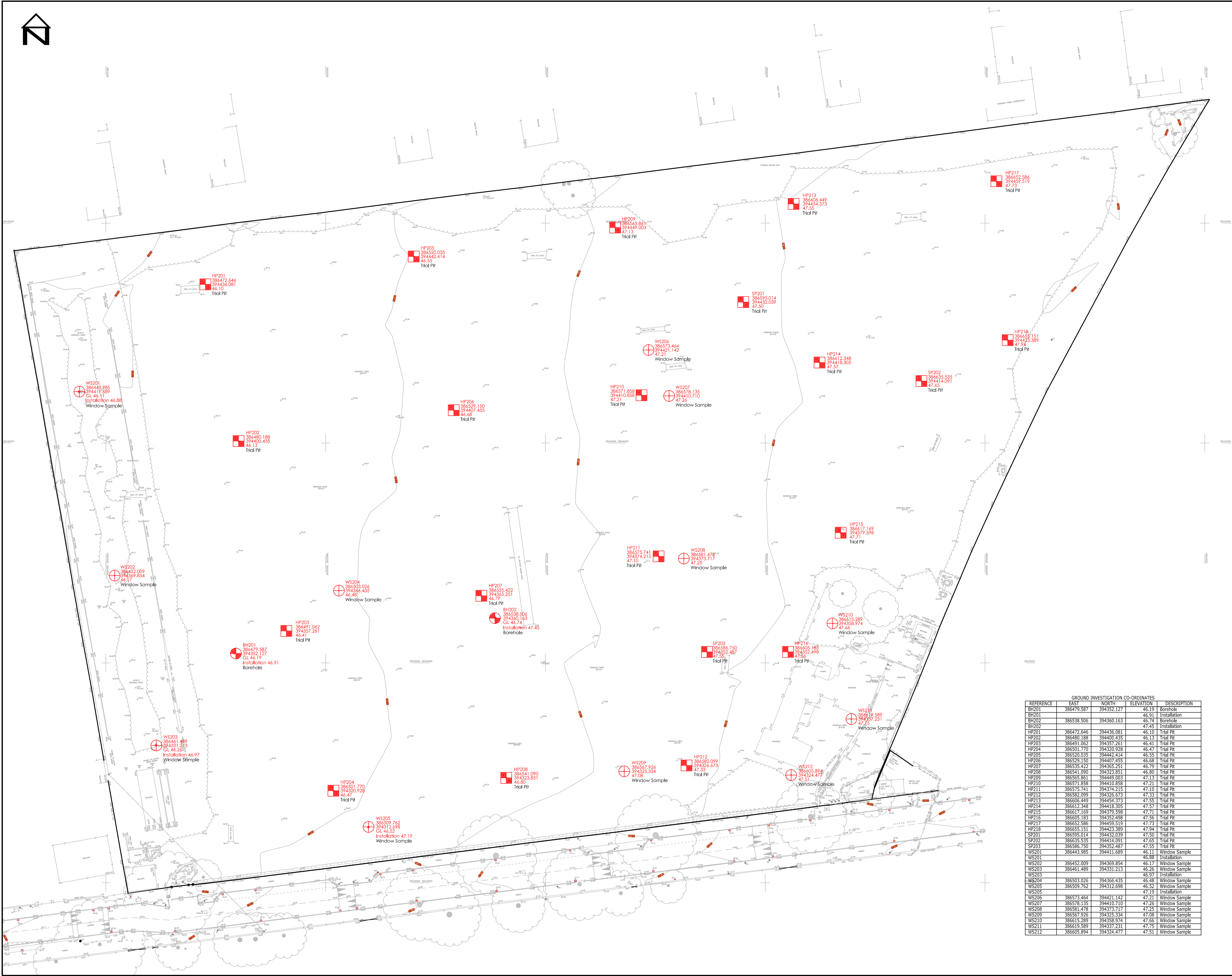
Date: Feb 16

Drawn: CC

Checked: SR

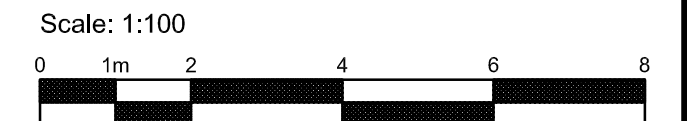
Figure No: 2

Rev:



- Notes
1. DO NOT SCALE FROM THIS DRAWING
 2. ALL DIMENSIONS ARE MILLIMETRES U.N.O.
 3. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM U.N.O.
 4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS
 5. CO-ORDINATES AND LEVELS ARE BASED UPON OSGB 1936 NATIONAL GRID (OSGB36) AND ORDNANCE SURVEY DATUM NEWLYN (ODN).
 6. THEY ARE DERIVED USING REALTIME ON SITE GPS SURVEY, THAT UTILISES THE NATIONAL GRID TRANSFORMATION OSTN02 AND THE NATIONAL GEOID MODEL OSGM02GB.
 7. THE DATA OBTAINED FOR USE IN THIS DRAWING INVOLVED THE USE OF REALTIME GPS SURVEY AND TOTAL STATION SURVEY.

- LEGEND TO SYMBOLS
- DENOTES BOREHOLE LOCATION
 - DENOTES TRIAL PIT LOCATION
 - DENOTES WINDOW SAMPLE LOCATION



101	FOR INFORMATION	15/03/2016	LC	PS
Rev	Description	Date	By	App

INFORMATION

LYTHAM ROAD
MANCHESTER M14 6PL



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www.ramboll.co.uk

EXPLORATORY HOLE LOCATION PLAN

Scale:	Date:	Drawn:	Checked:
A1@NTS	15/03/2016	LC	SR
Drawing No.:	1620001457-RAM-XX-XX-DR-G-00100	Rev:	I01

APPENDIX B: BOREHOLE LOGS

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No BH201
Job No 1620001457	Date 07-03-16 07-03-16	Ground Level (m) 46.19	Co-Ordinates () E 386,479.6 N 394,352.1	
Contractor TerraConsult Ltd				Sheet 1 of 1

SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.00-0.30	BB1						0.30	MADE GROUND: Turf over very soft dark brown sandy rarely gravelly SILT/CLAY . Sand is fine. Gravel is sub-angular to sub-rounded fine and medium of brick, sandstone, siltstone, quartzite, concrete. Frequent fine roots/rootlets.		
0.10	ES									
0.30-1.20	BB2									
0.50	ES									
1.20-1.65	U3	53 blows					(1.50)	Soft to firm pale orange-brown and pale grey slightly sandy slightly gravelly CLAY . Sand is fine. Gravel is sub-angular to rounded fine to coarse of sandstone, siltstone, quartzite. Frequent fine roots in upper 0.30m.		
1.70	DD4						1.80			
1.80	DD5									
2.00-2.45	BB7						(0.70)	From 0.50mbgl: Becoming firm.		
2.00-2.45	SSD6	N20					2.50	Stiff red-brown and pale grey gravelly CLAY . Gravel is sub-angular to rounded fine to coarse of siltstone, sandstone, mudstone, quartzite, rarely of coal.		
2.80	DD8									
3.00-3.45	U9	79 blows						Stiff grey-brown slightly gravelly slightly sandy CLAY . Sand is fine and medium. Gravel is sub-angular to rounded fine to coarse of sandstone, siltstone, mudstone, quartzite, rarely of coal. Occasional lenses of fine and medium SAND . Occasional sub-angular cobbles of siltstone or fine-grained sandstone.		
3.50	DD10									
3.80	DD11									
4.00-4.45	BB13									
4.00-4.45	SSD12	N18								
4.80	DD14						(4.60)	From 5.80mbgl: Becoming sandy. Sand is fine and medium.		
5.00-5.45	U15	77 blows						From 6.20mbgl: Frequent sub-angular cobbles of siltstone, sandstone.		
5.50	DD16									
6.00	DD17									
6.50-6.95	BB19									
6.50-6.95	SSD18	N36					7.10	Stiff grey-brown sandy very gravelly CLAY . Sand is fine and medium. Gravel is sub-angular to rounded fine to coarse of mudstone, siltstone, sandstone, quartzite.		
7.50	DD20						(0.60)			
7.80-8.00	BB21						7.70			
8.00-8.45	SSD22	N50/ 225 mm					7.80	Cobble of SILTSTONE (recovered as fragments).		
							(0.65)	Very stiff to hard red-brown MUDSTONE .		
							8.45	Borehole completed at 8.00mbgl [SPT to 8.45mbgl].		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered; No visual or olfactory evidence of potential contamination; Combined gas/groundwater monitoring standpipe installed; Borehole completed at 8.00mbgl [SPT to 8.45mbgl].
All dimensions in metres Scale 1:62.5			Client Laing O'Rourke			Method/ Plant Used Dando 2000			Logged By SAR		

AGS3 UK BH LYTHAM RD. BOREHOLE LOGS.GPJ GINT STD AGS 3.1.GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No BH202
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 46.74	Co-Ordinates () E 386,538.5 N 394,360.2	
Contractor TerraConsult Ltd				Sheet 1 of 1

SAMPLES & TESTS						STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION			
0.10	ES	N12					0.25	MADE GROUND: Turf over soft brown slightly sandy SILT/CLAY with rare sub-angular to sub-rounded fine and medium gravel of sandstone, siltstone, quartzite. Sand is fine and medium. Rare fragments solidified tar, porcelain. Frequent fine roots/rootlets.			
0.30-0.70	BB1					(0.50)					
0.70-1.20	BB2					0.75					
1.10	ES					(1.05)					
1.20-1.65	BB4	100 blows					1.80	MADE GROUND: Soft to firm brown and orange-brown slightly gravelly CLAY . Gravel is sub-angular to sub-rounded fine and medium of sandstone, siltstone, mudstone, quartzite. Occasional fragments of porcelain. Frequent fine roots/rootlets in upper 0.40m.			
1.20-1.65	SSD3					(0.50)					
1.80	DD5					2.30					
2.00-2.45	U6										
2.50	DD7	N20						Firm to stiff orange, pale grey and orange-brown slightly sandy slightly gravelly CLAY . Sand is fine. Gravel is angular to sub-rounded fine and medium of sandstone, siltstone, mudstone, quartzite, rarely of coal, slate/shale.			
2.80	DD8										
3.00-3.45	BB10										
3.00-3.45	SSD9										
3.80	DD11	78 blows						Stiff red-brown gravelly CLAY . Gravel is sub-angular to rounded fine to coarse of siltstone, sandstone, quartzite, coal, mudstone. Occasional sub-angular to rounded cobbles of siltstone, sandstone.			
4.00-4.45	U12										
4.50	DD13										
4.80	DD14										
5.00-5.45	BB16	N16					(5.50)	Stiff brown and grey-brown gravelly CLAY . Gravel is angular to rounded fine to coarse of siltstone, sandstone, mudstone, quartzite, rarely of coal. Occasional sub-angular to rounded cobbles of siltstone, sandstone.			
5.00-5.45	SSD15										
6.00	DD17	100 blows					7.80	Stiff red-brown sandy gravelly CLAY . Gravel is angular to rounded fine to coarse of siltstone, sandstone, mudstone, quartzite, rarely of coal. Frequent sub-angular to sub-rounded cobbles of siltstone, sandstone. Occasional sub-angular to rounded boulders of siltstone (recovered as fragments). Very stiff to hard red-brown MUDSTONE .			
6.50-6.95	U18										
7.00	DD19										
7.50	DD20										
8.00-8.45	BB22	N50/ 262 mm						Borehole completed at 9.10mbgl [SPT to 9.45mbgl].			
8.00-8.45	SSD21					(1.10)					
		N75/ 138 mm					8.90	Very stiff to hard red-brown MUDSTONE .			
9.00-9.45	BB24					(0.55)					
9.00-9.45	SSD23						9.45				

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
						8.9	9.1	0100			No groundwater encountered; No visual or olfactory evidence of potential contamination, except for fragments of solidified tar in Made Ground 0.00-0.25mbgl; Chiselling for 1hr 8.90-9.10mbgl; Combined gas/groundwater monitoring standpipe installed; Borehole completed at 9.10mbgl [SPT to 9.45mbgl].
All dimensions in metres Scale 1:62.5						Method/ Plant Used Dando 2000			Logged By SAR		

AGS3 UK BH LYTHAM RD. BOREHOLE LOGS GPJ GINT STD AGS 3.1 GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS201	
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 46.11	Co-Ordinates () E 386,444.0 N 394,411.7		
Contractor TerraConsult Ltd				Sheet 1 of 1	

SAMPLES & TESTS						STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.45	ES						0.02	MADE GROUND: Moss and leaf litter over TARMACADAM hardstanding.		
							0.10			
							0.45			
1.00-1.30	ES						(0.35)	MADE GROUND: Dark grey-brown, pale cream-grey and black angular to sub-angular fine to coarse GRAVEL of limestone, tarmac, cinder/clinker, slag, with many fine fibrous roots/rootlets throughout.		
							(0.30)			
							0.75			
							(1.05)			
							1.80			
							(2.10)			
							3.90	MADE GROUND: Pink-brown, dark grey, grey-brown and black sandy angular to sub-rounded fine to coarse GRAVEL of cinder/clinker, slag, ash, burnt shale. Sand is fine to coarse. Occasional sub-angular to sub-rounded cobbles of slag, cinder/clinker.		
								Soft to firm grey slightly gravelly CLAY . Gravel is sub-angular to rounded fine and medium of sandstone, siltstone, mudstone, quartzite.		
								Firm to stiff orange-brown mottled pale grey gravelly CLAY . Gravel is angular to rounded fine to coarse of sandstone, siltstone, mudstone, quartzite, coal.		
								Stiff red-brown gravelly CLAY . Gravel is angular to rounded fine to coarse of sandstone, siltstone, mudstone, quartzite, rarely of coal.		
								Stiff grey-brown gravelly CLAY . Gravel is angular to rounded fine to coarse of siltstone, sandstone, mudstone, quartzite.		
								Borehole completed at 5.00mbgl.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered; No olfactory evidence of potential contamination; Visual evidence of potential contamination includes tarmac, cinder/clinker, slag, ash, burnt shale in shallow Made Ground; Gas/groundwater monitoring standpipe installed upon completion.
All dimensions in metres Scale 1:31.25			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By SAR		

AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD AGS 3.1 GDT 18/3/16

BOREHOLE LOG

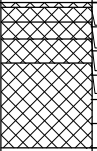
Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS202
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 46.17	Co-Ordinates () E 386,452.0 N 394,369.9	
Contractor TerraConsult Ltd				Sheet 1 of 1

SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.08-0.15 0.15-0.30	ES ES		↓				0.02 0.08 0.15 0.30 0.50 0.60	MADE GROUND: Moss over TARMACADAM hardstanding. MADE GROUND: Pale cream-grey angular to sub-angular medium GRAVEL if limestone. MADE GROUND: Dark grey and black sandy angular to sub-rounded fine to coarse GRAVEL of cinder/clinker, slate, shale, ash, slag. MADE GROUND: Pale pink-orange slightly sandy angular to sub-angular fine to coarse GRAVEL of burnt shale, rarely of siltstone, sandstone. Sand is fine to coarse. Rare fragments of porcelain. MADE GROUND: Dark brown, grey-brown and black sandy angular to sub-rounded fine to coarse GRAVEL of cinder/clinker, ash, slag. Sand is fine to coarse. 0.40mbgl: Slight groundwater seepage. Firm grey mottled dark grey and black slightly gravelly CLAY . Gravel is sub-angular to sub-rounded fine and medium of siltstone, sandstone, mudstone, quartzite. Firm to stiff pale grey and pale orange-brown slightly gravelly CLAY . Gravel is sub-angular to rounded fine to coarse of sandstone, siltstone, mudstone, rarely of quartzite, coal. Rare rounded to sub-rounded cobbles of siltstone, sandstone. Stiff red-brown gravelly CLAY . Gravel is angular to rounded fine and medium of siltstone, sandstone, mudstone, quartzite. Borehole completed at 3.00mbgl.		
							(1.40)			
							2.00			
							(1.00)			
							3.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater encountered as slight seepage 0.40mbgl; No olfactory evidence of potential contamination; Visual evidence of potential contamination include cinder/clinker, slag, ash, burnt shale in shallow Made Ground; Borehole backfilled with arisings upon completion.
All dimensions in metres Scale 1:31.25			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By SAR		

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS203
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 46.26	Co-Ordinates () E 386,461.5 N 394,331.2	
Contractor TerraConsult Ltd				Sheet 1 of 2

SAMPLES & TESTS			STRATA						Geology	Instrument/Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.15-0.25 0.25-0.60	ES ES		↓				0.02 0.08 0.15 0.25 (0.35) 0.60 0.65	MADE GROUND: Leaf mulch over TARMACADAM hardstanding. MADE GROUND: Pale cream-grey angular to sub-angular medium GRAVEL of limestone. Frequent fine rootlets. MADE GROUND: Dark grey-brown and black sandy sub-angular to sub-rounded fine to coarse GRAVEL of cinder/clinker, slag, ash, quartzite, sandstone, siltstone, slate, shale. Sand is fine to coarse. MADE GROUND: Pale orange-pink slightly sandy angular to sub-angular fine and medium GRAVEL of burnt shale, occasionally of siltstone, quartzite. MADE GROUND: Black and dark grey angular to sub-rounded fine to coarse GRAVEL of cinder/clinker, slag, ash, slate, shale. 0.40mbgl: Slight groundwater seepage. Soft to firm grey mottled dark grey and black slightly gravelly CLAY . Gravel is angular to sub-rounded fine to coarse of sandstone, siltstone, mudstone, quartzite. Firm pale grey and pale orange-brown slightly gravelly CLAY . Gravel is sub-angular to rounded fine to coarse of sandstone, siltstone, mudstone, quartzite, rarely of coal. Rare rounded to sub-rounded cobbles of siltstone, fine-grained sandstone. Stiff red-brown gravelly CLAY . Gravel is angular to rounded fine and medium of siltstone, sandstone, mudstone, quartzite, rarely of coal. 4.30 Stiff grey-brown slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to rounded fine and medium of siltstone, sandstone, mudstone, quartzite. (0.70) From 4.60mbgl: Occasional narrow lenses of grey-brown clayey fine and medium SAND . 5.00		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater encountered as slight seepage 0.40mbgl; No olfactory evidence of potential contamination; Visual evidence of potential contamination includes cinder/clinker, slag, ash, burnt shale in shallow Made Ground; Gas/groundwater monitoring standpipe installed upon completion.

All dimensions in metres Scale 1:31.25	Client Laing O'Rourke	Method/ Plant Used Archway Dart	Logged By SAR
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AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD AGS 3.1 GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS203
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 46.26	Co-Ordinates () E 386,461.5 N 394,331.2	
Contractor TerraConsult Ltd				Sheet 2 of 2

SAMPLES & TESTS							STRATA		Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
								Borehole completed at 5.00mbgl.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater encountered as slight seepage 0.40mbgl; No olfactory evidence of potential contamination; Visual evidence of potential contamination includes cinder/clinker, slag, ash, burnt shale in shallow Made Ground; Gas/groundwater monitoring standpipe installed upon completion.

All dimensions in metres Scale 1:31.25	Client Laing O'Rourke	Method/ Plant Used Archway Dart	Logged By SAR
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AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD AGS 3_1.GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS204	
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 46.48	Co-Ordinates () E 386,503.0 N 394,366.4		
Contractor TerraConsult Ltd				Sheet 1 of 1	

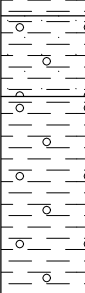
SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.20	ES						(0.45)	MADE GROUND: Very soft dark brown slightly sandy gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-rounded fine and medium of brick, clinker, ash, porcelain.		
0.50	ES						0.45			
1.50	ES							Firm grey-brown slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-angular fine and medium of mudstone, sandstone, coal.		
								From 0.55mbgl: Becoming orange-brown mottled grey.		
								3.20-4.00mbgl: Occasional gravel-sized pockets of fine SAND .		
								Borehole completed at 5.00mbgl [SPT to 5.45mbgl].		
5.00		N20					(5.00)			
										
										
										
										
										
										
										
										
										
										
										
										

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered; No olfactory evidence of potential contamination; Visual evidence of potential contamination includes clinker, ash, in shallow Made Ground; Borehole backfilled with arisings upon completion.
All dimensions in metres Scale 1:37.5			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By GB		

AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD.AGS 3.1.GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS205	
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 46.52	Co-Ordinates () E 386,509.8 N 394,312.7		
Contractor TerraConsult Ltd				Sheet 1 of 1	

SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.40	ES						(0.45) 0.45	MADE GROUND: Turf over soft dark brown sandy slightly gravelly SILT/CLAY . Sand is fine and medium. Gravel is sub-angular to rounded fine of sandstone, siltstone. Frequent fine roots/rootlets.		
1.20	N9						(0.95) 1.40	Soft to firm pale orange, orange, pale grey and orange-brown mottled pale grey slightly sandy CLAY . Sand is fine. Rare sub-angular to rounded fine GRAVEL of sandstone, siltstone, mudstone.		
2.00	N33						(0.40) 1.80	Firm to stiff orange-brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine. Gravel is sub-angular to rounded fine to coarse of sandstone, siltstone, mudstone, rarely of coal, quartzite. Occasional narrow lenses of orange-brown fine and medium SAND .		
3.00	N17		1				(1.10) 2.90	Stiff brown gravelly CLAY . Gravel is angular to rounded fine to coarse of sandstone, siltstone, quartzite, coal, mudstone.		
4.00	N20		2				(0.70) 3.60	Orange-brown fine and medium SAND . 2.90mbgl: Groundwater strike.		
5.00	N50/ 245 mm						(0.40) 4.00	Stiff brown gravelly CLAY . Gravel is angular to rounded fine to coarse of sandstone, siltstone, quartzite, coal, mudstone.		
							(0.70) 4.70	Orange-brown fine and medium SAND . 4.00mbgl: Groundwater strike.		
							(0.75) 5.45	Stiff brown slightly sandy gravelly CLAY . Sand is fine. Gravel is angular to rounded fine and medium of sandstone, siltstone, quartzite, mudstone.		
								Borehole completed at 5.00mbgl [SPT to 5.45mbgl].		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater encountered at 2.90mbgl and 4.00mbgl; No visual or olfactory evidence of potential contamination; Gas/groundwater monitoring standpipe installed upon completion.
All dimensions in metres Scale 1:37.5			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By SAR		

AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD.AGS 3.1.GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS206	
Job No 1620001457	Date 09-09-16 09-09-16	Ground Level (m) 47.21	Co-Ordinates () E 386,573.5 N 394,421.1		
Contractor TerraConsult Ltd				Sheet 1 of 1	

SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.20	ES						0.15	MADE GROUND: Very soft dark brown slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-rounded fine and medium brick.		
							(0.45)			
							0.60	MADE GROUND: Grey-brown clayey sandy angular to sub-rounded fine and medium GRAVEL of ash, clinker, brick, glass, porcelain, clay. Sand is fine and medium.		
0.70-0.80	ES		↓				(0.30)			
							0.90	Dark brown clayey fine, rarely medium, SAND .		
							0.90mbgl	Groundwater seepage.		
							(0.60)	Soft dark grey slightly sandy slightly gravelly CLAY with frequent small pockets of firm pseudo-fibrous PEAT . Sand is fine and medium. Gravel is sub-angular to sub-rounded fine and medium of mudstone, coal.		
							1.50	Stiff brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-angular fine and medium of mudstone, sandstone, coal.		
							(3.50)			
							5.00	Borehole completed at 5.00mbgl.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater encountered as seepage at 0.90mbgl; No olfactory evidence of potential contamination; Visual evidence of potential contamination includes ash, clinker in shallow Made Ground; Gas/groundwater monitoring standpipe installed upon completion.
All dimensions in metres Scale 1:31.25			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By GB		

AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD AGS 3.1 GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS207	
Job No 1620001457	Date 09-09-16 09-09-16	Ground Level (m) 47.26	Co-Ordinates () E 386,578.1 N 394,410.7		
Contractor TerraConsult Ltd				Sheet 1 of 1	

SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.50-0.60	ES						0.10	MADE GROUND: Very soft dark brown slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-rounded fine and medium of ash and brick. MADE GROUND: Grey-brown clayey sandy fine and medium angular to sub-rounded GRAVEL of ash, clinker, brick, glass and porcelain. Sand is fine and medium. MADE GROUND: Firm brown slightly sandy slightly gravelly CLAY with a low cobble content of angular brick. Sand is fine and medium. Gravel is fine to coarse angular to sub-angular of brick. Soft dark grey slightly sandy slightly gravelly CLAY with frequent small pockets of firm pseudo-fibrous PEAT . Sand is fine and medium. Gravel is angular to sub-rounded fine and medium of mudstone and coal. 1.00mbgl: Groundwater Stiff brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine. Gravel is angular to sub-angular fine and medium of mudstone, sandstone and coal. Borehole completed at 5.00mbgl.		
							(0.40)			
							0.50			
							(0.25) 0.75			
1.20-1.50	ES						(0.75)			
							1.50			
							(3.50)			
							5.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											Groundwater encountered as seepage at 1.00mbgl; No olfactory evidence of potential contamination; Visual evidence of potential contamination includes ash, clinker in shallow Made Ground; Borehole backfilled with arisings upon completion.
All dimensions in metres Scale 1:31.25			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By GB		

AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD AGS 3.1 GDT 18/3/16

BOREHOLE LOG

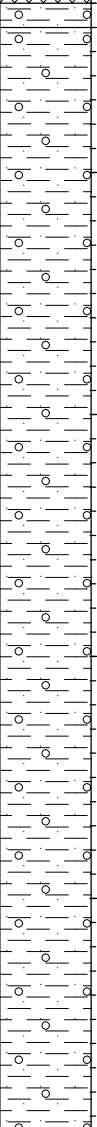
Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS208	
Job No 1620001457	Date 09-09-16 09-09-16	Ground Level (m) 47.25	Co-Ordinates () E 386,581.5 N 394,373.7		
Contractor TerraConsult Ltd				Sheet 1 of 1	

SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.00-0.10	ES						0.10	MADE GROUND: Very soft dark brown sandy CLAY . Sand is fine and medium.		
0.20-0.40	ES						(0.30) 0.40	MADE GROUND: Soft dark brown slightly sandy gravelly CLAY . Sand is fine to coarse. Gravel is angular to sub-rounded fine and medium of brick, tiles and porcelain.		
								Stiff orange-brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine, occasionally medium. Gravel is angular to sub-angular fine and medium of mudstone, sandstone and coal.		
								From 0.90mbgl: Becoming brown mottled grey.		
								Borehole completed at 5.00mbgl.		
							(4.60)			
							5.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered; No visual or olfactory evidence of potential contamination; Gas/ groundwater monitoring standpipe installed upon completion.
All dimensions in metres Scale 1:31.25			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By GB		

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS209
Job No 1620001457	Date 08-03-16 08-03-16	Ground Level (m) 47.08	Co-Ordinates () E 386,567.9 N 394,325.3	
Contractor TerraConsult Ltd				Sheet 1 of 1

SAMPLES & TESTS						STRATA		Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)		
0.10	ES						(0.30) 0.30	MADE GROUND: Very soft dark brown slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular fine of brick.	
							0.40	Soft brown slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-rounded fine and medium of mudstone and coal.	
							(4.60)	Firm orange-brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine. Gravel is angular to sub-rounded fine and medium of mudstone, sandstone and coal.	
								From 0.90mbgl: Becoming brown mottled grey.	
							5.00	Borehole completed at 5.00mbgl.	

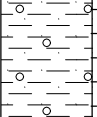
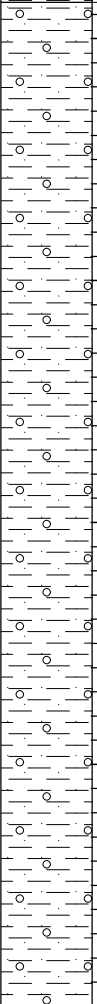
Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered; No visual or olfactory evidence of potential contamination; Borehole backfilled with arisings upon completion.

All dimensions in metres Scale 1:31.25	Client Laing O'Rourke	Method/ Plant Used Archway Dart	Logged By GB
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AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD AGS 3_1.GDT 18/3/16

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS210	
Job No 1620001457	Date 09-09-16 09-09-16	Ground Level (m) 47.66	Co-Ordinates () E 386,615.3 N 394,359.0		
Contractor TerraConsult Ltd				Sheet 1 of 1	

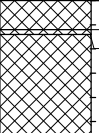
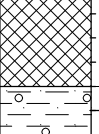
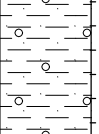
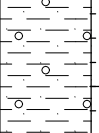
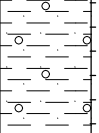
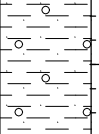
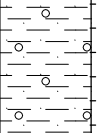
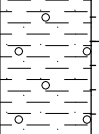
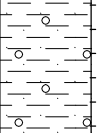
SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.05-0.15	ES						(0.35) 0.35	MADE GROUND: Very soft dark brown sandy CLAY . Sand is fine and medium.		
							(0.50) 0.85	Firm orange-brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-rounded fine and medium of mudstone, sandstone and coal.		
							(4.15) 5.00	Stiff brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine. Gravel is angular to sub-rounded fine and medium of mudstone, sandstone and coal. Borehole completed at 5.00mbgl.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered; No visual or olfactory evidence of potential contamination; Borehole backfilled with arisings upon completion.
All dimensions in metres Scale 1:31.25			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By GB		

AGS3 UK BH LYTHAM RD. WINDOWLESS SAMPLER LOGS.GPJ GINT STD AGS 3.1 GDT 18/3/16

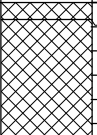
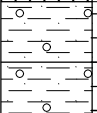
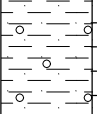
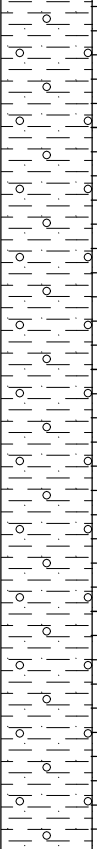
BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS211	
Job No 1620001457	Date 09-09-16 09-09-16	Ground Level (m) 47.75	Co-Ordinates () E 386,619.6 N 394,337.2		
Contractor TerraConsult Ltd				Sheet 1 of 1	

SAMPLES & TESTS						STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.15-0.60	ES						0.12	MADE GROUND: Brown clayey sandy angular to sub-rounded fine and medium GRAVEL of tile, brick, concrete and porcelain. Sand is fine to coarse.		
							0.14			
0.80-1.00	ES						(0.76)	MADE GROUND: ASPHALT.		
							0.90	MADE GROUND: Black sandy angular to sub-rounded fine and medium GRAVEL of ash, clinker, brick and glass with a low cobble content of angular brick.		
1.50-1.70	ES							Firm brown slightly sandy slightly gravelly CLAY . Gravel is angular to sub-rounded fine and medium of mudstone and coal.		
								From 1.50mbgl: Becoming stiff.		
								Borehole completed at 5.00mbgl.		
										
										
										
										
										
										

BOREHOLE LOG

Project EBN High Schools - Lytham Rd., Manchester				BOREHOLE No WS212	
Job No 1620001457	Date 09-09-16 09-09-16	Ground Level (m) 47.51	Co-Ordinates () E 386,605.9 N 394,324.5		
Contractor TerraConsult Ltd				Sheet 1 of 1	

SAMPLES & TESTS			STRATA						Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	TCR (SCR) RQD	(FI) Fracture Spacing min/av/max	Legend	Depth (Thickness)	DESCRIPTION		
0.10-0.20	ES						0.07 (0.48)	MADE GROUND: Black sandy angular to sub-rounded fine and medium GRAVEL of ash, cinder /clinker and brick. Sand is fine to coarse.		
							0.55 (0.25)	MADE GROUND: Soft grey slightly sandy slightly gravelly CLAY . Sand is fine to coarse. Gravel is angular fine of brick.		
							0.80 (4.20)	Firm orange-brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine and medium. Gravel is angular to sub-rounded fine and medium of mudstone, sandstone and coal.		
							5.00	Stiff brown mottled grey slightly sandy slightly gravelly CLAY . Sand is fine. Gravel is angular to sub-rounded fine and medium of mudstone, sandstone and coal. Borehole completed at 5.00mbgl.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered; No olfactory evidence of potential contamination; Visual evidence of potential contamination includes ash, cinder/clinker in shallow Made Ground; Borehole backfilled with arisings upon completion.
All dimensions in metres Scale 1:31.25			Client Laing O'Rourke			Method/ Plant Used Archway Dart			Logged By GB		

TerraConsult

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TerraConsult

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.40)	MADE GROUND: Very soft dark brown sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of brick, plastic and coal..	0.10	ES	
			45.73 0.40	Stiff orangish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium mudstone, sandstone and coal.			
			45.53 0.60	Trial pit terminated at 0.60m			
					0.60 0.60 0.60	FIELD FIELD FIELD	104 kPa 106 kPa 112 kPa
					Depth	Type & No	Results
Groundwater entries: Depth: Rose to: Remarks:				Depth related remarks: From to: Remarks:		General remarks: Weather: Sunny Stability: Stable Remarks: Termination: Target depth	

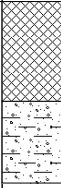
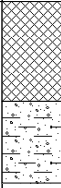
TerraConsult

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Trial Pit Log

TerraConsult

Personnel:		Equipment & methods:		Dimensions:	Coordinates & level:	Dates:
Logged by:	GB	Method:	Machine excavated	Width: 0.60	mE: 386501.77	Start: 07/03/2016
Checked by:	DD	Plant:	JCB 3CX	Length: 0.60	mN: 394320.93	End: 07/03/2016
		Shoring:	n/a	Orientation:	mAOD: 46.47	Logged: 07/03/2016
				Bearing =	Grid: OSGB	

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.33)	MADE GROUND: Very soft dark brown sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded of concrete, brick and tile.	0.20	ES	
			46.14 0.33	Stiff orangish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium mudstone, sandstone and coal.			
			45.87 0.60	Trial pit terminated at 0.60m			
					0.60	FIELD	90 kPa
					0.60	FIELD	98 kPa
					0.60	FIELD	98 kPa

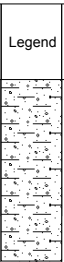
Groundwater entries:		Depth related remarks:		General remarks:	
Depth:	Rose to:	Remarks:	From to: Remarks:	Weather:	Sunny
				Stability:	Stable
				Remarks:	
				Termination:	Target depth

 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters.		Project: Lytham Road	Exploratory position reference: HP204
Log issue:	DRAFT	Project No: 2739	
Scale:	1:25	Client: Ramboll	

TerraConsult

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TerraConsult

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			46.23 0.45	MADE GROUND: Very soft dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of tile, porcelain and rare glass.	0.10	ES	
				0.35-0.45: Red clay land drain ecoutered (100mm diameter).			
				Stiff orangish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium mudstone, sandstone and coal.			
				Trial pit terminated at 0.60m			
					0.60 0.60	FIELD FIELD	110 kPa 89 kPa
					Depth	Type & No	Results

 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: DRAFT Scale: 1:25	Project: Lytham Road Project No: 2739 Client: Ramboll	Exploratory position reference: HP206 Sheet 1 of 1
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TerraConsult

Sheet 1 of 1

TerraConsult

Sheet 1 of 1

TerraConsult

Sheet 1 of 1

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Sheet 1 of 1

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 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: DRAFT Scale: 1:25	Project: Lytham Road Project No: 2739 Client: Ramboll	Exploratory position reference: HP211 Sheet 1 of 1
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TerraConsult

Sheet 1 of 1

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Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing			
					Depth	Type & No	Results	
		 	(0.35)	MADE GROUND: Very soft dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium of brick.	0.15	ES		
			47.59 0.35	Stiff orangish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium mudstone, sandstone and coal.				
			47.34 0.60					
			Trial pit terminated at 0.70m				0.70 0.70 0.70	FIELD FIELD FIELD
Groundwater entries: Depth: Rose to: Remarks:				Depth related remarks: From to: Remarks:		General remarks: Weather: Showers Stability: Stable Remarks: Termination: Target depth		

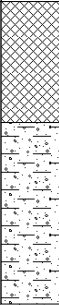
 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: DRAFT Scale: 1:25	Project: Lytham Road Project No: 2739 Client: Ramboll	Exploratory position reference: HP218 Sheet 1 of 1
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TerraConsult

Backfill/ Instal'n	Water strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.40) 47.10 0.40	MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium of brick, tiles and porcelain.	1.00	BRE DG 365	n/a
			(0.60) 46.50 1.00	Firm dark brown mottled grey slightly gravelly sandy CLAY. Gravel is angular to subangular fine to medium mudstone and sandstone. <i>0.70-0.80: Red clay land drain encountered (100mm diameter).</i>			
				Trial pit terminated at 1.00m			
					Depth	Type & No	Results
Groundwater entries: Depth: Rose to: Remarks:				Depth related remarks: From to: Remarks:			General remarks: Weather: Sunny Stability: Stable Remarks: Termination: Target depth

 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: DRAFT Scale: 1:25	Project: Lytham Road Project No: 2739 Client: Ramboll	Exploratory position reference: SP201 Sheet 1 of 1
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TerraConsult

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			(0.40)	MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY. Gravel is angular to subrounded fine to medium brick, tile and porcelain.	1.00	BRE DG 365	n/a
			47.25 0.40 (0.60)	0.30-0.40: Red clay land drain ecoutered (100mm diameter). Firm dark brown mottled grey slightly gravelly sandy CLAY. Gravel angular to subangular fine to medium mudstone and sandstone.			
			46.65 1.00	Trial pit terminated at 1.00m			
					Depth	Type & No	Results

 Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters. Log issue: DRAFT Scale: 1:25	Project: Lytham Road Project No: 2739 Client: Ramboll	Exploratory position reference: SP202 Sheet 1 of 1
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Trial Pit Log

TerraConsult

Personnel:		Equipment & methods:		Dimensions:	Coordinates & level:	Dates:
Logged by:	JP	Method:		Width: 0.60	mE: 386586.75	Start: 07/03/2016
Checked by:	DD	Plant: JCB 3CX		Length: 2.00	mN: 394352.49	End: 07/03/2016
		Shoring: n/a		Orientation:	mAOD: 47.55	Logged: 07/03/2016
				Bearing =	Grid: OSGB	

Backfill/ Instal'n	Water- strike	Legend	Level & Depth (Thickness)	Stratum Description	Samples & In Situ Testing		
					Depth	Type & No	Results
			47.30 0.25	MADE GROUND: Soft dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subrounded of brick, tiles and porcelain.			
			(0.95)	Firm orangish brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to subangular mudstone, sandstone and coal.			
			46.35 1.20	Stiff brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is angular to subangular fine to medium mudstone, sandstone and coal.			
			(2.20)				
			44.15 3.40	Trial pit terminated at 3.40m	3.40	BRE DG 365	n/a
					Depth	Type & No	Results

Groundwater entries:		Depth related remarks:		General remarks:	
Depth:	Rose to:	Remarks:	From to: Remarks:	Weather:	Sunny
				Stability:	Stable
				Remarks:	
				Termination:	Target depth

Notes: For explanation of symbols and abbreviations see Key Sheet. All depths and reduced levels are in meters.		Project: Lytham Road	Exploratory position reference: SP203
Log issue:	DRAFT	Project No: 2739	
Scale:	1:25	Client: Ramboll	

**APPENDIX C: GEOTECHNICAL LABORATORY ANALYTICAL DATA AND
SOAKWAY TEST RESULTS**



LABORATORY REPORT



4043

Contract Number: PSL16/1156

Report Date: 31 March 2016
Client's Reference: 1620007156
Client Name: Ramboll
Third Floor Halsbury House
Chancellor Court
21 The Calls
Leeds
LS2 7EH

For the attention of: Simon Ramsdale

Contract Title: Lytham Road Manchester
Date Received: 14/03/2016
Date Commenced: 14/03/2016
Date Completed: 31/03/2016

Notes: Opinions and Interpretations are outside the UKAS Accreditation

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

Checked and Approved Signatories:

R Gunson
(Director)

D Lambe
(Senior Technician)

A Watkins
(Director)

S Royle
(Senior Technician)

M Beastall
(Laboratory Manager)

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
BH201	2	B	0.30	1.20	Brown mottled grey slightly gravelly very sandy CLAY.
BH201	3	U	1.20	1.65	Firm brown slightly gravelly very sandy CLAY.
BH201	9	U	3.00	3.45	Stiff brown slightly gravelly very sandy CLAY.
BH201	13	B	4.00	4.45	Brown slightly gravelly very sandy very silty CLAY.
BH201	15	U	5.00	5.45	Firm brown slightly gravelly very sandy CLAY.
BH202	2	B	0.70	1.20	Brown slightly gravelly very sandy very silty CLAY.
BH202	4	B	1.20	1.65	Brown mottled grey slightly gravelly very sandy CLAY.
BH202	6	U	2.00	2.45	Stiff brown slightly gravelly very sandy very silty CLAY.
BH202	12	U	4.00	4.45	Stiff brown gravelly very sandy CLAY.
BH202	18	U	6.50	6.95	Stiff brown gravelly very sandy CLAY.

		Checked / Approved		Date	31/03/16	Contract No:
		Lytham Road, Manchester				PSL16/1156
						Client Ref:

SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m ³ Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
BH201	2	B	0.30	1.20	25			35	18	17	92	Intermediate plasticity CL.
BH201	9	U	3.00	3.45	13			32	16	16	86	Low plasticity CL.
BH201	13	B	4.00	4.45	19			31	16	15	83	Low plasticity CL.
BH202	2	B	0.70	1.20	33			36	18	18	85	Intermediate plasticity CL.
BH202	4	B	1.20	1.65	11			30	15	15	84	Low plasticity CL.
BH202	6	U	2.00	2.45	13			30	15	15	85	Low plasticity CL.

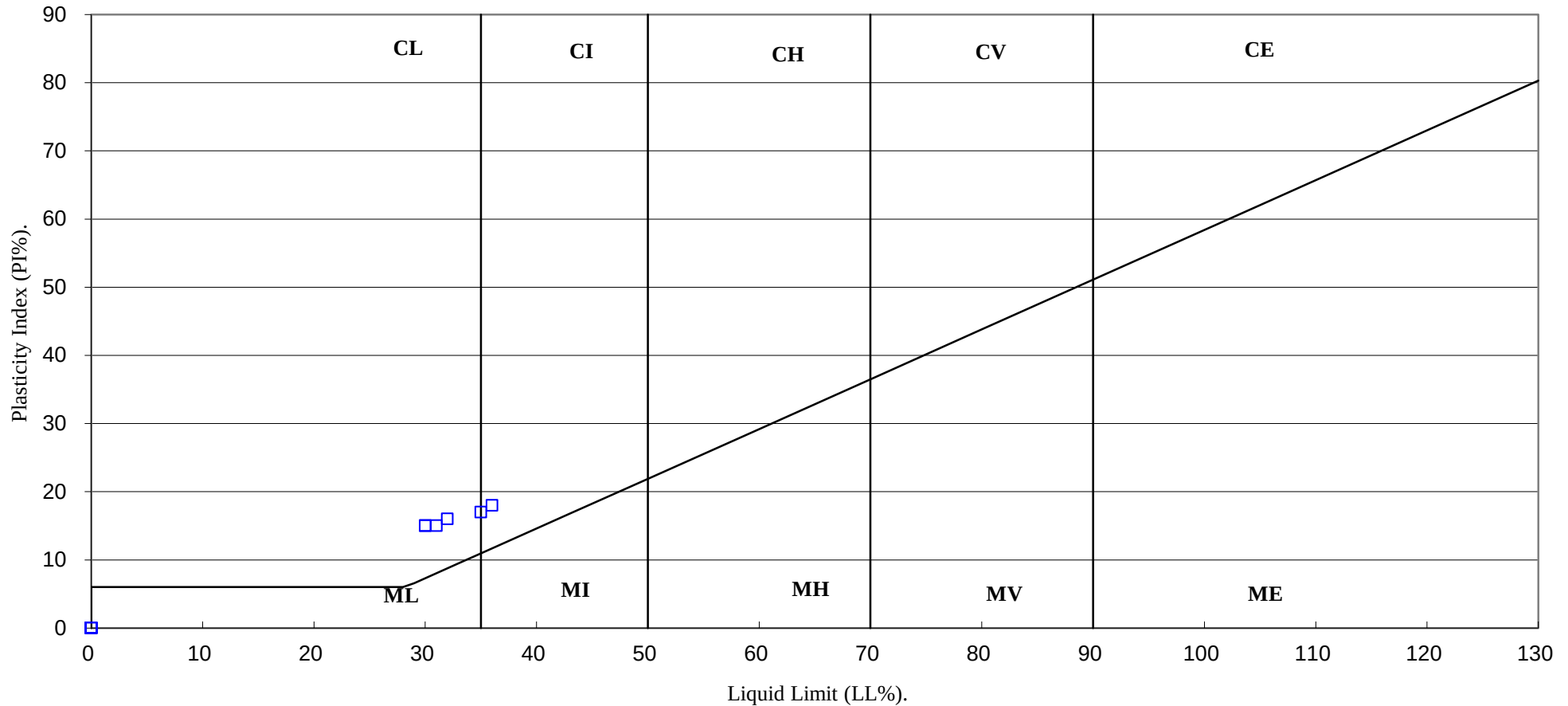
SYMBOLS : NP : Non Plastic

* : Liquid Limit and Plastic Limit Wet Sieved.

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		Lytham Road, Manchester				PSL16/1156
						Client Ref:

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

(BS5930 :2015)



PSL
Professional Soils Laboratory

Checked /Approved

[Signature]

Date

31/03/16

Contract No:

PSL16/1156

Client Ref:

Lytham Road, Manchester

PARTICLE SIZE DISTRIBUTION TEST

BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

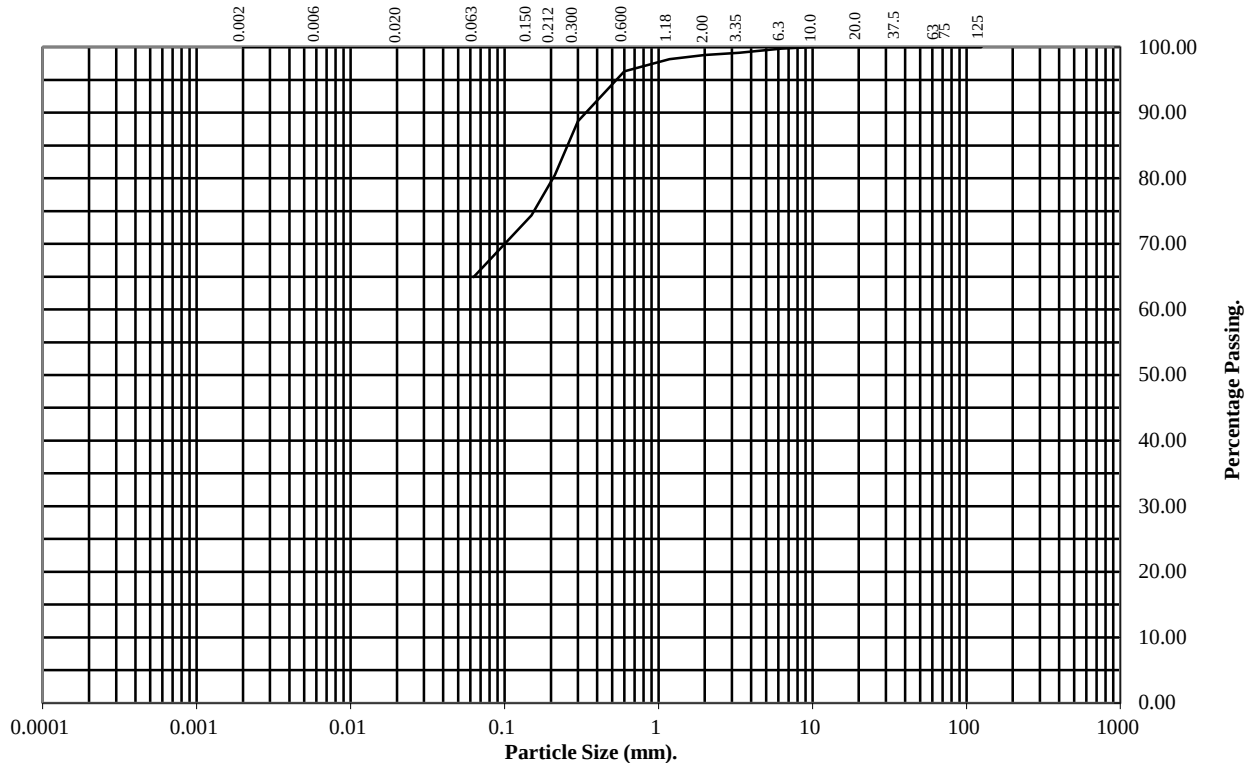
Hole Number: BH201

Top Depth (m): 0.30

Sample Number: 2

Base Depth(m): 1.20

Sample Type: B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2	99
1.18	98
0.6	96
0.3	89
0.212	81
0.15	74
0.063	65

Soil Fraction	Total Percentage
Cobbles	0
Gravel	1
Sand	34
Silt/Clay	65

Remarks:

See summary of soil descriptions.



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				Client Ref:
				1620007156

PARTICLE SIZE DISTRIBUTION TEST

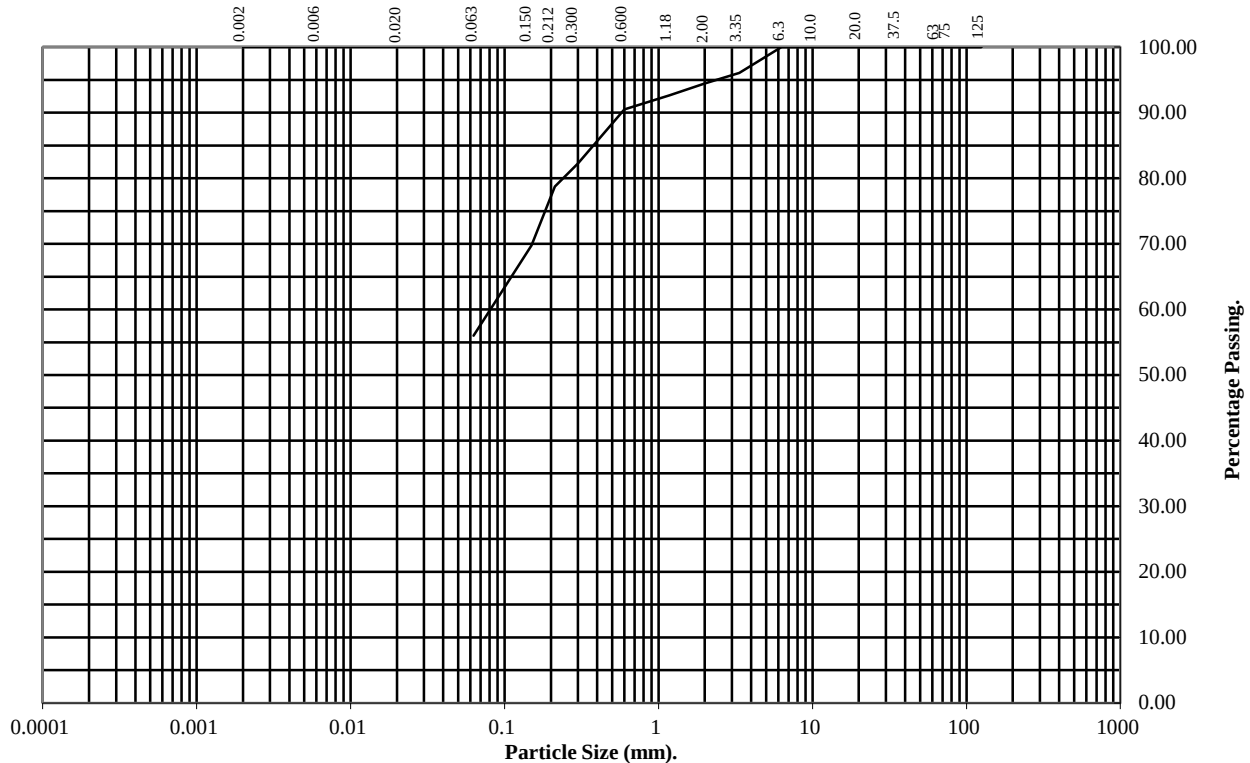
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: BH201 Top Depth (m): 3.00

Sample Number: 9 Base Depth(m): 3.45

Sample Type: U



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	96
2	94
1.18	93
0.6	91
0.3	82
0.212	79
0.15	70
0.063	56

Soil Fraction	Total Percentage
Cobbles	0
Gravel	6
Sand	38
Silt/Clay	56

Remarks:

See summary of soil descriptions.



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				Client Ref:
				1620007156

PARTICLE SIZE DISTRIBUTION TEST

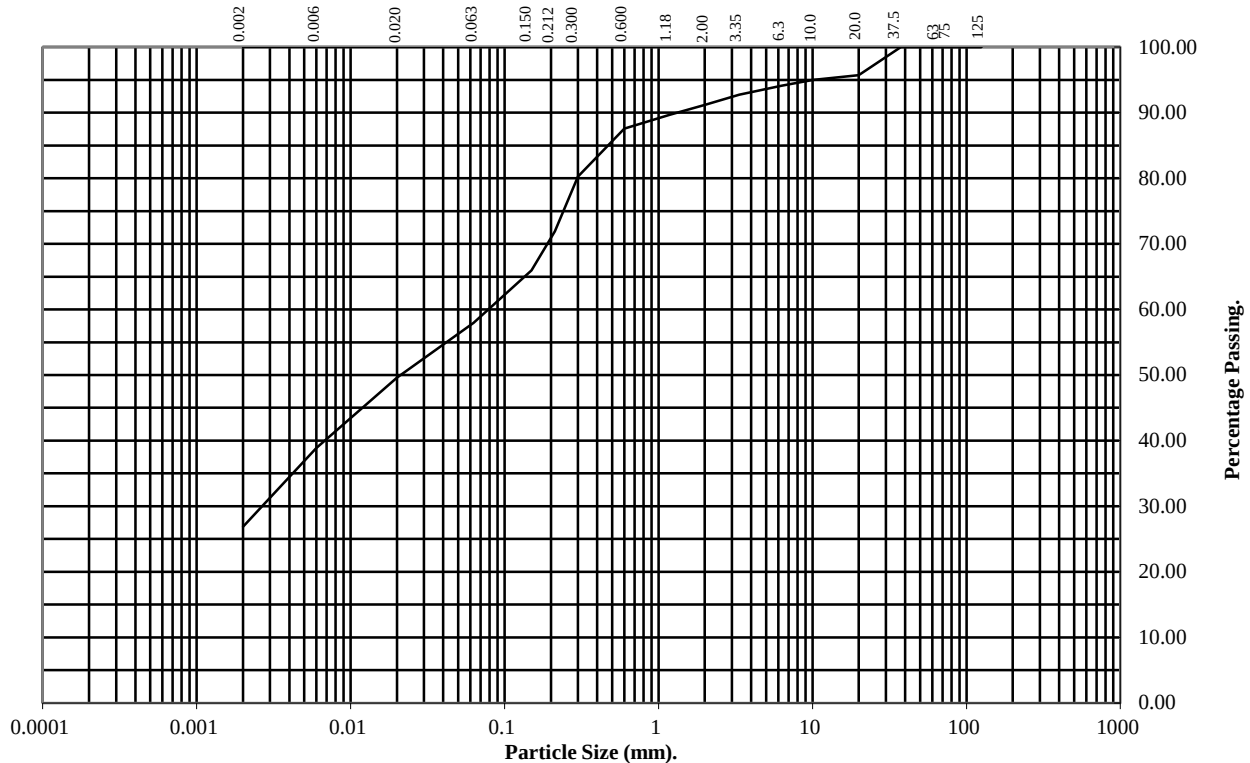
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH201 Top Depth (m): 4.00

Sample Number: 13 Base Depth(m): 4.45

Sample Type: B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	96
10	95
6.3	94
3.35	93
2	91
1.18	90
0.6	88
0.3	80
0.212	72
0.15	66
0.063	58

Particle Diameter	Percentage Passing
0.02	50
0.006	39
0.002	27

Soil Fraction	Total Percentage
Cobbles	0
Gravel	9
Sand	33
Silt	31
Clay	27

Remarks:

See summary of soil descriptions.



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				Client Ref:
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PARTICLE SIZE DISTRIBUTION TEST

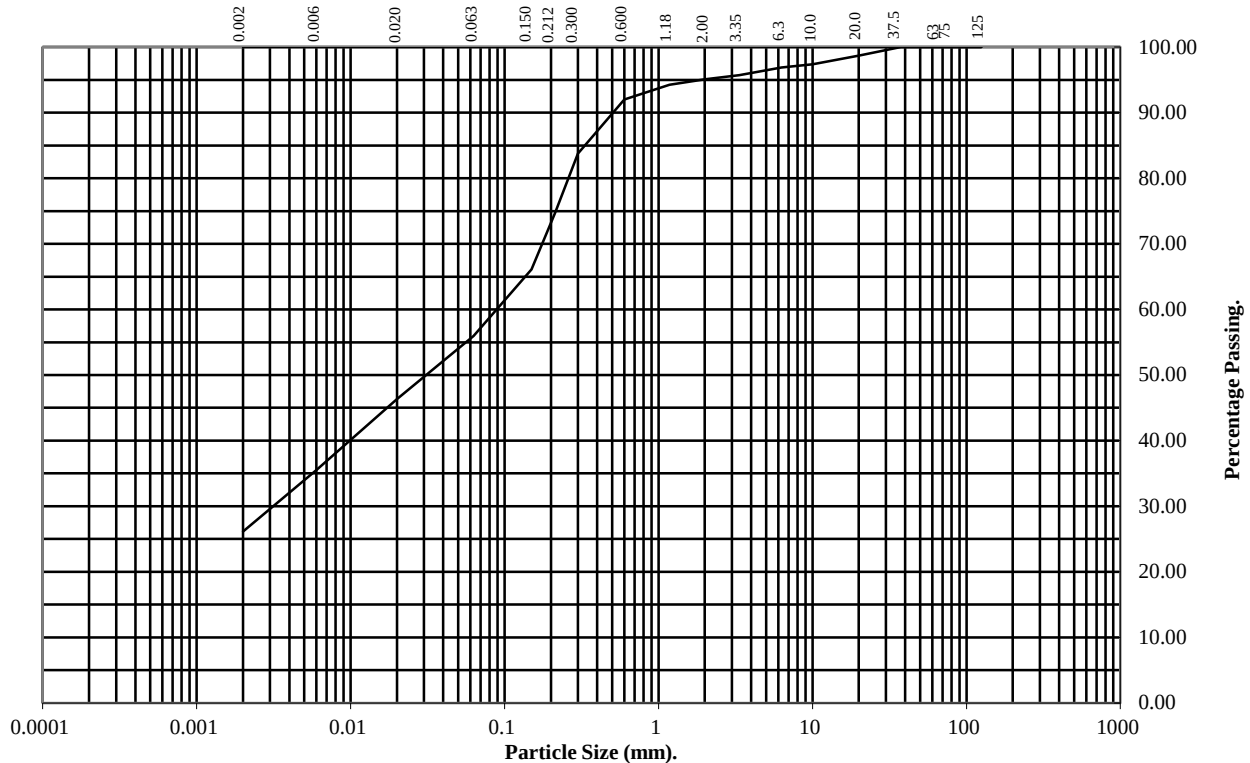
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH202 Top Depth (m): 0.70

Sample Number: 2 Base Depth(m): 1.20

Sample Type: B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	99
10	97
6.3	97
3.35	96
2	95
1.18	94
0.6	92
0.3	84
0.212	75
0.15	66
0.063	56

Particle Diameter	Percentage Passing
0.02	46
0.006	35
0.002	26

Soil Fraction	Total Percentage
Cobbles	0
Gravel	5
Sand	39
Silt	30
Clay	26

Remarks:

See summary of soil descriptions.



Checked / Approved		Date	31/03/16	Contract No:
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				Client Ref:
				1620007156

PARTICLE SIZE DISTRIBUTION TEST

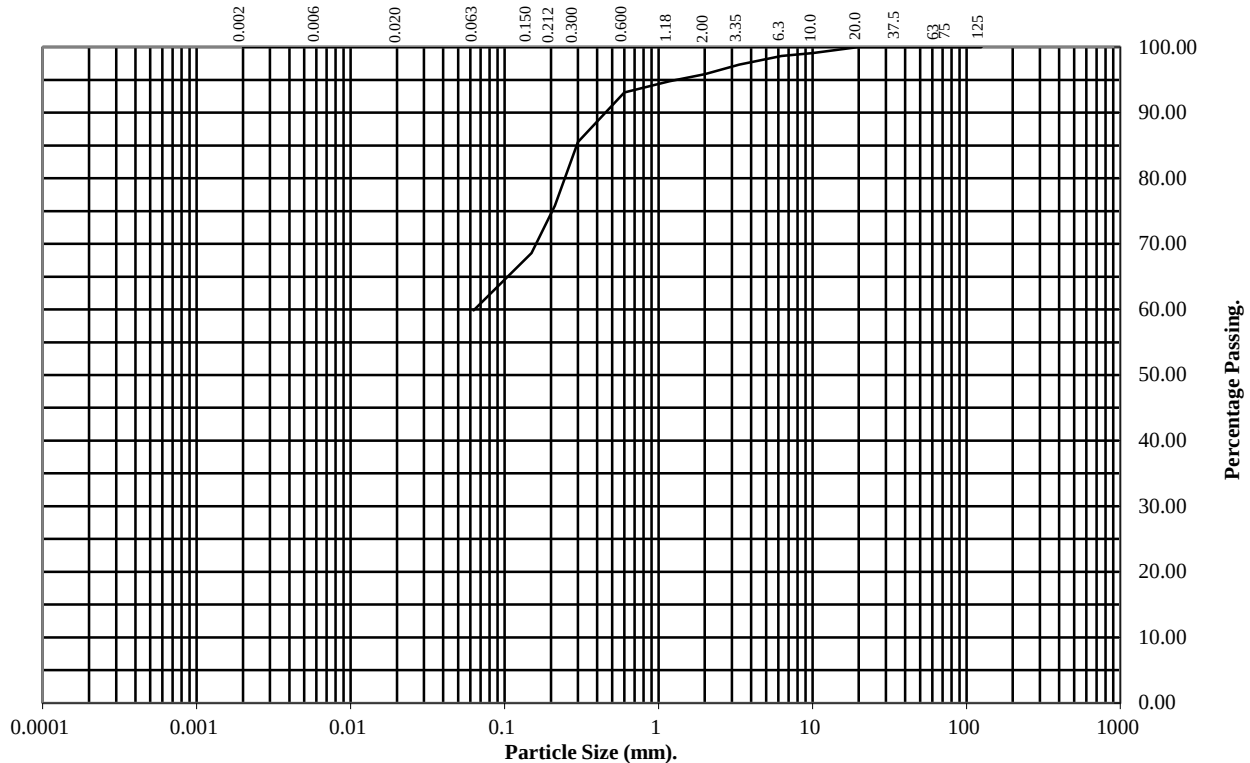
BS1377 : Part 2 : 1990

Wet Sieve, Clause 9.2

Hole Number: BH202 Top Depth (m): 1.20

Sample Number: 4 Base Depth(m): 1.65

Sample Type: B



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	99
6.3	99
3.35	97
2	96
1.18	95
0.6	93
0.3	86
0.212	76
0.15	69
0.063	60

Soil Fraction	Total Percentage
Cobbles	0
Gravel	4
Sand	36
Silt/Clay	60

Remarks:

See summary of soil descriptions.



Checked / Approved		Date	31/03/16	Contract No:
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				Client Ref:
				1620007156

PARTICLE SIZE DISTRIBUTION TEST

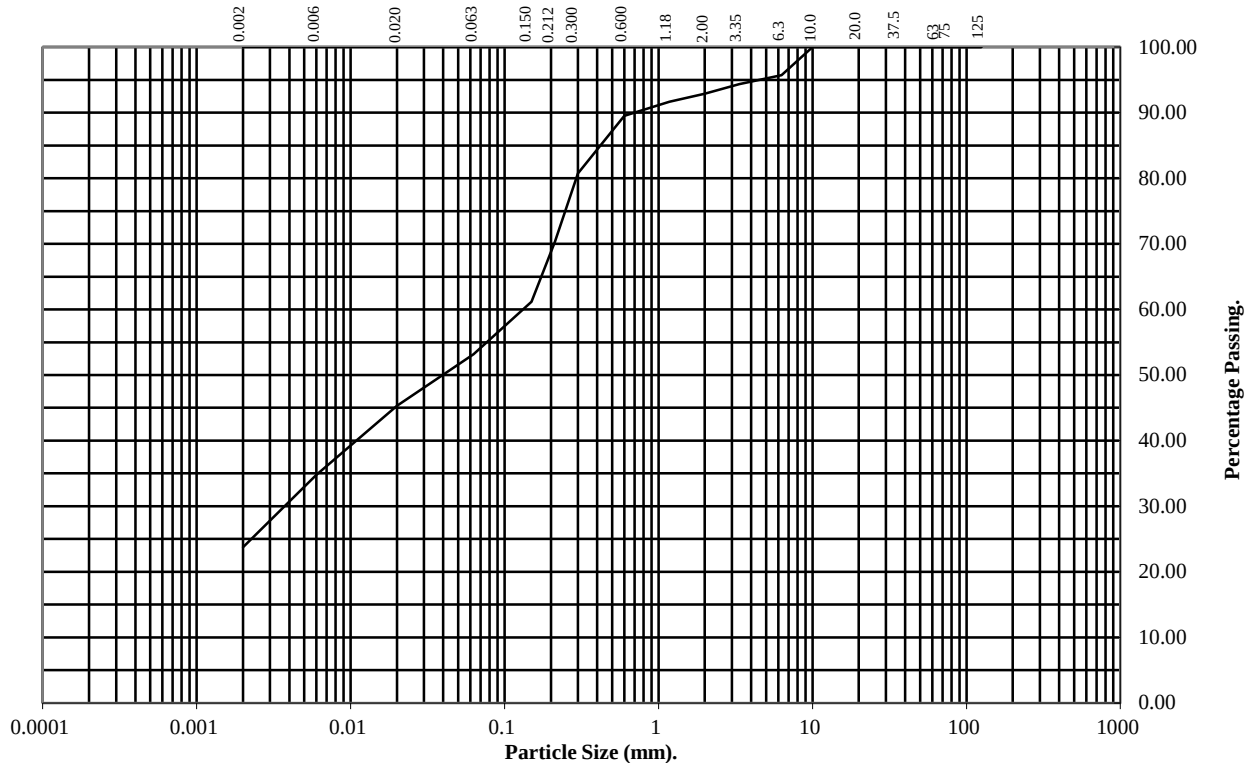
BS1377 : Part 2 : 1990

Wet Sieve & Pipette Analysis, Clause 9.2 & 9.4

Hole Number: BH202 Top Depth (m): 2.00

Sample Number: 6 Base Depth(m): 2.45

Sample Type: U



BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	96
3.35	94
2	93
1.18	92
0.6	90
0.3	81
0.212	70
0.15	61
0.063	53

Particle Diameter	Percentage Passing
0.02	45
0.006	35
0.002	24

Soil Fraction	Total Percentage
Cobbles	0
Gravel	7
Sand	40
Silt	29
Clay	24

Remarks:

See summary of soil descriptions.



Checked / Approved		Date	31/03/16	Contract No:
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				Client Ref:
				1620007156

ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: BH201

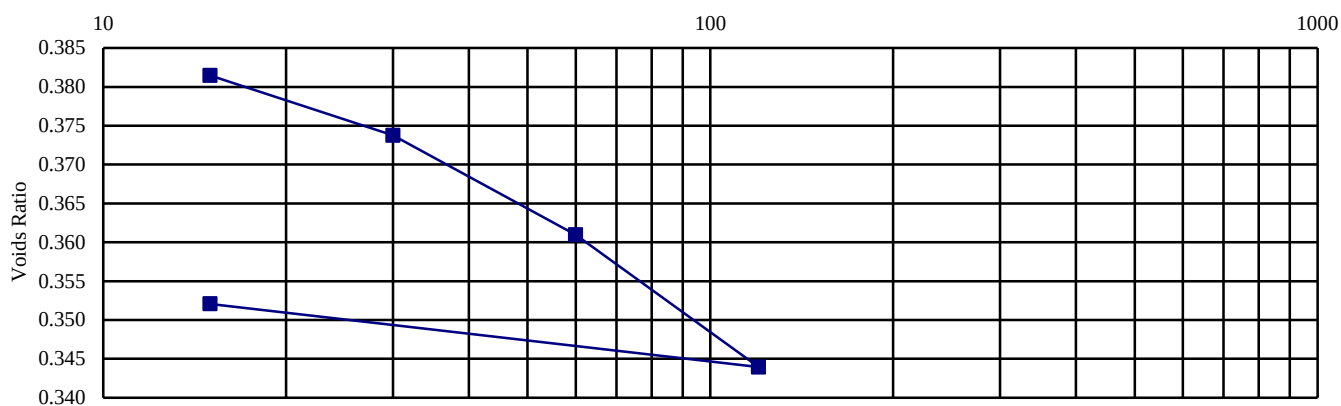
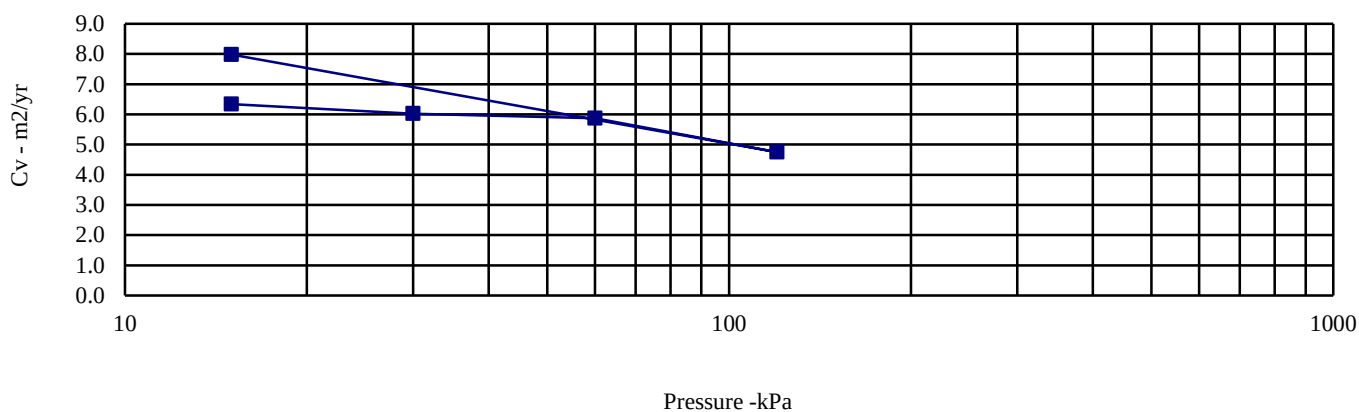
Top Depth (m): 1.20

Sample Number: 3

Base Depth (m) : 1.65

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	15	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.19	0	15	0.430	6.337	Method used to	
Dry Density (Mg/m3):	1.91	15	30	0.372	6.026	determine CV:	T90
Voids Ratio:	0.390	30	60	0.310	5.869	Nominal temperature	
Degree of saturation:	102.9	60	120	0.208	4.751	during test ' C:	20
Height (mm):	20.016	120	15	0.058	7.983	Remarks:	
Diameter (mm)	75.03					See summary of soils description.	
Particle Density (Mg/m3):	2.65						
Assumed							



		Checked / Approved		Date	31/03/16	Contract No:
		Lytham Road, Manchester				PSL16/1156
						Client Ref:
						1620007156

ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: BH201

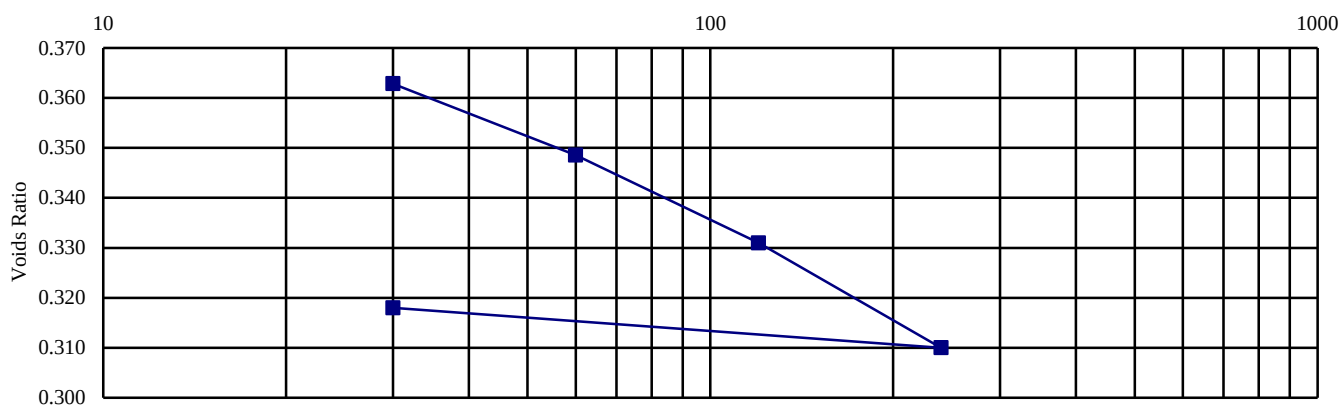
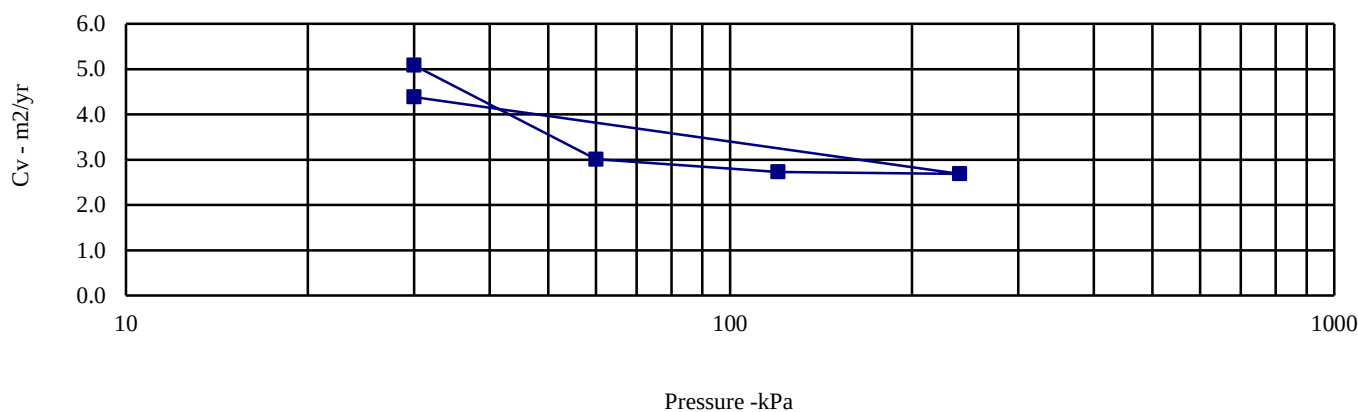
Top Depth (m): 3.00

Sample Number: 9

Base Depth (m) : 3.45

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	14	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.18	0	30	0.730	5.085	Method used to	
Dry Density (Mg/m3):	1.90	30	60	0.350	3.008	determine CV:	T90
Voids Ratio:	0.393	60	120	0.217	2.729	Nominal temperature	
Degree of saturation:	97.2	120	240	0.131	2.689	during test ' C:	20
Height (mm):	20.042	240	30	0.029	4.383	Remarks:	
Diameter (mm)	75.15					See summary of soils description.	
Particle Density (Mg/m3):	2.65						
Assumed							



		Checked / Approved		Date	31/03/16	Contract No:
		Lytham Road, Manchester				PSL16/1156
						Client Ref:
						1620007156

ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: BH201

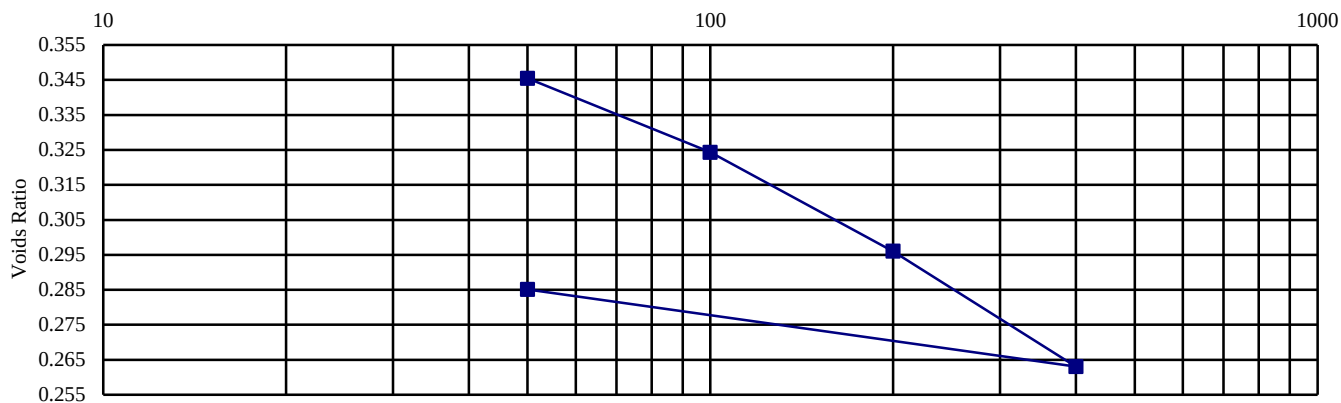
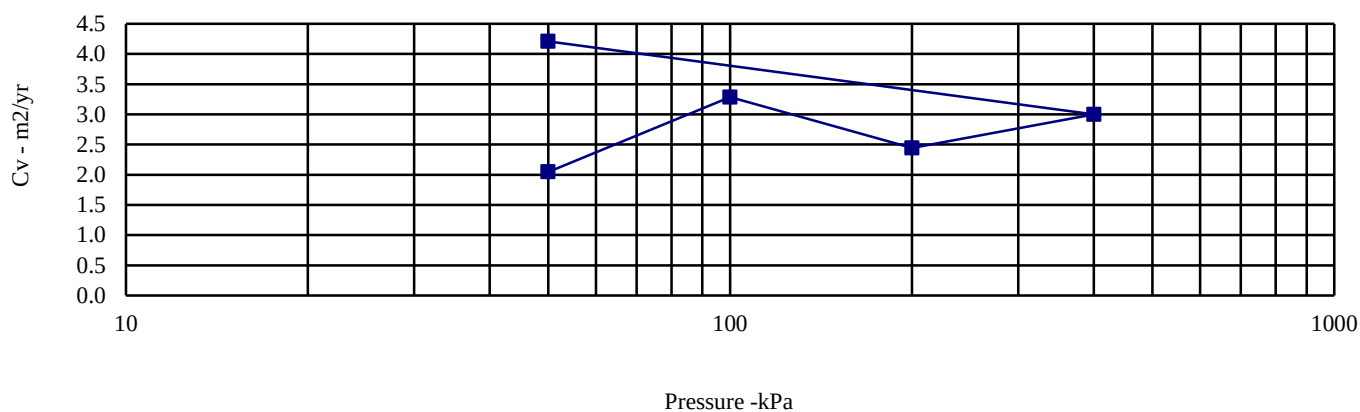
Top Depth (m): 5.00

Sample Number: 15

Base Depth (m) : 5.45

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	15	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.19	0	50	0.598	2.048	Method used to	
Dry Density (Mg/m3):	1.91	50	100	0.315	3.285	determine CV:	T90
Voids Ratio:	0.387	100	200	0.214	2.445	Nominal temperature	
Degree of saturation:	101.1	200	400	0.127	3.000	during test ' C:	20
Height (mm):	19.984	400	50	0.050	4.208	Remarks:	
Diameter (mm)	75.02					See summary of soils description.	
Particle Density (Mg/m3):	2.65						
Assumed							



	PSL Professional Soils Laboratory	Checked / Approved		Date	31/03/16	Contract No:
		Lytham Road, Manchester				PSL16/1156
						Client Ref:
						1620007156

ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: BH202

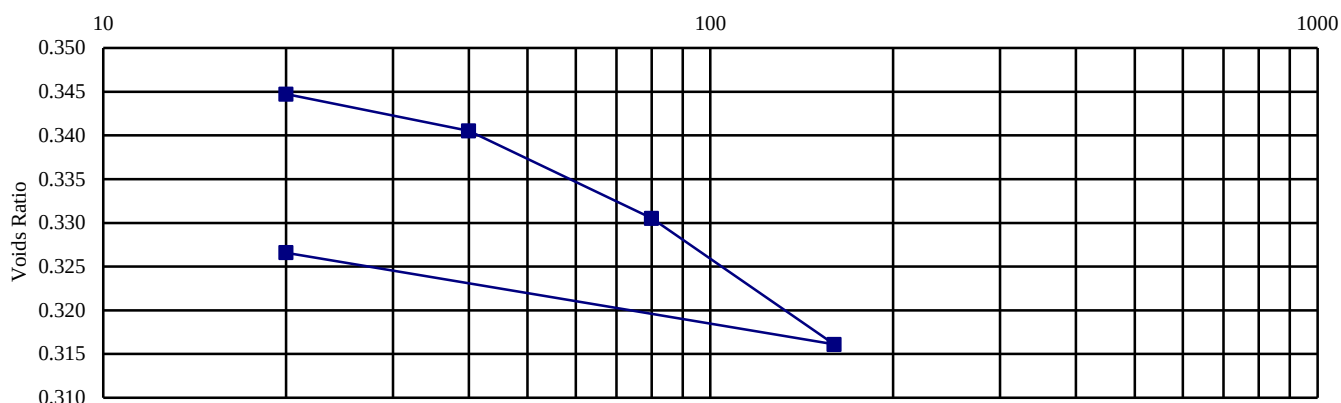
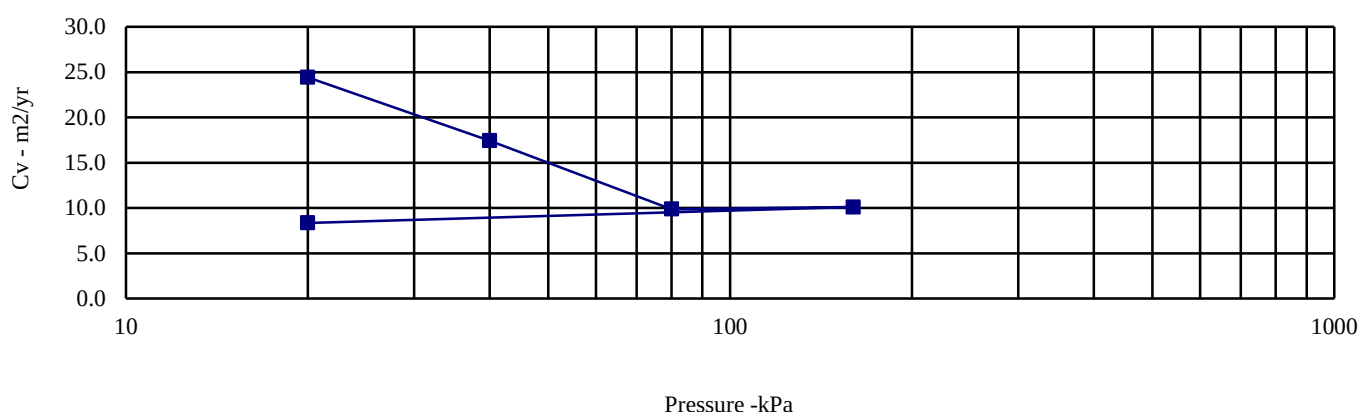
Top Depth (m): 2.00

Sample Number: 6

Base Depth (m) : 2.45

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	13	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.21	0	20	0.263	24.411	Method used to	
Dry Density (Mg/m3):	1.96	20	40	0.156	17.414	determine CV:	T90
Voids Ratio:	0.352	40	80	0.187	9.875	Nominal temperature	
Degree of saturation:	94.2	80	160	0.135	10.091	during test ' C:	20
Height (mm):	19.976	160	20	0.057	8.342	Remarks:	See summary of soils description.
Diameter (mm)	75.05						
Particle Density (Mg/m3): Assumed	2.65						



		Checked / Approved		Date	31/03/16	Contract No:
		Lytham Road, Manchester				PSL16/1156
						Client Ref:
						1620007156

ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: BH202

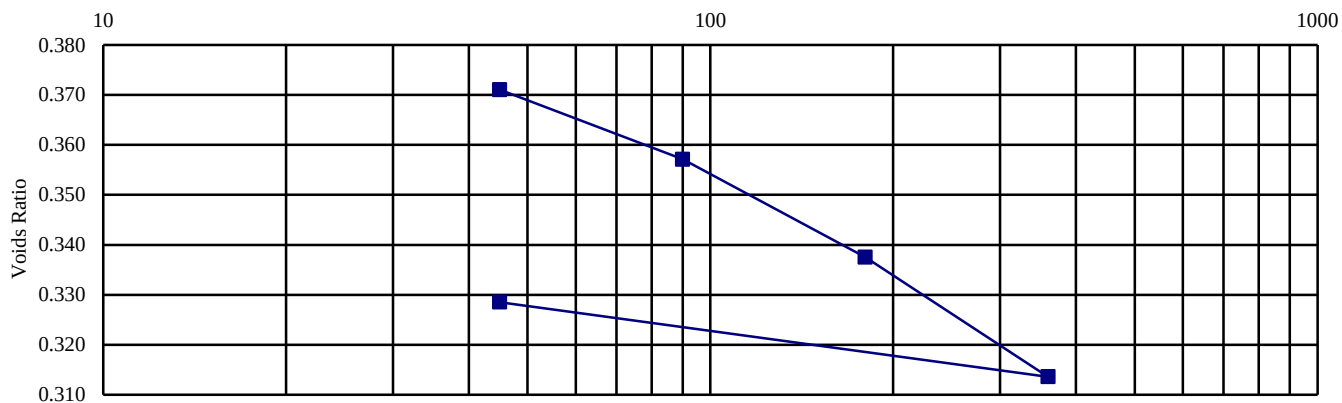
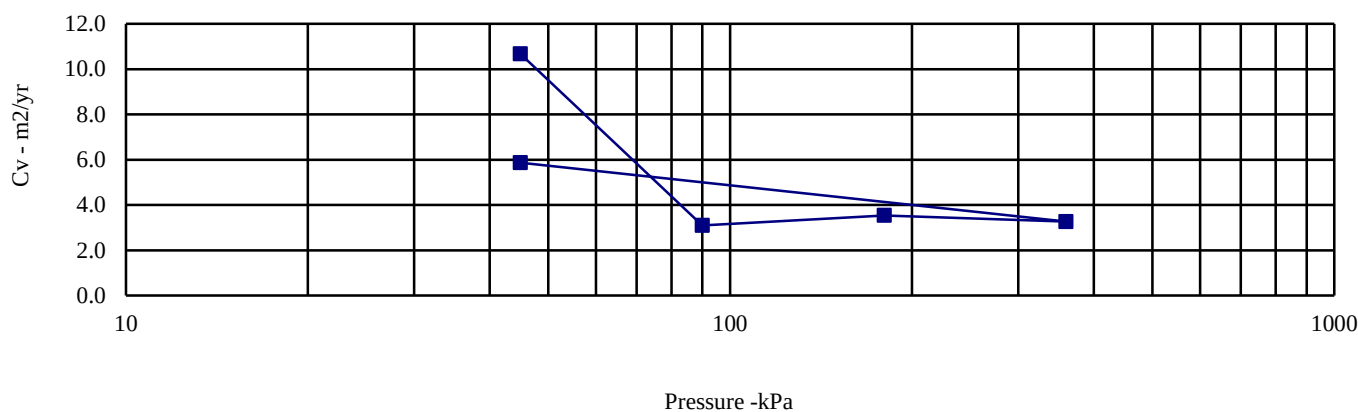
Top Depth (m): 4.00

Sample Number: 12

Base Depth (m) : 4.45

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	14	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.18	0	45	0.286	10.670	Method used to	
Dry Density (Mg/m3):	1.91	45	90	0.225	3.097	determine CV:	T90
Voids Ratio:	0.389	90	180	0.161	3.532	Nominal temperature	
Degree of saturation:	96.4	180	360	0.099	3.259	during test ' C:	20
Height (mm):	20.1	360	45	0.036	5.864	Remarks:	
Diameter (mm)	75.05					See summary of soils description.	
Particle Density (Mg/m3):	2.65						
Assumed							



		Checked / Approved		Date	31/03/16	Contract No:
		Lytham Road, Manchester				PSL16/1156
						Client Ref:
						1620007156

ONE DIMENSIONAL CONSOLIDATION TEST

BS 1377: Part 5: 1990: Clause 3

Hole Number: BH202

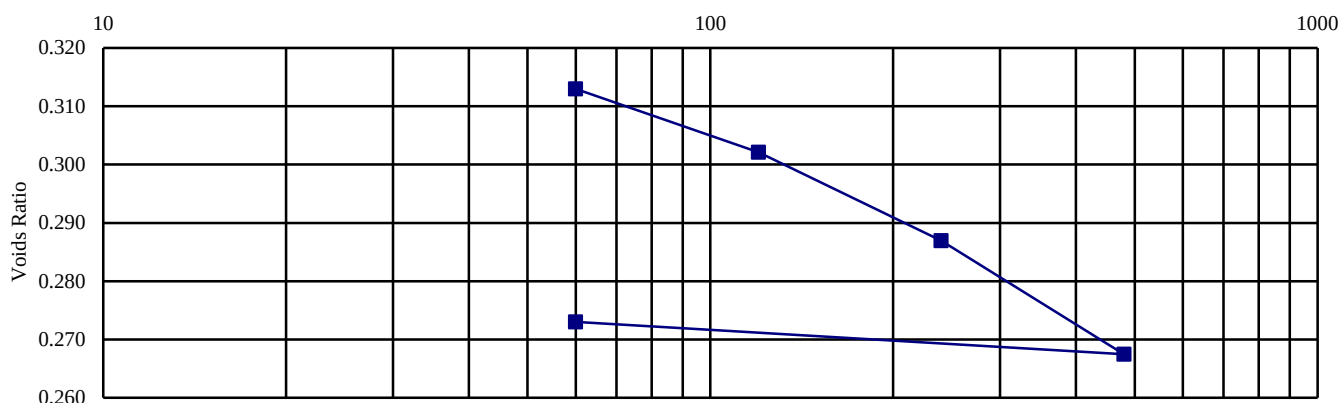
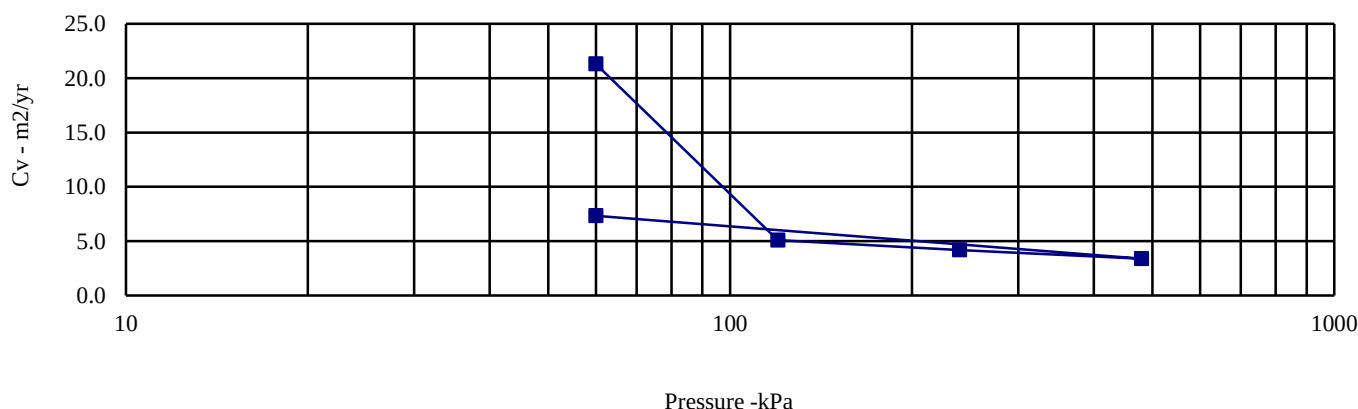
Top Depth (m): 6.50

Sample Number: 18

Base Depth (m) : 6.95

Sample Type: U

Initial Conditions		Pressure Range		Mv	Cv	Specimen location	
Moisture Content (%):	12	kPa		m2/MN	m2/yr	within tube:	Top
Bulk Density (Mg/m3):	2.23	0	60	0.227	21.304	Method used to	
Dry Density (Mg/m3):	1.99	60	120	0.138	5.086	determine CV:	T90
Voids Ratio:	0.331	120	240	0.097	4.190	Nominal temperature	
Degree of saturation:	96.6	240	480	0.063	3.388	during test ' C:	20
Height (mm):	20.098	480	60	0.010	7.328	Remarks:	
Diameter (mm)	75.075					See summary of soils description.	
Particle Density (Mg/m3):	2.65						
Assumed							



		Checked / Approved		Date	31/03/16	Contract No:
		Lytham Road, Manchester				PSL16/1156
						Client Ref:
						1620007156

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

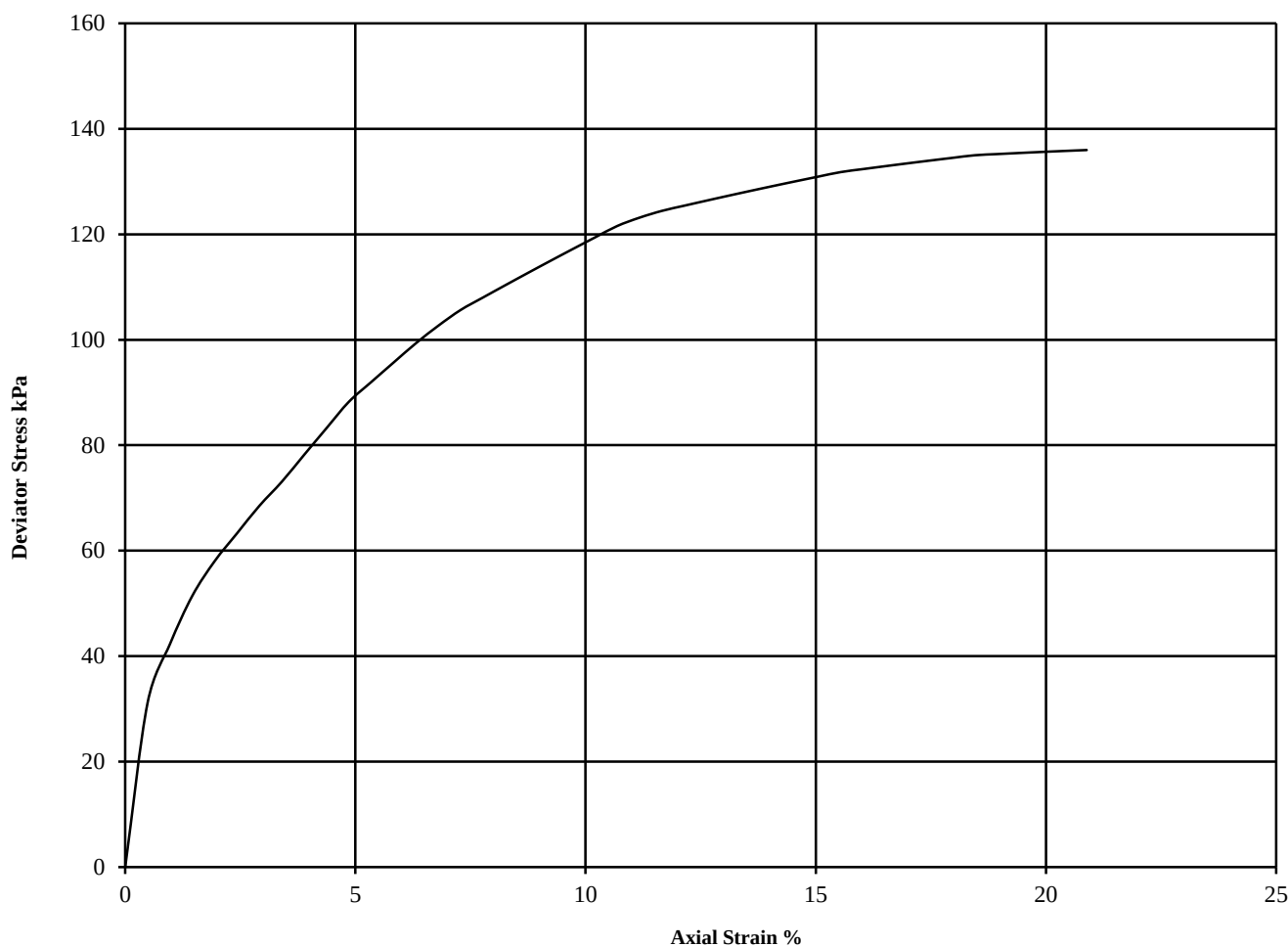
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH201 Top Depth (m): 1.20

Sample Number: 3 Base Depth (m): 1.65

Sample Type U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33 See summary of soil descriptions.
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	14	2.20	1.93	30	136	68	20.9	Plastic	



Checked / Approved



Date

31/03/16

Contract No:

PSL16/1156

Client Ref:

1620007156

Lytham Road, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

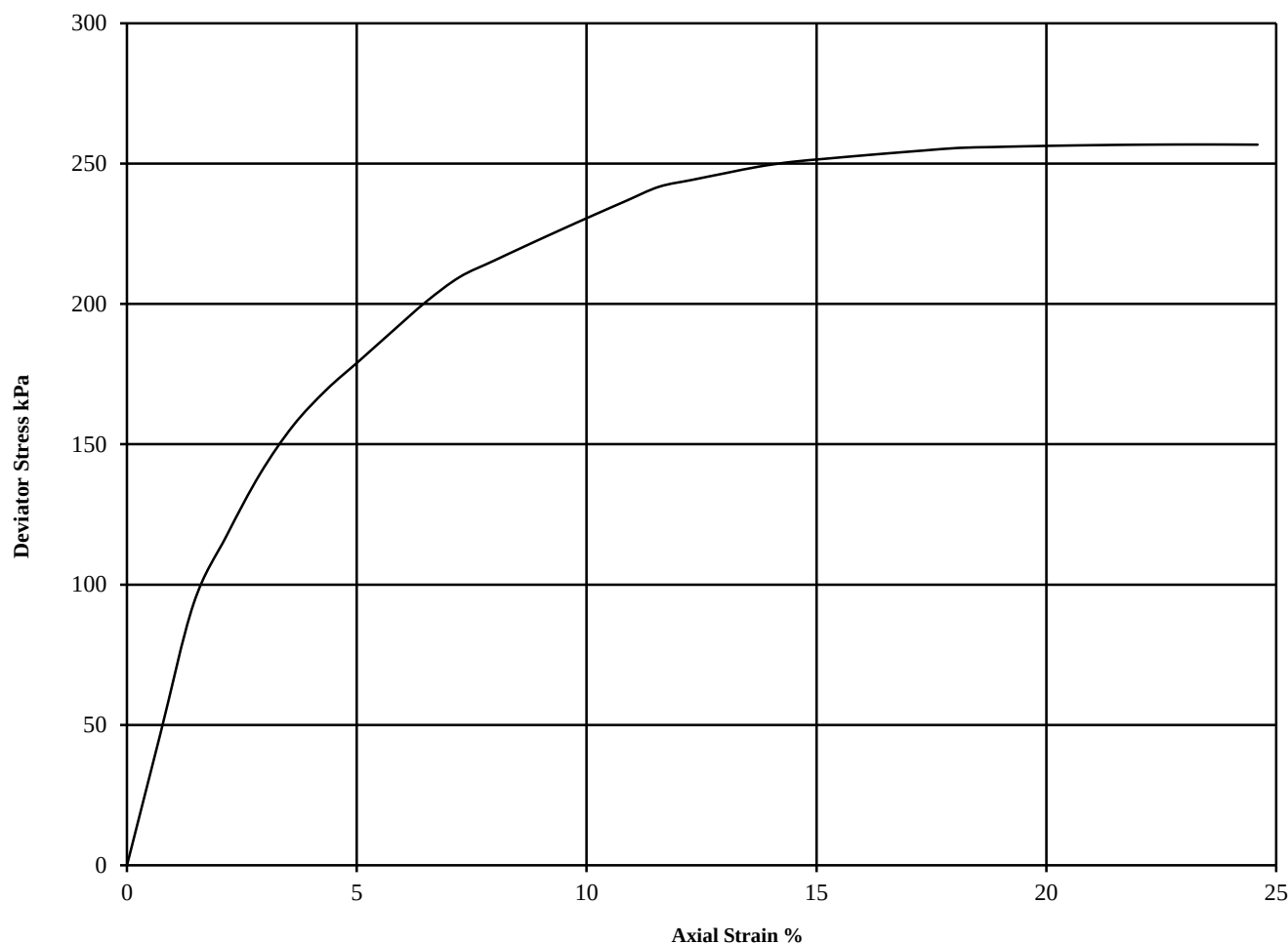
Hole Number: BH201

Top Depth (m): 3.00

Sample Number: 9

Base Depth (m): 3.45

Sample Type U



Diameter (mm):		102.0	Height (mm):		141.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33 See summary of soil descriptions.
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	13	2.24	1.99	65	257	128	23.1	Intermediate	



Checked / Approved

Date

31/03/16

Contract No:

PSL16/1156

Client Ref:

1620007156

Lytham Road, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

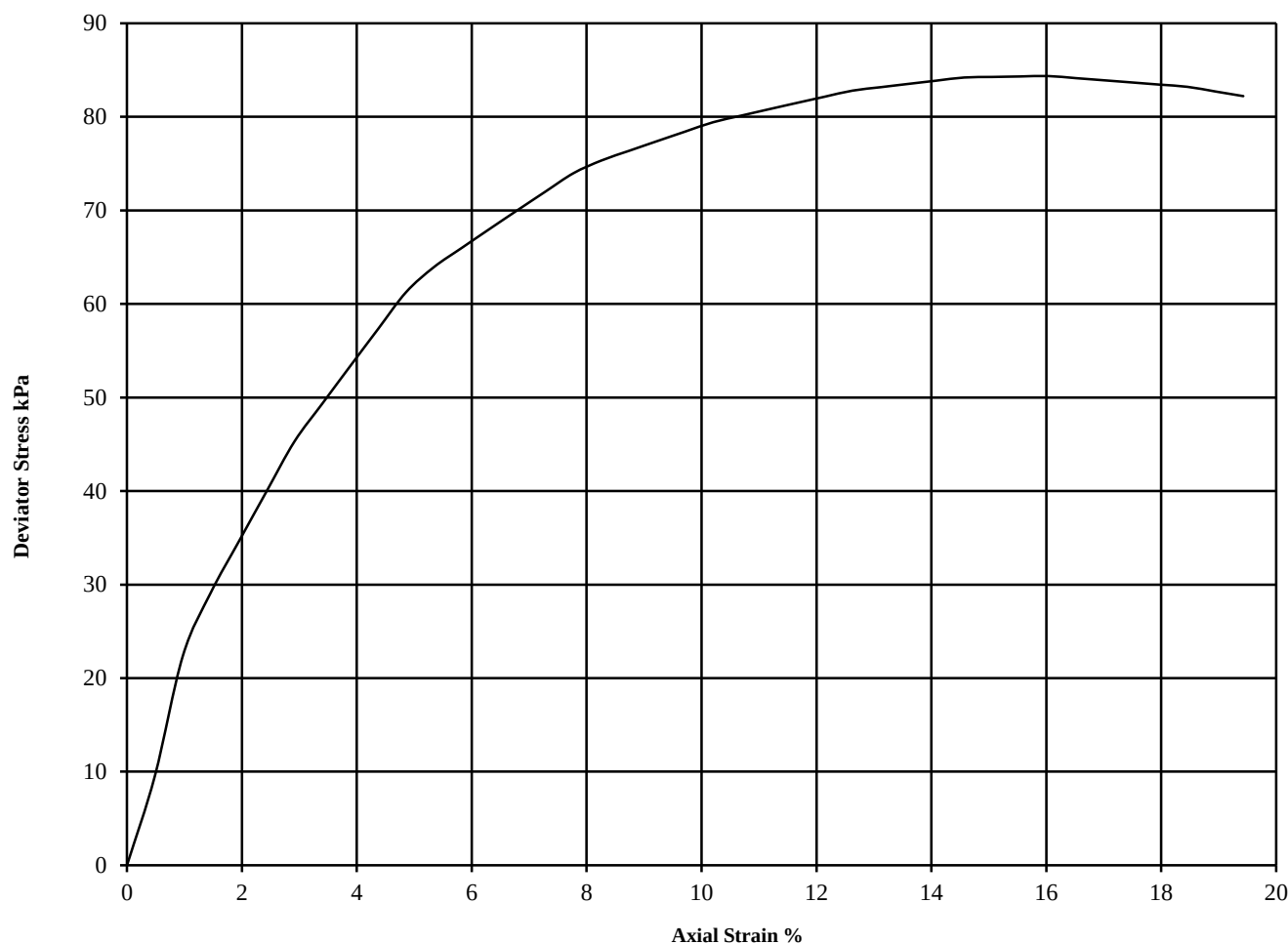
Hole Number: BH201

Top Depth (m): 5.00

Sample Number: 15

Base Depth (m): 5.45

Sample Type U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34 See summary of soil descriptions.
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	11	2.20	1.99	100	84	42	16.0	Plastic	



Checked / Approved

Date

31/03/16

Contract No:

PSL16/1156

Client Ref:

1620007156

Lytham Road, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

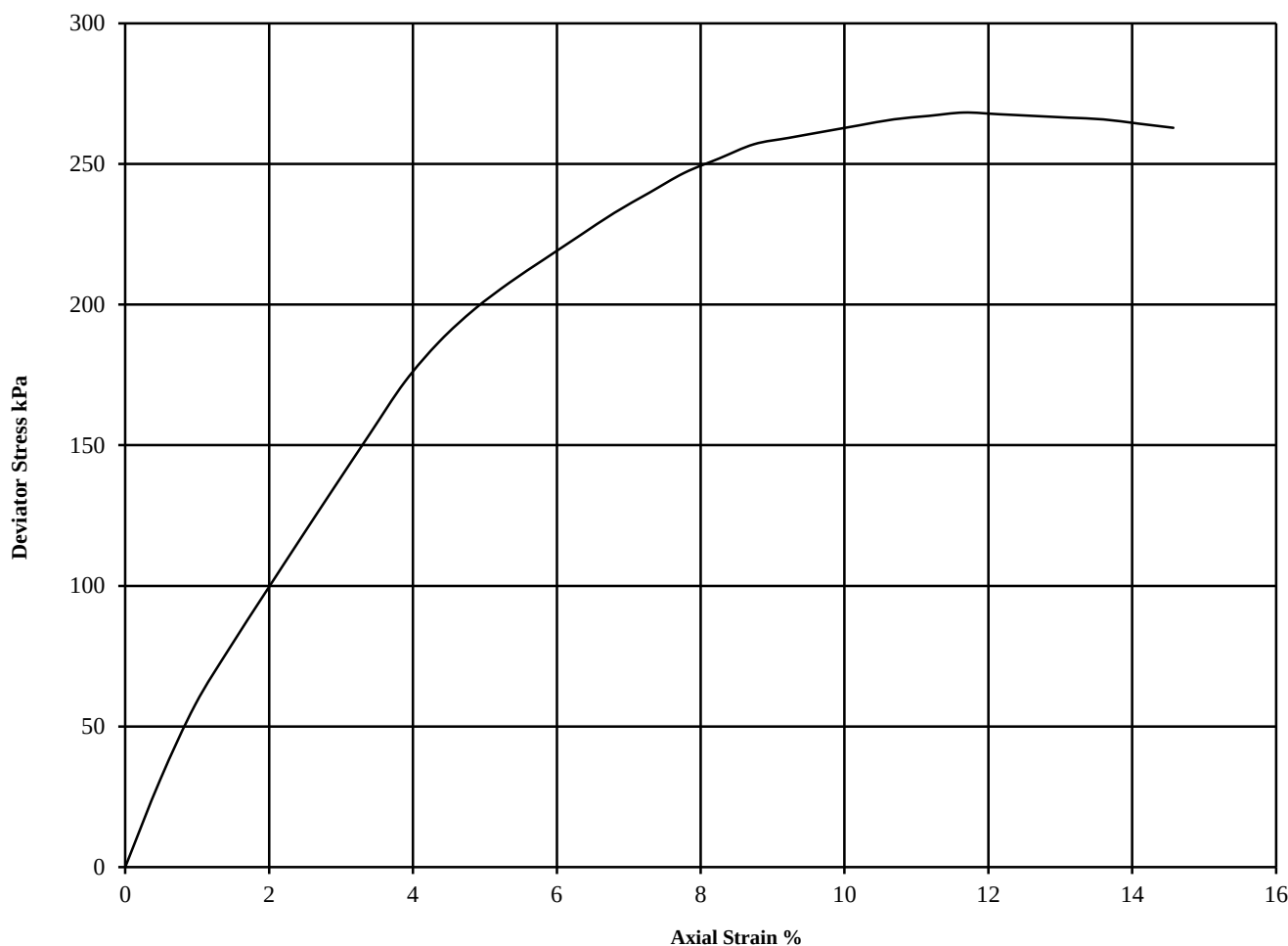
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH202 Top Depth (m): 2.00

Sample Number: 6 Base Depth (m): 2.45

Sample Type U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Cell	Corr. Max.	Shear	Failure Strain (%)	Mode of Failure	Undisturbed Sample
				Pressure	Deviator	Strength			Sample taken from top of tube
				(kPa)	Stress	Cu			Rate of strain = 2 %/min
				(kPa)	(kPa)				Latex Membrane used 0.2 mm thick,
				θ_3	$(\theta_1-\theta_3)_f$	$^{1/2}(\theta_1-\theta_3)_f$			Correction applied 0.35
1	13	2.21	1.96	45	268	134	11.7	Brittle	See summary of soil descriptions.



Checked / Approved



Date

31/03/16

Contract No:

PSL16/1156

Client Ref:

1620007156

Lytham Road, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

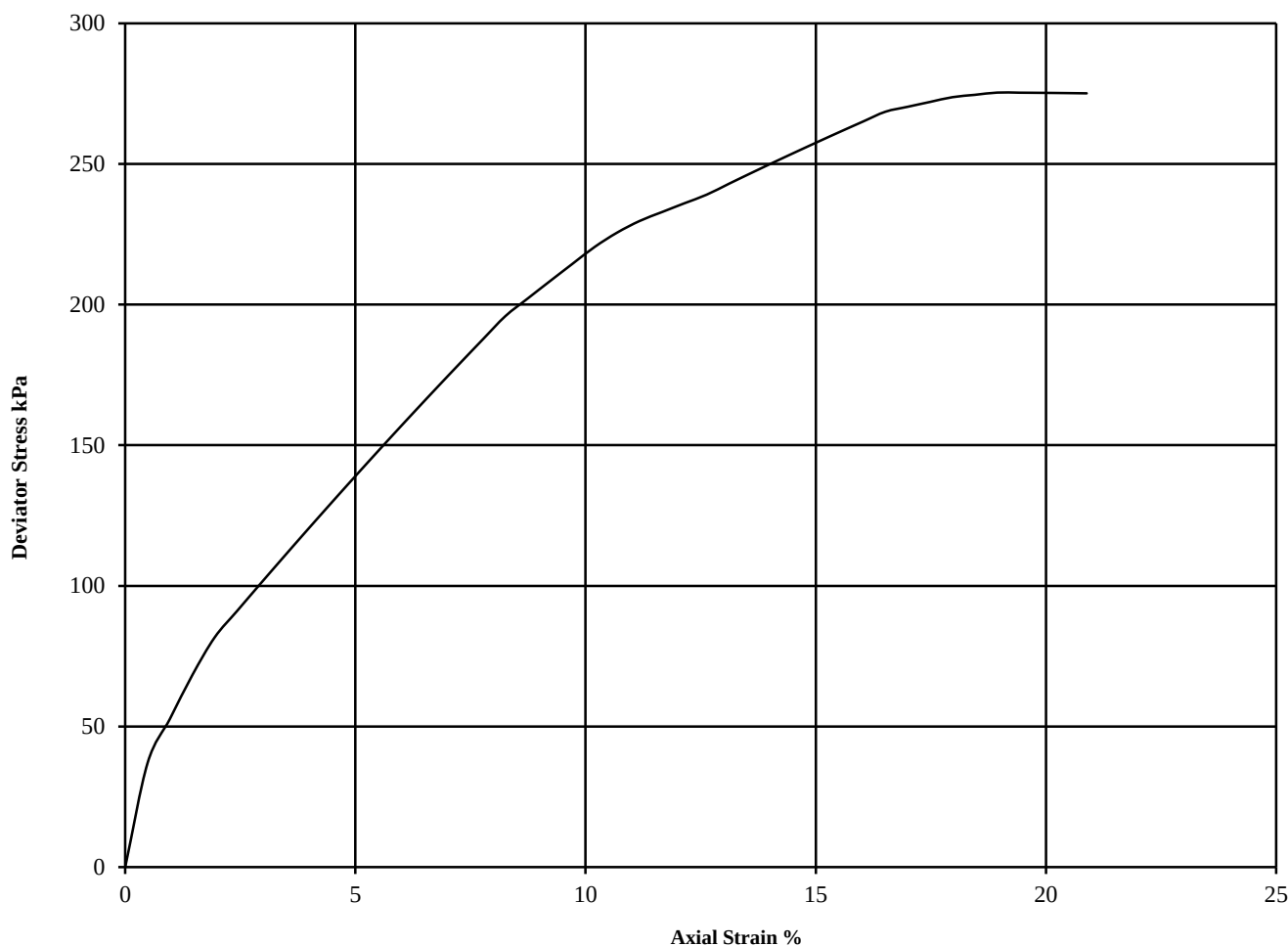
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH202 Top Depth (m): 4.00

Sample Number: 12 Base Depth (m): 4.45

Sample Type U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.34 See summary of soil descriptions.
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	13	2.20	1.95	100	275	138	18.9	Intermediate	



Checked / Approved



Date

31/03/16

Contract No:

PSL16/1156

Client Ref:

1620007156

Lytham Road, Manchester

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

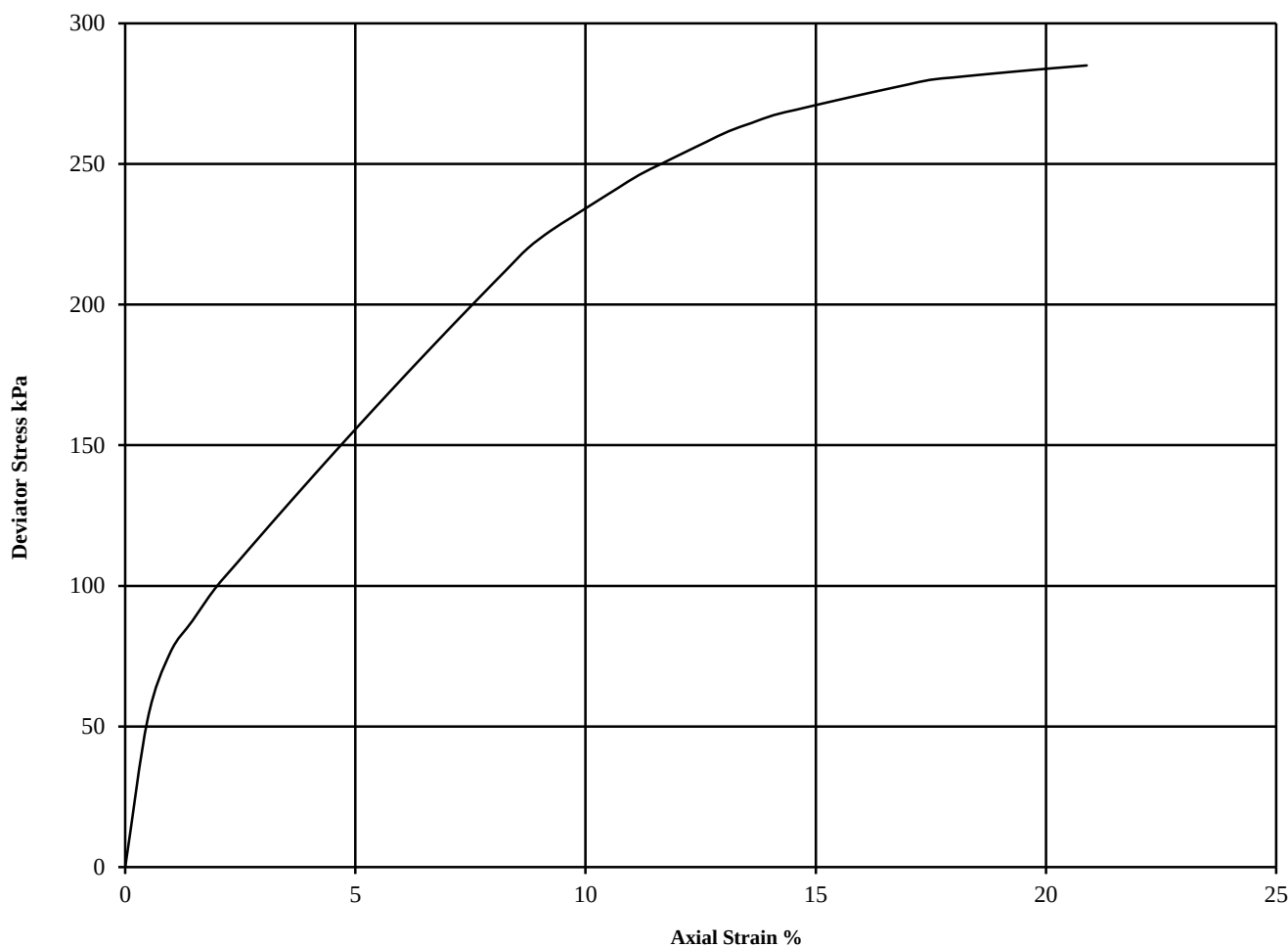
WITHOUT MEASUREMENT OF PORE PRESSURE

BS1377 : Part7 : 1990: Clause 8

Hole Number: BH202 Top Depth (m): 6.50

Sample Number: 18 Base Depth (m): 6.95

Sample Type U



Diameter (mm):		102.0	Height (mm):		210.0	Test:	UU Single Stage		Remarks
Specimen	Moisture Content (%)	Bulk Density (Mg/m ³)	Dry Density (Mg/m ³)	Cell Pressure (kPa)	Corr. Max. Deviator Stress (kPa)	Shear Strength Cu (kPa)	Failure Strain (%)	Mode of Failure	Undisturbed Sample Sample taken from top of tube Rate of strain = 2 %/min Latex Membrane used 0.2 mm thick, Correction applied 0.33 See summary of soil descriptions.
				θ_3	$(\theta_1 - \theta_3)_f$	$\frac{1}{2}(\theta_1 - \theta_3)_f$			
1	9.4	2.26	2.07	135	285	143	20.9	Intermediate	



Checked / Approved

Date

31/03/16

Contract No:

PSL16/1156

Client Ref:

1620007156

Lytham Road, Manchester

Client: Ramboll UK Limited (Leeds)
3rd Floor, Halsbury House, Chancellor Court, 21 The Calls, Leeds, LS2 7EH
Site: Lytham Road, Manchester - Soil samples
Date Tested: 16/03/16
Date Reported: 29 March, 2016
Date Received: 14 March, 2016
Sample Type: Solid

Certificate No: 16/1243/RG/SAC
File No: 16/1243/RG/S
Client Ref: 1620007033

Certificate No: 16/1243/RG/SAC
File No: 16/1243/RG/S
Client Ref: 1620007033

[illegible]

Client:	Ramboll	TerraConsult
Project Name:	Lytham Road, Manchester	
Project No:	2739	

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST DG 365: 2016 and BS6297:2007+A1:2008

CALCULATION OF SOIL INFILTRATION RATE

Soakaway SP

201

- Test

1

Test carried out without any stone in pit

Elapsed Time minutes	Depth to water mm
0	600
0.5	620
1	640
1.5	660
2	670
2.5	680
3	680
3.5	680
4	680
4.5	680
5	690
6	690
7	690
8	690
9	690
10	700
15	710
20	720
25	720
30	720
40	720
50	720
60	720
90	730
120	730
180	730
240	730

Size of Soakaway

Length	1800.00	mm
Width	600.00	mm
Gravel Thickness	N/A	mm
Depth to base	1000.00	mm

Depth at start of test	600
Depth at end of test	730

75% full level	700	mm
50% full level	800	mm
25% full level	900	mm

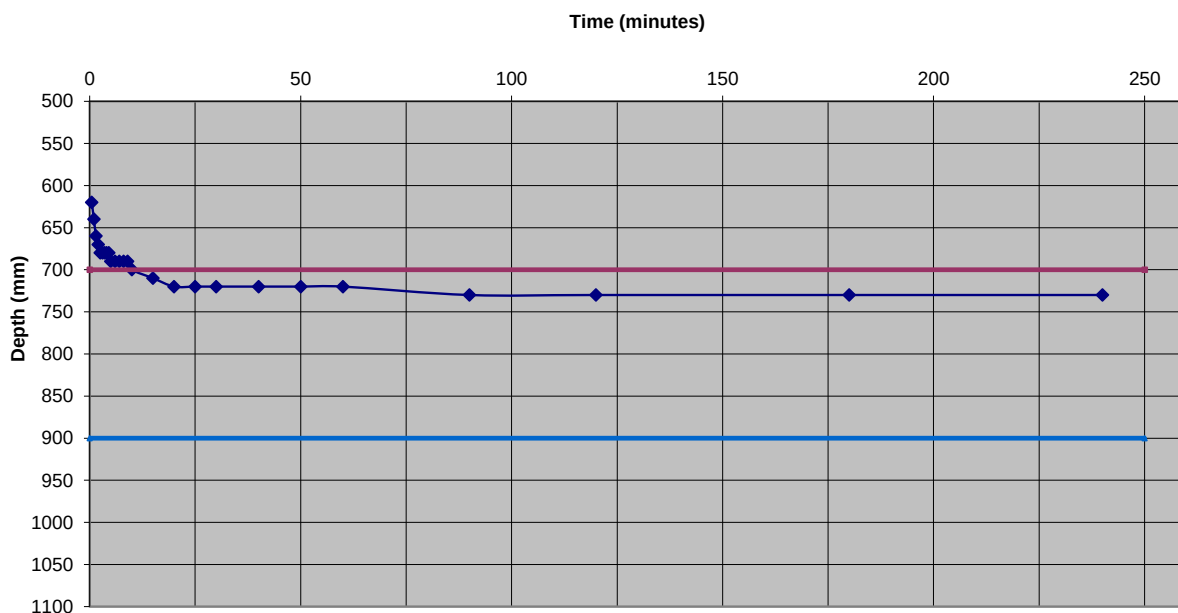
Base area of pit	m ²	1.080
Mean surface area through which outflow occurs	m ²	2.040
Volume outflow between 75 and 25% effective depth	m ³	0.216

From the graph:	
tp 75 min	
tp 25 min	N/A
tp 25 min	N/A

% void space in granular fill		N/A
-------------------------------	--	-----

Soil infiltration rate, f , m³/m²/s = N/A test with no stone in pit
 Soil infiltration rate, f , m/hr = N/A test with no stone in pit
 Percolation Value, v_p , s/mm = N/A

**Test did not reach 25% full level
infiltration and percolation rates cannot be calculated**



Client: Ramboll
 Project Name: Lytham Road, Manchester
 Project No: 2739

TerraConsult

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST DG 365: 2016 and BS6297:2007+A1:2008

CALCULATION OF SOIL INFILTRATION RATE

Soakaway SP

202

- Test

1

Test carried out without any stone in pit

Elapsed Time minutes	Depth to water mm
0	520
0.5	530
1	540
1.5	550
2	560
2.5	570
3	580
3.5	580
4	590
4.5	590
5	600
6	600
7	600
8	600
9	600
10	600
15	610
20	610
25	620
30	630
40	640
50	650
60	650
75	660
90	670
120	680
150	690
180	690
240	690

Size of Soakaway

Length	1800	mm
Width	600	mm
Gravel Thickness	N/A	mm
Depth to base	1000	mm

Depth at start of test	520
Depth at end of test	690

75% full level	640	mm
50% full level	760	mm
25% full level	880	mm

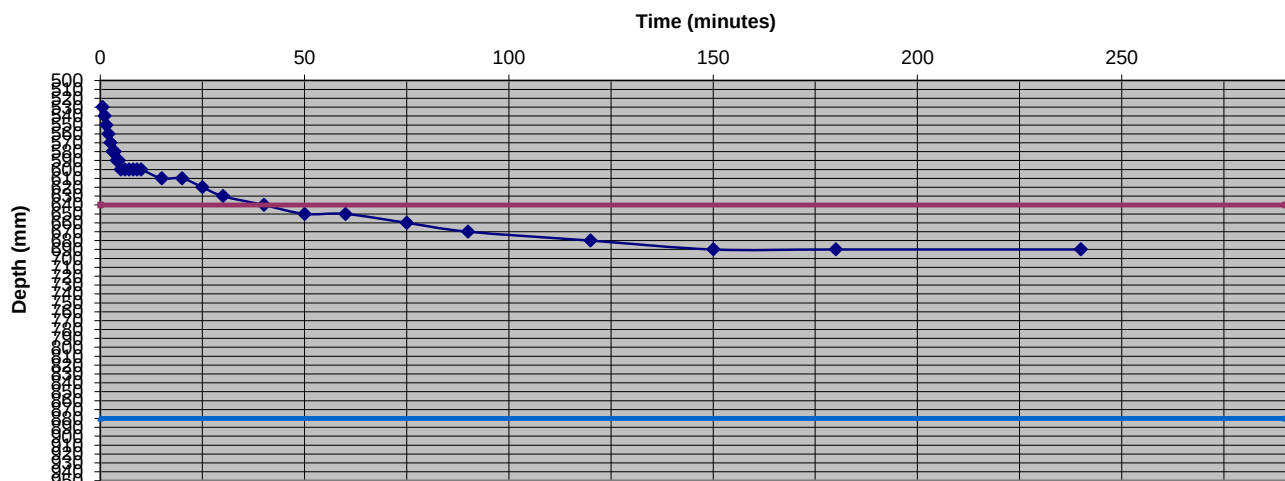
Base area of pit	m ²	1.080
Mean surface area through which outflow occurs	m ²	2.232
Volume outflow between 75 and 25% effective depth	m ³	0.259

From the graph:	
tp 75 min	640
tp 25 min	880

% void space in granular fill	N/A
-------------------------------	-----

Soil infiltration rate, f , m³/m²/s = N/A test with no stone in pit
 Soil infiltration rate, f , m/hr = N/A test with no stone in pit
 Percolation Value, vp , s/mm = N/A

Test did not reach 25% full level
 infiltration and percolation rates cannot be calculated



Client: Ramboll
 Project Name: Lytham Road, Manchester
 Project No: 2739

TerraConsult

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST DG 365: 2016 and BS6297:2007+A1:2008

CALCULATION OF SOIL INFILTRATION RATE

Soakaway SP 203

- Test

1

Test carried out without any stone in pit

Elapsed Time minutes	Depth to water mm
0	2110
0.5	2110
1	2120
1.5	2120
2	2120
2.5	2120
3	2120
3.5	2120
4	2120
4.5	2120
5	2120
6	2120
7	2120
8	2120
9	2120
10	2120
15	2120
20	2120
25	2120
30	2120
40	2120
50	2120
60	2120
75	2120
90	2120
120	2120
150	2120
180	2120

Size of Soakaway

Length	2000	mm
Width	600	mm
Gravel Thickness	N/A	mm
Depth to base	3400	mm

Depth at start of test	2110
Depth at end of test	2120

75% full level	2433	mm
50% full level	2755	mm
25% full level	3078	mm

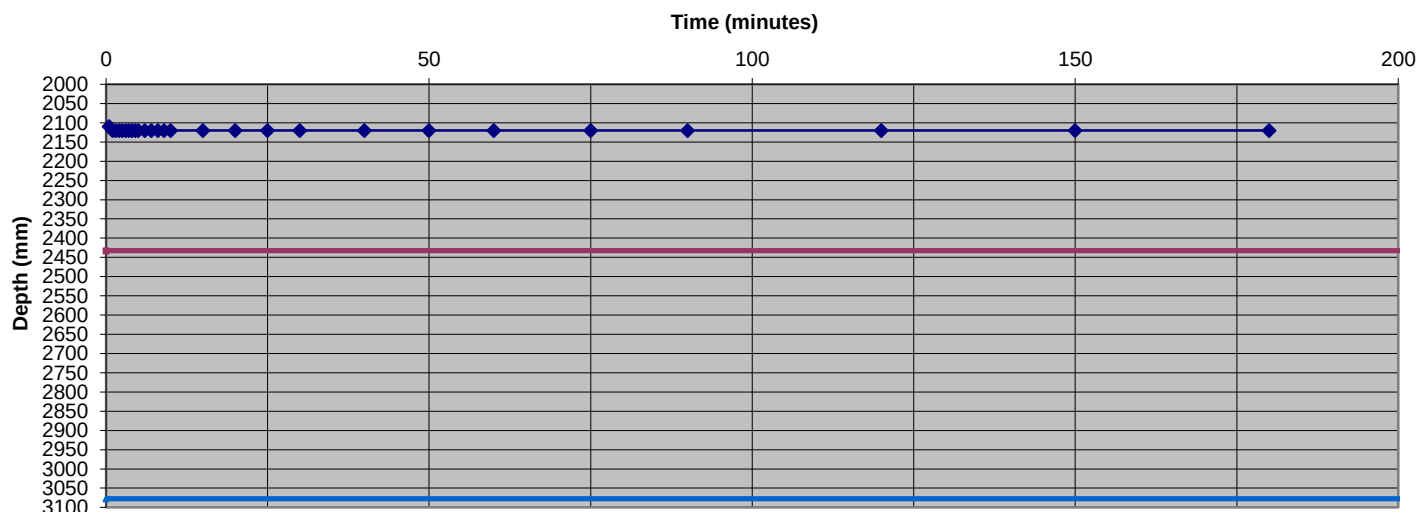
Base area of pit	m ²	1.200
Mean surface area through which outflow occurs	m ²	4.554
Volume outflow between 75 and 25% effective depth	m ³	0.774

From the graph:	
tp 75 min	N/A
tp 25 min	N/A

% void space in granular fill	N/A
-------------------------------	-----

Soil infiltration rate, f , m³/m²/s = N/A test with no stone in pit
 Soil infiltration rate, f , m/hr = N/A test with no stone in pit
 Percolation Value, v_p , s/mm = N/A

Test did not reach 75% full level (stiff clay preventing outflow) infiltration and percolation rates cannot be calculated



APPENDIX D: GROUNDWATER MONITORING RECORDS

Gas and Groundwater Monitoring Site Visit Record

www.ramboll.co.uk
3rd Floor Halsbury House, Leeds LS2 7EH

Job title: EBN High Schools - Lytham Rd., Manchester
Job number: 1620001457

Engineer: SAR
Date: 21/03/2016

Weather (wind, cloud cover, precipitation);
Barometric Pressure (Trend 24 hr):
Surface Ground Conditions:
Equipment Ref:
Calibration Date

No wind; 100% cloud cover; cool; dry
High and falling (1031-1028mb) [Weather data from Wunderground.com, Withington, Station No. IMANCHES25, approx. 2.6km SW of site]
Overgrown turf (BH201-BH202, WS205, WS206, WS208, WS211) and tarmacadam hardstanding (WS201, WS203)
GA5000
Mar-16

Ambient Air Monitoring	Temp (°C)	Time	Atmospheric Pressure	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	N ₂ (%)	H ₂ S (ppm)	CO (ppm)	Comment
Before	7.8	1000	1019	0.1	2	0.1	21.0	78.8	0	0
During	8.3	1101	1021	0.0	0	0.1	21.7	78.2	0	0
After	8.3	1126	1021	0.0	0	0.1	22.1	77.8	0	0

BH ID	BH Level	Time	Temp	Atmospheric Pressure	Water Depth	Total Well Depth	Flow	Gas Concentration														Comment
								Peak							Steady state							
								CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	
(mOD)	(°C)	(mb)	(mbgl)	(mbgl)	(l/h)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)			
BH201	46.19	1032	8.0	1018	0.940	7.895	0.5	0.0	0	0.3	21.4	78.3	0	0	0.0	0	0.1	21.5	78.4	0	0	
BH202	46.74	1054	8.2	1018	3.250	9.080	0.4	0.0	0	0.1	21.6	78.3	0	0	0.0	0	0.1	21.6	78.3	0	0	
WS201	46.11	1004	7.8	1019	1.065	5.015	0.5	0.1	2	1.7	20.2	78.0	0	4	0.1	2	0.5	20.9	78.5	0	0	
WS203	46.26	1017	7.9	1019	1.545	4.920	0.6	0.1	2	0.5	20.8	78.6	14	12	0.1	2	0.5	20.8	78.6	13	0	"Pump has flow failed" after few minutes
WS205	46.52	1042	8.1	1018	0.560	3.880	0.4	0.0	0	0.1	21.5	78.4	0	0	0.0	0	0.1	21.5	78.4	0	0	
WS206	47.21	1103	8.3	1021	0.610	4.865	-2.5	0.2	4	1.4	21.1	77.3	2	4	0.1	2	0.6	21.5	77.8	1	0	
WS208	47.25	1112	8.3	1021	0.525	4.510	0.0	0.0	0	1.0	20.4	78.6	36	38	0.0	0	1.0	20.4	78.6	36	38	"Pump has flow failed" after few minutes
WS211	47.75	1123	8.3	1021	0.655	4.860	0.4	0.0	0	0.2	21.9	77.9	2	0	0.0	0	0.2	21.9	77.9	2	0	

Notes:

¹The Lower Explosive Limit (LEL) of CH₄ is equal to 5% by volume in air

- Denotes where data was not recorded

Gas and Groundwater Monitoring Site Visit Record

www.ramboll.co.uk
3rd Floor Halsbury House, Leeds LS2 7EH

Job title: EBN High Schools - Lytham Rd., Manchester
Job number: 1620001457

Engineer: SAR
Date: 30/03/2016

Weather (wind, cloud cover, precipitation);
Barometric Pressure (Trend 24 hr):
Surface Ground Conditions:
Equipment Ref:
Calibration Date

Initially: V. light breeze; 10-20% cloud cover; sunny; dry; cold; becoming: light-moderate wind (WSW); 40-60% cloud cover; sunny spells; dry; cool.
High and rising (1004-1010mb) [Weather data from Wunderground.com, Withington, Station No. IMANCHES25, approx. 2.6km SW of site]
Overgrown turf (BH201-BH202, WS205, WS206, WS208, WS211) and tarmacadam hardstanding (WS201, WS203)
GA5000
Mar-16

Ambient Air Monitoring	Temp (°C)	Time	Atmospheric Pressure	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	N ₂ (%)	H ₂ S (ppm)	CO (ppm)	Comment
Before	7.6	1008	1000	0.1	2	0.1	21.6	78.2	0	0
During	8.5	1102	1000	0.0	0	0.1	21.6	78.3	0	0
After	9.2	1201	1000	0.0	0	0.1	22.4	77.5	0	0

BH ID	BH Level	Time	Temp	Atmospheric Pressure	Water Depth	Total Well Depth	Flow	Gas Concentration														Comment
								Peak							Steady state							
								CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	
(mOD)	(°C)	(mb)	(mbgl)	(mbgl)	(l/h)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)			
BH201	46.19	1030	7.9	1000	0.750	7.850	-0.6	0.0	0	0.1	21.8	78.1	0	0	0.0	0	0.1	21.9	78.0	0	0	
BH202	46.74	1052	8.4	1000	3.300	9.075	-1.4	0.0	0	0.9	20.1	79.0	0	1	0.0	0	0.9	20.1	79.0	0	1	
WS201	46.11	1009	7.6	1000	0.870	5.015	0.1	0.1	2	1.7	20.8	77.4	0	1	0.0	0	0.4	21.4	78.2	0	0	
WS203	46.26	1022	7.8	1000	1.550	4.920	0.2	0.0	0	0.8	21.3	77.9	0	2	0.0	0	0.1	21.6	78.3	0	0	
WS205	46.52	1105	8.5	1000	0.250	3.875	-0.1	0.0	0	0.1	21.5	78.4	0	0	0.0	0	0.1	21.5	78.4	0	0	"Pump has flow failed" after few minutes
WS206	47.21	1122	9.0	1000	0.530	4.865	0.2	0.0	0	0.3	21.7	78.0	0	1	0.0	0	0.2	21.9	77.9	0	0	
WS208	47.25	1142	9.5	1000	1.245	4.510	0.0	0.0	0	0.8	21.5	77.7	5	8	0.0	0	0.7	21.5	77.8	4	0	"Pump has flow failed" after few minutes
WS211	47.75	1152	9.3	1000	1.170	4.865	0.1	0.0	0	0.3	22.0	77.7	2	0	0.0	0	0.1	22.2	77.7	0	0	
WS4	46.37	1042	8.2	1000	0.805	2.615	-0.2	0.0	0	0.9	21.4	77.7	0	0	0.0	0	0.1	21.7	78.2	0	0	
WS6	47.10	1109	8.5	1000	0.235	2.930	0.1	0.0	0	0.2	21.4	78.4	0	1	0.0	0	0.1	21.6	78.3	0	0	
WS9	47.53	1131	9.2	1000	0.315	2.925	0.1	0.0	0	0.1	22.1	77.8	0	1	0.0	0	0.1	22.1	77.8	0	0	

Notes:

¹The Lower Explosive Limit (LEL) of CH₄ is equal to 5% by volume in air

- Denotes where data was not recorded

Gas and Groundwater Monitoring Site Visit Record

www.ramboll.co.uk
3rd Floor Halsbury House, Leeds LS2 7EH

Job title: EBN High Schools - Lytham Rd., Manchester
Job number: 1620001457

Engineer: SAR
Date: 07/04/2016

Weather (wind, cloud cover, precipitation):
Barometric Pressure (Trend 24 hr):
Surface Ground Conditions:
Equipment Ref:
Calibration Date

Light-moderate wind (variable); 80-100% cloud cover; sunny spells; cool; dry, recently wet
High and rising (1006-1010mb) [Weather data from Wunderground.com, Withington, Station No. IMANCHES25, approx. 2.6km SW of site]
Overgrown turf (BH201-BH202, WS205, WS206, WS208, WS211) and tarmacadam hardstanding (WS201, WS203)
GA5000
Mar-16

Ambient Air Monitoring	Temp (°C)	Time	Atmospheric Pressure	CH ₄ (%)	CO ₂ (%)	O ₂ (%)	N ₂ (%)	H ₂ S (ppm)	CO (ppm)	Comment
Before	8.6	1010	996	0.1	2	0.1	21.2	78.6	0	
During	9.7	1115	996	0.0	0	0.1	21.8	78.1	0	
After	11.9	1152	996	0.0	0	0.1	21.3	78.6	0	

BH ID	BH Level	Time	Temp	Atmospheric Pressure	Water Depth	Total Well Depth	Flow	Gas Concentration														Comment
								Peak							Steady state							
								CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	
(mOD)	(°C)	(mb)	(mbgl)	(mbgl)	(l/h)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)	(%)	(% LEL) ¹	(%)	(%)	(%)	(%)	(ppm)	(ppm)		
BH201	46.19	1033	9.2	996	0.740	7.845	-0.1	0.1	2	1.3	20.2	78.4	0	0	0.0	0	1.3	20.2	78.5	0	0	"Pump has flow failed" after ~3 minutes
BH202	46.74	1107	9.8	996	3.285	9.080	-0.2	0.0	0	1.2	19.7	79.0	0	0	0.0	0	1.1	19.9	79.0	0	0	"Pump has flow failed" after ~5 minutes
WS201	46.11	1012	8.6	996	0.895	5.015	0.1	0.1	2	2.0	20.3	77.6	0	1	0.1	2	0.4	20.8	78.7	0	0	
WS203	46.26	1023	8.8	996	1.485	4.920	-0.2	0.1	2	1.1	20.6	78.2	0	1	0.1	2	0.1	21.0	78.8	0	0	
WS205	46.52	1056	9.9	996	0.150	3.875	-0.4	0.0	0	0.7	20.8	78.5	0	0	0.0	0	0.3	21.1	78.6	0	0	
WS206	47.21	1134	10.5	996	0.530	4.870	0.0	0.0	0	0.3	21.7	78.0	0	0	0.0	0	0.1	21.7	78.2	0	0	
WS208	47.25	1122	9.9	996	1.010	4.510	0.1	0.0	0	1.2	20.9	78.0	2	4	0.0	0	0.1	21.8	78.1	0	0	
WS211	47.75	1145	11.2	996	0.425	4.855	0.1	0.0	0	0.3	21.1	78.6	0	0	0.0	0	0.1	21.2	78.7	0	0	
WS4	46.37	1044	9.7	996	0.800	2.620	0.0	0.0	0	3.4	19.3	77.3	0	0	0.0	0	1.1	20.1	78.8	0	0	
WS6	47.10	1105	9.8	996	0.000	2.930	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Headworks flooded
WS9	47.53	1131	10.5	996	0.320	2.925	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	"Pump has flow failed" immediately; well flooded

Notes:

¹The Lower Explosive Limit (LEL) of CH₄ is equal to 5% by volume in air

- Denotes where data was not recorded

Gas and Groundwater Monitoring Site Visit Record

www.ramboll.co.uk
3rd Floor Halsbury House, Leeds LS2 7EH

Job title: EBN High Schools - Lytham Rd., Manchester
Job number: 1620001457

Engineer: SAR
Date: 15/04/2016

Weather (wind, cloud cover, precipitation);
Barometric Pressure (Trend 24 hr):
Surface Ground Conditions:
Equipment Ref:
Calibration Date

V. light breeze; 80-100% cloud cover; dry; sunny spells; cool to mild
High and falling (1015-1006mb) [Weather data from Wunderground.com, Withington, Station No. IMANCHES25, approx. 2.6km SW of site]
Overgrown turf (BH201-BH202, WS205, WS206, WS208, WS211) and tarmacadam hardstanding (WS201, WS203)
GA2000
Apr-16

Ambient Air Monitoring	Temp (°C)	Time	Atmospheric Pressure	CH ₄ (%)	CH ₄ (% LEL) ²	CO ₂ (%)	O ₂ (%)	N ₂ (%)	H ₂ S (ppm)	CO (ppm)	Comment
Before	10.0	1053	998	0.0	0	0.0	21.4	78.6	0	0	
During	10.4	1149	998	0.0	0	0.0	21.4	78.6	0	0	
After	10.6	1217	998	0.0	0	0.0	21.6	78.4	0	0	

BH ID	BH Level	Time	Temp	Atmospheric Pressure	Water Depth	Total Well Depth	Flow	Gas Concentration														Comment
								Peak							Steady state							
	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO								
(mOD)	(°C)	(mb)	(mbgl)	(mbgl)	(l/h)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)			
BH201	46.19	1114	10.3	998	0.760	7.845	0.0	0.0	0	1.1	20.7	78.2	0	1	0.0	0	0.0	21.5	78.5	0	0	
BH202	46.74	1142	10.5	998	3.200	9.080	0.2	0.0	0	1.2	19.7	79.1	0	1	0.0	0	0.0	21.4	78.6	0	0	
WS201	46.11	1055	10.2	998	0.865	5.020	0.0	0.0	0	0.9	21.0	78.1	0	0	0.0	0	0.3	21.3	78.4	0	0	
WS203	46.26	1106	10.3	998	1.440	4.920	0.0	0.0	0	0.4	21.3	78.3	0	1	0.0	0	0.0	21.6	78.4	0	0	
WS205	46.52	1131	10.1	998	0.375	3.875	0.0	0.0	0	0.6	21.2	78.2	0	0	0.0	0	0.0	21.5	78.5	0	0	
WS206	47.21	1150	10.4	998	0.670	4.870	0.0	0.0	0	0.1	21.4	78.5	0	0	0.0	0	0.0	21.4	78.6	0	0	
WS208	47.25	1201	10.6	998	0.915	4.510	0.0	0.0	0	0.6	20.9	78.5	0	7	0.0	0	0.0	21.5	78.5	0	0	
WS211	47.75	1209	10.5	998	0.535	4.865	0.0	0.0	0	0.1	21.3	78.6	0	1	0.0	0	0.1	21.4	78.5	0	0	
WS4	46.37	1123	10.2	998	0.810	2.610	0.0	0.0	0	1.4	20.2	78.4	0	0	0.0	0	0.0	21.5	78.5	0	0	
WS6	47.10	1139	10.3	998	0.080	0.235	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Headworks flooded
WS9	47.53	1159	10.6	998	0.240	2.925	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Headworks flooded

Notes:

¹The Lower Explosive Limit (LEL) of CH₄ is equal to 5% by volume in air

- Denotes where data was not recorded

Gas and Groundwater Monitoring Site Visit Record

www.ramboll.co.uk
3rd Floor Halsbury House, Leeds LS2 7EH

EBN High Schools - Lytham Rd., Manchester
1620001457

SAR
22/04/2016

Light to moderate E wind; 10-20% cloud cover; dry; sunny; cool
High and falling (1030-1027mb) [Weather data from Wunderground.com, Withington, Station No. IMANCHES25, approx. 2.6km SW of site]
Overgrown turf (BH201-BH202, WS205, WS206, WS208, WS211) and tarmacadam hardstanding (WS201, WS203)
GA2000
Apr-16

Ambient Air Monitoring	Temp (°C)	Time	Atmospheric Pressure	CH ₄ (%)	CH ₄ (% LEL) ²	CO ₂ (%)	O ₂ (%)	N ₂ (%)	H ₂ S (ppm)	CO (ppm)	Comment
Before	12.7	1120	1020	0.0	0	0.0	21.5	78.5	0	0	
During	13.8	1215	1020	0.0	0	0.0	21.6	78.4	0	0	
After	14.5	1302	1020	0.0	0	0.0	21.5	78.5	0	0	

BH ID	BH Level	Time	Temp	Atmospheric Pressure	Water Depth	Total Well Depth	Flow	Gas Concentration												Comment		
								Peak						Steady state								
	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO								
(mOD)	(°C)	(mb)	(mbgl)	(mbgl)	(l/h)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)			
BH201	46.19	1147	12.8	1020	0.800	7.845	0.0	0.0	0	0.6	21.4	78.0	0	0	0.0	0	0.0	21.9	78.1	0	0	
BH202	46.74	1218	13.9	1020	3.185	9.080	0.0	0.0	0	0.9	20.5	78.6	0	0	0.0	0	0.0	21.7	78.3	0	0	
WS201	46.11	1121	12.7	1020	0.985	5.020	0.0	0.0	0	0.7	21.2	78.1	0	0	0.0	0	0.2	21.6	78.2	0	0	
WS203	46.26	1140	12.7	1020	1.555	4.920	0.0	0.0	0	0.5	21.6	77.9	0	0	0.0	0	0.0	21.9	78.1	0	0	
WS205	46.52	1207	13.6	1020	0.610	3.875	0.0	0.0	0	0.2	21.5	78.3	0	0	0.0	0	0.0	21.6	78.4	0	0	
WS206	47.21	1235	14.0	1020	0.760	4.870	0.0	0.0	0	0.0	21.7	78.3	0	0	0.0	0	0.0	21.7	78.3	0	0	
WS208	47.25	1226	13.9	1020	0.840	4.510	0.0	0.0	0	0.2	21.2	78.6	0	4	0.0	0	0.0	21.7	78.3	0	0	
WS211	47.75	1252	14.6	1020	0.545	4.860	0.0	0.0	0	0.1	21.2	78.7	0	1	0.0	0	0.0	21.3	78.7	0	0	
WS4	46.37	1155	13.1	1020	0.855	2.610	0.0	0.0	0	1.5	20.1	78.4	0	0	0.0	0	1.1	20.6	78.3	0	0	
WS6	47.10	1216	13.9	-	0.095	2.930	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Headworks flooded
WS9	47.53	1244	14.3	1020	0.210	2.925	0.0	0.0	0	0.0	21.7	78.3	0	0	0.0	0	0.0	21.7	78.3	0	0	Standpipe flooded immediately below gas tap

Notes:

¹The Lower Explosive Limit (LEL) of CH₄ is equal to 5% by volume in air

- Denotes where data was not recorded

Gas and Groundwater Monitoring Site Visit Record

www.ramboll.co.uk
3rd Floor Halsbury House, Leeds LS2 7EH

Job title: EBN High Schools - Lytham Rd., Manchester
Job number: 1620001457

Engineer: SAR
Date: 27/04/2016

Weather (wind, cloud cover, precipitation);
Barometric Pressure (Trend 24 hr):
Surface Ground Conditions:
Equipment Ref:
Calibration Date

Light wind; 50-90% cloud cover; mainly dry, occasional sleet/hail showers; sunny; cold
Rising then falling (1013-1017-1016mb) [Weather data from Wunderground.com, Withington, Station No. IMANCHES25, approx. 2.6km SW of site]
Overgrown turf (BH201-BH202, WS205, WS206, WS208, WS211) and tarmacadam hardstanding (WS201, WS203)
GA2000
Apr-16

Ambient Air Monitoring	Temp (°C)	Time	Atmospheric Pressure	CH ₄ (%)	(% LEL) ²	CO ₂ (%)	O ₂ (%)	N ₂ (%)	H ₂ S (ppm)	CO (ppm)	Comment
Before	7.1	1144	1008	0.0	0	0.0	21.6	78.4	0	0	
During	9.7	1245	1008	0.0	0	0.0	21.7	78.3	0	0	
After	8.5	1336	1008	0.0	0	0.0	22.1	77.9	0	0	

BH ID	BH Level	Time	Temp	Atmospheric Pressure	Water Depth	Total Well Depth	Flow	Gas Concentration														Comment
								Peak							Steady state							
	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO	CH ₄		CO ₂	O ₂	N ₂	H ₂ S	CO								
(mOD)	(°C)	(mb)	(mbcl)	(mbcl)	(l/h)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)	(%)	(% LEL) ¹	(%)	(%)	(%)	(ppm)	(ppm)			
BH201	46.19	1205	9.0	1008	0.835	7.825	-0.1	0.0	0	0.4	21.2	78.4	0	1	0.0	0	0.1	21.4	78.5	0	0	
BH202	46.74	1246	9.7	1008	3.260	9.080	0.0	0.0	0	1.1	20.3	78.6	0	1	0.0	0	0.0	21.7	78.3	0	0	
WS201	46.11	1145	7.1	1008	0.910	5.020	0.0	0.0	0	0.5	21.4	78.1	0	0	0.0	0	0.2	21.6	78.2	0	0	
WS203	46.26	1156	8.1	1008	1.555	4.925	0.0	0.0	0	0.6	21.3	78.1	0	1	0.0	0	0.0	21.7	78.3	0	0	
WS205	46.52	1227	9.8	1008	0.655	3.875	0.0	0.0	0	0.3	21.8	77.9	0	0	0.0	0	0.0	21.9	78.1	0	0	
WS206	47.21	1255	9.1	1008	0.815	4.870	0.0	0.0	0	0.0	22.0	78.0	0	1	0.0	0	0.0	22.0	78.0	0	0	
WS208	47.25	1315	8.5	1008	0.810	4.510	0.0	0.0	0	0.4	21.4	78.2	0	1	0.0	0	0.0	21.7	78.3	0	0	
WS211	47.75	1326	8.4	1008	0.545	4.860	-0.1	0.0	0	0.1	21.6	78.3	0	0	0.0	0	0.0	21.8	78.2	0	0	
WS4	46.37	1216	9.8	1008	0.910	2.610	0.0	0.0	0	2.9	19.4	77.7	0	0	0.0	0	1.1	21.1	77.8	0	0	
WS6	47.10	1236	10.0	1008	0.295	2.930	0.0	0.0	0	0.1	21.6	78.3	0	0	0.0	0	0.0	21.7	78.3	0	0	
WS9	47.53	1306	8.6	1008	0.505	2.925	0.0	0.0	0	0.1	21.8	78.1	0	0	0.0	0	0.0	21.8	78.2	0	0	

Notes:

¹The Lower Explosive Limit (LEL) of CH₄ is equal to 5% by volume in air

- Denotes where data was not recorded

APPENDIX E: GEOTECHNICAL DATA PLOTS

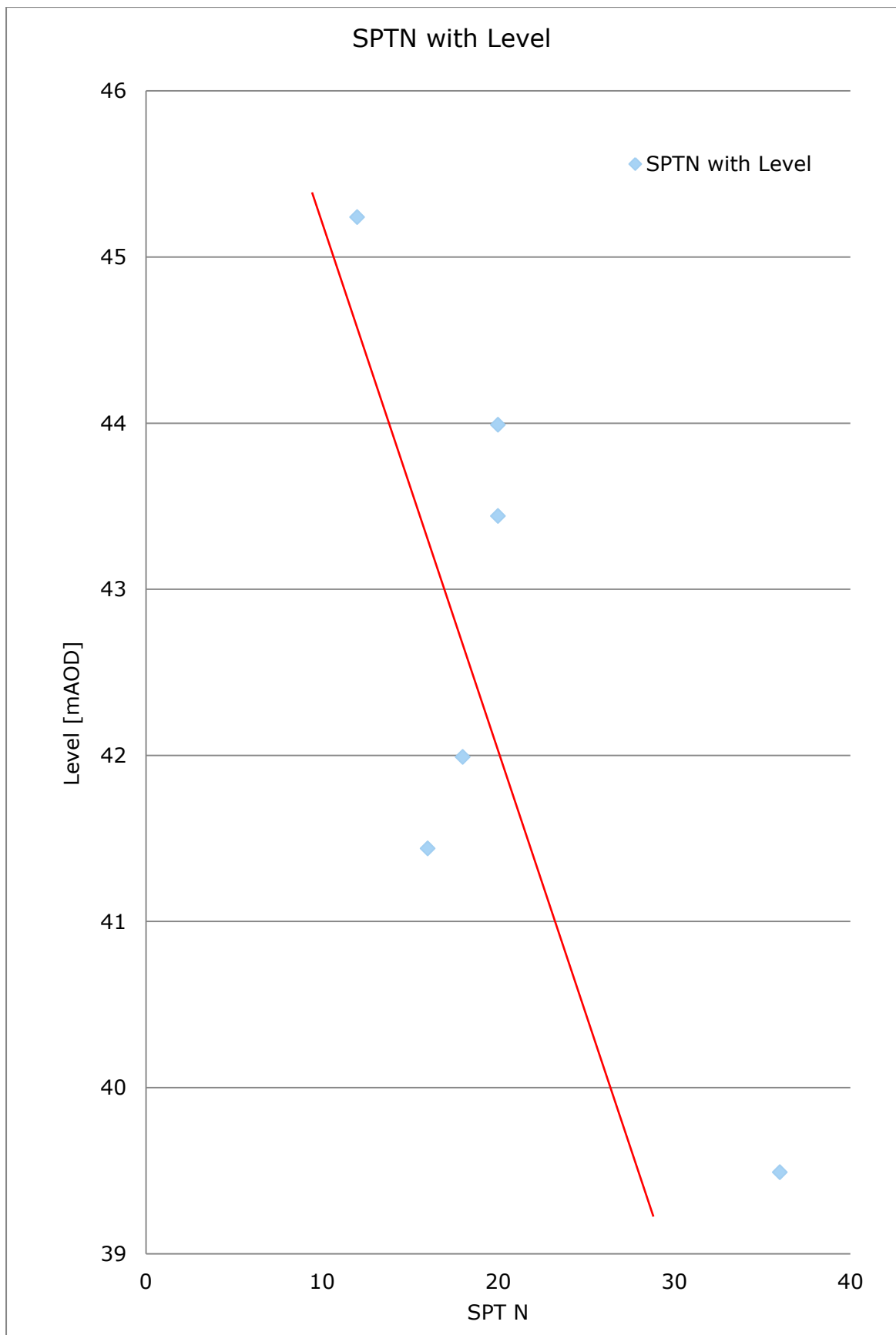


Figure E1 Cu vs level

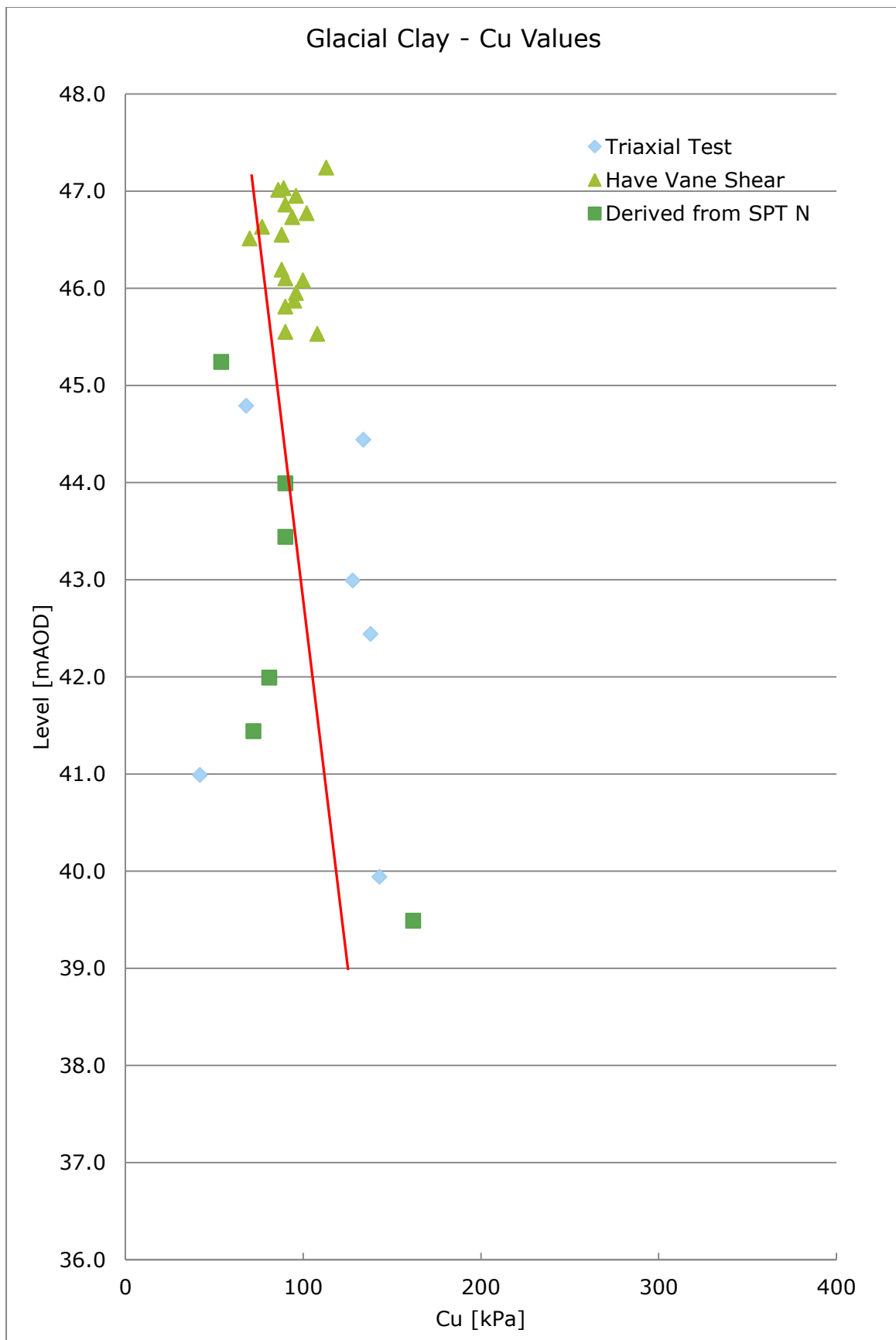


Figure E2 Cu vs level

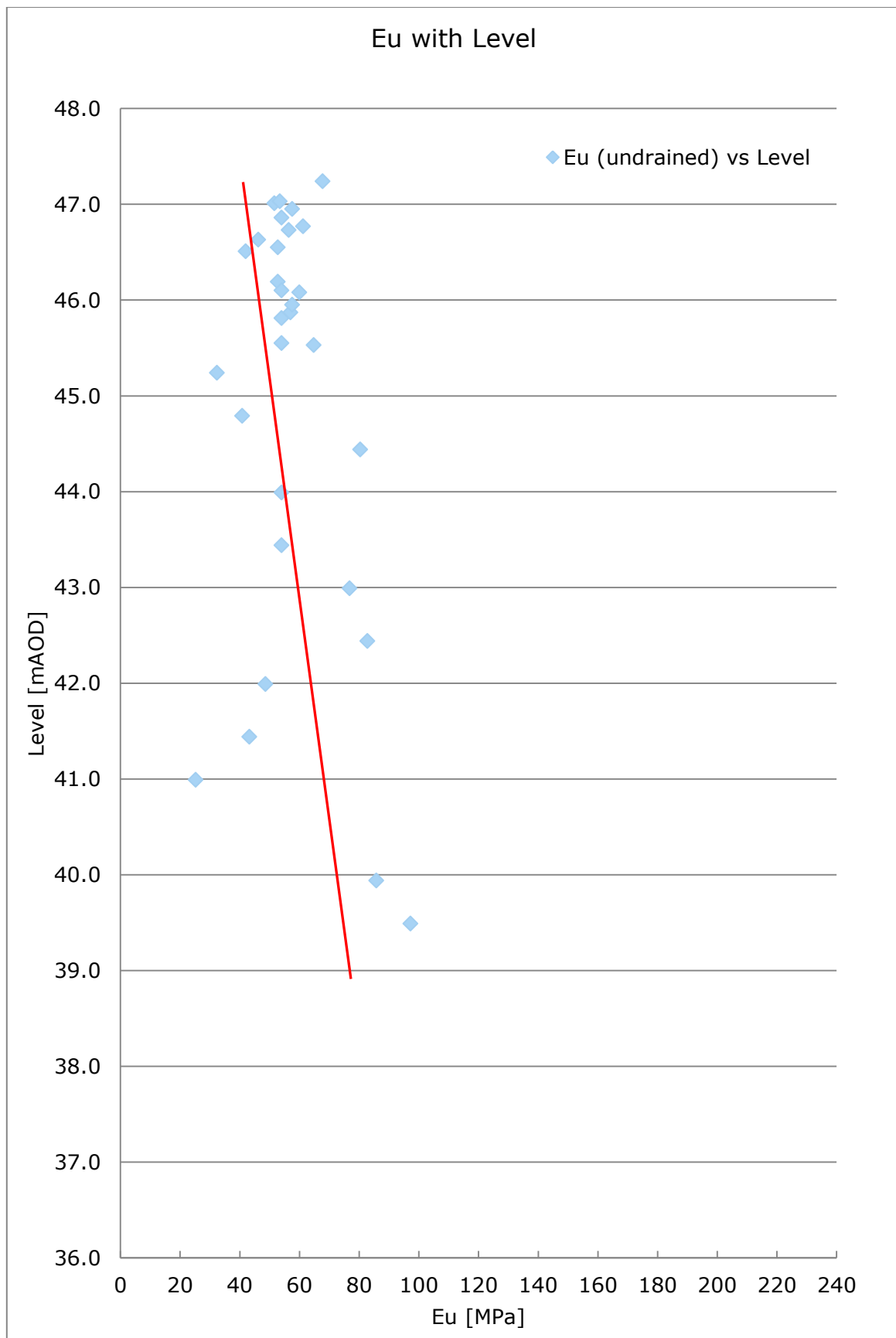


Figure E3 Eu vs Level

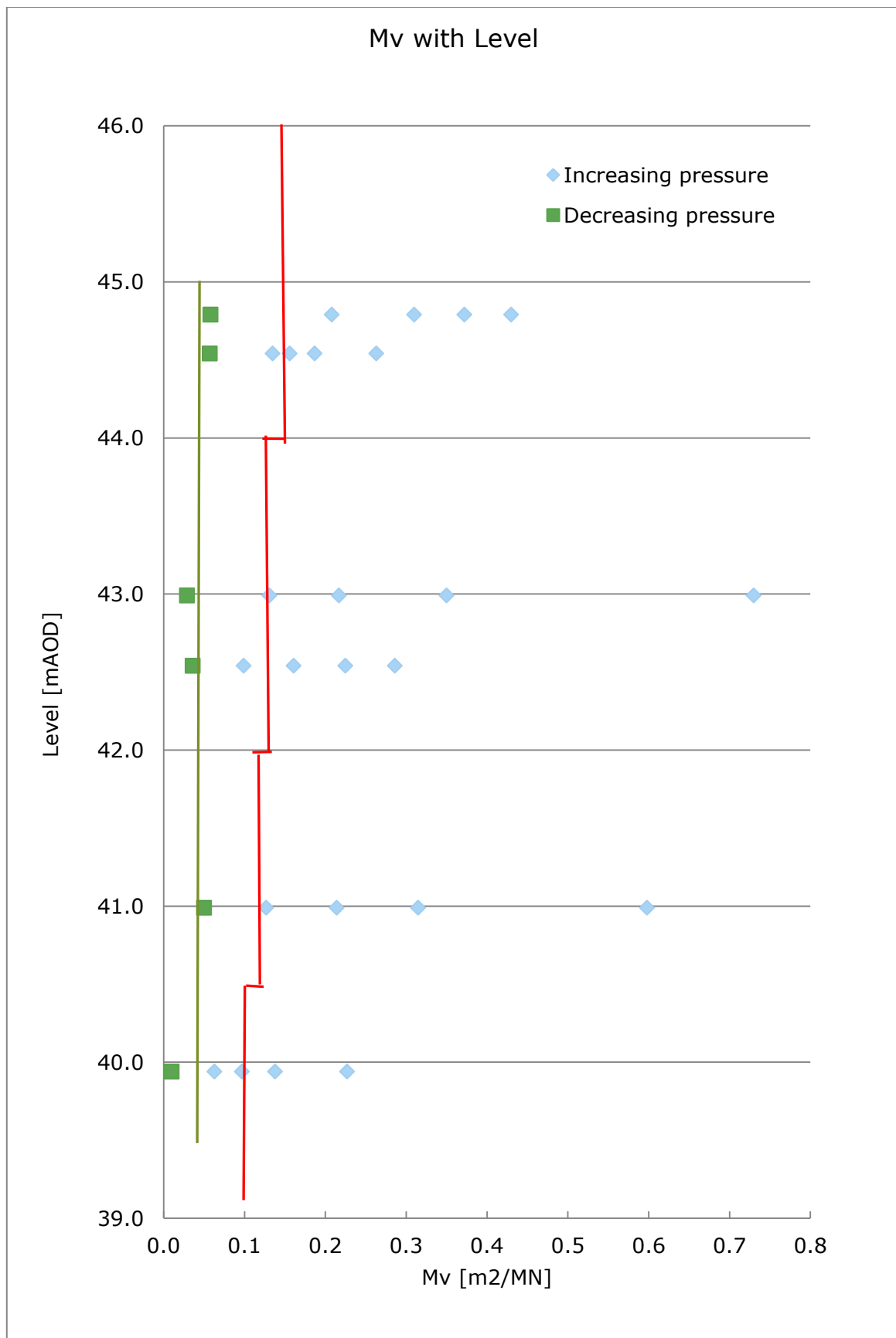


Figure E4 Mv with Level