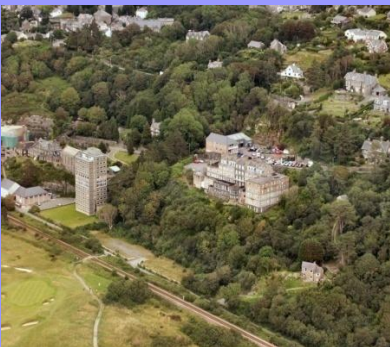




ENVIRONMENTAL & GEOTECHNICAL ENGINEERING



**Phase II
Intrusive
Ground
Investigation**

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**Land off Chatburn Road,
Clitheroe**

C2099

PROPOSED RESIDENTIAL DEVELOPMENT, CHATBURN ROAD, CLITHEROE

Phase II Geo-Environmental Assessment Report

This report was produced by HSP Consulting Engineers Ltd for Oakmere Homes MW Ltd as the Phase II Geoenvironmental Assessment Report on land off Chatburn Road, Clitheroe, BB7 2EQ to identify possible areas of contamination and provide an assessment of potential ground related development constraints.

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Contents

1.	Introduction	1
1.1	Background.....	1
1.2	Client Brief & Scope	1
1.2	Report Objectives.....	1
1.3	Limitations	1
1.4	Previous Reports.....	1
2.	Review of Existing Information & Geoenvironmental Setting	2
2.1	The Site.....	2
2.2	Geology.....	3
2.3	Pertinent Site Sensitivity Information.....	3
2.3.3	Hydrology	4
2.3.4	Flood Risk.....	4
2.3.5	Radon.....	4
2.3.6	Sensitive Land Uses, Ecological and Statutory Designations	4
3.	Fieldwork & Factual Information.....	5
3.1	Exploratory Methods	5
3.2	In-situ Testing.....	5
3.3	Laboratory Testing	5
3.4	Ground Conditions	6
3.5	Groundwater Levels	7
3.6	Ground Gas Monitoring	7
4.	Geotechnical Assessment.....	8
4.1	Detailed Ground Model	8
4.2	Earthworks	9
4.3	Excavations.....	10
4.4	Foundations	10
4.5	Ground Floor Slab.....	11
4.6	Concrete Classification	11
4.7	Pavement Design.....	11
4.8	Drainage	12
5.	Environmental Assessment.....	13
5.1	Introduction	13



5.2	Assessment of Soil Analysis Results.....	13
5.3	Human Health Mitigation.....	14
5.4	Water Supply.....	14
5.5	Ground Gas Risk Assessment	15
5.6	Updated Conceptual Site Model.....	15
6.	References	17

Appendices

Appendix I	- Proposed Development Layout
Appendix II	- Exploratory Hole Logs
Appendix III	- Ground Investigation Layout Plan
Appendix IV	- Geotechnical Testing Results
Appendix V	- Chemical Analysis Results
Appendix VI	- Ground Gas Monitoring Certificates



Executive Summary

HSP Consulting has been commissioned by Oakmere Homes NW Ltd to provide a Phase II Geoenvironmental Assessment report providing information on likely constraints to the development of the site, parameters for design and recommendations for any mitigation measures should they be required.

The site comprises two open fields to the north west of Chatburn Road, 1.5km north east of Clitheroe town centre at approximate National Grid reference (NGR) 375200,442990. The site address is Chatburn Road, Clitheroe, BB7 2EQ. It is proposed to develop the site to provide twenty eight residential houses.

The ground investigation comprised ten window sample boreholes to a maximum depth of 2.80m, twelve machine excavated trial pits to a maximum depth of 2.60m and three cable percussive boreholes to a maximum depth of 3.00m to provide information for foundation design and obtain representative disturbed soil samples to forward for geotechnical and geo-environmental analysis. The geology of the site comprises topsoil to a maximum depth of 0.30m overlain by firm to stiff clay, gravel and limestone of the Clitheroe Limestone Formation and Hodder Mudstone Formation, the full depth of which was not proven.

The natural cohesive deposits belonging to the Clitheroe Limestone Formation and Hodder Mudstone Formation are considered as suitable a formation layer for the proposed houses where they have been encountered in a medium strength condition from a minimum depth of 0.50m (i.e. at least 200mm into the natural weathered bedrock deposits). At the above depth HSP would recommend that an allowable bearing pressure of 126kNm² should be readily achievable when utilising a 0.60m wide strip trench footing.

It is considered appropriate to adopt a basic Design Sulphate Class of DS-1 together with an Aggressive Chemical Environment for Concrete (ACEC) of AC-1.

Elevated concentrations of Arsenic have been identified in one location at the site at 0.50m depth. Contamination at this depth is unlikely to pose a risk to end users and remediation is unlikely to be required unless ground levels are to be reduced in the area. Elevated levels of Benzo[b]fluoranthene and Dibenz(a,h)Anthracene have been identified in topsoil from WS3A and WS5. This material will need to be removed from site and is not suitable for re-use in gardens on the site.

Analysis of the ground gas monitoring undertaken to date indicates the site falls into a Characteristic Situation 1 / Green. Therefore gas protection measures are not necessary within any new developments upon the site.

The executive summary contains an overview of key findings and conclusions. However no reliance should be placed on the executive summary until the whole of the report has been read. Other sections of the report may contain information which puts into context the findings noted within the executive summary.



1. Introduction

1.1 Background

Oakmere Homes NW Ltd propose develop the site with twenty eight residential properties and associated gardens, soft landscaping and access roads. Our Client intends to submit this report to support the discharge of planning conditions.

1.2 Client Brief & Scope

HSP Consulting has been commissioned by Oakmere Homes NW Ltd to undertake an intrusive ground investigation at the site to investigate the existing ground conditions and provide information on likely constraints to the development, parameters for design and recommendations for any mitigation measures should they be required.

The report presents the following information:

- a summary of the previous Geo-environmental Reports (Section 1.4 below),
- details of the ground investigation undertaken and the ground conditions encountered,
- details and results of the geotechnical testing and contamination analysis,
- recommendations for mitigating constraints to the proposed development where appropriate and providing parameters for foundation design.

Where applicable, the fieldwork was undertaken in accordance with BS5930:1999 Code of Practice for Site Investigations and BS10175:2001 Investigation of Potentially Contaminated Sites.

1.2 Report Objectives

The objectives of this report are to:

- establish the geological and hydrogeological conditions using existing available/published information;
- summarise available information and identify site specific geotechnical and environmental hazards which may place a constraint upon the proposed site use;
- produce an updated Conceptual Site Model identifying potential pollution linkages between sources of contamination, pathways and receptors;

1.3 Limitations

The recommendations made in this report are based on the findings of the intrusive ground investigation undertaken by HSP Consulting Ltd between 16th and 18th March 2015.

1.4 Previous Reports

A previous Phase I report has been made available to HSP Consulting Engineers Ltd by the Client.

- Thomas Consulting, Preliminary Risk Assessment Report, Land at Chatburn Road, Clitheroe, Ref: P4559-01-R1, October 2013.

2. Review of Existing Information & Geoenvironmental Setting

2.1 The Site

2.1.1 Location

The site comprises two open fields to the north west of Chatburn Road, 1.5km north east of Clitheroe town centre at approximate National Grid reference (NGR) 375200,442990. The site address is Chatburn Road, Clitheroe, BB7 2EQ.

2.1.2 Description

The site rises from approximately 82.7m by the watercourse in the north west to approximately 92.7m along the south eastern boundary with Chatburn Road. A wall defines the south eastern boundary while to the north west and north east the site is bound by wooden fencing. The site boundary to the south west is marked by a line of trees and hedges.

Two stone walled pens are present, one in the southern corner of the site and another along the centre of the south eastern boundary. An unnamed watercourse flows north east to south west in the north of the site.

2.1.3 Surrounding Land Use

The main features of interest identified from the Phase I report and site walkover are:

North: Railway line with residential properties and the former Coplow Hill Lime Quarry beyond.
East: Open fields and the watercourse which flows through the site.
South: Chatburn Road with further fields and a hospital beyond.
West: Residential Housing.

2.1.4 Site Access

Vehicle access is off Chatburn Road in the southern corner of the site.

2.1.5 Proposed End Use

It is proposed to redevelop the site to provide twenty eight houses. The proposed development plan is provided in Appendix I.

2.2 Geology

2.2.1 Made Ground

The BGS mapping (Ref 2) indicates that Made Ground should not be encountered upon the site.

2.2.2 Superficial Deposits

The BGS mapping indicates that the site is underlain by glacial till of Devensian age. This is likely to comprise sandy gravelly clay with boulders.

2.2.3 Bedrock Geology

The BGS mapping indicates the site is underlain by the Clitheroe Limestone Formation and Hodder Mudstone Formation, described as *'Predominantly pale grey and commonly coarsely crinoidal, packstones, wackestones and subordinate grainstones and mudstones with Waulsortian mudmound reef limestones present at two levels' and 'redominantly grey to dark grey mudstone, with subordinate and variable detrital limestone, siltstone and sandstone. Mudmound reef (Waulsortian) limestones, limestone boulder conglomerates and breccias locally, near the base. Soft sediment deformation, slumps, debris flows and gravity slides are widespread.'*

2.2.4 Structural Geology

One structural fault has been identified on BGS mapping 800m south west of the site. The fault trends north west to south east downthrown to the south west.

2.3 Pertinent Site Sensitivity Information

This information is provided in the Preliminary Risk Assessment Report by Thomas Consulting (Ref. 1) and summarised here for completeness.

2.3.1 Mining

The site is not in an area with potential for coal mining. One BGS mineral extraction site has been identified within 250m of the site relating to Coplow Limestone Quarry 145m north of the site. Extraction at the site is recorded as being ceased.

2.3.2 Hydrogeology Aquifer Units

The Clitheroe Limestone Formation and Hodder Mudstone Formation at the site are designated as a Secondary A Aquifer strata described as *permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.*

Groundwater Vulnerability

The site is not located within a Source Protection Zone.

2.3.3 Hydrology

Nearest Surface Water Course

The closest recorded surface water course is the unnamed watercourse in the north of the site. The nearest off site water feature is a pond off Deanfield Way 280m east of the site.

2.3.4 Flood Risk

The site is recorded to be located within the influence of an Environment Agency Zone 2 and 3 floodplain in the north and west of the site.

Although the report provides information on flood risk this does not constitute a flood risk assessment for the site. The flood risk information provided only relates to flooding from Rivers or Seas and does not account for flooding from other sources such as groundwater, blockages in drainage systems, artificial water features and overlandflow.

2.3.5 Radon

The property is in a higher probability radon area, as between 10 and 30% of homes are above the action level. Full radon protective measures are necessary in the construction of new dwellings or extensions at the site.

2.3.6 Sensitive Land Uses, Ecological and Statutory Designations

The site is not located within a Nitrate Vulnerable Zone.

A Site of Special Scientific Interest (SSSI) is located 19m north of the site at Coplow Quarry. A second SSSI and local nature reserve are present 260m south east of the site at Salthill Quarry. A local nature reserve is also present 415m north of the site at Cross Hill Quarry. No other records of sensitive land use (SSSI, SAC, Environmentally Sensitive Areas, Local Nature Reserves etc) have been identified within 1km radius of the site.

3. Fieldwork & Factual Information

Site work was carried out between the 16th and 18th of March 2015. Where applicable, the fieldwork was undertaken in accordance with BS5930:1999 + A2:2010 Code of Practice for Site Investigations (Ref. 6) and BS 10175:2011 + A1:2013 Investigation of Potentially Contaminated Sites (Ref. 8).

The exploratory holes were positioned as close to the proposed building footprints as possible to provide information for foundation design and obtain representative soil samples for geotechnical and geo-environmental analysis. A number of trial pits were also excavated under the footprint of proposed roads in order to obtain samples for California Bearing Ratio (CBR) testing.

3.1 Exploratory Methods

The physical methods of investigation employed were 10No window sample boreholes to a maximum depth of 2.80m begl, 3No cable percussive boreholes to a maximum depth of 7.00m begl and 12No machine excavated trial pits to a maximum depth of 2.60m begl. The exploratory holes were logged and sampled by an Engineer from HSP Consulting Ltd and the logs are presented in Appendix II. The exploratory hole locations are shown on the Ground Investigation Layout Plan presented in Appendix III.

Fragmentary bulk, disturbed and undisturbed samples were recovered from materials revealed within all of the exploratory holes. Geo-environmental samples, placed in plastic tubs and glass jars supplied by the laboratory, were also obtained specifically for chemical analysis. The samples were taken to UKAS accredited laboratories for further examination and testing.

3.2 In-situ Testing

3.2.1 Standard Penetration Tests

Standard Penetration Tests (SPT's) were carried out at 1.00m intervals to refusal within all of the window sample boreholes. In the cable percussive boreholes alternate SPTs and U100s at 1.00m intervals to 5.00m and at 1.50m intervals thereafter. The SPT's were undertaken in accordance with BS 1377:1990 and the results are included on the appended borehole logs (Appendix II).

3.3 Laboratory Testing

The laboratory testing schedules were prepared by HSP Consulting Ltd.

3.3.1 Geotechnical Testing

Geotechnical testing has been undertaken by a UKAS accredited laboratory as part of the works at the site:

- Particle Size Distribution
- Atterburg Limits
- One Dimensional Consolidation
- Triaxial Tests
- Natural Moisture Content
- Dry Density / Optimum Moisture Content relationship tests
- Laboratory California Bearing Ratio (CBR) - undisturbed tests

- Sulphate Analysis

The laboratory testing has been carried out by Geolabs Limited (UKAS accredited, laboratory No.1982) in accordance with BS1377:1990 using calibrated equipment specifically for the British Standard.

3.3.2 Chemical Analysis

The geo-environmental samples retained specifically for chemical analysis were stored in cooled containers until delivery to the laboratory by courier.

Chemical analysis was scheduled on nine soil samples for the presence of a selected suite of potential contaminants as outlined in the tables below:

Exploratory Hole Location & Depth	Sample Description
WS1 0.50m	Clay ¹
WS2 0.50m	Clay ¹
WS3A 0.10m	Topsoil ¹
WS4 0.10m	Topsoil ¹
WS5 0.10m	Topsoil ¹
WS5 0.50m	Clay ¹
WS6 0.50m	Clay ¹
WS7 0.50m	Clay ¹
WS8 0.50m	Clay ¹

¹ Geo-environmental Analysis Only

Metals	Cadmium	Chromium (III & VI)	Copper
	Lead	Mercury	Nickel
	Zinc		
Semi Metals and Non-metals	Arsenic	Boron	Selenium
Others	pH	Asbestos	
Inorganic Chemicals	Cyanide	Sulphate	Sulphide
Organic Chemicals	PAH (US EPA 16)	TPH (CWG)	Phenol

The contamination analysis was carried out by Chemtest Environmental Ltd (UKAS accredited, laboratory No. 2183) during the period 9th to 14th April 2015. The results are presented in Appendix V.

3.4 Ground Conditions

3.4.1 Published Geology

The published geology indicates the site is underlain by Till overlying the Clitheroe Limestone Formation and Hodder Mudstone formation as described in section 2.2.3 above.

3.4.2 Ground Conditions on site or General Geology & Revealed Strata

The exploratory hole confirms the published information, the strata generally comprises:

Table 1 – Encountered Ground Conditions

Strata		Depth (mbegl)	Thickness (m)	Description
Anthropogenic and Topsoil	TOPSOIL	G.L - 0.30	0.30m	TOPSOIL comprising turf over sandy gravelly CLAY
Strata		Depth (mbegl)	Thickness (m)	Description
Bedrock	Clitheroe Limestone Formation and Hodder Mudstone Formation	0.15 – 2.80	2.65m	Firm to stiff sandy gravelly CLAY with occasional cobbles and boulders
		0.20 – 1.60	1.40m	Firm to stiff silty sandy CLAY
		0.25 – 1.30	1.05m	Clayey sandy GRAVEL & COBBLES of sandstone
		1.00 – 2.50	1.50m	Clayey sandy GRAVEL of sandstone
		1.60 – 6.70	5.10m	Firm to stiff brown and grey CLAY with occasional cobbles and boulders
		3.40 – 5.30	1.90m	Stiff gravelly CLAY with cobbles and boulders
		5.30 – 5.80	0.50m	Stiff sandy CLAY
		4.10 – 7.00	2.90m	LIMESTONE

3.5 Groundwater Levels

Groundwater was encountered from a minimum depth of 1.00m during the drilling works.

Monitoring of the groundwater has been undertaken as part of this investigation. WS2 was proven to be dry on three occasions. Groundwater was proven in the remaining borehole installations at depths between 0.52m begl within CP1 and 4.16m begl in CP1.

3.6 Ground Gas Monitoring

Sources of potential ground gas were identified with the Preliminary Risk Assessment Report (Ref. 1). Gas monitoring installations were constructed within six of the boreholes at the site (CP1, CP2, CP3, WS2, WS6 and WS8). Each well has been constructed using 50mm diameter HDPE pipe with the top one metre being plain and the remainder slotted. All of the borehole installations have a 6mm pea gravel surround to the slotted pipe with a bentonite seal above and a gas tap. The covers are cemented flush with ground level and are either a round or square lockable stopcock cover.

HSP Consulting uses a GFM 430 Gas Analyser. Prior to its use a calibration check can be performed against gas readings in air. It is recommended that this check is undertaken once on each day the analyser is used. Annual calibration is undertaken on the unit and a copy of this certificate has been included within Appendix VI.

The results of the ground gas monitoring undertaken to date are discussed in Section 5.5 below.

4. Geotechnical Assessment

4.1 Detailed Ground Model

For the purposes of this assessment the trial pit logs, cable percussive and window sample borehole information has been utilised. The borehole logs are presented in Appendix II.

4.1.1 Topsoil

Topsoil was encountered in all exploratory locations across the site and generally comprised turf over sandy gravelly CLAY to a maximum depth of 0.30m begl.

4.1.2 Made Ground

Made Ground was not encountered at the site.

4.1.3 Clitheroe Limestone Formation and Hodder Mudstone Formation

Cohesive deposits of the Clitheroe Limestone Formation and Hodder Mudstone Formation was encountered in all exploratory hole locations from 0.15m to 6.70m begl. This generally comprised firm to soft silty sandy CLAY with cobbles and occasional boulders overlying stiff gravelly CLAY with occasional boulders to a maximum proven depth of 6.70m begl. Sandstone GRAVEL was encountered between 1.00m and 2.50m begl in CP3, TP5 and TP6.

The bedrock strata was generally recorded to comprise limestone and sandstone recovered as gravel and cobbles from a minimum depth of 0.25m begl in the south west of the site to a maximum proven depth of 7.00m in the east of the site. The base of the Clitheroe Limestone Formation and Hodder Mudstone Formation was not proven.

4.1.4 In-situ Testing and Assessment

A series of Standard Penetration Tests (SPT's) undertaken within the window sample boreholes have returned a SPT 'N' values in the range of 5 to 50 at 1.00m depth. The following table summarises the N values at depth across the site within the natural strata. The range of N values is provided for the site as a whole.

Table 2 – SPT N Values

Depth (m)	Range of 'N' Values	Mean 'N' Value	Description
1.00	5 - 50	13	Clay
2.00	7 - 50	18	Clay
3.00	42 - 50	37.5	Clay
3.80	50	50	Clay

Thirteen Plasticity Index Tests have been undertaken to confirm the visual description and engineering behaviour of the soils. The results are included in Appendix IV.

The plasticity index of the cohesive till deposits is in the range 11 to 24% indicating clays of low to high plasticity. The modified plasticity index of the cohesive soils are in the range 3% to 19% indicating soils of Low Volume Change Potential (VCP) in accordance with the NHBC guidance on building near trees (Ref. 9). The natural moisture content of the samples was in the range 10% to 26%.

Seven Particle Size Distribution and Natural Moisture Content tests have been undertaken to confirm the visual description and engineering behaviour of the soils. The results are included in Appendix IV.

4.2 Earthworks

Earthworks operations are expected at the site to allow vehicle access. Significant earthworks are not expected for the individual residential housing plots as the finished floor levels can be tailored to suit the contours of the site. The site levels drop from the road at the south eastern boundary to the watercourse in the north west of the site and levels will need to be altered along the alignment of the access road to allow the highway gradients to conform to adoptable standards.

The grading results indicate the Glacial Till, broadly classifies as general cohesive fill Class 2 in accordance with Highways Specification for Highways Works, Series 600, however the soils do not wholly conform to further subdivision due to the gravel and cobble sized fractions. These materials are unlikely to be suitable for use as engineered fill without the use of a ground improvement technique and possibly some sorting to reduce the number of oversized particles (i.e the cobbles and boulders observed during the site work. Consideration should be given to a scheme of lime stabilisation to reduce the moisture content and to aid in achieving high compaction criteria with respect to controlling long term settlements. Specific details should be discussed with a specialist contractor.

Stringent groundwater and surface water control will be imperative during excavation, as the cohesive deposits will rapidly soften upon contact with water. In addition these materials will be susceptible to softening during periods of wet weather and will easily be damaged by site traffic and deterioration at times of heavy rainfall. It can be seen from the appended compaction test results that the samples tested, in many cases had natural moisture contents above (by a maximum of 17%) the optimum moisture content. End product compaction criteria of 100% of the maximum dry density obtained in the 2.5kg tests will need to be achieved if these materials are to be used as fill to structures including the highway.

Given the alteration of the site levels it is recommended that in-situ CBR testing is carried out to determine the design CBR values once the formation levels are exposed. CBR values in the order of 2% may be anticipated at formation providing any anomalously very soft or soft pockets are over excavated.

It is recommended that the following should be carried out with respect to hardstanding in areas of cut:

- The exposed formation should be carefully inspected and any undesirable materials such as topsoil, obstructions and hard spots should be removed and replaced with suitable granular hardcore.
- Any very soft / soft spots should be similarly over excavated and replaced.
- The formation should be proof rolled prior to construction which, in view of the cohesive nature of the soils encountered, should be undertaken as soon as possible to reduce the exposure time and the risk of softening, particularly in wet or frosty weather conditions. Where it is unavoidable, the softened upper layer should be scraped back prior to rolling and emplacement of the sub-base and /or capping.
- Consideration should be given to provision of a geofabric and / or geogrid stiffener between the formation soils and road, car park or hard landscaping construction

materials in order to prevent either punching of materials into any soft underlying soils, or the squeezing of the soils into the road construction during rolling. This would have the added benefit of providing a small degree of long term reinforcement and will lessen the effect of any differential settlement across areas of hardstanding spanning a variable subgrade.

It should be appreciated that the comments above are based upon a limited number of samples and should be treated as a preliminary basic guide only and not for detailed design work. A full earthworks appraisal will be required prior to the earthworks.

4.3 Excavations

Excavations to proposed formation level for new foundations and infrastructure should generally be readily achievable adopting standard excavation plant. However, random and potentially severe falls should be anticipated from the faces of near vertically sided unsupported excavations carried out at the site. Where personnel are required to enter near vertically sided excavations, it is considered that full support should be provided to the full depth of all excavations.

It is recommended that all support systems are continually assessed by fully trained or experienced personnel.

Groundwater was encountered from a minimum depth of 1.00m begl during the fieldwork, there is a possibility that groundwater entries may be encountered at shallow depths during construction. It should be noted that groundwater levels may vary due to seasonal variations or other effects. Should shallow groundwater entries be encountered at the site during groundwork operations traditional sump and pump dewatering should be sufficient if required.

4.4 Foundations

The development proposals for the site indicate twenty eight residential properties. The proposed development plans for the site can be seen in Appendix I. Should development plans alter a geotechnical engineer from HSP must be consulted to review the foundation options.

For the purpose of this foundation assessment the information gained from all window sample and cable percussive boreholes has been included.

The table below indicates the indicative allowable bearing pressure (ABP) that could be achieved using strip foundations across the building footprint. An ABP has been calculated using the mean of the corrected SPT (N_1)₆₀ values for the borehole group at 1m intervals from the existing ground level.

Table 3 – Indicative Allowable Bearing Pressures

Depth (m)	Mean SPT 'N160 Value	Eurocode 7 Soil Strength Description	Consistency (BS5930) Description	Approximate ABP (kN/m ²) – 0.60m wide strip footing	Approximate ABP (kN/m ²) – 2x2m pad footing
1.0	15.25	Medium Strength	-	125	130

2.0	21.11	High Strength	-	195	200
3.0	37.5	Very High Strength	-	415	450

The natural cohesive deposits belonging to the Clitheroe Limestone Formation and Hodder Mudstone Formation are considered as suitable a formation layer for the proposed houses where they have been encountered in a medium strength condition from a minimum depth of 0.50m (i.e. at least 200mm into the natural weathered bedrock deposits).

At the above depth HSP would recommend that an allowable bearing pressure of 125kNm² should be readily achievable when utilising a 0.60m wide strip trench footing.

The allowable bearing capacity value incorporates a factor of safety of 3 and total settlements are not expected to exceed approximately 25mm, thereby keeping differential settlements within acceptable limits.

Should higher loadings be required, consideration should be given to deepening the foundations to bear onto the very high strength cohesive deposits encountered from 3.00m begl.

4.5 Ground Floor Slab

Ground bearing floor slabs are considered to be a feasible option for the proposed development. In order to meet the requirements for radon protection these will need to be reinforced.

4.6 Concrete Classification

The results of sulphate and pH testing carried out on selected soil samples taken during this investigation have been compared with the recommendations outlined in BRE Special Digest 1, Part 1: 2005.

The guidelines given in BRE Special Digest 1 are based upon a site classification relating to its previous usage. It is considered appropriate to define this site as a 'greenfield site' location for the purposes of concrete classification.

On the basis of the above, it is considered appropriate to adopt a basic Design Sulphate Class of DS-1 together with and Aggressive Chemical Environment for Concrete (ACEC) of AC-1.

4.7 Pavement Design

At this stage the external proposals indicate a dedicated vehicular access from Chatburn Road heading to a turn head in the north of the site with smaller side roads for access to the residential dwellings.

Given the cohesive nature of the shallow soils encountered a CBR value of 3% to 3.5% is recommended for design purposes at this stage.

Consideration should be given to proof rolling the proposed building footprint and external areas once the formation level has been achieved as good practice. This is to target a CBR value of at least 5% throughout. Should any soft spots be encountered across the area they should be removed and replaced with suitably compacted stone or sub-base material.

Exposed subgrades will likely deteriorate rapidly on exposure to wet weather and should be shaped to shed water. Sub-base should be placed as soon as possible to minimise the exposure of the subgrade to adverse weather conditions.

4.8 Drainage

No soakaway or permeability testing was carried out on the underlying soils at the site at the time of this ground investigation.

The exploratory holes encountered cohesive deposits of low permeability across the site. The use of soakaway drainage is not considered feasible at the site.

5. Environmental Assessment

5.1 Introduction

The approach to the human health risk assessment reported here follows the principals given in CRL 11, i.e. application of the following assessment hierarchy:

- Tier 1 risk screening by establishment of potential pollutant linkages, i.e. the preliminary conceptual site model (PCSM), or
- Tier 2 generic quantitative assessment using generic assessment criteria (GACs) that represent 'minimal' or 'tolerable' risk, or
- Tier 3 quantitative risk assessment using site specific assessment criteria (SSACs) that represent 'unacceptable risk', or where generic assessment criteria are not available or they are not applicable to the CSM.

The results of laboratory analysis have been screened against GACs including the Defra Category 4 Screening Levels (C4SL) and LQM and CIEH S4ULs for Human Health Risk Assessment (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3180. All rights reserved). (Refs 11 & 10 respectively).

The potential sources of contamination based on historical and current land uses were identified within the Preliminary Risk Assessment Report (Ref. 1). The standard exposure scenario of residential with plant uptake has been used to identify potential exposure pathways for human health receptors as the proposed development plan indicates rear gardens to the two. Controlled water, flora and fauna and property receptors have also been included within the CSM.

5.2 Assessment of Soil Analysis Results

Nine samples, as detailed in section 3.3.2, were scheduled for analysis from the development area. These provide a basis for characterising the soils to outline the potential impacts on human health and any environmental receptors from any contamination found.

The screening process for on-site human health receptors show that the GAC, representative of minimal risk for a residential setting was marginally exceeded for Arsenic and Benzo[b]fluoranthene in one location and Dibenz(a,h)Anthracene in two locations. The results for the remaining potential contaminants of concern were below the screening criteria for individual contaminant concentrations.

Table 4 – GAC Exceedances

Contaminant	GAC (mg/kg)	No. of exceedances	Concentration (mg/kg), sampling location and depth (m)
Arsenic	37 ¹	1	54 WS1, 0.50m
Benzo[b]fluoranthene	2.6 ²	1	3.5 WS5, 0.10m
Dibenz(a,h)Anthracene	0.24 ²	2	0.44 @ WS3A, 0.10m 0.43 @ WS5, 0.10m

¹C4SL, ²LQM & CIEH GAC

This investigation has identified the ground conditions to comprise a layer of Topsoil to a maximum depth of 0.20m (WS5) underlain by Clay to a maximum depth of 1.75m (WS1).

We therefore consider that there is the potential risk associated with the interaction between the near surface soils and end users of the site including construction workers. Mitigation measures and recommendations in relation to the contamination identified are made in Section 5.3 below.

5.3 Human Health Mitigation

Results from the nine geo-environmental samples have been screened for on-site human health receptors and none of the GACs (C4SLs or S4ULs) have been exceeded for any of the potential contaminants of concern with the exception of one elevated level of Arsenic in WS1 at 0.50m begl, one elevated level of Benzo[b]fluoranthene in WS5 at 0.10m begl and elevated levels of Dibenz(a,h)Anthracene in WS3A at 0.10m begl and WS5 at 0.10mbegl.

The exceedance of the C4SL for Arsenic in WS1 is a single exceedance at 0.50m depth within undisturbed natural ground it is unlikely to pose a significant possibility of significant harm to the proposed end users of the site unless ground levels in this area are reduced during development. Should the lowering of levels in this area be considered a geoenvironmental engineer from HSP must be consulted to review the mitigation options.

The elevated levels of Benzo[b]fluoranthene and Dibenz(a,h)Anthracene at 0.10m begl in WS3A and WS5 are within topsoil at the site. It is recommended that the topsoil in the vicinity of WS3A and WS5 is removed from site. This material will not be suitable for re-use in gardens. The concentrations of Benzo[b]fluoranthene and Dibenz(a,h)Anthracene recorded in these locations are not considered to pose a significant possibility of significant harm to the proposed end use of the site provided they are removed from site. If the material passes a 3AA2 test it may be suitable for reuse on a commercial site. Should any obvious evidence of unexpected contamination be encountered during the redevelopment works it should be reported to HSP so that an inspection can be made and appropriate sampling and assessment work be carried out.

Appropriate health and safety precautions should be adopted during any excavation works to avoid exposure to contaminated soils and dust. Reference to the HSE document HSG 66 'Protection of workers and the General Public during Redevelopment of Contaminated Land'.

The approval of the local Environmental Health Officer should be sought with respect to the soil contamination assessment and mitigation proposals.

5.4 Water Supply

The environmental testing for the site has been compared to the following document in order to assess the most appropriate pipe material that should be used upon the site for mains water supply:

'Guidance for the selection of water supply pipes to be used in Brownfield sites – UK Water Industry Research – Ref: 10/WM/03/21.'

Based on the chemical analysis report it is considered that specialist materials are unlikely to be required for water supply pipes at the site. However confirmation of supply pipes should be sought from utility providers.

5.5 Ground Gas Risk Assessment

Sources of potential ground gas were identified within the Preliminary Risk Assessment Report. Ground gas concentrations have been monitored on six occasions over a three month period in order to obtain an indication of the ground gas regime at the site.

The results indicate that methane has not been recorded above the limits of detection of the gas monitor. Carbon dioxide has been recorded at concentrations up to a maximum 4.4% by volume in air. Positive gas flows have been recorded at levels up to 1.2l/hr.

The results have been assessed in line with the guidance provided in NHBC Guidance on Methane and Carbon Dioxide (Ref 14) and CIRIA Document C665 'Assessing Risks Posed by Hazardous Ground Gases to Buildings' (Ref 15.). Comparison of these results with Table 8.5 of the CIRIA document indicates that the site falls into a Characteristic Situation 1 and NHBC Green. Therefore gas protection measures are not necessary within any new developments upon the site with regards to methane and carbon dioxide, however full radon protection measures are required for the site.

The certificates and summary for the gas monitoring are included as Appendix VI.

5.6 Updated Conceptual Site Model

The PCSM and Summary of plausible pollutant linkages was produced by undertaking a Source-Pathway-Receptor analysis of the site and is present in the Preliminary Risk Assessment (Ref. 1). Based on the findings of this and the previous investigation the updated conceptual site model has been updated and is presented in the table below.

Table 5 - Updated Conceptual Site Model.

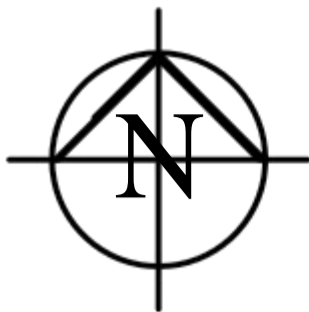
Source	Pathway	Receptor	Comments
On site	P1: Horizontal and vertical migration of contaminants through potentially permeable soils and rocks.	R1: Property, services and substructures	The glacial till and Clitheroe Limestone Formation and Hodder Mudstone Formation may contain sulphates that present a risk to buried concrete. Testing indicates the soils are unlikely to be aggressive to concrete and it is considered appropriate to adopt a basic Design Sulphate Class of DS-1 together with and Aggressive Chemical Environment for Concrete (ACEC) of AC-1. The chemical analysis of the soils indicate specialist materials are unlikely to be required for water supply pipes at the site.
S1: Agricultural Land. On site	P2: Human uptake pathways <ul style="list-style-type: none"> • direct contact, • ingestion of soils and dust, • inhalation of fugitive dust. 	R2: Construction and maintenance workers	Elevated concentrations of Arsenic, Benzo[b]fluoranthene and Dibenz(a,h)Anthracene have been identified within the natural cohesive material and topsoil on site at 0.10 - 0.50m depth. Site workers should be advised of the potential for contact with the Made Ground materials. Appropriate health and safety precautions should be adopted during any excavation works to avoid exposure to contaminated soils and dust as per Section 5.3.
S2: Made Ground.	P2: Human uptake pathways <ul style="list-style-type: none"> • direct contact, • ingestion of soils and dust, • inhalation of fugitive dust. 	R3: End Users	Elevated concentrations of Arsenic have been identified within the natural cohesive material on site at 0.50m depth. Due to the depth of the contamination it is unlikely that the end users will come into contact with soils through leisure/sporting activities. Benzo[b]fluoranthene and Dibenz(a,h)Anthracene have been identified within the topsoil on site at 0.10m depth. This material is not suitable for reuse in gardens and should be removed from site. As a result it is unlikely that the end users will come into contact with soils through leisure/sporting activities. Therefore the risk is considered to be very low.

6. References

1. Thomas Consulting, Preliminary Risk Assessment Report, Land at Chatburn Road, Clitheroe, Ref: P4559-01-R1, October 2013.
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3. British Geological Survey Lexicon Search - <http://www.bgs.ac.uk/lexicon/>
4. Department of the Environment Industry Profiles.
5. Site Investigation in Construction, Volume 3, Specification for Ground Investigation 2nd Edition.
6. BS 5930:1999 + A2:2010 Code of Practice for Site Investigations.
7. BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)
8. BS 10175:2011 + A1:2013 Investigation of Potentially Contaminated Sites - Code of Practice.
9. NHBC Standards, Chapter 4.2, Building near trees.
10. Nathanail, C.P., McCaffrey, C., Gillett, A.G., Ogden, R.C. and Nathanail, J.F. 2015. The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.
11. Department for Environment, Food and Rural Affairs and Contaminated Land: Applications in Real Environments (CL:AIRE) (December 2013). SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination.
12. BRE Special Digest 1: Concrete in Aggressive Ground, 2005, Building Research Establishment.
13. CL:AIRE The definition of Waste: Development Industry Code of Practice, 2008.
14. NHBC & RSK Group Plc, March 2007. Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. Ed 4.
15. CIRIA C665 'Assessing Risks Posed by Hazardous Ground Gases to Buildings'

Appendix I

Housetype Schedule				
Ref	Housetype	Description	Sq Ft (Excluding Garage)	Number
Bow	Bowell	4 Bed detached house	1033	5
	Caldew	1 Bed terraced house	439	2
Enn	Ennerdale	4 Bed detached house	1521	4
Gras	Grasmere	4 Bed detached house	1434	5
Kirk	Kirkstone	4 Bed detached house	1404	1
Lough	Loughrigg	1 Bed semi detached bungalow	508	1
Roth	Rothay	2 Bed semi/terraced house	693	3
Rydal	Rydal	1 Bed semi detached bungalow	519	2
Thirl	Thirlmere	4 Bed detached house	1363	2
Ullis	Ullswater	4 Bed detached house	1662	1
Was	Wasdale	4 Bed detached house	1327	2
			Total	28



REV	DATE	DESCRIPTION
D	20/06/17	Replan. Additional plots added.
C	30/05/17	Contour labelling corrected
B	24/05/17	5m easement to rear of plots 12-18 Plots 1-11 repositioned to accommodate new road position. Plots 17-20 amended.
A	22/05/17	6m easement shown between Ullswater & Grasmere- plots 12 & 13 Wasdale plot 14 repositioned to accommodate.



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PROJECT TITLE CHATBURN ROAD CLITHEROE	
DRAWING TITLE Site Layout	
DRAWING NUMBER 016/P/01	REVISION D
DATE 05/17	SCALE 1:500@A2

Appendix II

Borehole Log

Borehole No.

CP1

Sheet 1 of 1

Project Name: Chatburn Road,

Project No.

Co-ords: -

Hole Type

C2099

CP

Location: Clitheroe

Level:

Scale

1:50

Client: Oakmere Homes

Dates: 17/03/2015 - 17/03/2015

Logged By
Driller

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.20	B		0.20		Grass overlying brown clayey TOPSOIL	
		0.10	D				Soft to firm orange brown mottled silty sandy CLAY.	
		0.20	D					
		0.50 - 1.00	B					
		1.00		50 (7,16/50 for 270mm)	1.60		...with a few large boulder and cobbles and a little coarse gravel.	
		1.00 - 1.50	B					
		1.60	D					
		1.70 - 1.80	U	50 (25 for 85mm/50 for 290mm)				
		1.80						
		1.80 - 2.30	B					
	2.80		50 (9,12/50 for 265mm)	4.10 4.20		Stiff dark grey CLAY.		
	2.80 - 3.30	B						
	3.80		50 (25 for 95mm/50 for 275mm)					
	3.80 - 4.10	B				LIMESTONE boulder.		
							End of borehole at 4.20 m	

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 4.20m due to refusal.
- Gas and water monitoring standpipe installed to 4.20m depth.



Borehole Log

Borehole No.

CP2

Sheet 1 of 1

Hole Type

CP

Scale

1:50

 Logged By
Driller

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 18/03/2015 - 19/03/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.00 - 0.25	B	N=19 (1,1/3,4,6,6)	0.25		Grass overlying silty TOPSOIL.			
		0.10	D				Ornage brown mottled silty sandy CLAY.			
		0.30	D							
		0.50 - 1.00	B							
		1.00								
		1.00 - 1.50	B							
		1.80	D		1.80		...with sandstone gravel and occasional cobbles.			
		1.90 - 2.35	U							
		2.40	D		2.40		Firm to stiff brown grey mottled CLAY.			
		2.60	D							
		2.70		N=42 (4,9/14,11,8,9)	2.60		Firm to stiff brown grey mottled CLAY.			
		2.70 - 3.20	B							
		3.40	D					3.40		Grey brown very sandy CLAY with much gravel and cobbles.
		3.50 - 3.65	U							
		3.50 - 3.80	B		3.80 - 4.20		Stiff grey gravelly CLAY. Gravel is of limestone.			
		3.80 - 4.20	U							
		4.20	D		4.20					
	4.80									
	4.80 - 5.20	B	50 (25 for 90mm/50 for 295mm)	5.30		Grey sandy CLAY.				
	5.30	D								
	5.30		50 (25 for 85mm/50 for 245mm)	5.80		...with limestone gravels, boulder and cobbles.				
	5.30 - 5.50	D								
	5.30 - 5.80	B		6.00		LIMESTONE				
	5.80	D								
	5.80		50 (25 for 90mm/50 for 250mm)				End of borehole at 6.00 m			
	6.00		50 (25 for 80mm/50 for 225mm)							

Remarks

1. No groundwater was encountered during the drilling process.

2. Borehole was terminated at 6.00m due to refusal.

3. Gas and water monitoring standpipe installed to 4.20m depth.

Borehole Log

Borehole No.

CP3

Sheet 1 of 1

Hole Type

CP

Scale

1:50

Logged By
Driller

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 18/03/2015 - 18/03/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.00 - 0.20	B	N=41 (4,5/8,11,14,8)	0.20		Grass overlying brown clayey TOPSOIL	
		0.10	D				Orange brown mottled silty sandy CLAY.	
		0.20	D		0.70		Grey brown mottled silty sandy CLAY with some gravel and cobbles.	
		0.20 - 0.70	B					
		0.70	D		1.00		Brown clayey GRAVEL.	
		0.70 - 1.00	B					
		0.80	W		1.70		Firm to stiff brown grey mottled CLAY.	
		1.00	D					
		1.10	D		2.40		Stiff grey CLAY with many limestone cobbles and boulders.	
		1.10 - 1.60	B					
		1.70	D	3.70 - 4.15		50 (25 for 80mm/50 for 250mm)		
		1.80 - 2.20	U					
		2.20	D	4.20		50 (25 for 135mm/50 for 228mm)		
		2.40	D					
		2.50 - 2.70	B	4.70		50 (25 for 85mm/50 for 225mm)		
		2.70	B					
		2.70 - 3.15	D	5.70 - 5.85		LIMESTONE		
		2.70 - 3.20	B					
		3.70 - 4.15	U	6.70		End of borehole at 7.00 m		
		4.20	D					
	4.70	B	7.00					
	4.70 - 5.20	B						
	5.70 - 5.85	U						
	5.70 - 6.20	B						
	6.70	D						
	6.70 - 6.80	D						
	7.00	D						

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 7.00m due to refusal.
- Gas and water monitoring standpipe installed to 4.20m depth.



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.30		Scale 1:25 Logged LEB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			Grass overlying brown sandy clayey TOPSOIL. High plasticity.
	0.80	B					Grey slightly clayey sandy GRAVEL & COBBLES. Gravel and cobbles is fine to coarse angular to sub angular sandstone.
	1.20	B		1.30			End of pit at 1.30m




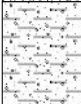
Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 1.30m depth and backfilled with arisings.

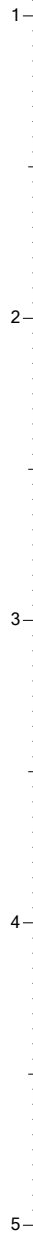
Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 0.50		Scale 1:25 Logged LB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone. Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone.
				0.50			
							End of pit at 0.50 m



Remarks: 1. No groundwater was encountered during the drilling process.
2. Trial pit was terminated at 0.50m depth due to bedrock and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 0.50		Scale 1:25 Logged LB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone. Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone.
				0.50			
							----- End of pit at 0.50 m -----

Remarks: 1. No groundwater seepage was encountered during the excavation process.
2. Trial pit was terminated at 0.50m depth due to bedrock and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.00		Scale 1:25 Logged LEB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			Grass overlying blackish brown sandy clayey TOPSOIL. Low plasticity.
	0.80	B					Firm orange brown slightly gravelly sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 24 kPa at 0.50m depth.</i>
	1.60	B					<i>...with medium sub angular to sub rounded boulder of sandstone at 1.50m depth.</i> <i>HSV - 32 kPa at 1.50m depth.</i>
				2.00			End of pit at 2.00 m

Remarks: 1. No groundwater was encountered during the drilling process.
2. Trial pit was terminated at 2.00m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.70		Scale 1:25 Logged LEB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.15			0.15			Grass overlying blackish brown sandy clayey TOPSOIL. High plasticity.
	0.50	B					Firm orangish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <u>HSV - 48 kPa at 0.60m depth.</u>
	1.50	B					<u>...with low sub rounded boulders of sandstone at 1.40m depth.</u> <u>HSV - 14 kPa at 1.50m depth.</u>
				1.70			End of pit at 1.70 m

Remarks: 1. Slight groundwater seepage was encountered during the excavation process at 1.30m depth.
2. Trial pit was terminated at 1.70m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.90		Scale 1:25 Logged LB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.15						Grass overlying blackish brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.60	B					Firm orangish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 38 kPa at 0.50m depth.</i> <i>...with a medium sub rounded boulder of sandstone.</i> <i>HSV - 22 kPa at 1.40m.</i>
				1.90			End of pit at 1.90m

Remarks: 1. No groundwater was encountered during the drilling process.
2. Trial pit was terminated at 2.00m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): 		Scale 1:25
Client: Oakmere Homes	Depth 2.10		Logged LB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.15			0.15			Grass overlying blackish brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.50	B					Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 63 kPa at 0.50m.</i>
							<i>...with medium sub angular to sub rounded at 0.80m.</i>
	1.60	B					<i>HSV - 46 kPa at 1.10m depth.</i> <i>...with medium angular to sub rounded sandstone.</i>
	1.90	B		1.90			Greyish brown clayey sandy GRAVEL. Gravel is fine to coarse angular to rounded of sandstone.
				2.10			----- End of pit at 2.10m

Remarks: 1. No groundwater was encountered during the excavation process .
2. Trial pit was terminated at 2.10m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.50		Scale 1:25
Client: Oakmere Homes			Logged LB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.10			Grass overlying blackish brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.50	B					Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone.
							HSV - 56 kPa at 0.60m.
	1.50	B		1.00			Firm greyish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded sandstone.
	2.20	B		2.10			Stiff dark grey silty sandy gravelly CLAY. Low plasticity. Gravel is fine to coarse angular to sub rounded of sandstone.
			2.30				Dark grey sandy very clayey GRAVEL. Gravel is fine to coarse angular to sub rounded of sandstone.
			2.50				End of pit at 2.50 m

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 2.50m depth and backfilled with arisings.

Stability:

Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.10		Scale 1:25 Logged LB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.50	B		0.30			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to coarse sub angular to sub rounded of sandstone.
				1.10			Firm light grey to orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to medium angular to sub angular of sandstone and mudstone. <i>HSV - 32 kPa at 0.60m depth.</i> <i>...becoming softer and very garvelly from 0.70m depth.</i>
							----- End of pit at 1.10m -----

Remarks: 1. Slight groundwater seepage was encountered during the excavation process at 0.70m depth.
2. Trial pit was terminated at 1.10m depth due to collapsing and backfilled with arisings.

Stability:



Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.50		Scale 1:25 Logged LB
Client: Oakmere Homes			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.25			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to coarse sub angular to sub rounded of sandstone.
	0.50	B					Firm greyish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 48 kPa at 0.50m depth.</i>
	1.50	B					<i>...with medium angular to sub rounded sandstone gravel at 0.90m depth.</i> <i>HSV - 38 kPa at 1.30m depth.</i> <i>...becoming softer with increased depth.</i>
	2.40	B		2.50			-End of pit at 2.50m-

Remarks: 1. Slight groundwater seepage was encountered during the excavation process at 0.80m depth.
2. Trial pit was terminated at 2.50m depth and backfilled with arisings.

Stability:



Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.50		Scale 1:25
Client: Oakmere Homes			Logged LB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.20			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.60	B					Firm greyish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone. <i>HSV - 61 kPa at 0.40m depth.</i>
							<i>...becoming very gravelly at 0.70m depth.</i>
							<i>...becoming less gravelly at 1.00m depth.</i>
	1.50	B		1.20			Firm dark grey slightly sandy gravelly CLAY. Low plasticity. Gravel is fine to coarse angular to sub angular of sandstone. <i>HSV - 28 kPa at 1.40m depth.</i> <i>...with a low sub rounded boulder content of sandstone at 1.50m depth.</i>
	2.20	B		2.50			
							End of pit at 2.50m

Remarks:

- Slight groundwater seepage was encountered during the excavation process at 1.00m depth.
- Trial pit was terminated at 2.50m depth and backfilled with arisings.

Stability:



Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): 		Scale 1:25
Client: Oakmere Homes	Depth 2.60		Logged LB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.60	B					Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone. <i>HSV - 52 kPa at 0.50m depth.</i>
							<i>...with medium angular to sub rounded content of sandstone at 0.80m depth.</i>
	1.50	B					<i>...with low angular to sub rounded content of sandstone at 1.20m depth.</i> <i>HSV - 40 kPa at 1.40m depth.</i>
	2.40	B					
				2.60			End of pit at 2.60m

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 2.60m depth and backfilled with arisings.

Stability:



Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099


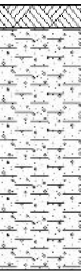
Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15	D		0.15		MADE GROUND - blackish brown very sandy clayey TOPSOIL. Low plasticity.	
		0.50	D				Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse subangular to angular of sandstone.	
		1.00		N=12 (0,0/1,2,3,6)			HSV - 46 kPa at 0.70m depth.	
		1.50	D		1.75			
		1.75	ES		1.80		Grey SANDSTONE. Recovered as a coarse angular gravel.	
							End of borehole at 1.80 m	



Remarks

1. No groundwater was encountered during the drilling process.
2. Borehole was terminated at 1.80m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS2

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	D		0.20		Grass overlying blackish brown very sandy clayey TOPSOIL. Low plasticity.	
		0.50	D					Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse sub angular to angular of sandstone. <i>HSV - 42 kPa at 0.80m depth.</i>
		1.00		N=10(1,1/2,2,3,3)				
		1.50	D					
		2.00		N=16(2,3/4,4,4,4)	2.10			Firm greyish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse sub rounded to angular of sandstone and mudstone. <i>HSV - 62 kPa at 1.80m depth</i>
	2.50 2.50	D	50 (25 for 105mm/50 for 255mm)	2.80			<i>HSV - 52 kPa at 2.40m depth.</i>	
							End of borehole at 2.80 m	

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 2.50m depth due to refusal.
- Gas and water monitoring standpipe installed to 2.50m depth.



Borehole Log

Borehole No.

WS3

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.20		Grass overlying blackish brown very sandy clay TOPSOIL. Low plasticity.	
		0.50	D				Firm light grey and oranish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to rounded of sandstone. <i>HSV - 44 kPa at 0.50m depth.</i>	
		0.60	D					
		1.00		N=9 (1,2/1,2,3,3)			<i>becoming soft from 1.10m depth.</i>	
		1.50	D				<i>...with a cobble of sandstone.</i>	
		1.50		50 (25 for 145mm/50 for 295mm)	1.80		End of borehole at 1.80 m	

Remarks

1. No groundwater was encountered during the drilling process.

2. Borehole was terminated at 1.80m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS3A

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Hatched Pattern]		0.10	D		0.15		Grass overlying blackish brown sandy clayey TOPSOIL. High plasticity.	
		0.50	D				Firm light grey and oragnish brown slightly gravelly sandy CLAY. High plasticity. Gravel is fine to medium sub rounded to angular of sandstone and mudstone.	
		1.00		N=16 (1,1/3,4,5,4)				
		1.40	D					
		1.60		50 (25 for 135mm/50 for 235mm)	1.60 1.70		...with a cobble of sandstone at 1.50m depth.	
							Extremely weak grey medium grained SANDSTONE recovered as angular coarse gravel.	
							End of borehole at 1.70 m	



Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 1.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS4

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	StratumDescription
		Depth (m)	Type	Results				
[Pattern]		0.10	D		0.20	[Pattern]	Grass overlying blackish brown slightly gravelly sandy clay TOSPOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone	
		0.50	D					
		1.00		N=5 (1,1/1,2,1,1)		[Pattern]	Firm orangish brown slightly gravelly sandy CLAY. High plasticity. Gravel is fine to medium angular to sub angular of sandstone and mudstone. <i>HSV - 44 kPa at 0.80m depth.</i>	
		1.50	D					
		2.00		N=31 (4,6/5,7,8,11)				
		2.50	D					
	2.70		35 (25 for 115mm/35 for 245mm)	2.70	[Pattern]	Stiff dark grey silty sandy gravelly CLAY. Low plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 102 kPa at 2.40m depth.</i>		
							End of borehole at 2.70 m	



Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 2.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS5

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
▲		0.10	D		0.20		Grass overlying brown slightly sandy gravelly very clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.	
		0.50	D					
		1.00		N=5 (3,2/2, 1,1,1)	1.70		Firm yellowish brown and grey slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 19 kPa at 0.90m depth. ...becoming soft from 1.20m depth.</i>	
		1.50	D					
		2.00		50 (25 for 135mm/50 for 275mm)			End of borehole at 1.70 m	



Remarks

1. Groundwater was encountered during the drilling process at 1.10m depth.
2. Borehole was terminated at 1.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS6

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	StratumDescription
		Depth (m)	Type	Results				
		0.10	D		0.15		Grass overlying blackish brown slightly gravelly sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium sub angular of sandstone and mudstone.	
		0.50	D				Soft light grey to orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone.	
		1.00		N=14 (1,2/2,3,4,5)	1.20		HSV - 32 kPa at 0.60m depth.	
		1.50	D				Dark grey gravelly clayey SAND. Sand is fine to coarse. Gravel is fine to coarse angular to sub angular of sandstone and mudstone.	
		1.90		50 (25 for 85mm/24,12,14,)	1.90		End of borehole at 1.90m	

Remarks

1. Groundwater was encountered during the drilling process at 1.00m depth.

2. Borehole was terminated at 1.90m depth due to refusal.

3. Gas and water monitoring standpipe installed to 1.90m depth.



Borehole Log

Borehole No.

WS7

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099




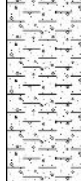
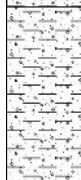
Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	StratumDescription
		Depth (m)	Type	Results				
		0.10	D		0.25		Grass overlying blackish brown slightly gravelly sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium sub angular of sandstone and mudstone.	
		0.50	D					
		1.00		N=10 (3,3/4,2,2,2)	1.50		Firm light brown and orangish brown sandy gravelly CLAY. High plasticity. Gravel is fine to medium angular to sub rounded of sandstone and mudstone. <i>HSV - 42 kPa at 0.70m depth.</i>	
		1.50	D					
		2.00		N=7 (2,2/1,2,1,3)				
2.70		N=50 (11,12/50 for 285mm)	2.70		End of borehole at 2.70 m			



Remarks

1. Groundwater was encountered during the drilling process at 1.40m depth.
2. Borehole was terminated at 2.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS8

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20		Grass overlying brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub rounded of sandstone and mudstone.	
		0.50	D				Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone. HSV - 68 kPa at 0.70m depth.	
		1.00		N=5 (1,1/1,1,1,2)				
		1.80		N=50 (11,14/50 for 285mm)	1.80		End of borehole at 1.80m	



Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 1.80m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS9

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	StratumDescription
		Depth (m)	Type	Results				
[Pattern]					0.30			Grass overlying brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone and mudstone.
		0.50	D		1.00			Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone.
		1.50	D	N=8 (2,2/2,2,2,2)	1.20			HSV - 42 kPa at 0.80m depth.
		2.00		N=50 (4,6/50 for 255mm)	2.00			Firm greenish brown silty sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone. HSV - 79 kPa at 1.50m depth.
								----- End of borehole at 2.00m -----



Remarks

1. No groundwater was encountered during the drilling process.
2. Borehole was terminated at 2.0m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS10

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes

Dates: -

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			
		0.50	D					
		1.0		50 (4 for 0mm/50 for 0mm)	1.00			






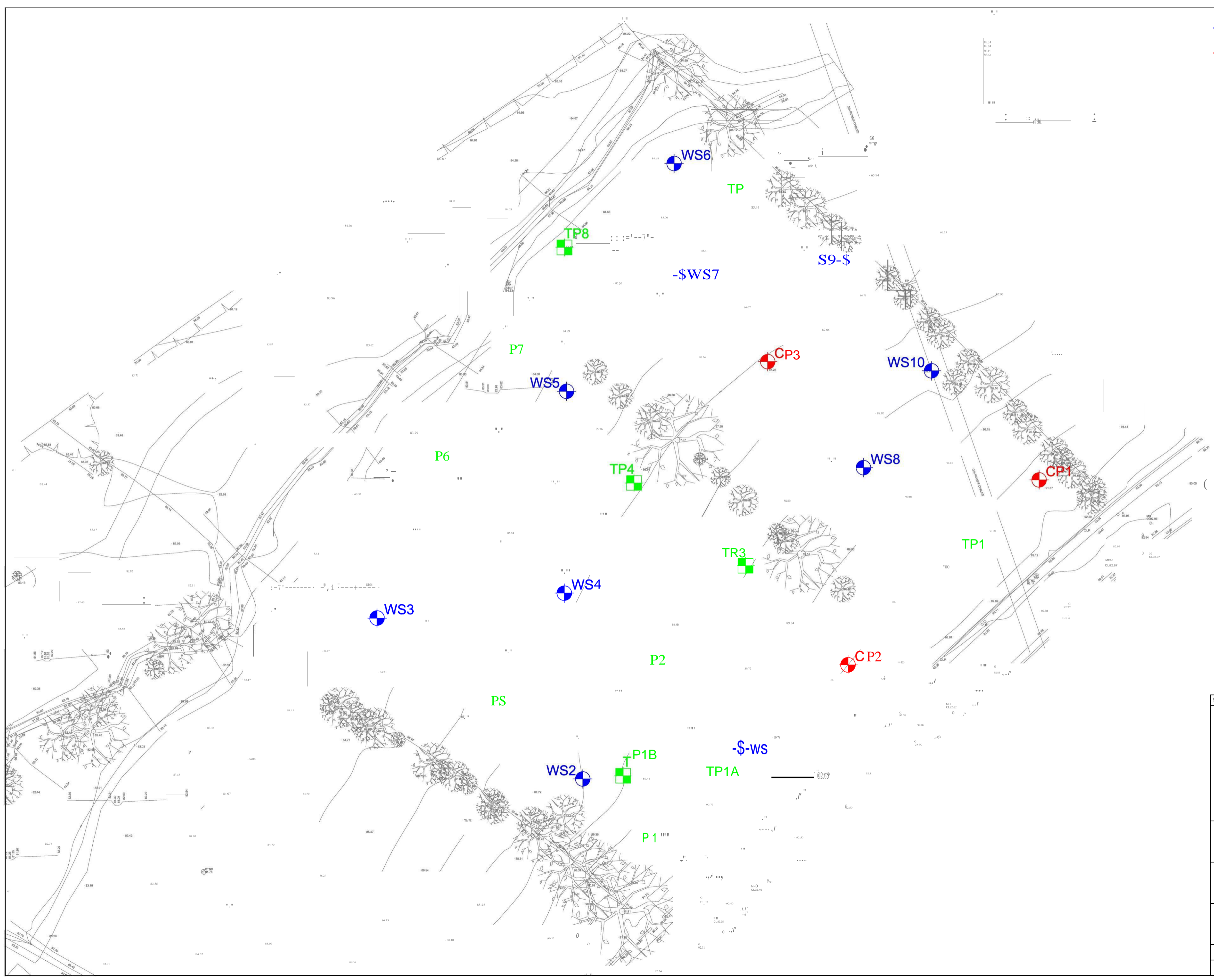
Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 1.00m depth due to refusal and backfilled with arisings.



Appendix III

KEY:
 Window sampling borehole location
 Cable percussive borehole location
 Trial pit location





Rev	By	Date	Details	Chkd
Drawing Status				
				
<small>Lawrence House, Meadowbank Way, Eastwood, Nottingham, NG16 3BB Tel: 0870 600 6090 www.hspconsulting.com</small>				
Client Oakmere Homes				
Project Land of Chatburn Road, Clitheroe				
Title Ground Investigation Layout Plan				
Scale (A1) NTS	Drawn by. DRS	Drg. No. C2099-501	Rev.	
Date: March 2015	Checked by. LB			

Appendix IV

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH1		2.80-3.30	B	Grey sandy silty CLAY with abundant gravel	8.4	27	14	13	62									2.5kg Compaction
BH2		1.00-1.50	B	Grey brown gravelly sandy silty CLAY. Gravel is mudstone.	37	43	23	20	80									Particle Size Distribution 2.5kg Compaction
BH2		1.90-2.35	U	Soft to firm brown silty CLAY with abundant gravel and rootlets														Oedometer consolidation
BH2		2.70-3.20	B	Grey brown gravelly sandy silty CLAY														Particle Size Distribution
BH2		3.50-3.80	B	Grey brown sandy silty clayey GRAVEL. Gravel is fine to cobble sized limestone.	4.9	24	13	11	28									Particle Size Distribution Compaction cancelled - insufficient material
BH2		3.50	U	Firm to stiff grey sandy gravelly CLAY	9.9					2.29	2.08	35	196	98				
BH3		1.10-1.60	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.	14	28	16	12	54									Particle Size Distribution Compaction cancelled - unsuitable material, too much coarse gravel present
BH3		1.80-2.20	U	Firm grey silty CLAY with abundant gravel	9.5	24	15	9.0	60									Oedometer consolidation
BH3		2.70-3.20	B	Dark grey-brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.	10	27	14	13	47									
BH3		3.70-4.15	U	Soft to firm grey brown sandy gravelly silty CLAY. Gravel is fine to medium.	12					2.39	2.13	37 74	87 90	44				
TP10		0.60	B	Brown sandy silty CLAY with rare fine to medium gravel														Particle Size Distribution California Bearing Ratio
TP10		1.50	B	Brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.	18	36	17	19	56									



Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by  Operations Manager 27/04/2015	Project Number: <p style="text-align: center;">GEO / 22476</p> Project Name: <p style="text-align: center;">C2099 CLITHEROE</p>	
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SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
TP10		2.40	B	Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.														Particle Size Distribution
TP2		0.80	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized														California Bearing Ratio
TP3		0.50	B	Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized limestone.														Particle Size Distribution California Bearing Ratio
TP3		1.50	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.	17	37	18	19	56									Particle Size Distribution Compaction cancelled - unsuitable material, too much coarse gravel present
TP4		0.60	B	Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized sandstone.														California Bearing Ratio
TP5		0.50	B	Brown sandy silty CLAY with rare fine to medium gravel														Particle Size Distribution
TP5		1.60	B	Brown mottled orange sandy gravelly silty CLAY. Gravel includes cobble sized gravel with rare rootlets.	17	36	20	16	67									
TP5		1.90	D	Brown sandy gravelly silty CLAY.	8.4	27	13	14	44									
TP6		0.50	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.	28	41	19	22	86									California Bearing Ratio
TP6		1.50	B	Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.														Particle Size Distribution
TP7		0.50	D	Mottled brown grey and dark orange silty CLAY with rare rootlets.	28	51	27	24	100									
TP8		0.50	B	Brown sandy gravelly silty CLAY. Gravel is sandstone.														California Bearing Ratio



Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by  Operations Manager 27/04/2015	Project Number: <p style="text-align: center;">GEO / 22476</p> Project Name: <p style="text-align: center;">C2099 CLITHEROE</p>	
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SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 μm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
TP9		0.60	B	Brown gravelly sandy silty CLAY. Gravel is sandstone.	30	39	28	11	73									Particle Size Distribution 2.5kg Compaction
TP9		1.50	B	Grey brown sandy gravelly silty CLAY.														Particle Size Distribution

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by  Operations Manager 27/04/2015	Project Number: <p style="text-align: center;">GEO / 22476</p> Project Name: <p style="text-align: center;">C2099 CLITHEROE</p>	
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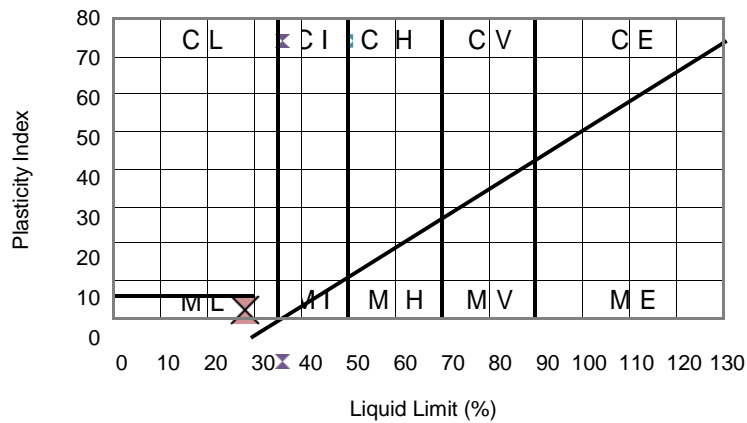
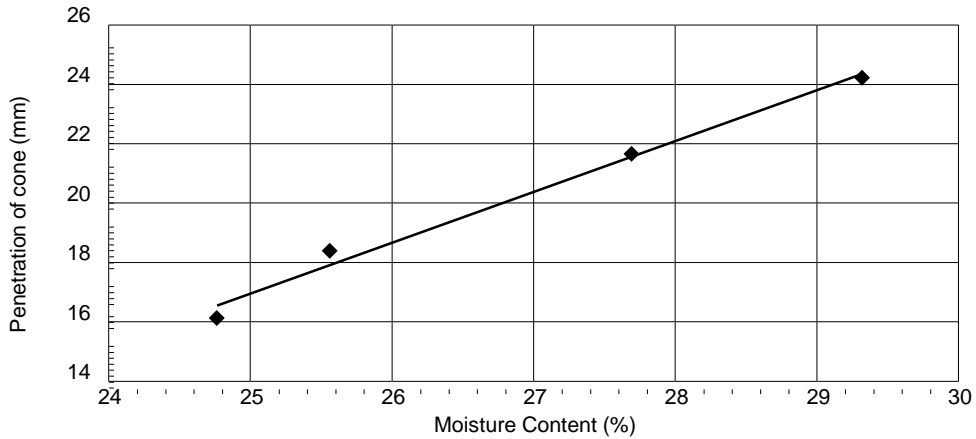
Liquid & Plastic Limits

Hole ID	BH1
Depth (m)	2.80-3.30
Sample Type	B

Description:
Grey sandy silty CLAY with abundant gravel

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	8.4 %
Percentage passing 425µm sieve :	62 %
Liquid Limit :	27 %
Plastic Limit :	14 %
Plasticity Index :	13
Equivalent moisture content of material passing 425µm sieve :	14 %
Liquidity Index :	-0.03



Checked and Approved by:

Operations Manager
27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



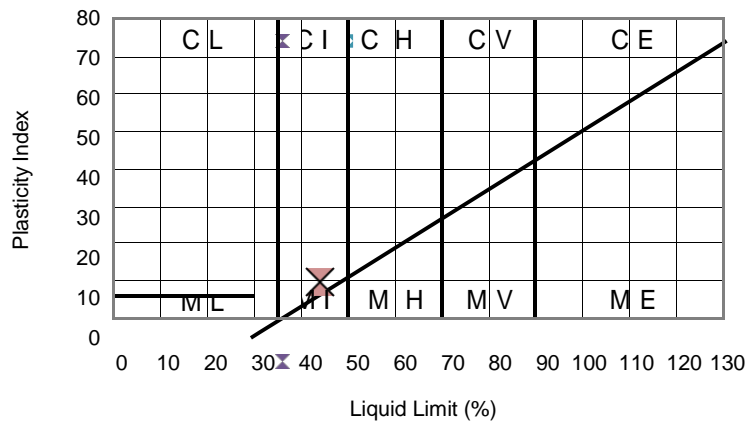
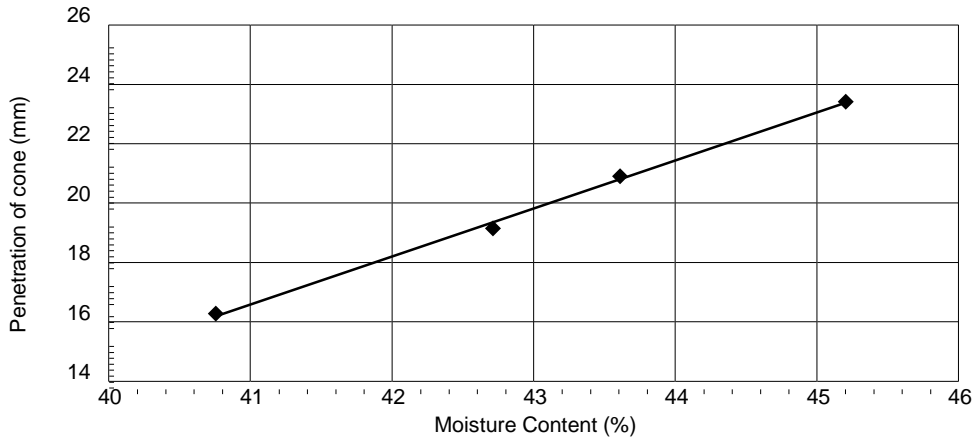
Liquid & Plastic Limits

Hole ID	BH2
Depth (m)	1.00-1.50
Sample Type	B

Description:
 Grey brown gravelly sandy silty CLAY. Gravel is mudstone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	37 %
Percentage passing 425µm sieve :	80 %
Liquid Limit :	43 %
Plastic Limit :	23 %
Plasticity Index :	20
Equivalent moisture content of material passing 425µm sieve :	46 %
Liquidity Index :	1.17



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Project Number:
GEO / 22476

Project Name:
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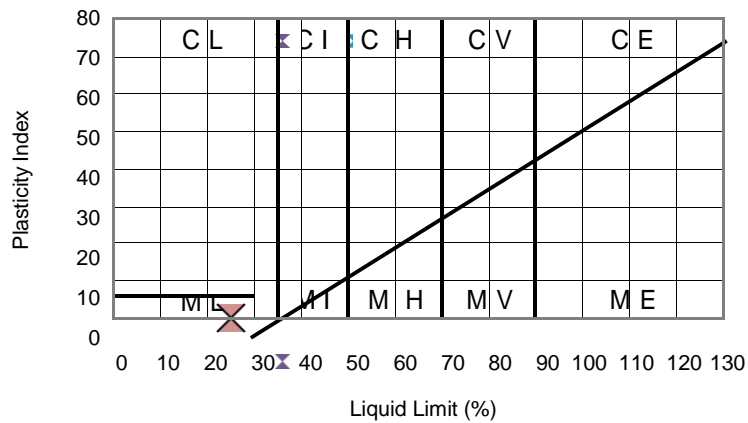
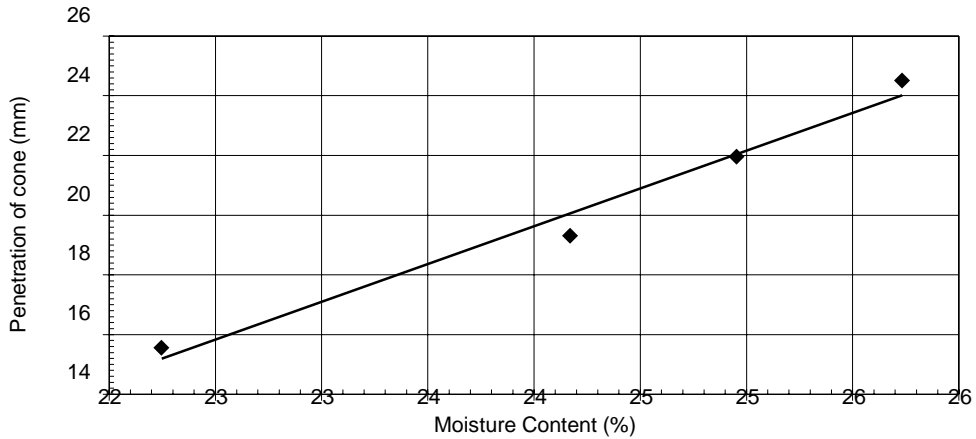
Liquid & Plastic Limits

Hole ID	BH2
Depth (m)	3.50-3.80
Sample Type	B

Description:
 Grey brown sandy silty clayey GRAVEL. Gravel is fine to cobble sized limestone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	4.9 %
Percentage passing 425µm sieve :	28 %
Liquid Limit :	24 %
Plastic Limit :	13 %
Plasticity Index :	11
Equivalent moisture content of material passing 425µm sieve :	18 %
Liquidity Index :	0.42



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Project Number:
GEO / 22476

Project Name:
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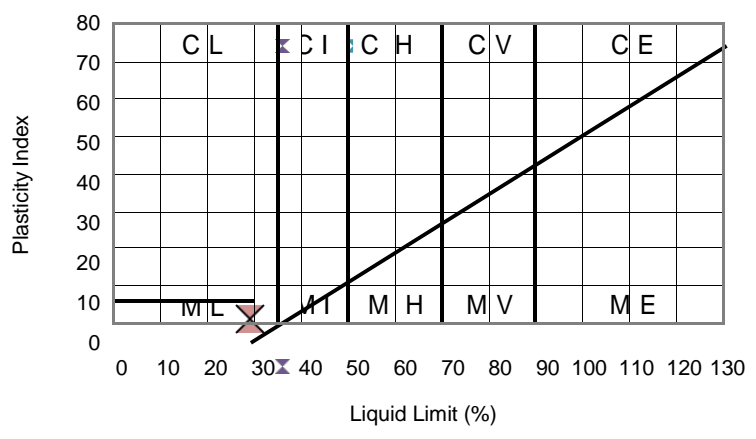
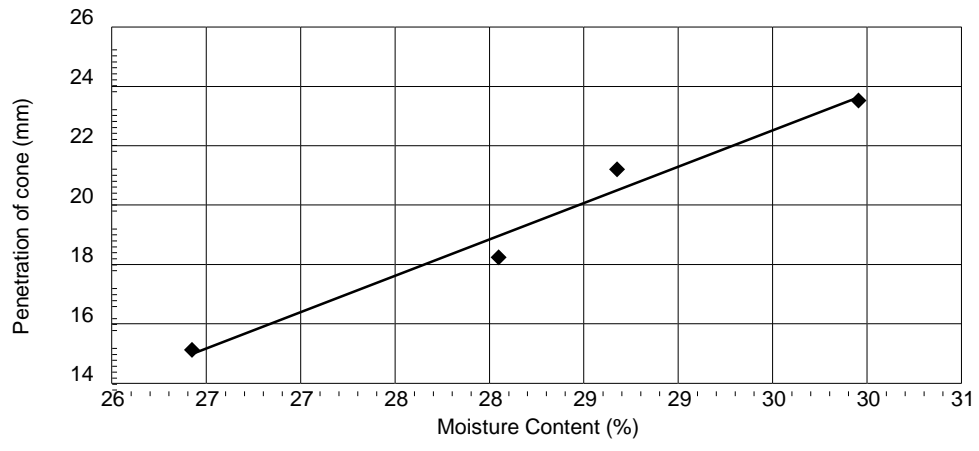
Liquid & Plastic Limits

Hole ID	BH3
Depth (m)	1.10-1.60
Sample Type	B

Description:
Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	14 %
Percentage passing 425µm sieve :	54 %
Liquid Limit :	28 %
Plastic Limit :	16 %
Plasticity Index :	12
Equivalent moisture content of material passing 425µm sieve :	26 %
Liquidity Index :	0.84



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Project Number: **GEO / 22476**
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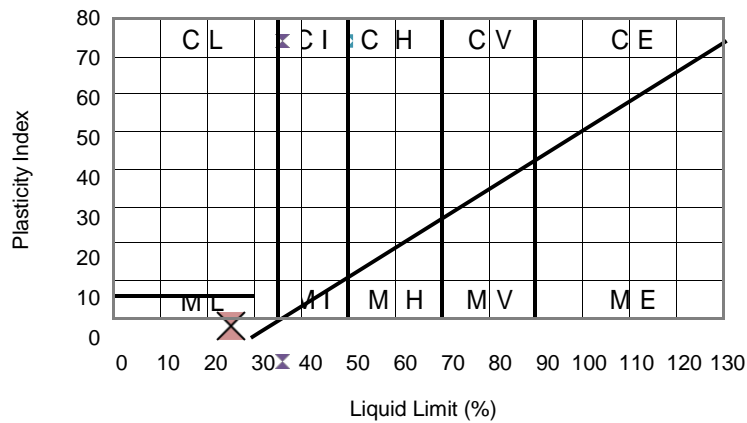
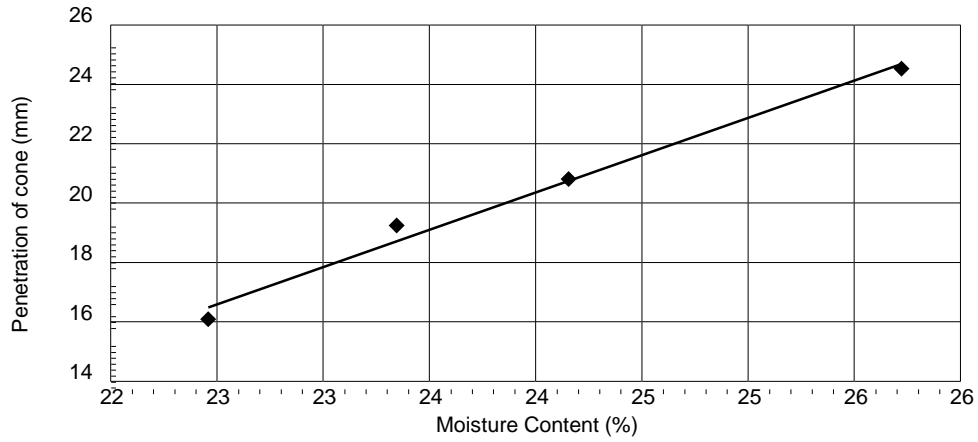
Liquid & Plastic Limits

Hole ID	BH3
Depth (m)	1.80-2.20
Sample Type	U

Description:
Firm grey silty CLAY with abundant gravel

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	9.5 %
Percentage passing 425µm sieve :	60 %
Liquid Limit :	24 %
Plastic Limit :	15 %
Plasticity Index :	9.0
Equivalent moisture content of material passing 425µm sieve :	16 %
Liquidity Index :	0.08



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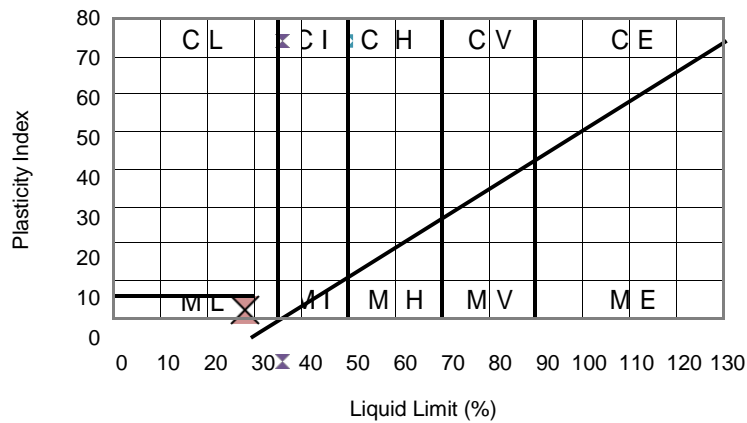
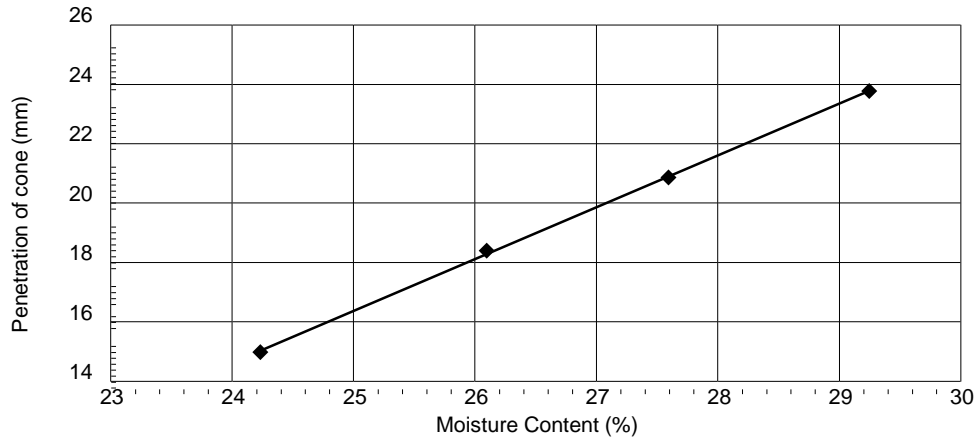
Liquid & Plastic Limits

Hole ID	BH3
Depth (m)	2.70-3.20
Sample Type	B

Description:
Dark grey-brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	10 %
Percentage passing 425µm sieve :	47 %
Liquid Limit :	27 %
Plastic Limit :	14 %
Plasticity Index :	13
Equivalent moisture content of material passing 425µm sieve :	21 %
Liquidity Index :	0.57



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Project Number:
GEO / 22476

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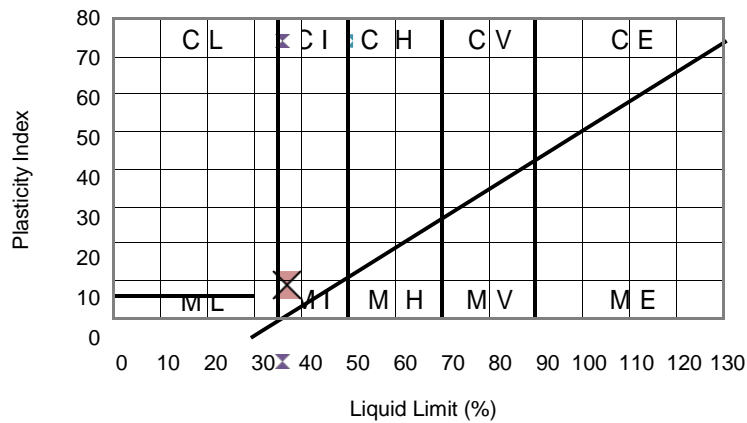
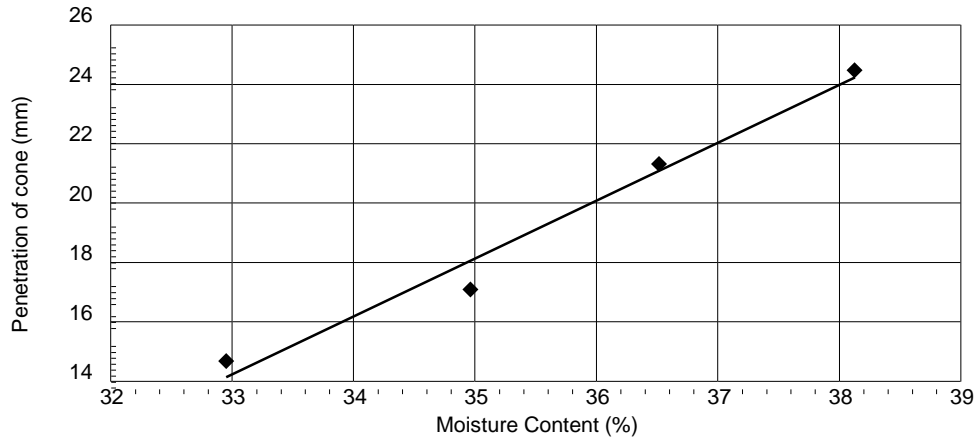
Liquid & Plastic Limits

Hole ID	TP10
Depth (m)	1.50
Sample Type	B

Description:
Brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	18 %
Percentage passing 425µm sieve :	56 %
Liquid Limit :	36 %
Plastic Limit :	17 %
Plasticity Index :	19
Equivalent moisture content of material passing 425µm sieve :	32 %
Liquidity Index :	0.79



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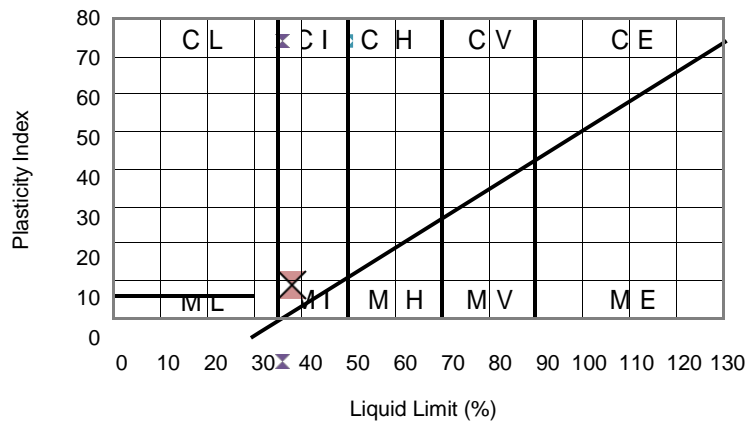
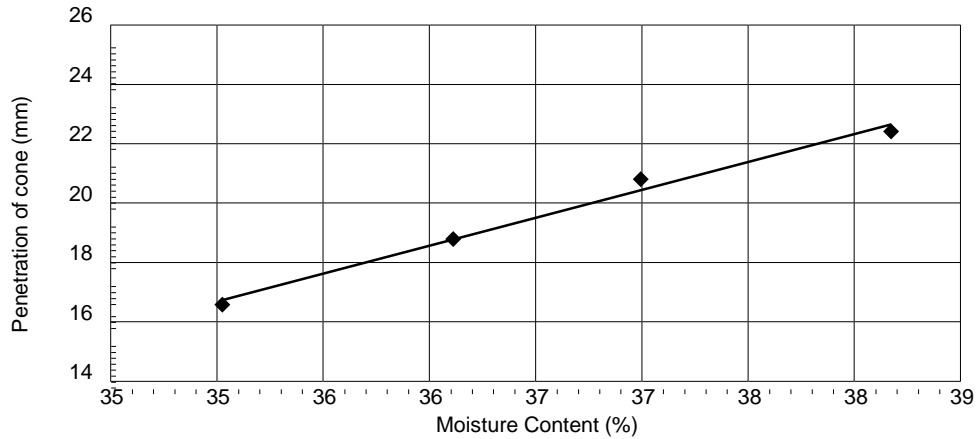
Liquid & Plastic Limits

Hole ID	TP3
Depth (m)	1.50
Sample Type	B

Description:
Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	17 %
Percentage passing 425µm sieve :	56 %
Liquid Limit :	37 %
Plastic Limit :	18 %
Plasticity Index :	19
Equivalent moisture content of material passing 425µm sieve :	31 %
Liquidity Index :	0.66



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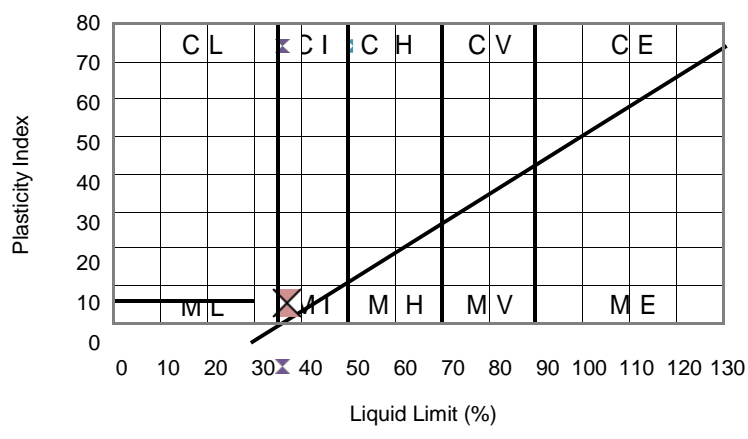
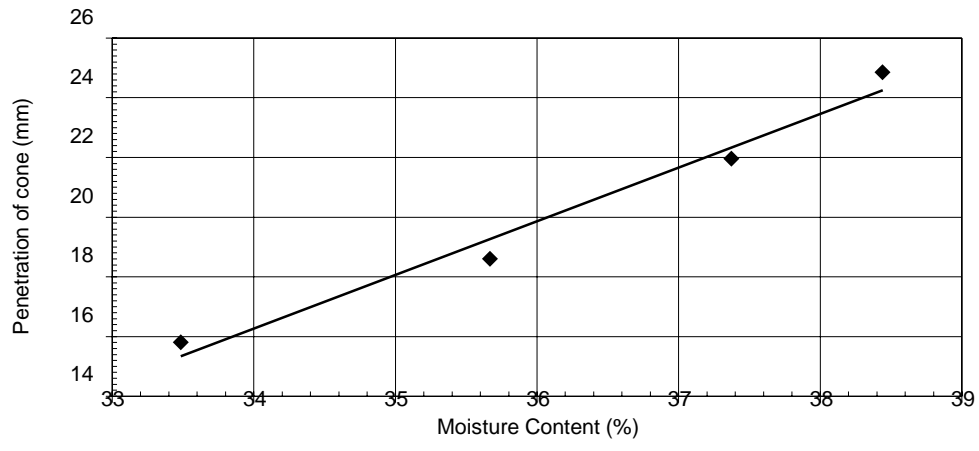
Liquid & Plastic Limits

Hole ID	TP5
Depth (m)	1.60
Sample Type	B

Description:
Brown mottled orange sandy gravelly silty CLAY. Gravel includes cobble sized gravel with rare rootlets.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	17 %
Percentage passing 425µm sieve :	67 %
Liquid Limit :	36 %
Plastic Limit :	20 %
Plasticity Index :	16
Equivalent moisture content of material passing 425µm sieve :	25 %
Liquidity Index :	0.33



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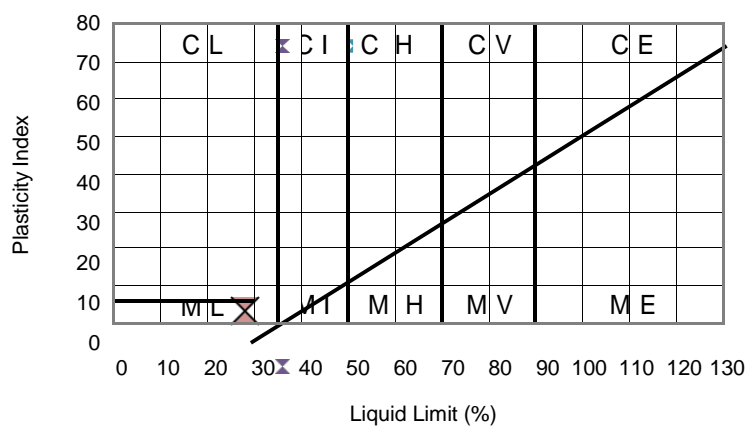
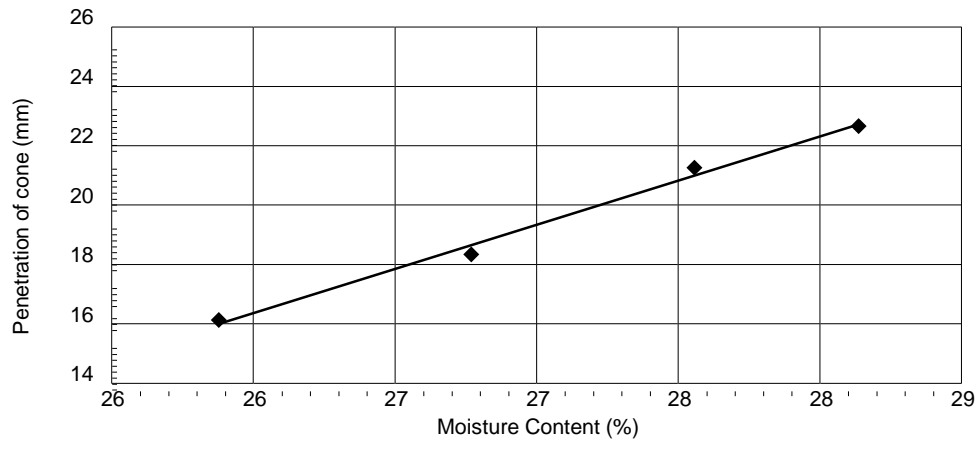
Liquid & Plastic Limits

Hole ID	TP5
Depth (m)	1.90
Sample Type	D

Description:
Brown sandy gravelly silty CLAY.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	8.4 %
Percentage passing 425µm sieve :	44 %
Liquid Limit :	27 %
Plastic Limit :	13 %
Plasticity Index :	14
Equivalent moisture content of material passing 425µm sieve :	19 %
Liquidity Index :	0.42



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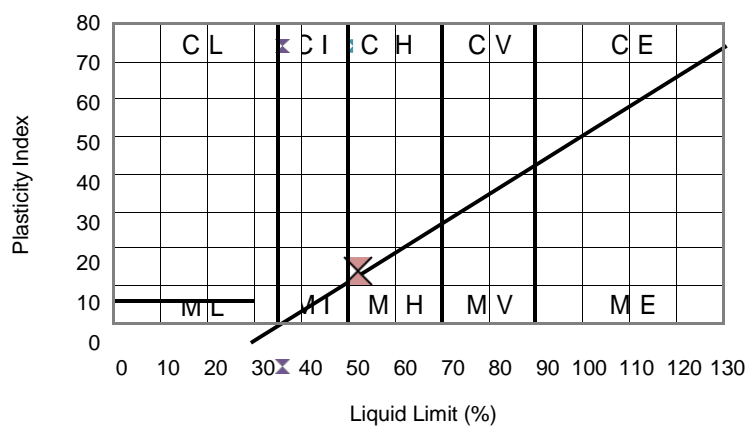
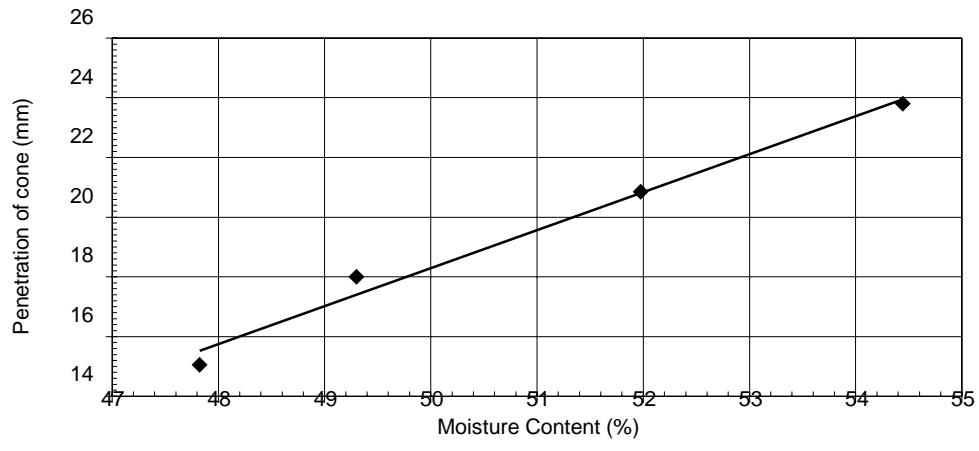
Liquid & Plastic Limits

Hole ID	TP7
Depth (m)	0.50
Sample Type	D

Description:
Mottled brown grey and dark orange silty CLAY with rare rootlets.

Preparation : Sample as received

Moisture content : (BS1377:Part 2:Clause 3:1990)	28 %
Percentage passing 425µm sieve :	100 %
Liquid Limit :	51 %
Plastic Limit :	27 %
Plasticity Index :	24
Equivalent moisture content of material passing 425µm sieve :	28 %
Liquidity Index :	0.04



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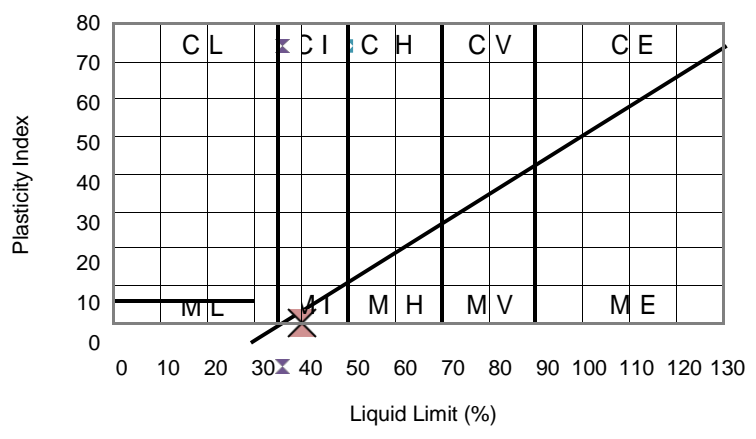
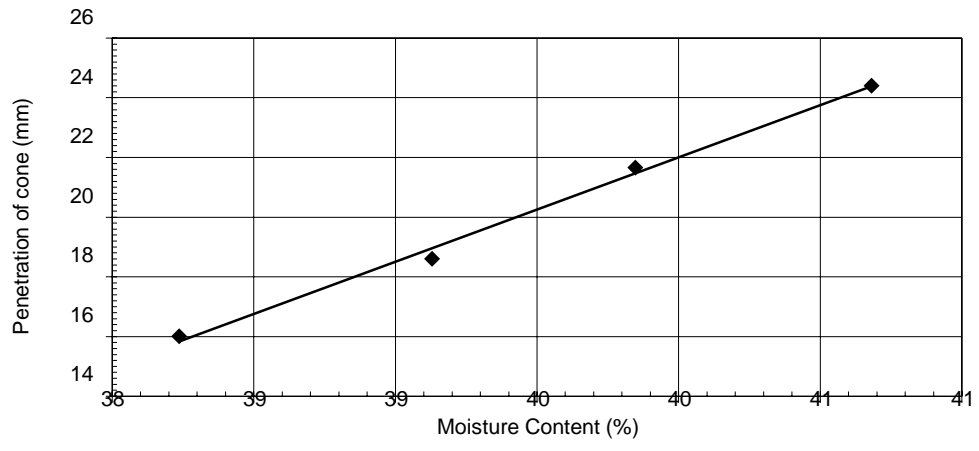
Liquid & Plastic Limits

Hole ID	TP9
Depth (m)	0.60
Sample Type	B

Description:
Brown gravelly sandy silty CLAY. Gravel is sandstone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	30 %
Percentage passing 425µm sieve :	73 %
Liquid Limit :	39 %
Plastic Limit :	28 %
Plasticity Index :	11
Equivalent moisture content of material passing 425µm sieve :	41 %
Liquidity Index :	1.19



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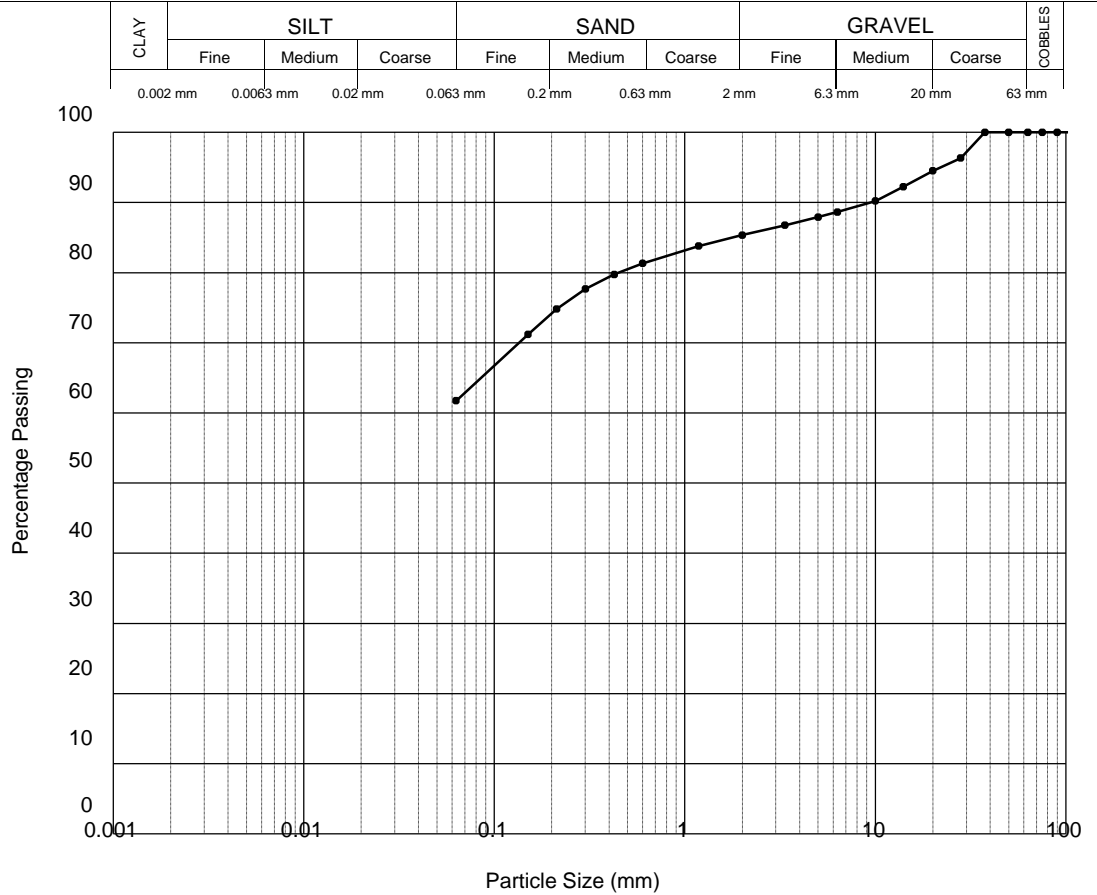
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH2
 Depth (m): 1.00-1.50
 Sample Type: B

Description:
 Grey brown gravelly sandy silty CLAY. Gravel is mudstone.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	96
20	94
14	92
10	90
6.3	89
5	88
3.35	87
2	85
1.18	84
0.6	81
0.425	80
0.3	78
0.212	75
0.15	71
0.063	62



Particle Proportions	
Cobbles	0.0 %
Gravel	14.7 %
Sand	23.6 %
Silt & Clay	61.8 %

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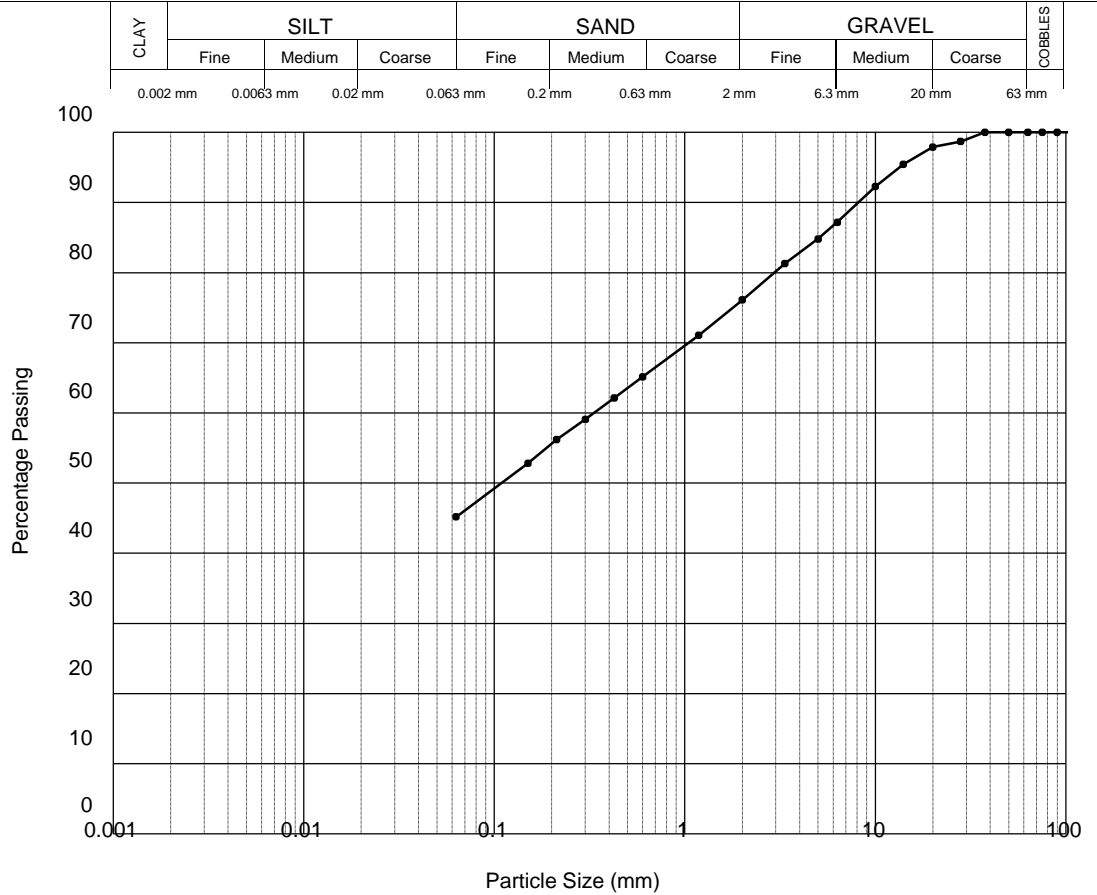
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH2
 Depth (m): 2.70-3.20
 Sample Type: B

Description:
 Grey brown gravelly sandy silty CLAY

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	98
14	95
10	92
6.3	87
5	85
3.35	81
2	76
1.18	71
0.6	65
0.425	62
0.3	59
0.212	56
0.15	53
0.063	45



Particle Proportions	
Cobbles	0.0 %
Gravel	23.9 %
Sand	30.9 %
Silt & Clay	45.2 %

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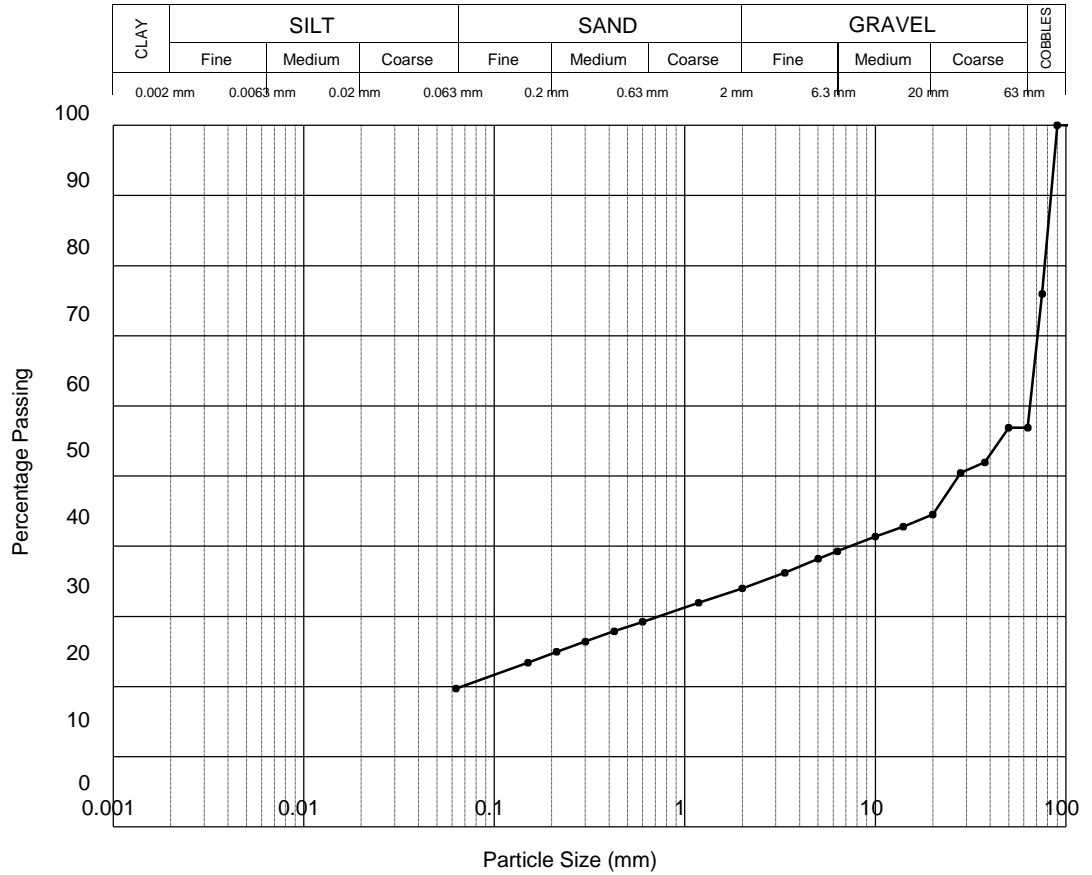
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH2
 Depth (m): 3.50-3.80
 Sample Type: B

Description:
 Grey brown sandy silty clayey GRAVEL. Gravel is fine to cobble sized limestone.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	76
63	57
50	57
37.5	52
28	50
20	45
14	43
10	41
6.3	39
5	38
3.35	36
2	34
1.18	32
0.6	29
0.425	28
0.3	26
0.212	25
0.15	23
0.063	20



Particle Proportions	
Cobbles	43.1 %
Gravel	22.9 %
Sand	14.3 %
Silt & Clay	19.7 %

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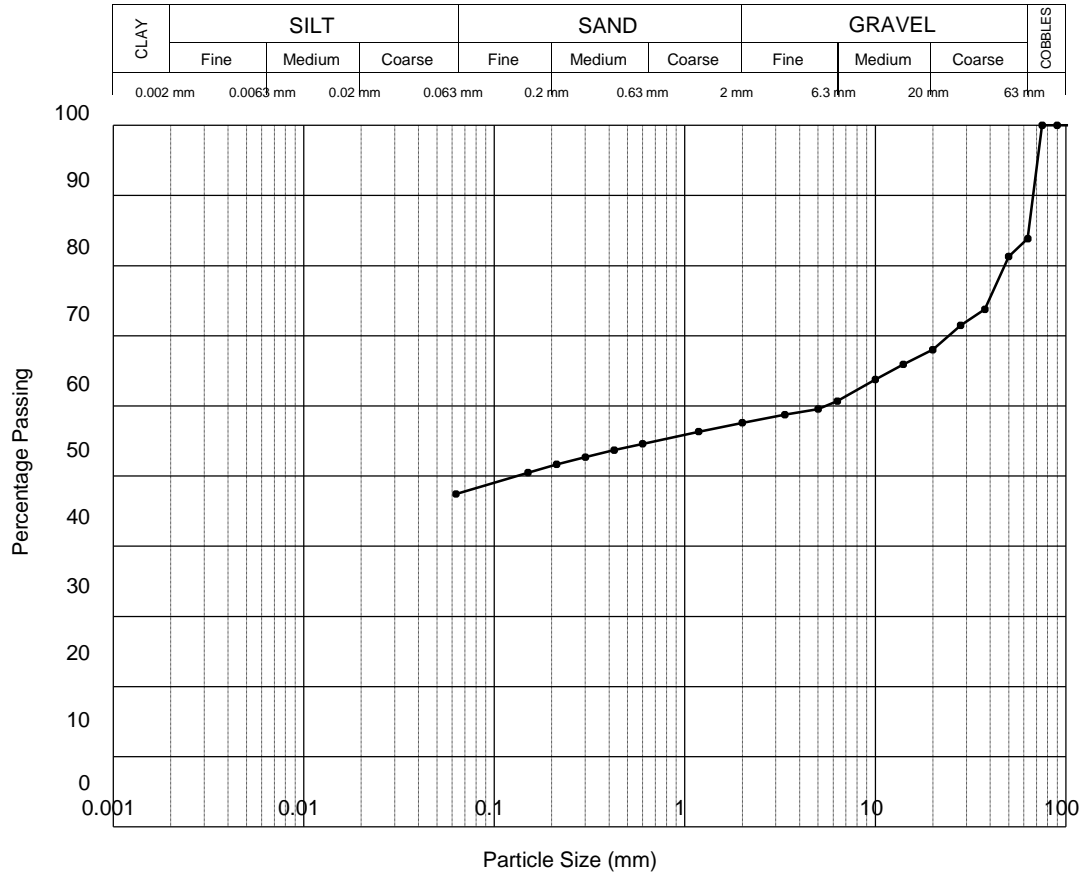
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH3
 Depth (m): 1.10-1.60
 Sample Type: B

Description:
 Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	84
50	81
37.5	74
28	71
20	68
14	66
10	64
6.3	61
5	60
3.35	59
2	58
1.18	56
0.6	55
0.425	54
0.3	53
0.212	52
0.15	50
0.063	47



Particle Proportions	
Cobbles	16.2 %
Gravel	26.2 %
Sand	10.1 %
Silt & Clay	47.5 %

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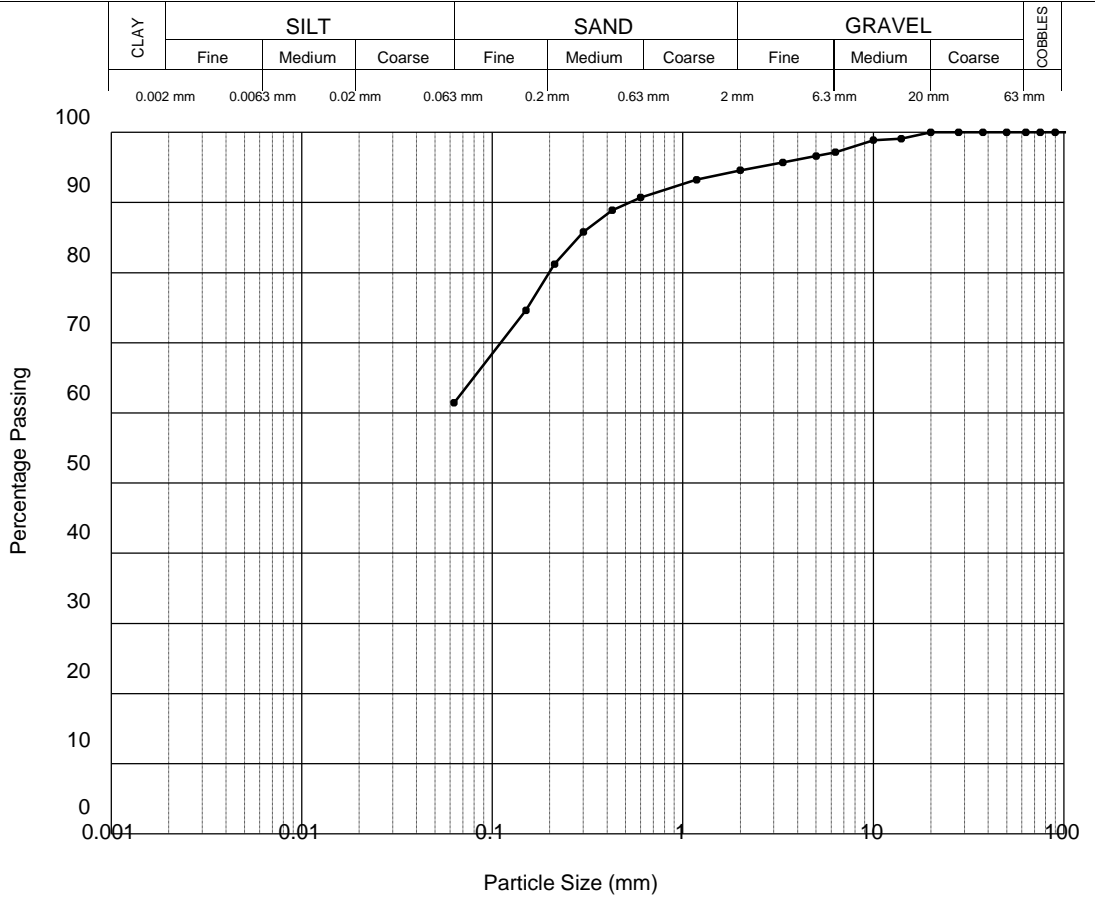
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP10
 Depth (m): 0.60
 Sample Type: B

Description:
 Brown sandy silty CLAY with rare fine to medium gravel

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	99
6.3	97
5	97
3.35	96
2	95
1.18	93
0.6	91
0.425	89
0.3	86
0.212	81
0.15	75
0.063	61



Particle Proportions	
Cobbles	0.0 %
Gravel	5.4 %
Sand	33.1 %
Silt & Clay	61.5 %

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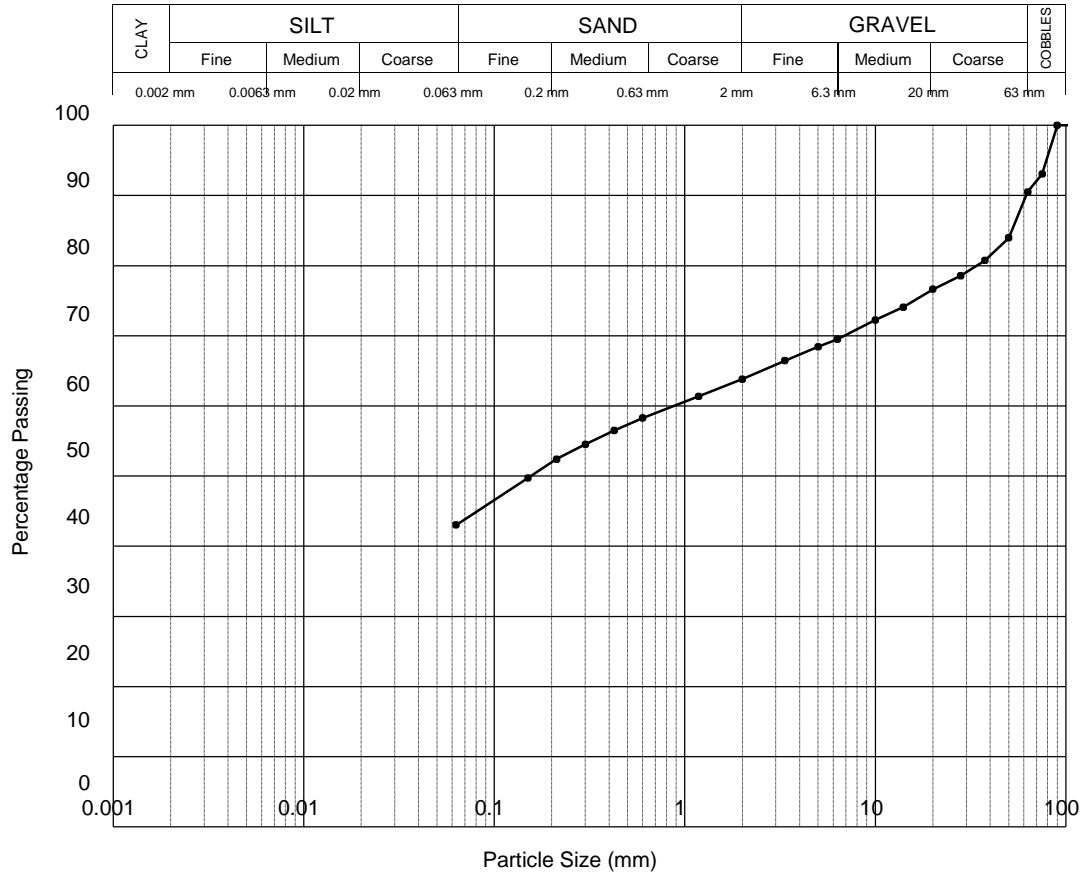
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP10
 Depth (m): 2.40
 Sample Type: B

Description:
 Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	93
63	91
50	84
37.5	81
28	79
20	77
14	74
10	72
6.3	70
5	68
3.35	66
2	64
1.18	61
0.6	58
0.425	56
0.3	55
0.212	52
0.15	50
0.063	43



Particle Proportions	
Cobbles	9.5 %
Gravel	26.7 %
Sand	20.8 %
Silt & Clay	43.0 %

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Project Name:

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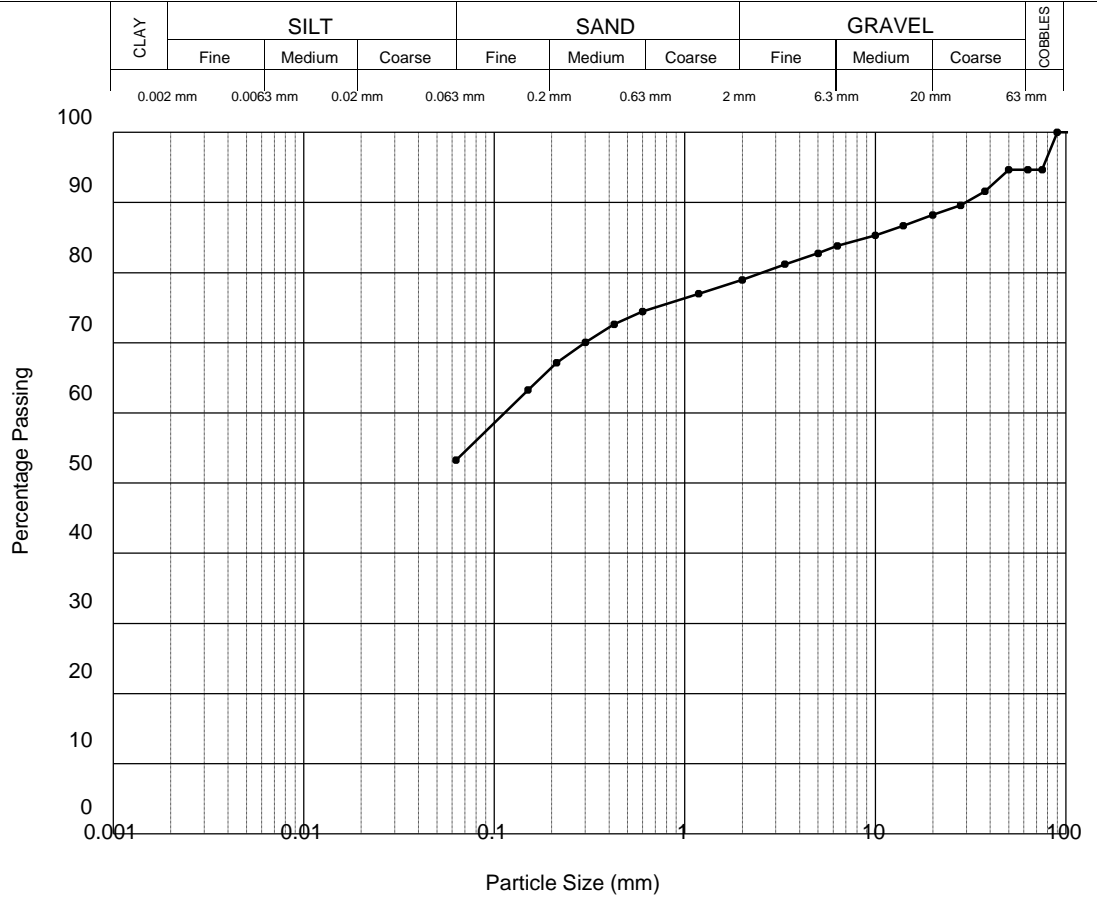
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP3
 Depth (m): 0.50
 Sample Type: B

Description:
 Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized limestone.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	95
63	95
50	95
37.5	92
28	90
20	88
14	87
10	85
6.3	84
5	83
3.35	81
2	79
1.18	77
0.6	74
0.425	73
0.3	70
0.212	67
0.15	63
0.063	53



Particle Proportions	
Cobbles	5.3 %
Gravel	15.7 %
Sand	25.7 %
Silt & Clay	53.3 %

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PARTICLE SIZE DISTRIBUTION

BH/TP No:
Depth (m):
Sample Type

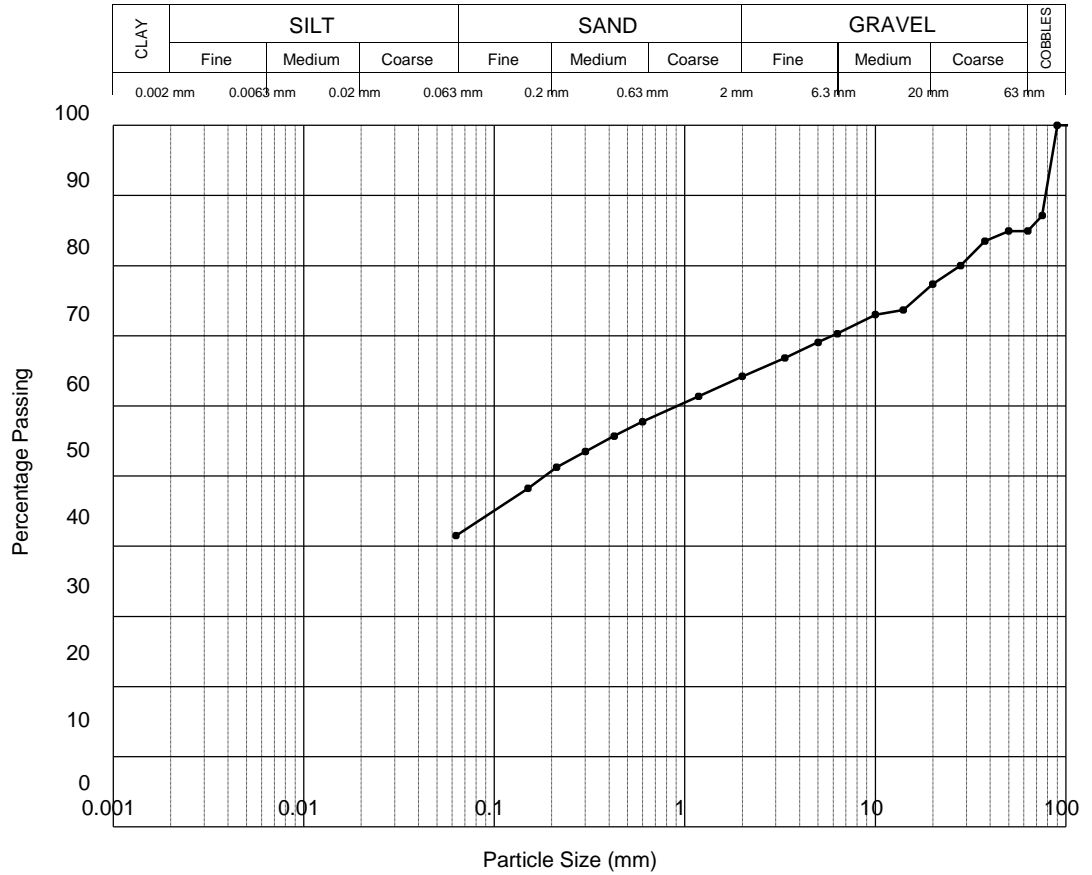
TP3
1.50
B

Description:

Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.
Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	87
63	85
50	85
37.5	83
28	80
20	77
14	74
10	73
6.3	70
5	69
3.35	67
2	64
1.18	61
0.6	58
0.425	56
0.3	53
0.212	51
0.15	48
0.063	42



Particle Proportions	
Cobbles	15.1 %
Gravel	20.7 %
Sand	22.7 %
Silt & Clay	41.5 %

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GEO / 22476

Project Name:

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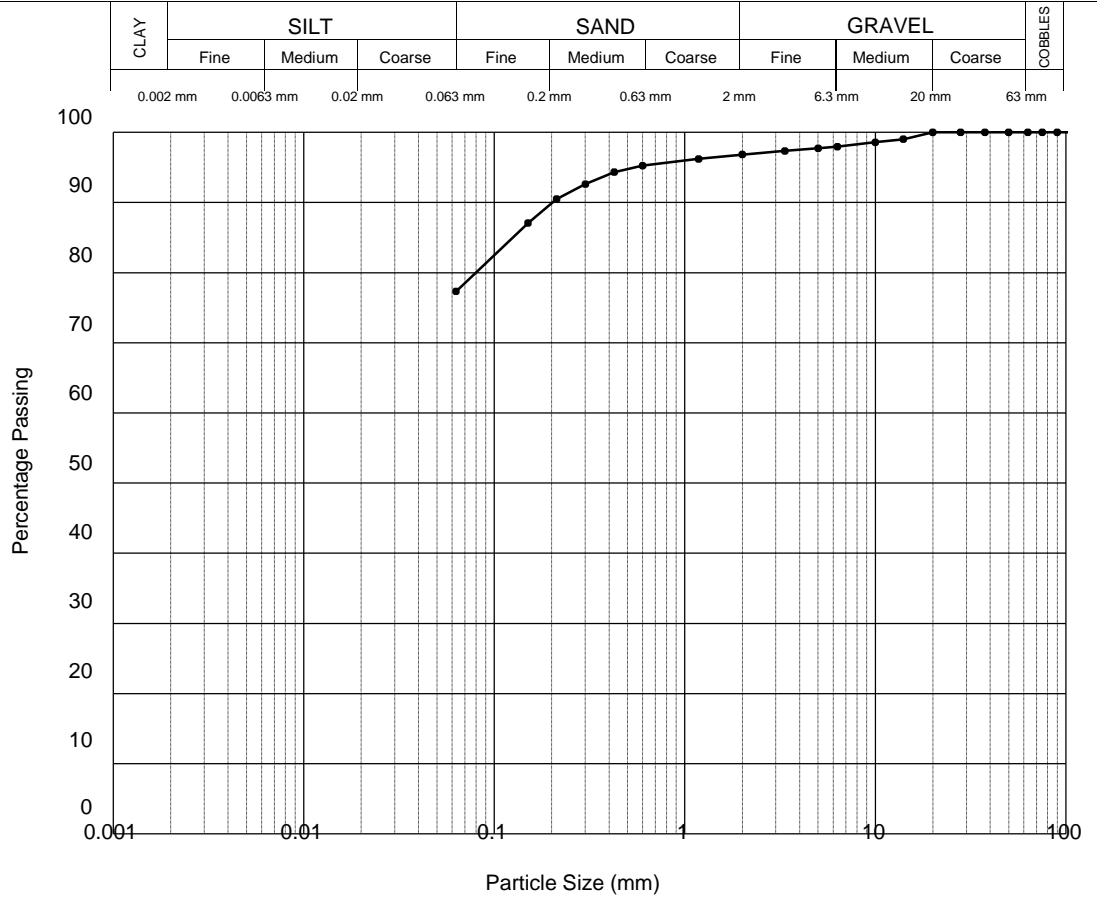
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP5
 Depth (m): 0.50
 Sample Type: B

Description:
 Brown sandy silty CLAY with rare fine to medium gravel

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	99
6.3	98
5	98
3.35	97
2	97
1.18	96
0.6	95
0.425	94
0.3	93
0.212	90
0.15	87
0.063	77



Particle Proportions	
Cobbles	0.0 %
Gravel	3.2 %
Sand	19.5 %
Silt & Clay	77.3 %

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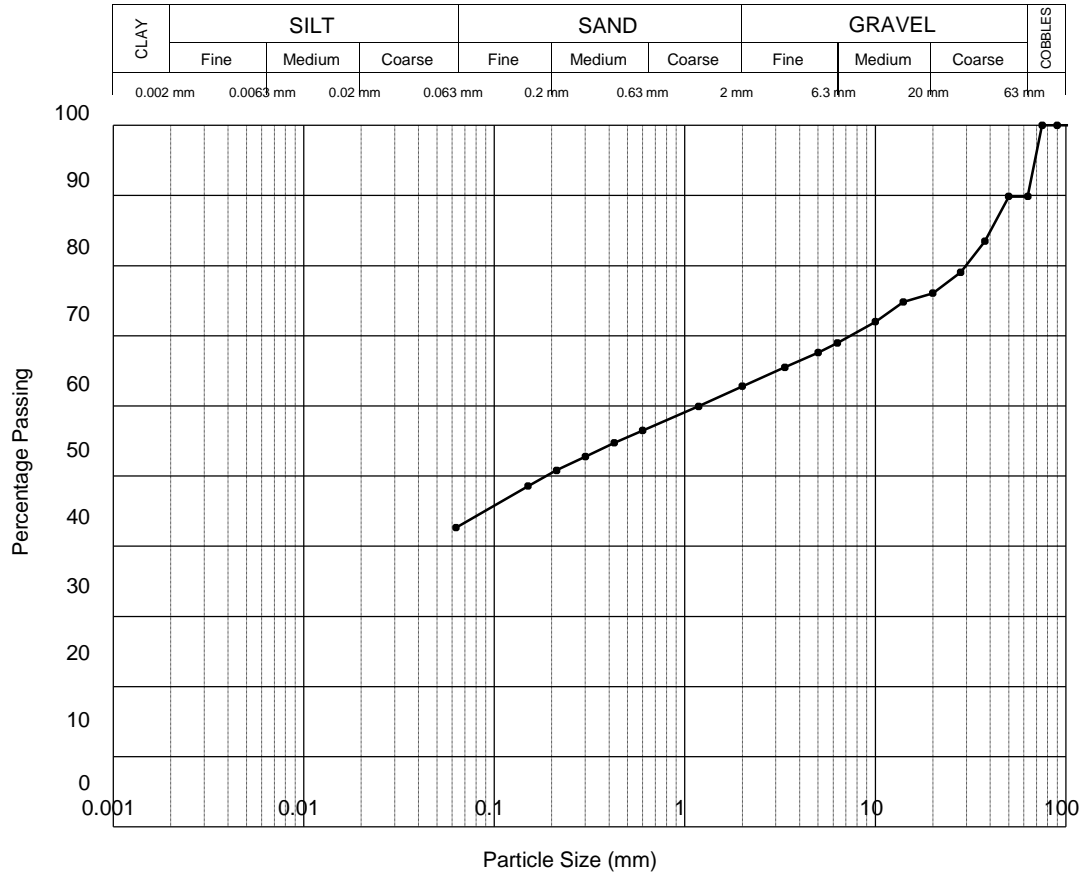
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP6
 Depth (m): 1.50
 Sample Type: B

Description:
 Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	90
50	90
37.5	83
28	79
20	76
14	75
10	72
6.3	69
5	68
3.35	66
2	63
1.18	60
0.6	57
0.425	55
0.3	53
0.212	51
0.15	49
0.063	43



Particle Proportions	
Cobbles	10.2 %
Gravel	27.0 %
Sand	20.2 %
Silt & Clay	42.6 %

Checked and Approved by

Operations Manager
27/04/2015

Project Number:

GEO / 22476

Project Name:

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PARTICLE SIZE DISTRIBUTION

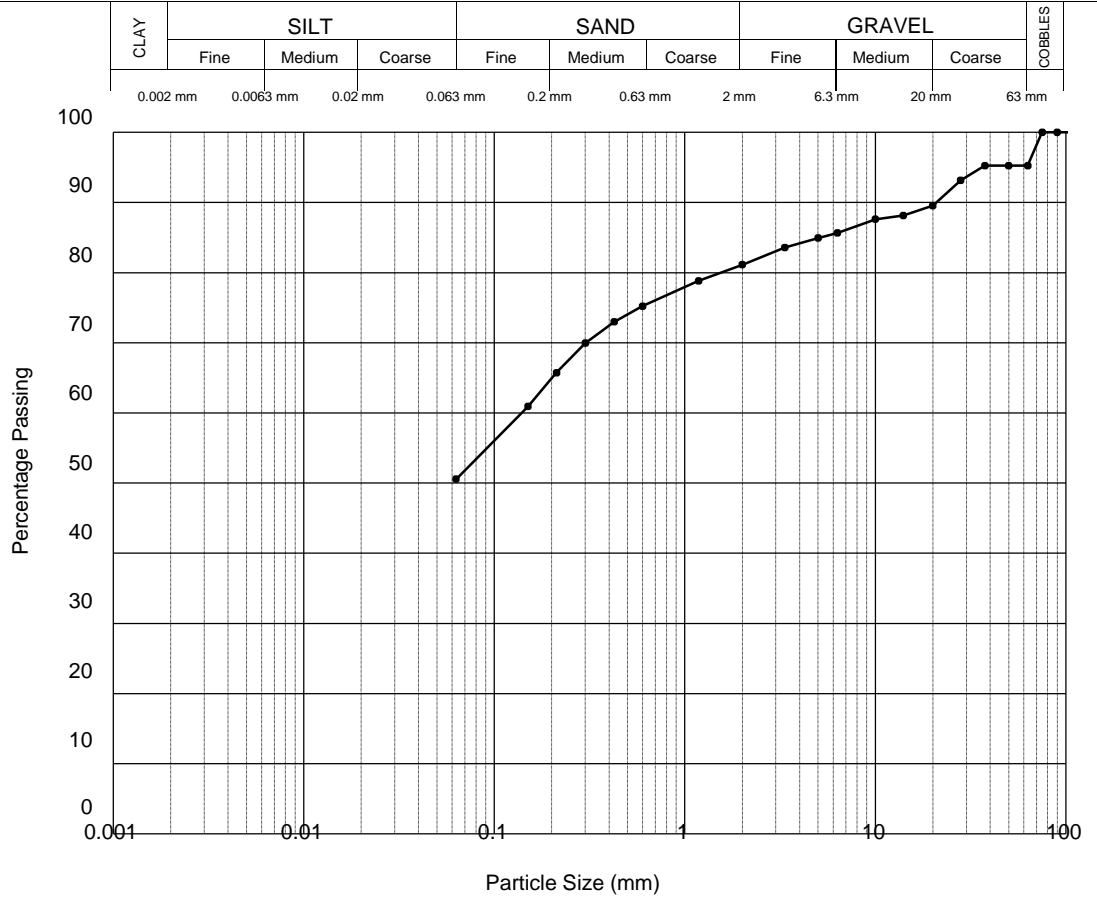
BH/TP No:
Depth (m):
Sample Type

TP9
0.60
B

Description:
Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	95
50	95
37.5	95
28	93
20	90
14	88
10	88
6.3	86
5	85
3.35	84
2	81
1.18	79
0.6	75
0.425	73
0.3	70
0.212	66
0.15	61
0.063	51



Particle Proportions	
Cobbles	4.7 %
Gravel	14.1 %
Sand	30.6 %
Silt & Clay	50.6 %

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PARTICLE SIZE DISTRIBUTION

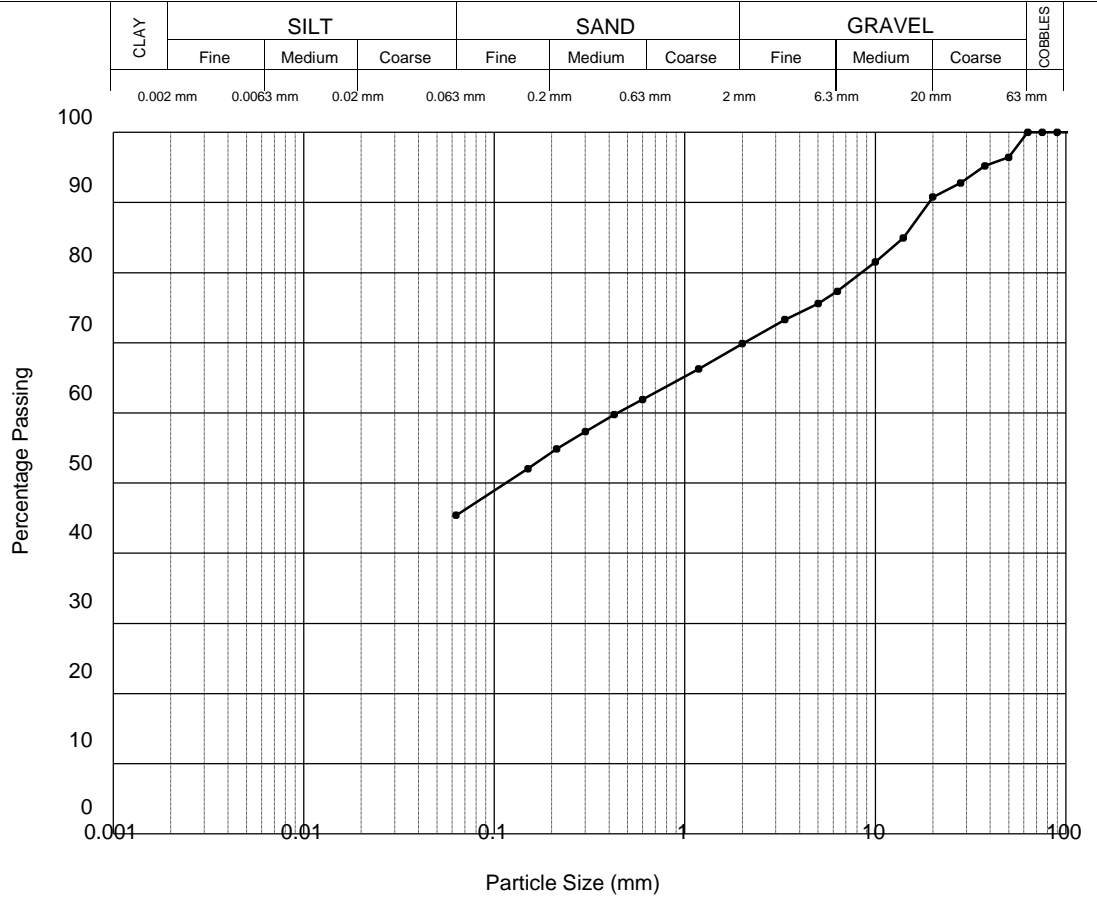
BH/TP No:
Depth (m):
Sample Type

TP9
1.50
B

Description:
Grey brown sandy gravelly silty CLAY.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	96
37.5	95
28	93
20	91
14	85
10	82
6.3	77
5	76
3.35	73
2	70
1.18	66
0.6	62
0.425	60
0.3	57
0.212	55
0.15	52
0.063	45



Particle Proportions	
Cobbles	0.0 %
Gravel	30.1 %
Sand	24.5 %
Silt & Clay	45.4 %

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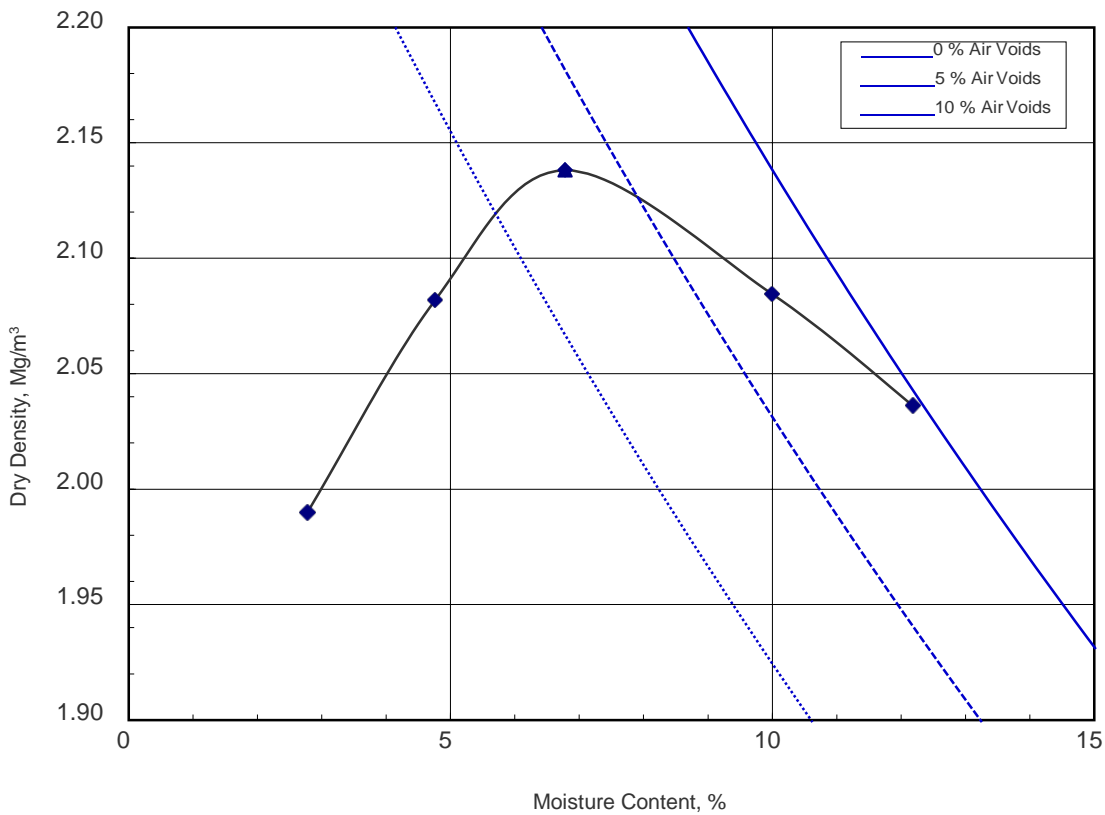


Moisture Content / Dry Density Relationship

BH/TP BH1
 Depth (m) 2.80-3.30
 Sample Type B

Description:
 Grey sandy silty CLAY with abundant gravel

Preparation	Air dried / Oven dried	
Test Method	2.5kg Rammer for soils with some coarse gravel-size particles	
Samples Used	Single / Multiple	
Mass Retained on 37.5 mm Sieve	%	9
Mass Retained on 20.0 mm Sieve	%	15
Particle Density - Assumed	Mg/m ³	2.72
Maximum Dry Density	Mg/m ³	2.14
Optimum Moisture Content	%	6.8



Determination	1	2	3	4	5
Moisture Content %	2.8	4.8	6.8	10.0	12
Dry Density Mg/m ³	1.99	2.08	2.14	2.08	2.04

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 27/04/2015

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Moisture Content / Dry Density Relationship

BH/TP
Depth (m)
Sample Type

BH2
1.00-1.50
B

Description:

Brown sandy silty CLAY with rare gravel

Preparation

Air dried / Oven dried

Test Method

2.5kg Rammer for soils with some coarse gravel-size particles

Samples Used

Single / Multiple

Mass Retained on 37.5 mm Sieve

%

9

Mass Retained on 20.0 mm Sieve

%

15

Particle Density - Assumed

Mg/m³

2.72

Maximum Dry Density

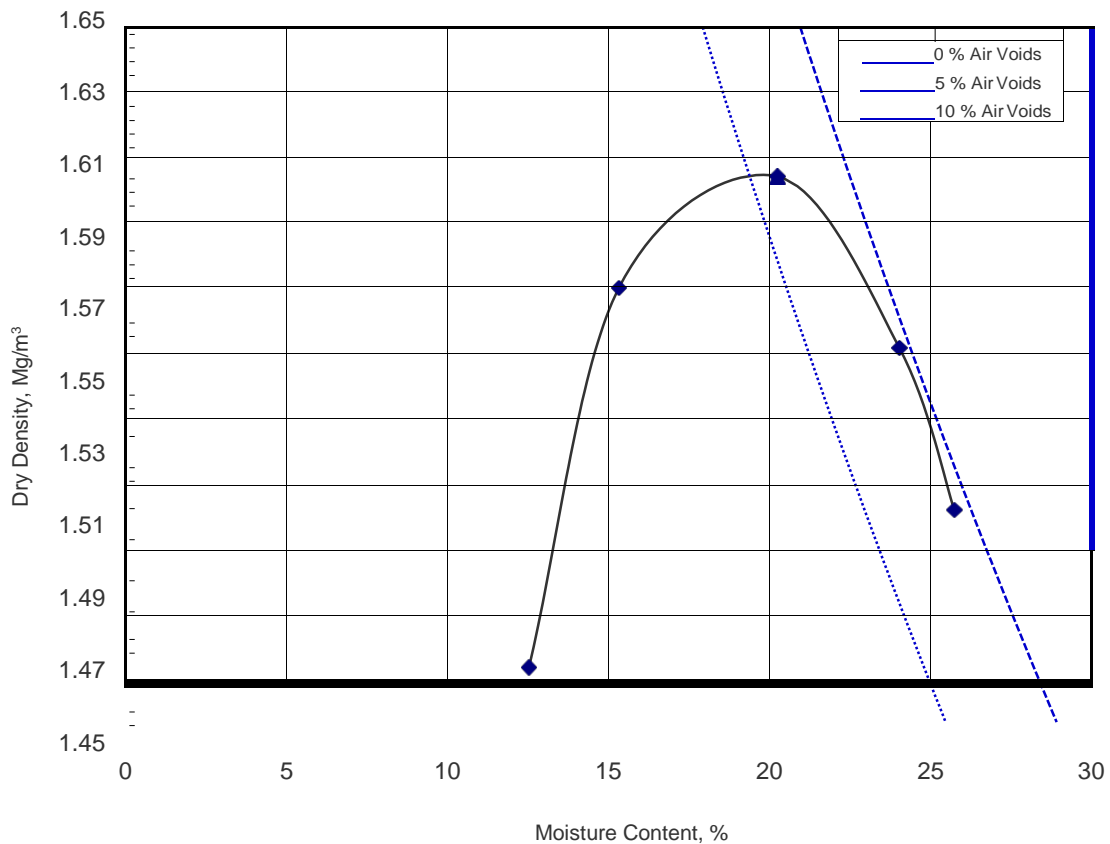
Mg/m³

1.61

Optimum Moisture Content

%

20.1



Determination	1	2	3	4	5	
Moisture Content	%	12	15	20	24	26
Dry Density	Mg/m ³	1.47	1.57	1.61	1.56	1.51

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27/04/2015

Project Number:

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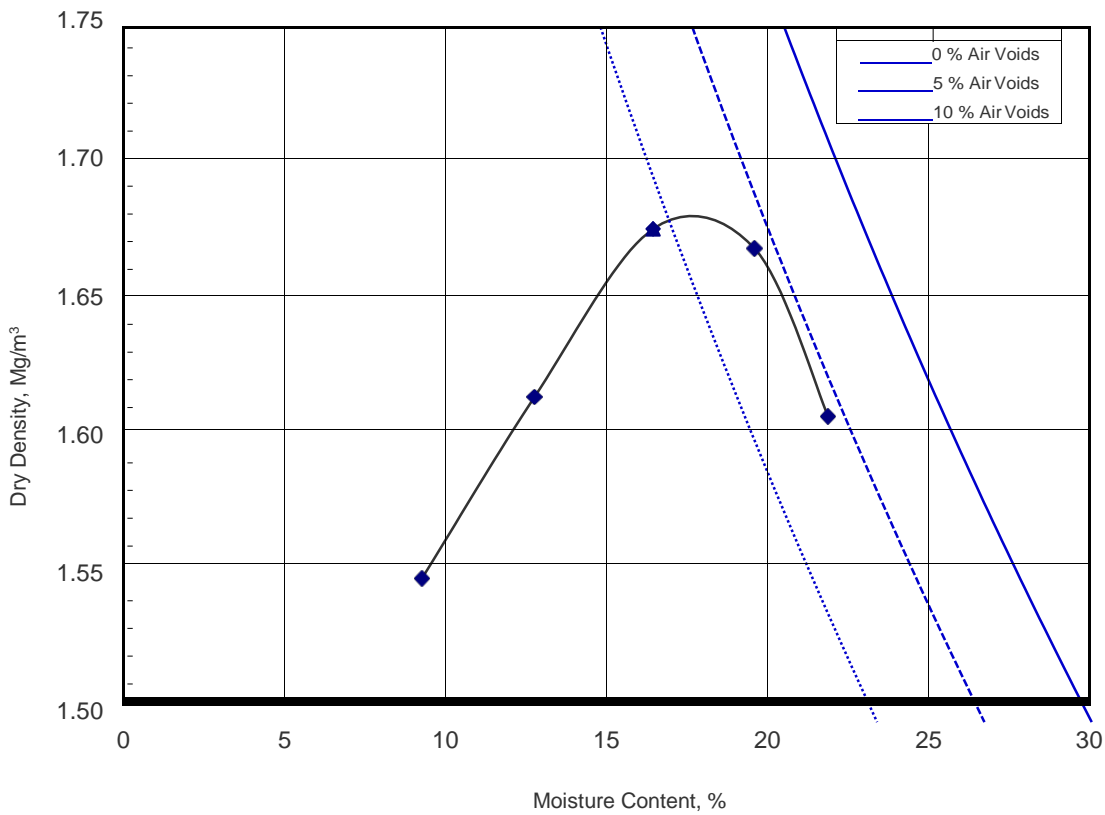


Moisture Content / Dry Density Relationship

BH/TP TP9
 Depth (m) 0.60
 Sample Type B

Description:
 Brown sandy silty CLAY with occasional gravel sized sandstone.

Preparation	Air dried / Oven dried	
Test Method	2.5kg Rammer for soils with some coarse gravel-size particles	
Samples Used	Single / Multiple	
Mass Retained on 37.5 mm Sieve	%	5
Mass Retained on 20.0 mm Sieve	%	6
Particle Density - Assumed	Mg/m ³	2.72
Maximum Dry Density	Mg/m ³	1.68
Optimum Moisture Content	%	16.3



Determination	1	2	3	4	5	
Moisture Content	%	9.1	13	16	19	22
Dry Density	Mg/m ³	1.55	1.62	1.68	1.67	1.61

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Operations Manager
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Determination of California Bearing Ratio

BH/TP No.: TP10
 Depth (m): 0.6
 Sample Type: B

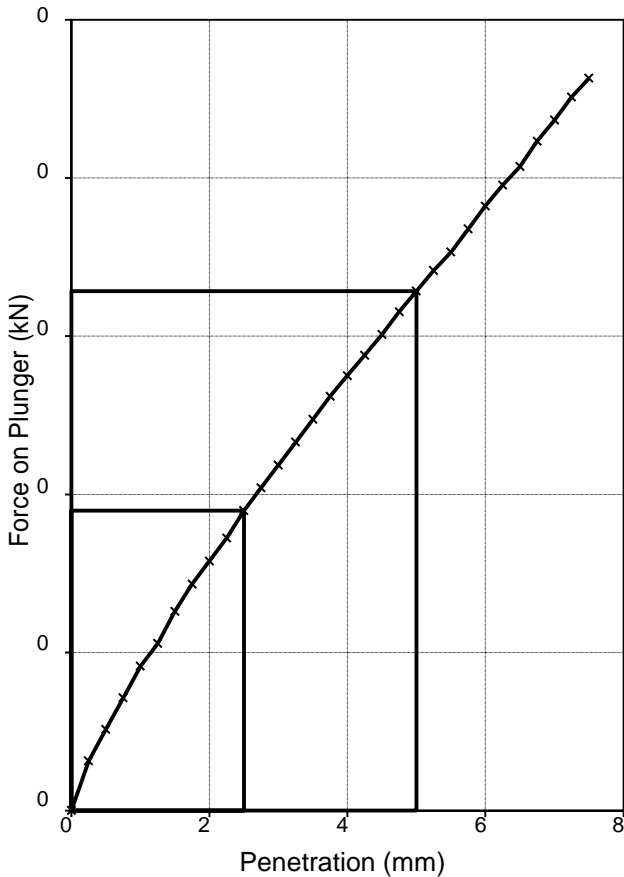
Description:
 Brown very sandy silty CLAY

PREPARATION DETAILS

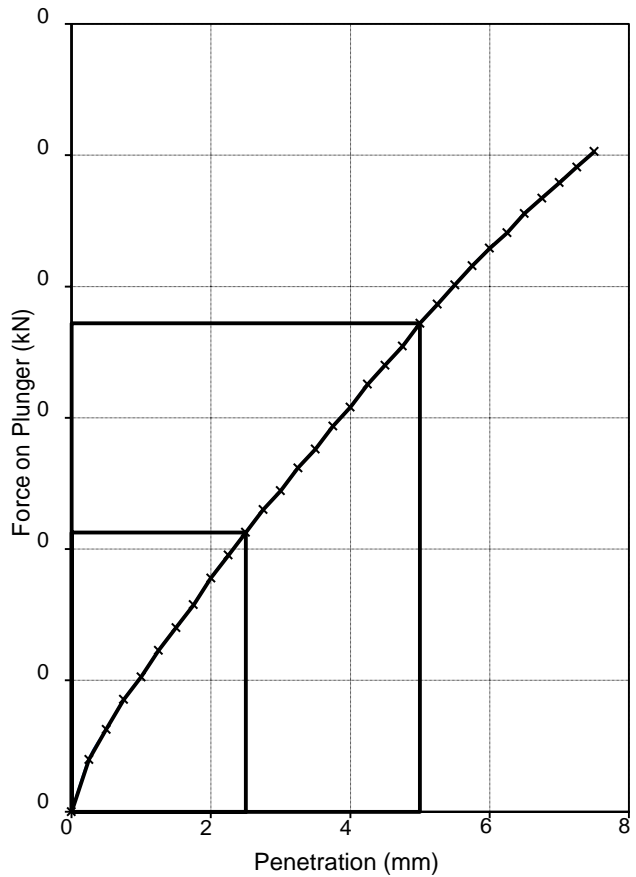
The specimen was tested in an unsoaked condition.
 The specimen was initially air dried
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.87 Mg/m³
 Prepared dry density 1.45 Mg/m³
 0.0 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	29 %	29 %
CBR Value	0.8 %	0.9 %

Top of Specimen



Base of Specimen



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Operations Manager
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Project Number:

GEO / 22476

Project Name:

C2099 CLITHEROE

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1441 - CBR TP10.00.60.B - 22476-113784.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP2
 Depth (m): 0.8
 Sample Type: B

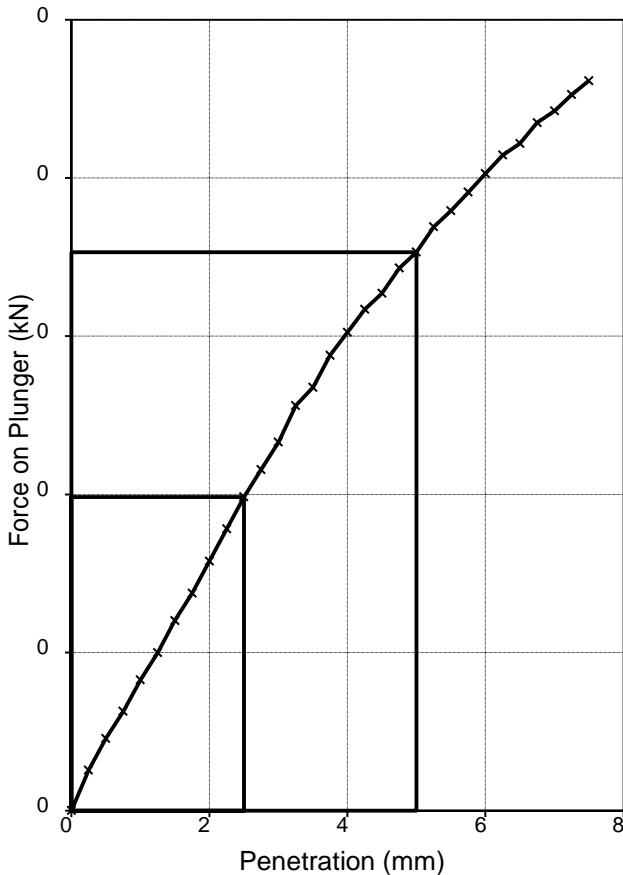
Description:
 Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized

PREPARATION DETAILS

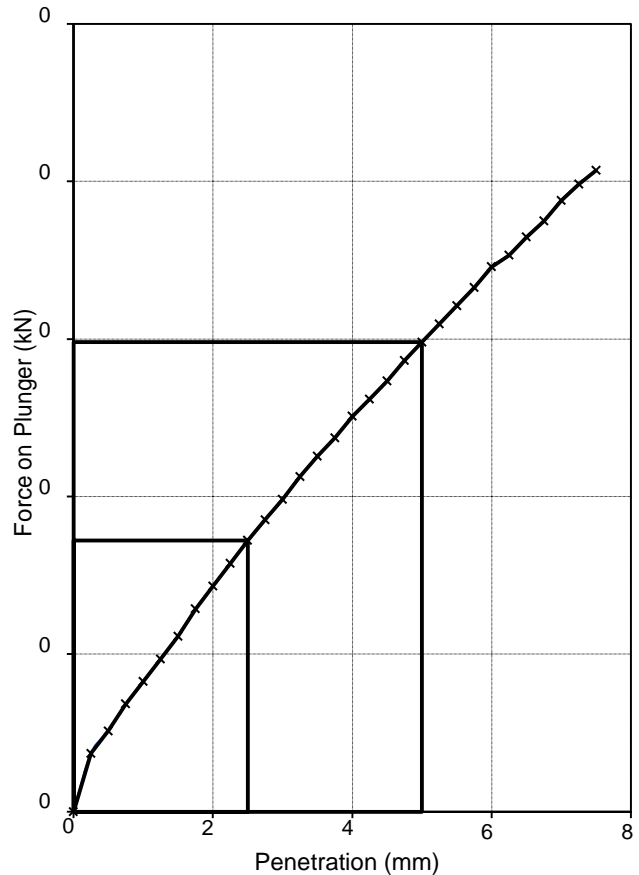
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.98 Mg/m³
 Prepared dry density 1.61 Mg/m³
 10.8 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	23 %	22 %
CBR Value	0.9 %	0.7 %

Top of Specimen



Base of Specimen



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Operations Manager
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Project Number:

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Project Name:

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Determination of California Bearing Ratio

BH/TP No.: TP3
 Depth (m): 0.5
 Sample Type: B

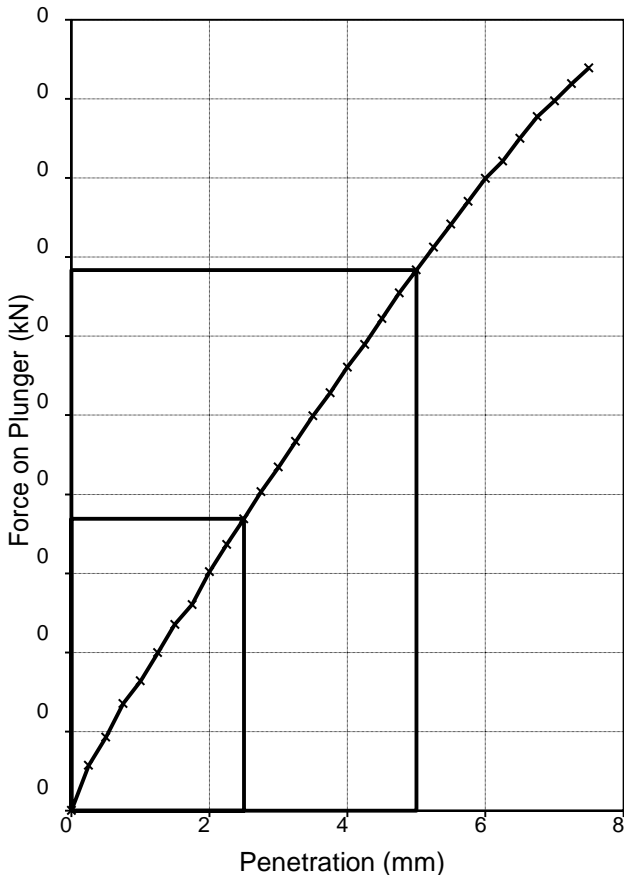
Description:
 Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized limestone.

PREPARATION DETAILS

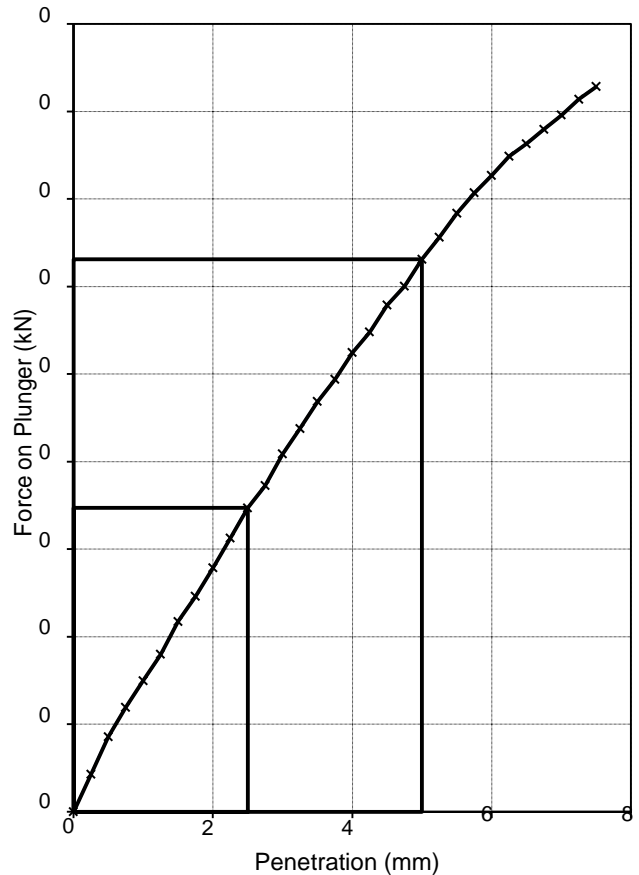
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.88 Mg/m³
 Prepared dry density 1.46 Mg/m³
 10.3 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	30 %	29 %
CBR Value	0.7 %	0.6 %

Top of Specimen



Base of Specimen



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Project Number:

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Project Name:

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1441 - CBR-TP3.00.50.B - 22476-113799.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP4
 Depth (m): 0.6
 Sample Type: B

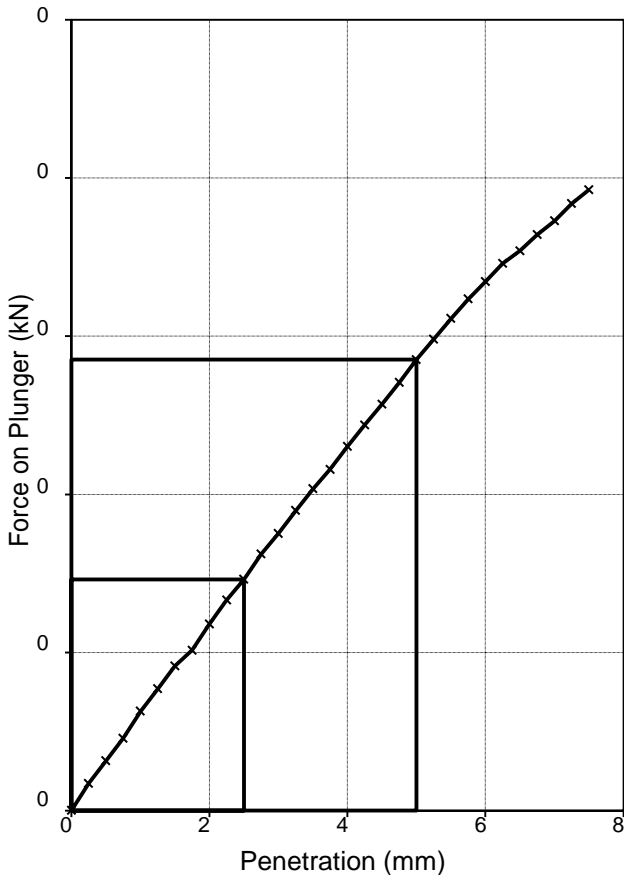
Description:
 Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized sandstone.

PREPARATION DETAILS

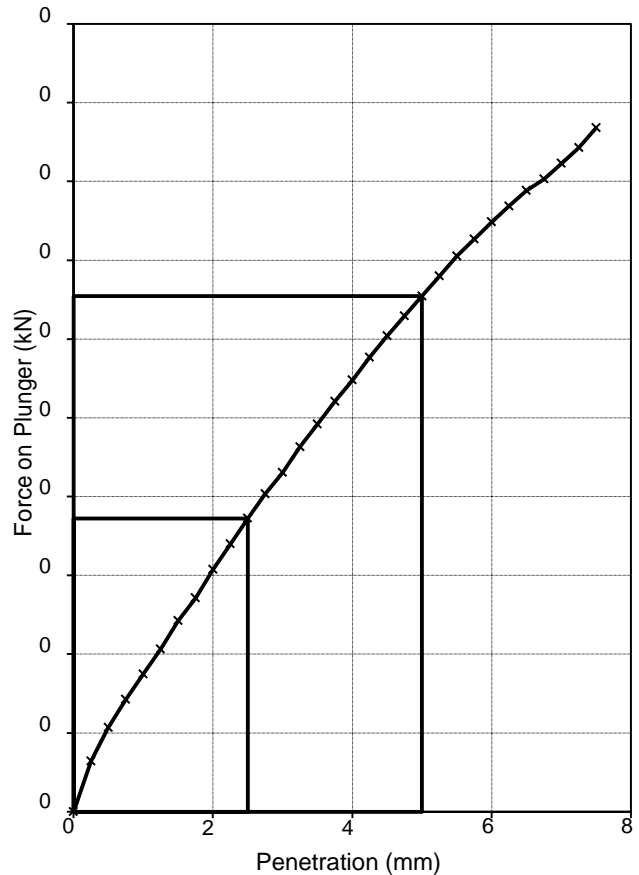
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.91 Mg/m³
 Prepared dry density 1.54 Mg/m³
 14.1 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	23 %	25 %
CBR Value	0.7 %	0.7 %

Top of Specimen



Base of Specimen



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1441 - CBR-TP4.00.60.B - 22476-113814.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP6
 Depth (m): 0.5
 Sample Type: B

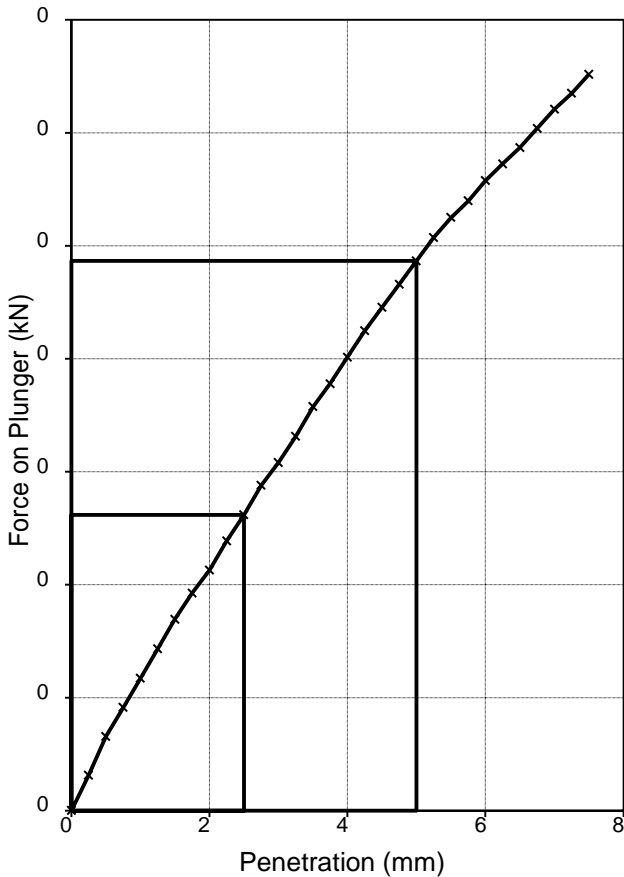
Description:
 Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.

PREPARATION DETAILS

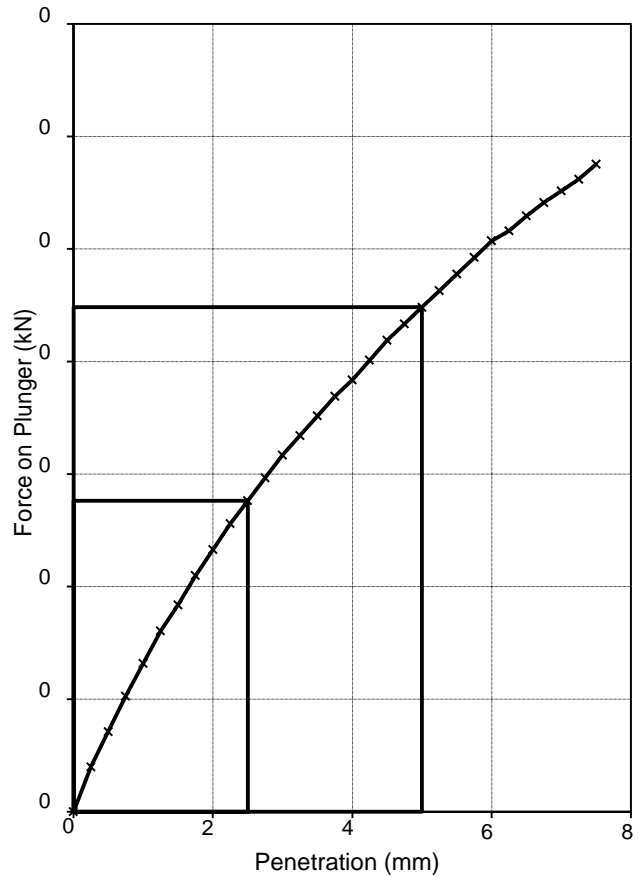
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.87 Mg/m³
 Prepared dry density 1.46 Mg/m³
 3.8 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	28 %	28 %
CBR Value	1.2 %	1.1 %

Top of Specimen



Base of Specimen



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Project Name:

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1441 - CBR TP6 00.50 B - 22476-113805.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP8
 Depth (m): 0.5
 Sample Type: B

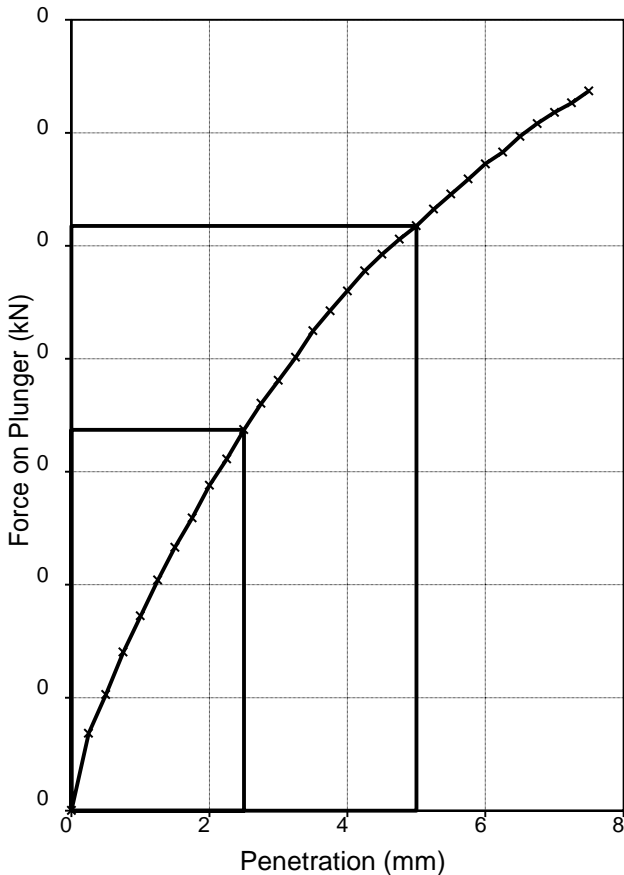
Description:
 Brown sandy gravelly silty CLAY. Gravel is sandstone.

PREPARATION DETAILS

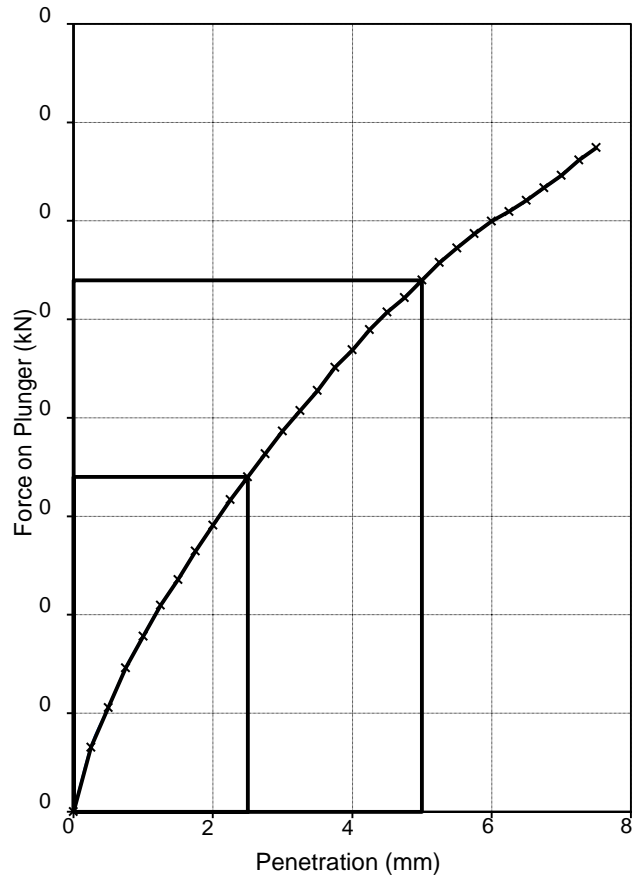
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.84 Mg/m³
 Prepared dry density 1.41 Mg/m³
 2.1 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	30 %	30 %
CBR Value	1.3 %	1.3 %

Top of Specimen



Base of Specimen



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Project Number:

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Project Name:

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1441 - CBR TP8 00.50 B - 22476-113825.xls

GL:Version 1.12 - 26/02/2015

Quick Undrained Triaxial Compression Test

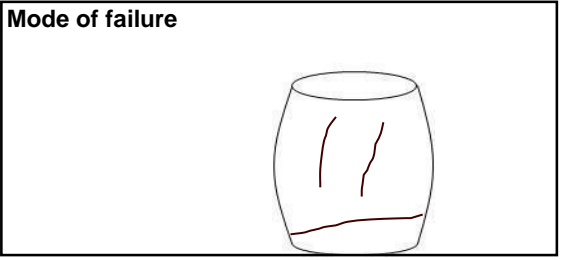
BH/TP No	BH2
Depth (m)	3.50
Sample Type	U

Description:	Firm to stiff grey sandy gravelly CLAY
Remarks :	Sample reached 20% strain on first stage of multistage test

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	201.6
Diameter	(mm)	102.1
Moisture Content	(%)	9.9
Bulk Density	(Mg/m ³)	2.29
Dry Density	(Mg/m ³)	2.08
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	1.1
Axial displacement rate	(%/min)	2.0
Cell pressure	(kPa)	35
Strain at failure	(%)	20.8
Maximum Deviator Stress	(kPa)	196
Shear Stress Cu	(kPa)	98

Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	50

Checked and Approved by: _____ Project Number: _____


 Operations Manager
 27/04/2015

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 Project Name:

C2099 CLITHEROE



1731 - UUTXL BH3 03.70 U - 22476-113830.xls

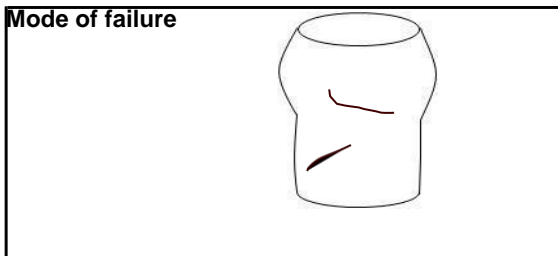
Quick Undrained Triaxial Compression Test

BH/TP No BH3
 Depth (m) 3.70-4.15
 Sample Type U

Description:
 Soft to firm grey brown sandy gravelly silty CLAY. Gravel is fine to medium.
 Remarks : Sample went to 20% on second stage of multistage test

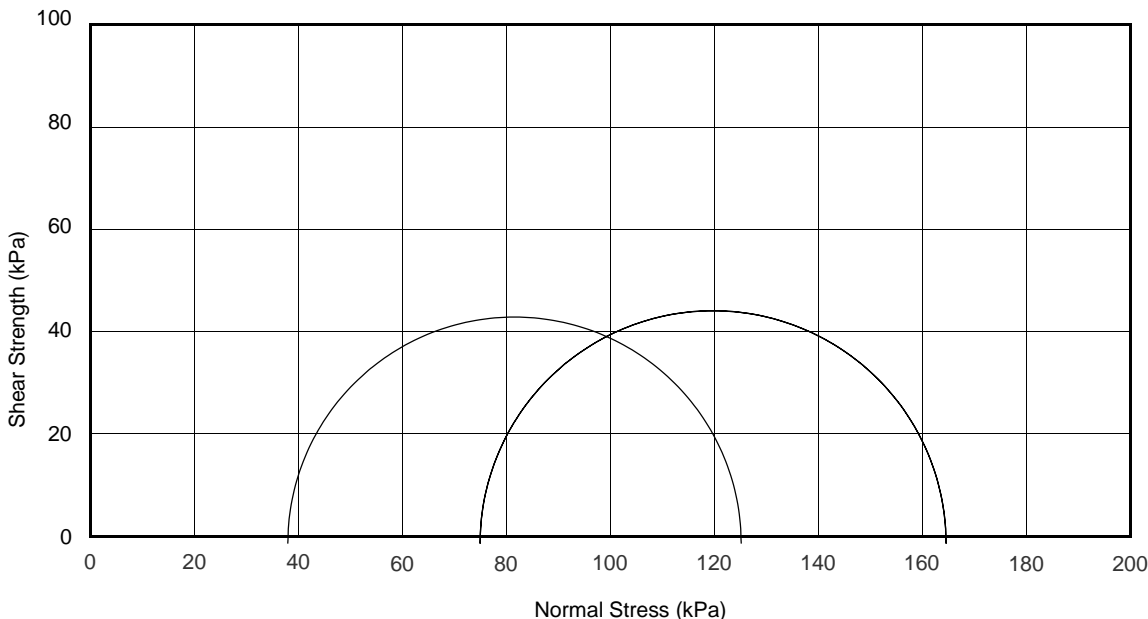
Specimen Details

Specimen conditions		Undisturbed	
Length	(mm)	202.5	
Diameter	(mm)	101.7	
Moisture Content	(%)	12	
Bulk Density	(Mg/m ³)	2.39	
Dry Density	(Mg/m ³)	2.13	
Test Details		1	2
Latex membrane thickness	(mm)	0.3	0.3
Membrane correction	(kPa)	1.0	1.1
Axial displacement rate	(%/min)	1.0	1.0
Cell pressure	(kPa)	37	74
Strain at failure	(%)	17.3	20.7
Maximum Deviator Stress	(kPa)	87	90
Shear Stress Cu	(kPa)	44	45



Orientation of the sample	Vertical
Distance from top of tube mm	80

Shear Strength Parameters
 Cohesion (kPa) 41
 Angle of Shear Resistance (°) 2.0



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 27/04/2015

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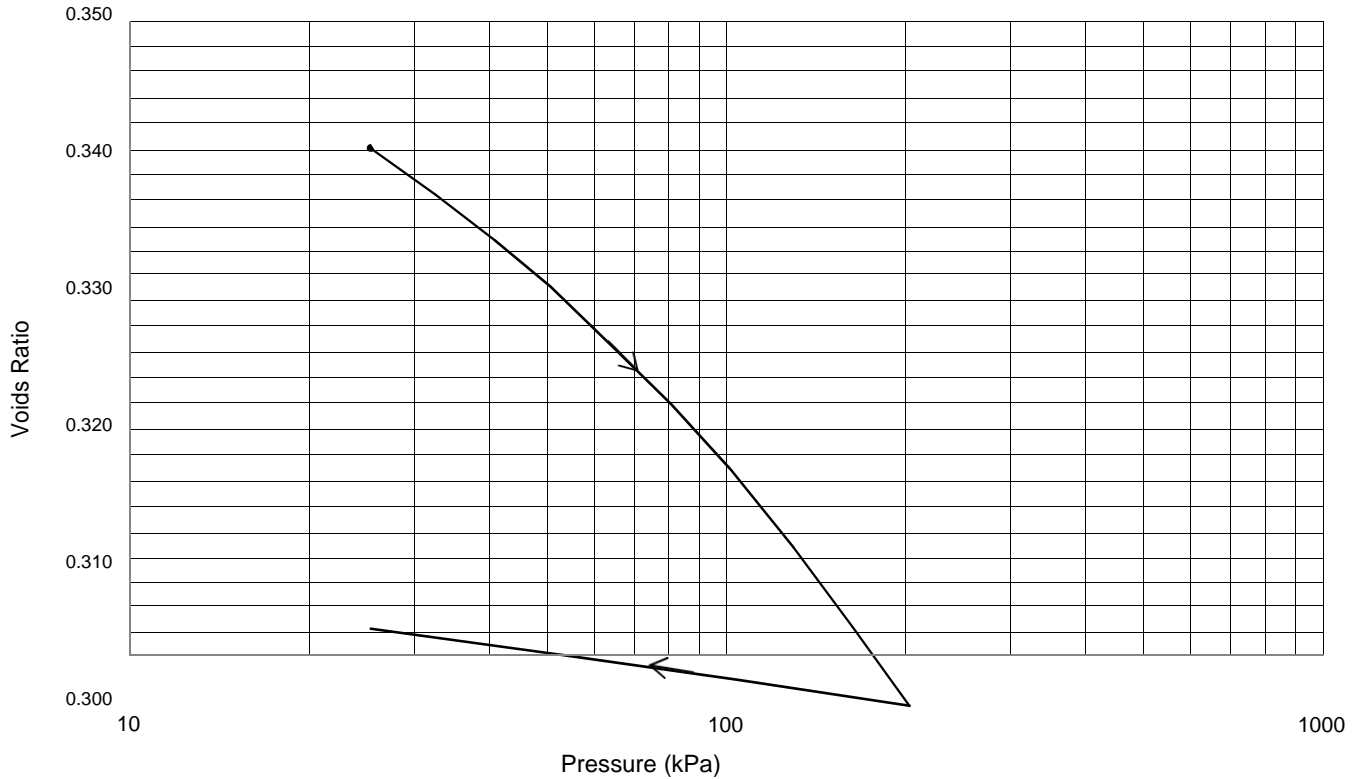
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GL:Version 1.44 - 16/03/2015

Determination of One Dimensional Consolidation Properties of Soil

Borehole No.: BH2 Sample Ref.: - Depth (m): 1.90 Depth within original: 1.94 Orientation within original: Vertical Specimen preparation: Undisturbed	Description: Soft to firm brown silty CLAY with abundant gravel and roots Oedometer taken from base of sample due to amount of gravel present
---	---



Initial Conditions:

					Initial
Height	(mm)	18.7	Moisture Content	(%)	14
Diameter	(mm)	76.1	Voids Ratio		0.364
Area	(mm ²)	4550.8	Bulk Density	(Mg/m ³)	2.26
Volume	(cm ³)	85.1	Dry Density	(Mg/m ³)	1.98
Laboratory Temperature	(°C)	20	Particle density	(Mg/m ³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m ² /MN)	c_v (m ² /year)	Time Fitting Method	Void Ratio
0 - 25	0.65	2.4	t50	0.342
25 - 50	0.28	6.8	t50	0.333
50 - 100	0.18	5.6	t50	0.321
100 - 200	0.12	5.8	t50	0.305
200 - 25	0.010	7.0 (Sv)	t50	0.307

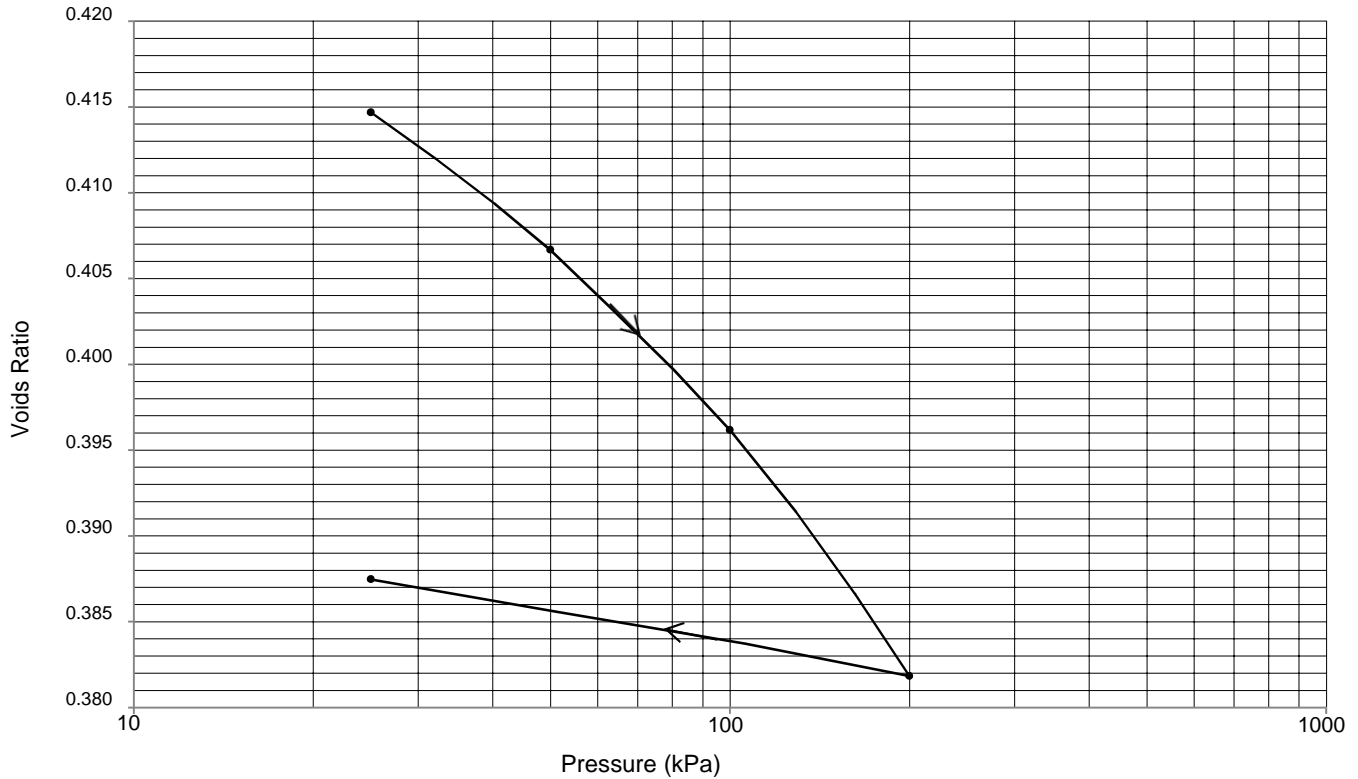
Checked and Approved by J Sturges (Ops Mgr) Date: 23/04/2015	Project Number: GEO / 22476 Project Name: C2099 Clitheroe	
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Determination of One Dimensional Consolidation Properties of Soil

Borehole No.: BH3
 Sample Ref.: -
 Depth (m): 1.80
 Depth within original: 1.84
 Orientation within original: Vertical
 Specimen preparation: Undisturbed

Description:

Firm grey silty CLAY with abundant gravel



Initial Conditions:

Height	(mm)	18.4	Moisture Content	(%)	11
Diameter	(mm)	76.2	Voids Ratio		0.418
Area	(mm ²)	4556.8	Bulk Density	(Mg/m ³)	2.11
Volume	(cm ³)	83.8	Dry Density	(Mg/m ³)	1.90
Laboratory Temperature	(°C)	20	Particle density	(Mg/m ³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m ² /MN)	c_v (m ² /year)	Time Fitting Method	Void Ratio
0 - 25	0.015	0.72	t90	0.417
25 - 50	0.16	9.8	t90	0.412
50 - 100	0.10	5.8	t90	0.404
100 - 200	0.086	7.2	t90	0.392
200 - 25	-0.0073	4.3 (Sv)	t90	0.391

Checked and Approved by

J Sturges (Ops Mgr)

Date: 23/04/2015

Project Number:

GEO / 22476

Project Name:

C2099 Clitheroe



Appendix V



Final Report

Report Number: 15-06828 Issue-1

Initial Date of Issue: 31-Mar-2015

Client: HSP Consulting Engineers Limited

Client Address: Lawrence House
Meadowbank Way
Eastwood
Nottinghamshire
NG16 3SB

Contact(s): Luke Bradley

Project: C2099 -Clitheroe

Quotation No.: **Date Received:** 25-Mar-2015

Order No.: **Date Instructed:** 25-Mar-2015

No. of Samples: 15

Turnaround: (Wkdays) 5 **Results Due Date:** 31-Mar-2015

Date Approved: 31-Mar-2015

Approved By:

KT Jones

Details: Keith Jones, Technical Manager

Results Summary - Soil

Project: C2099 - Clitheroe

Client: HSP Consulting Engineers Limited		Chemtest Job No.: 15-06828										
Quotation No.:		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Top Depth (m):										
		Bottom Depth(m):										
		Date Sampled:										
Determinand	Accred.	SOP	Units	LOD	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828
Moisture	N	2030	%	0.02	17	26	44	21	19	24	22	31
Soil Colour	N				Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N				Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N				Clay	Clay	Sand	Clay	Clay	Clay	Clay	Clay
pH	M	2010			6.9	7.2	5.7	7.4	6.5	7.5	7.0	6.2
Boron (Hot Water Soluble)	M	2120	mg/kg	0.4	< 0.40	0.41	1.9	0.66	0.51	0.52	< 0.40	1.8
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.01	0.017	0.032	0.082	0.036	0.023	0.085	0.028	0.21
Total Sulphur	M	2175	%	0.01	< 0.010		0.070	< 0.010		< 0.010		
Sulphur (Elemental)	M	2180	mg/kg	1	< 1.0	< 1.0	4.2	4.0	< 1.0	< 1.0	< 1.0	6.5
Cyanide (Total)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Free)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5	1.6	1.7	1.3	1.8	1.4	0.96	1.3	1.1
Sulphate (Acid Soluble)	M	2430	%	0.01	0.021		0.17	0.046		0.080		
Arsenic	M	2450	mg/kg	1	54	10	13	4.2	8.8	6.9	15	9.9
Cadmium	M	2450	mg/kg	0.1	< 0.10	0.21	0.77	0.41	0.85	0.42	2.3	0.50
Chromium	M	2450	mg/kg	1	28	29	33	19	26	23	29	25
Copper	M	2450	mg/kg	0.5	54	20	32	4.1	14	11	23	21
Mercury	M	2450	mg/kg	0.1	0.15	< 0.10	0.20	< 0.10	< 0.10	< 0.10	< 0.10	0.13
Nickel	M	2450	mg/kg	0.5	15	31	22	8.6	21	16	55	18
Lead	M	2450	mg/kg	0.5	85	27	100	23	45	31	56	65
Selenium	M	2450	mg/kg	0.2	0.52	0.25	0.72	0.27	0.38	0.23	1.0	0.34
Zinc	M	2450	mg/kg	0.5	75	80	130	68	130	95	280	100
Chromium (Hexavalent)	N	2490	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.4	0.90	1.7	15	1.5	1.1	1.7	1.1	7.8
Aliphatic TPH >C5-C6	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	M	2675	mg/kg	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Results Summary - Soil

Project: C2099 - Clitheroe

Client: HSP Consulting Engineers Limited		Chemtest Job No.: 15-06828										
Quotation No.:		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Top Depth (m):										
		Bottom Depth(m):										
		Date Sampled:										
Determinand	Accred.	SOP	Units	LOD	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828
Aromatic TPH >C5-C7	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	M	2675	mg/kg	1	< 1.0	< 1.0	3.9	< 1.0	< 1.0	< 1.0	< 1.0	2.6
Aromatic TPH >C21-C35	M	2675	mg/kg	1	< 1.0	< 1.0	11	< 1.0	< 1.0	< 1.0	< 1.0	11
Aromatic TPH >C35-C44	N	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	M	2675	mg/kg	5	< 5.0	< 5.0	15	< 5.0	< 5.0	< 5.0	< 5.0	15
Total Petroleum Hydrocarbons	M	2675	mg/kg	10	< 10	< 10	15	< 10	< 10	< 10	< 10	15
Naphthalene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.44	< 0.10	< 0.10	< 0.10	< 0.10	0.48
Acenaphthylene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.34	< 0.10	< 0.10	< 0.10	< 0.10	0.39
Acenaphthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.16	< 0.10	< 0.10	< 0.10	< 0.10	0.34
Fluorene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	0.45
Phenanthrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.3	< 0.10	< 0.10	< 0.10	< 0.10	3.5
Anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.33	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	3.1	< 0.10	< 0.10	< 0.10	< 0.10	5.5
Pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	3.2	< 0.10	< 0.10	< 0.10	< 0.10	5.5
Benzo[a]anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.6	< 0.10	< 0.10	< 0.10	< 0.10	2.6
Chrysene	M	2700	mg/kg	0.1	< 0.10	< 0.10	2.3	< 0.10	< 0.10	< 0.10	< 0.10	3.3
Benzo[b]fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.9	< 0.10	< 0.10	< 0.10	< 0.10	3.5
Benzo[k]fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.34	< 0.10	< 0.10	< 0.10	< 0.10	2.0
Benzo[a]pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.7	< 0.10	< 0.10	< 0.10	< 0.10	2.3
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.54	< 0.10	< 0.10	< 0.10	< 0.10	0.78
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.44	< 0.10	< 0.10	< 0.10	< 0.10	0.43
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.45	< 0.10	< 0.10	< 0.10	< 0.10	0.47
Total Of 16 PAH's	M	2700	mg/kg	2	< 2.0	< 2.0	18	< 2.0	< 2.0	< 2.0	< 2.0	32
Benzene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results Summary - Soil

Project: C2099 - Clitheroe

Client: HSP Consulting Engineers Limited	Chemtest Job No.:				15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828
Quotation No.:	Chemtest Sample ID.:				120111	120112	120113	120114	120115	120116	120117	120118
Order No.:	Client Sample Ref.:											
	Client Sample ID.:				WS1	WS2	WS3A	WS6	WS7	WS8	WS5	WS5
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.5	0.5	0.1	0.5	0.5	0.6	0.5	0.1
	Bottom Depth(m):											
	Date Sampled:				17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15
Determinand	Accred.	SOP	Units	LOD								
Total Phenols	M	2920	mg/kg	0.3	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

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- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at our Coventry laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 60 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk



Final Report

Report Number: 15-06833 Issue-1

Initial Date of Issue: 31-Mar-2015

Client: HSP Consulting Engineers Limited

Client Address: Lawrence House
Meadowbank Way
Eastwood
Nottinghamshire
NG16 3SB

Contact(s): Luke Bradley

Project: C2099 -Clitheroe


Quotation No.: **Date Received:** 25-Mar-2015

Order No.: **Date Instructed:** 25-Mar-2015

No. of Samples: 2

Turnaround: (Wkdays) 5 **Results Due Date:** 31-Mar-2015

Date Approved: 31-Mar-2015

Approved By:


Details: Darrell Hall, Laboratory Director

Results Summary - 2 Stage WAC

Project: C2099 - Clitheroe

Chemtest Job No: 15-06833 Chemtest Sample ID: 120134 Sample Ref: Sample ID: WS2 Top Depth(m): 0.5 Bottom Depth(m): Sampling Date: 17-Mar-2015							Landfill Waste Acceptance Criteria Limits			
							Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	U	%				0.92	3	5	6
Loss on Ignition	2610	U	%				4.3	--	--	10
Total BTEX	2760	U	mg/kg				< 0.01	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg				< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg				< 10	500	--	--
Total (of 17) PAHs	2700	N	mg/kg				< 2.0	100	--	--
pH	2010	U					7.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				0.003	--	To evaluate	To evaluate
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg			
Arsenic	1450	U	< 0.001	0.002	< 0.050	< 0.050	0.5	2	25	
Barium	1450	U	0.003	0.008	< 0.50	< 0.50	20	100	300	
Cadmium	1450	U	0.00068	0.0035	< 0.010	0.033	0.04	1	5	
Chromium	1450	U	0.004	0.011	< 0.050	0.11	0.5	10	70	
Copper	1450	U	0.003	0.011	< 0.050	< 0.050	2	50	100	
Mercury	1450	U	< 0.0005	< 0.0005	< 0.001	< 0.005	0.01	0.2	2	
Molybdenum	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.5	10	30	
Nickel	1450	U	0.002	0.006	< 0.050	0.054	0.4	10	40	
Lead	1450	U	0.001	0.005	< 0.010	0.048	0.5	10	50	
Antimony	1450	U	< 0.001	< 0.001	< 0.010	< 0.010	0.06	0.7	5	
Selenium	1450	U	0.001	< 0.001	< 0.010	< 0.010	0.1	0.5	7	
Zinc	1450	U	0.033	0.14	< 0.50	1.3	4	50	200	
Chloride	1220	U	4.6	1.3	< 10	14	800	15000	25000	
Fluoride	1220	U	0.19	0.14	< 1.0	1.4	10	150	500	
Sulphate	1220	U	4.9	< 1.0	< 10	< 10	1000	20000	50000	
Total Dissolved Solids	1020	N	48	17	93	180	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	31	18	60	190	500	800	1000	

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	23

Leachate Test Information	
Leachant volume 1st extract/l	0.296
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.084

Results Summary - 2 Stage WAC

Project: C2099 - Clitheroe

Chemtest Job No: 15-06833 Chemtest Sample ID: 120135 Sample Ref: Sample ID: WS4 Top Depth(m): 0.1 Bottom Depth(m): Sampling Date: 17-Mar-2015							Landfill Waste Acceptance Criteria Limits			
							Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	U	%				3.5	3	5	6
Loss on Ignition	2610	U	%				9.4	--	--	10
Total BTEX	2760	U	mg/kg				< 0.01	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg				< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg				37	500	--	--
Total (of 17) PAHs	2700	N	mg/kg				34	100	--	--
pH	2010	U					7.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				0.003	--	To evaluate	To evaluate
Eluate Analysis				2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
Arsenic	1450	U	0.002	0.001	< 0.050	< 0.050	0.5	2	25	
Barium	1450	U	0.014	0.019	< 0.50	< 0.50	20	100	300	
Cadmium	1450	U	0.0021	0.0015	< 0.010	0.015	0.04	1	5	
Chromium	1450	U	0.005	0.007	< 0.050	0.064	0.5	10	70	
Copper	1450	U	0.01	0.012	< 0.050	< 0.050	2	50	100	
Mercury	1450	U	< 0.0005	< 0.0005	< 0.001	< 0.005	0.01	0.2	2	
Molybdenum	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.5	10	30	
Nickel	1450	U	0.005	0.004	< 0.050	< 0.050	0.4	10	40	
Lead	1450	U	0.01	0.012	0.019	0.12	0.5	10	50	
Antimony	1450	U	< 0.001	< 0.001	< 0.010	< 0.010	0.06	0.7	5	
Selenium	1450	U	0.001	0.001	< 0.010	0.011	0.1	0.5	7	
Zinc	1450	U	0.077	0.05	< 0.50	0.51	4	50	200	
Chloride	1220	U	4.1	2	< 10	21	800	15000	25000	
Fluoride	1220	U	0.13	0.085	< 1.0	< 1.0	10	150	500	
Sulphate	1220	U	15	2.2	29	28	1000	20000	50000	
Total Dissolved Solids	1020	N	60	19	120	210	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	83	22	160	250	500	800	1000	

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	18

Leachate Test Information	
Leachant volume 1st extract/l	0.313
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.086

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Appendix VI

Borehole Log

Borehole No.

CP1

Sheet 1 of 1

Hole Type

CP

Scale

1:50

Logged By
Driller

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/03/2015 - 17/03/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.20	B	50 (7,16/50 for 270mm)	0.20		Grass overlying brown clayey TOPSOIL		
		0.10	D				Soft to firm orange brown mottled silty sandy CLAY.		
		0.20	D						
		0.50 - 1.00	B						
		1.00						1	
		1.00 - 1.50	B	50 (25 for 85mm/50 for 290mm)	1.60		...with a few large boulder and cobbles and a little coarse gravel.		
		1.60	D						
		1.70 - 1.80	U	50 (25 for 85mm/50 for 290mm)	1.60		Stiff dark grey CLAY.		
		1.80							
		1.80 - 2.30	B					2	
		2.80							3
		2.80 - 3.30	B	50 (25 for 95mm/50 for 275mm)	4.10		LIMESTONE boulder.		
	3.80								
	3.80 - 4.10	B		4.20		End of borehole at 4.20 m	4		
								5	
								6	
								7	
								8	
								9	
								10	

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 4.20m due to refusal.
- Gas and water monitoring standpipe installed to 4.20m depth.



Borehole Log

Borehole No.

CP2

Sheet 1 of 1

Hole Type

CP

Scale

1:50

 Logged By
Driller

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 18/03/2015 - 19/03/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.25	B	N=19 (1,1/3,4,6,6)	0.25		Grass overlying silty TOPSOIL.		
		0.10	D					Ornage brown mottled silty sandy CLAY.	
		0.30	D						
		0.50 - 1.00	B						
		1.00							
		1.00 - 1.50	B						
		1.80	D		1.80			<i>...with sandstone gravel and occasional cobbles.</i>	
		1.90 - 2.35	U					Firm to stiff brown grey mottled CLAY.	
		2.40	D		2.40			Firm to stiff brown grey mottled CLAY.	
		2.60	D	N=42 (4,9/14,11,8,9)	2.60			Firm to stiff brown grey mottled CLAY.	
		2.70	D						Grey brown very sandy CLAY with much gravel and cobbles.
		2.70 - 3.20	B						
		3.40	D			3.40			Stiff grey gravelly CLAY. Gravel is of limestone.
		3.50 - 3.65	U						
		3.50 - 3.80	B						
		3.80 - 4.20	U						
		4.20	D						
		4.80		50 (25 for 90mm/50 for 295mm)					
	4.80 - 5.20	B							
	5.30	D		5.30					
	5.30	D	50 (25 for 85mm/50 for 245mm)						
	5.30 - 5.50	D					<i>...with limestone gravels, boulder and cobbles.</i>		
	5.30 - 5.80	B		5.80			LIMESTONE		
	5.80	D		6.00					
	5.80		50 (25 for 90mm/50 for 250mm)						
	6.00		50 (25 for 80mm/50 for 225mm)				End of borehole at 6.00 m		

Remarks

1. No groundwater was encountered during the drilling process.

2. Borehole was terminated at 6.00m due to refusal.

3. Gas and water monitoring standpipe installed to 4.20m depth.

Borehole Log

Borehole No.

CP3

Sheet 1 of 1

Hole Type

CP

Scale

1:50

Logged By
Driller

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 18/03/2015 - 18/03/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00 - 0.20	B		0.20		Grass overlying brown clayey TOPSOIL		
		0.10	U				Orange brown mottled silty sandy CLAY.		
		0.20	D						
		0.20 - 0.70	B		0.70				
		0.70	D						
		0.70 - 1.00	B		1.00		Grey brown mottled silty sandy CLAY with some gravel and cobbles.		
		0.80	W				Brown clayey GRAVEL.		
		1.00	D						
		1.10		N=41 (4,5/8,11,14,8)					
		1.10 - 1.60	B		1.70		Firm to stiff brown grey mottled CLAY.		
		1.70	D						
		1.80 - 2.20	U						
		2.20	D		2.40				
		2.40	D						
		2.50 - 2.70	B				Stiff grey CLAY with many limestone cobbles and boulders.		
		2.70 - 3.15	D	N=33 (4,7/6,8,8,11)					
		2.70 - 3.20	B						
	3.70 - 4.15	U							
	4.20	D							
	4.70		50 (25 for 80mm/50 for 250mm)						
	4.70 - 5.20	B							
	5.70 - 5.85	U							
	5.70 - 6.20	B							
	6.70		50 (25 for 135mm/50 for 228mm)	6.70			LIMESTONE		
	6.70 - 6.80	D		7.00					
	7.00		50 (25 for 85mm/50 for 225mm)						
							----- End of borehole at 7.00 m		

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 7.00m due to refusal.
- Gas and water monitoring standpipe installed to 4.20m depth.



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.30		Scale 1:25 Logged LEB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			Grass overlying brown sandy clayey TOPSOIL. High plasticity.
	0.80	B					Grey slightly clayey sandy GRAVEL & COBBLES. Gravel and cobbles is fine to coarse angular to sub angular sandstone.
	1.20	B		1.30			End of pit at 1.30m




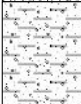
Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 1.30m depth and backfilled with arisings.

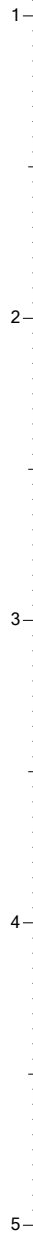
Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 0.50		Scale 1:25 Logged LB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone. Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone.
				0.50			
							End of pit at 0.50 m



Remarks: 1. No groundwater was encountered during the drilling process.
2. Trial pit was terminated at 0.50m depth due to bedrock and backfilled with arisings.

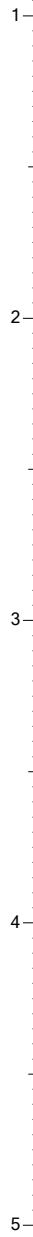
Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 0.50		Scale 1:25 Logged LB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone. Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone. ----- End of pit at 0.50 m
				0.50			



Remarks: 1. No groundwater seepage was encountered during the excavation process.
2. Trial pit was terminated at 0.50m depth due to bedrock and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.00		Scale 1:25 Logged LEB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.15			Grass overlying blackish brown sandy clayey TOPSOIL. Low plasticity.
	0.80	B					Firm orange brown slightly gravelly sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 24 kPa at 0.50m depth.</i>
	1.60	B					<i>...with medium sub angular to sub rounded boulder of sandstone at 1.50m depth.</i> <i>HSV - 32 kPa at 1.50m depth.</i>
				2.00			End of pit at 2.00 m

Remarks: 1. No groundwater was encountered during the drilling process.
2. Trial pit was terminated at 2.00m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.70		Scale 1:25 Logged LEB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.15			0.15			Grass overlying blackish brown sandy clayey TOPSOIL. High plasticity.
	0.50	B					Firm orangish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <u>HSV - 48 kPa at 0.60m depth.</u>
	1.50	B					<u>...with low sub rounded boulders of sandstone at 1.40m depth.</u> <u>HSV - 14 kPa at 1.50m depth.</u>
				1.70			End of pit at 1.70 m

Remarks: 1. Slight groundwater seepage was encountered during the excavation process at 1.30m depth.
2. Trial pit was terminated at 1.70m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.90		Scale 1:25 Logged LB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.15			Grass overlying blackish brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.60	B					Firm orangish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 38 kPa at 0.50m depth.</i> <i>...with a medium sub rounded boulder of sandstone.</i> <i>HSV - 22 kPa at 1.40m.</i>
				1.90			End of pit at 1.90m

Remarks: 1. No groundwater was encountered during the drilling process.
2. Trial pit was terminated at 2.00m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.10		Scale 1:25 Logged LB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.15						Grass overlying blackish brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.50	B					Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <u>HSV - 63 kPa at 0.50m.</u>
							<u>...with medium sub angular to sub rounded at 0.80m.</u>
	1.60	B					<u>HSV - 46 kPa at 1.10m depth.</u> <u>...with medium angular to sub rounded sandstone.</u>
	1.90	B		1.90			Greyish brown clayey sandy GRAVEL. Gravel is fine to coarse angular to rounded of sandstone.
				2.10			----- End of pit at 2.10m

Remarks: 1. No groundwater was encountered during the excavation process .
2. Trial pit was terminated at 2.10m depth and backfilled with arisings.

Stability:



Trial Pit Log

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.50		Scale 1:25 Logged LB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.10			Grass overlying blackish brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.50	B					Firm orange brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone. <i>HSV - 56 kPa at 0.60m.</i>
	1.00						Firm greyish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded sandstone.
	1.50	B					
	2.10	B					Stiff dark grey silty sandy gravelly CLAY. Low plasticity. Gravel is fine to coarse angular to sub rounded of sandstone.
	2.20			2.30			Dark grey sandy very clayey GRAVEL. Gravel is fine to coarse angular to sub rounded of sandstone.
				2.50			End of pit at 2.50 m

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 2.50m depth and backfilled with arisings.

Stability:



Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 1.10		Scale 1:25
Client: Oakmere Homes Ltd			Logged LB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.50	B		0.30			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to coarse sub angular to sub rounded of sandstone.
							Firm light grey to orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to medium angular to sub angular of sandstone and mudstone. <i>HSV - 32 kPa at 0.60m depth.</i> <i>...becoming softer and very garvelly from 0.70m depth.</i>
				1.10			----- End of pit at 1.10m -----

Remarks:

- Slight groundwater seepage was encountered during the excavation process at 0.70m depth.
- Trial pit was terminated at 1.10m depth due to collapsing and backfilled with arisings.

Stability:



Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.50		Scale 1:25 Logged LB
Client: Oakmere Homes Ltd			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼	0.25			0.25			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to coarse sub angular to sub rounded of sandstone.
	0.50	B					Firm greyish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 48 kPa at 0.50m depth.</i>
	1.50	B					<i>...with medium angular to sub rounded sandstone gravel at 0.90m depth.</i> <i>HSV - 38 kPa at 1.30m depth.</i> <i>...becoming softer with increased depth.</i>
	2.40	B		2.50			-End of pit at 2.50m-

Remarks: 1. Slight groundwater seepage was encountered during the excavation process at 0.80m depth.
2. Trial pit was terminated at 2.50m depth and backfilled with arisings.

Stability:



Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): Depth 2.50		Scale 1:25
Client: Oakmere Homes Ltd			Logged LB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
▼				0.20			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.60	B					Firm greyish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone. <i>HSV - 61 kPa at 0.40m depth.</i>
							<i>...becoming very gravelly at 0.70m depth.</i>
							<i>...becoming less gravelly at 1.00m depth.</i>
	1.50	B		1.20			Firm dark grey slightly sandy gravelly CLAY. Low plasticity. Gravel is fine to coarse angular to sub angular of sandstone. <i>HSV - 28 kPa at 1.40m depth.</i>
							<i>...with a low sub rounded boulder content of sandstone at 1.50m depth.</i>
	2.20	B		2.50			
							End of pit at 2.50m

Remarks:

- Slight groundwater seepage was encountered during the excavation process at 1.00m depth.
- Trial pit was terminated at 2.50m depth and backfilled with arisings.

Stability:

Project Name: Chatburn Road,	Project No. C2099	Co-ords: - Level:	Date 18/03/2015
Location: Clitheroe	Dimensions (m): 		Scale 1:25
Client: Oakmere Homes Ltd	Depth 2.60		Logged LB

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.25			Grass overlying blackish brown slightly gravelly very sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.
	0.60	B					Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone. <i>HSV - 52 kPa at 0.50m depth.</i>
							<i>...with medium angular to sub rounded content of sandstone at 0.80m depth.</i>
	1.50	B					<i>...with low angular to sub rounded content of sandstone at 1.20m depth.</i> <i>HSV - 40 kPa at 1.40m depth.</i>
	2.40	B					
				2.60			End of pit at 2.60m

Remarks: 1. No groundwater was encountered during the excavation process.
2. Trial pit was terminated at 2.60m depth and backfilled with arisings.

Stability:



Borehole Log

Borehole No.

WS1

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099


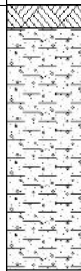
Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.15	D		0.15		MADE GROUND - blackish brown very sandy clayey TOPSOIL. Low plasticity.	
		0.50	D				Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse subangular to angular of sandstone.	
		1.00		N=12 (0,0/1,2,3,6)			HSV - 46 kPa at 0.70m depth.	
		1.50 1.75	D ES		1.75 1.80		Grey SANDSTONE. Recovered as a coarse angular gravel.	
							End of borehole at 1.80 m	



Remarks

1. No groundwater was encountered during the drilling process.
2. Borehole was terminated at 1.80m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS2

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	D		0.20		Grass overlying blackish brown very sandy clayey TOPSOIL. Low plasticity.	
		0.50	D				Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse sub angular to angular of sandstone.	
		1.00		N=10 (1,1/2,2,3,3)			HSV - 42 kPa at 0.80m depth.	
		1.50	D				HSV - 62 kPa at 1.80m depth	
		2.00		N=16 (2,3/4,4,4,4)	2.10			
	2.50	D		2.80		Firm greyish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse sub rounded to angular of sandstone and mudstone.		
	2.50		50 (25 for 105mm/50 for 255mm)			HSV - 52 kPa at 2.40m depth.	End of borehole at 2.80 m	

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 2.50m depth due to refusal.
- Gas and water monitoring standpipe installed to 2.50m depth.



Borehole Log

Borehole No.

WS3

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.20		Grass overlying blackish brown very sandy clay TOPSOIL. Low plasticity.	
		0.50	D				Firm light grey and oranish brown sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to rounded of sandstone. <i>HSV - 44 kPa at 0.50m depth.</i>	
		0.60	D					
		1.00		N=9 (1,2/1,2,3,3)			<i>becoming soft from 1.10m depth.</i>	
		1.50	D		1.80		<i>...with a cobble of sandstone.</i>	
		1.50		50 (25 for 145mm/50 for 295mm)				
End of borehole at 1.80 m								



Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 1.80m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS3A

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Hatched Pattern]		0.10	D		0.15		Grass overlying blackish brown sandy clayey TOPSOIL. High plasticity.	
		0.50	D				Firm light grey and oragnish brown slightly gravelly sandy CLAY. High plasticity. Gravel is fine to medium sub rounded to angular of sandstone and mudstone.	
		1.00		N=16 (1,1/3,4,5,4)				
		1.40	D					
		1.60		50 (25 for 135mm/50 for 235mm)	1.60 1.70		...with a cobble of sandstone at 1.50m depth. Extremely weak grey medium grained SANDSTONE recovered as angular coarse gravel.	
							End of borehole at 1.70 m	



Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 1.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS4

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LEB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	D		0.20		Grass overlying blackish brown slightly gravelly sandy clay TOSPOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone	
		0.50	D					
		1.00		N=5 (1,1/1,2,1,1)	2.30		Firm orangish brown slightly gravelly sandy CLAY. High plasticity. Gravel is fine to medium angular to sub angular of sandstone and mudstone. <i>HSV - 44 kPa at 0.80m depth.</i>	
		1.50	D					
		2.00		N=31 (4,6/5,7,8,11)				
		2.50	D					
2.70		35 (25 for 115mm/35 for 245mm)	2.70		Stiff dark grey silty sandy gravelly CLAY. Low plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 102 kPa at 2.40m depth.</i>			
End of borehole at 2.70 m								

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 2.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS5

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By
LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
▲		0.10	D		0.20		Grass overlying brown slightly sandy gravelly very clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone.	
		0.50	D					
		1.00		N=5 (3,2/2, 1,1,1)	1.70		Firm yellowish brown and grey slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone. <i>HSV - 19 kPa at 0.90m depth. ...becoming soft from 1.20m depth.</i>	
		1.50	D					
	2.00		50 (25 for 135mm/50 for 275mm)			----- End of borehole at 1.70 m		



Remarks

1. Groundwater was encountered during the drilling process at 1.10m depth.
2. Borehole was terminated at 1.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS6

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	D		0.15		Grass overlying blackish brown slightly gravelly sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium sub angular of sandstone and mudstone.	
		0.50	D				Soft light grey to orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone.	
		1.00		N=14 (1,2/2,3,4,5)	1.20		HSV - 32 kPa at 0.60m depth.	
		1.50	D				Dark grey gravelly clayey SAND. Sand is fine to coarse. Gravel is fine to coarse angular to sub angular of sandstone and mudstone.	
		1.90		50 (25 for 85mm/24,12,14,)	1.90		End of borehole at 1.90m	

Remarks

1. Groundwater was encountered during the drilling process at 1.00m depth.

2. Borehole was terminated at 1.90m depth due to refusal.

3. Gas and water monitoring standpipe installed to 1.90m depth.



Borehole Log

Borehole No.

WS7

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
[Pattern]	▼	0.10	D		0.25	[Pattern]	Grass overlying blackish brown slightly gravelly sandy clayey TOPSOIL. High plasticity. Gravel is fine to medium sub angular of sandstone and mudstone.	
		0.50	D					
		1.00		N=10 (3,3/4,2,2,2)	1.50	[Pattern]	Firm light brown and orangish brown sandy gravelly CLAY. High plasticity. Gravel is fine to medium angular to sub rounded of sandstone and mudstone. <i>HSV - 42 kPa at 0.70m depth.</i>	
		1.50	D					
		2.00		N=7 (2,2/1,2,1,3)				
2.70		N=50 (11,12/50 for 285mm)	2.70	[Pattern]	Soft reddish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone and mudstone. <i>HSV - 24 kPa at 1.60m depth.</i>			
End of borehole at 2.70 m								



Remarks

1. Groundwater was encountered during the drilling process at 1.40m depth.
2. Borehole was terminated at 2.70m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS8

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By
LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20		Grass overlying brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub rounded of sandstone and mudstone.	
		0.50	D				Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone. <i>HSV - 68 kPa at 0.70m depth.</i>	
		1.00		N=5 (1,1/1,1,1,2)				
		1.80		N=50 (11,14/50 for 285mm)	1.80		End of borehole at 1.80m	

Remarks

- No groundwater was encountered during the drilling process.
- Borehole was terminated at 1.80m depth due to refusal and backfilled with arisings.

Borehole Log

Borehole No.

WS9

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

LB

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: 17/04/2015 - 17/04/2015

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	StratumDescription
		Depth (m)	Type	Results				
[Pattern]					0.30		Grass overlying brown sandy gravelly clayey TOPSOIL. High plasticity. Gravel is fine to medium angular to sub angular of sandstone and mudstone.	
		0.50	D		1.00		Firm orangish brown slightly gravelly very sandy CLAY. High plasticity. Gravel is fine to coarse angular to sub rounded of sandstone and mudstone.	
		1.50	D	N=8 (2,2/2,2,2,2)	1.20		HSV - 42 kPa at 0.80m depth.	
		2.00		N=50 (4,6/50 for 255mm)	2.00		Firm greenish brown silty sandy gravelly CLAY. High plasticity. Gravel is fine to coarse angular to sub angular of sandstone. HSV - 79 kPa at 1.50m depth.	
							----- End of borehole at 2.00m -----	



Remarks

1. No groundwater was encountered during the drilling process.
2. Borehole was terminated at 2.0m depth due to refusal and backfilled with arisings.



Borehole Log

Borehole No.

WS10

Sheet 1 of 1

Hole Type

WS

Scale

1:50

Logged By

Project Name: Chatburn Road,

Project No.

C2099

Co-ords: -

Location: Clitheroe

Level:

Client: Oakmere Homes Ltd

Dates: -

Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.15			
		0.50	D					
		1.0		50 (4 for 0mm/50 for 0mm)	1.00			






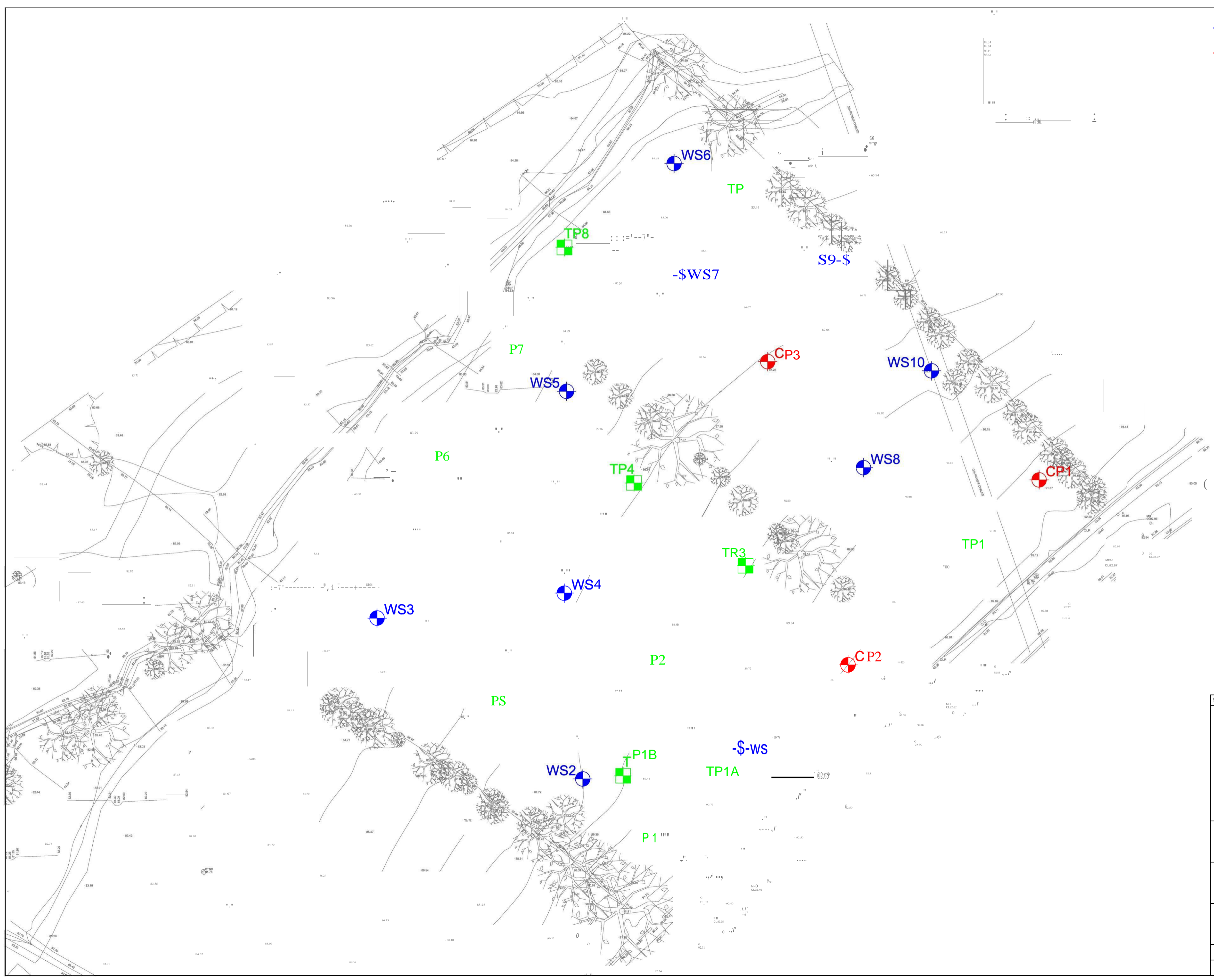
Remarks

1. No groundwater was encountered during the drilling process.
2. Borehole was terminated at 1.00m depth due to refusal and backfilled with arisings.



Appendix III

KEY:
 Window sampling borehole location
 Cable percussive borehole location
 Trial pit location





Rev	By	Date	Details	Chkd
Drawing Status				
				
<small>Lawrence House, Meadowbank Way, Eastwood, Nottingham, NG16 3BB Tel: 0870 600 6090 www.hspconsulting.com</small>				
Client Oakmere Homes Ltd				
Project Land of Chatburn Road, Clitheroe				
Title Ground Investigation Layout Plan				
Scale (A1) NTS	Drawn by. DRS	Drg. No. C2099-501	Rev.	
Date: March 2015	Checked by. LB			

Appendix IV

SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
BH1		2.80-3.30	B	Grey sandy silty CLAY with abundant gravel	8.4	27	14	13	62									2.5kg Compaction
BH2		1.00-1.50	B	Grey brown gravelly sandy silty CLAY. Gravel is mudstone.	37	43	23	20	80									Particle Size Distribution 2.5kg Compaction
BH2		1.90-2.35	U	Soft to firm brown silty CLAY with abundant gravel and rootlets														Oedometer consolidation
BH2		2.70-3.20	B	Grey brown gravelly sandy silty CLAY														Particle Size Distribution
BH2		3.50-3.80	B	Grey brown sandy silty clayey GRAVEL. Gravel is fine to cobble sized limestone.	4.9	24	13	11	28									Particle Size Distribution Compaction cancelled - insufficient material
BH2		3.50	U	Firm to stiff grey sandy gravelly CLAY	9.9					2.29	2.08	35	196	98				
BH3		1.10-1.60	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.	14	28	16	12	54									Particle Size Distribution Compaction cancelled - unsuitable material, too much coarse gravel present
BH3		1.80-2.20	U	Firm grey silty CLAY with abundant gravel	9.5	24	15	9.0	60									Oedometer consolidation
BH3		2.70-3.20	B	Dark grey-brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.	10	27	14	13	47									
BH3		3.70-4.15	U	Soft to firm grey brown sandy gravelly silty CLAY. Gravel is fine to medium.	12					2.39	2.13	37 74	87 90	44				
TP10		0.60	B	Brown sandy silty CLAY with rare fine to medium gravel														Particle Size Distribution California Bearing Ratio
TP10		1.50	B	Brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.	18	36	17	19	56									



Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by  Operations Manager 27/04/2015	Project Number: <p style="text-align: center;">GEO / 22476</p> Project Name: <p style="text-align: center;">C2099 CLITHEROE</p>	
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SUMMARY OF GEOTECHNICAL TESTING

Sample details					Classification Tests					Density Tests		Undrained Triaxial Compression			Chemical Tests			Other tests and comments
Borehole / Trial Pit	Sample Ref	Depth (m)	Type	Description	MC (%)	LL (%)	PL (%)	PI (%)	<425 µm (%)	Bulk Mg/m³	Dry Mg/m³	Cell Pressure kPa	Deviator Stress kPa	Shear Stress kPa	pH	2:1 W/S SO4 (g/L)	W/S Mg (mg/L)	
TP10		2.40	B	Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.														Particle Size Distribution
TP2		0.80	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized														California Bearing Ratio
TP3		0.50	B	Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized limestone.														Particle Size Distribution California Bearing Ratio
TP3		1.50	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.	17	37	18	19	56									Particle Size Distribution Compaction cancelled - unsuitable material, too much coarse gravel present
TP4		0.60	B	Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized sandstone.														California Bearing Ratio
TP5		0.50	B	Brown sandy silty CLAY with rare fine to medium gravel														Particle Size Distribution
TP5		1.60	B	Brown mottled orange sandy gravelly silty CLAY. Gravel includes cobble sized gravel with rare rootlets.	17	36	20	16	67									
TP5		1.90	D	Brown sandy gravelly silty CLAY.	8.4	27	13	14	44									
TP6		0.50	B	Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.	28	41	19	22	86									California Bearing Ratio
TP6		1.50	B	Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.														Particle Size Distribution
TP7		0.50	D	Mottled brown grey and dark orange silty CLAY with rare rootlets.	28	51	27	24	100									
TP8		0.50	B	Brown sandy gravelly silty CLAY. Gravel is sandstone.														California Bearing Ratio

Sample type: B (Bulk disturb.) BLK (Block) C (Core) D (Disturbed) LB (Large Bulk dist.) U (Undisturbed)

Checked and Approved by  Operations Manager 27/04/2015	Project Number: <p style="text-align: center;">GEO / 22476</p> Project Name: <p style="text-align: center;">C2099 CLITHEROE</p>	
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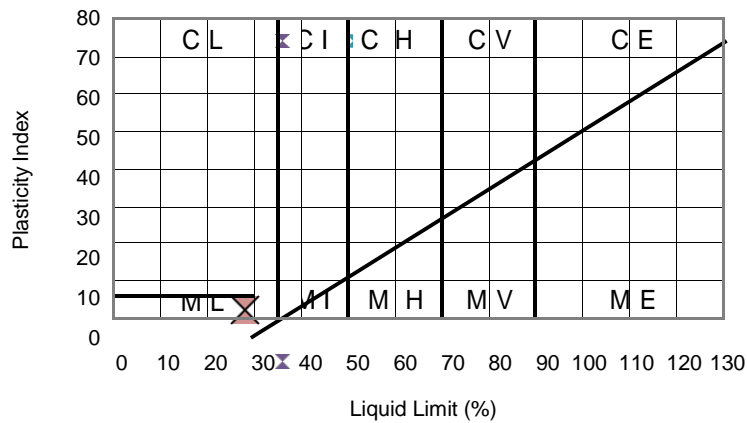
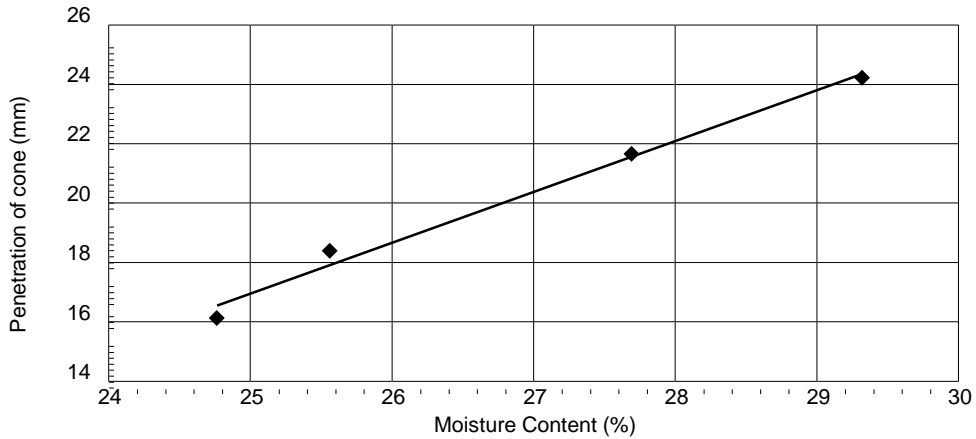
Liquid & Plastic Limits

Hole ID	BH1
Depth (m)	2.80-3.30
Sample Type	B

Description:
Grey sandy silty CLAY with abundant gravel

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	8.4 %
Percentage passing 425µm sieve :	62 %
Liquid Limit :	27 %
Plastic Limit :	14 %
Plasticity Index :	13
Equivalent moisture content of material passing 425µm sieve :	14 %
Liquidity Index :	-0.03



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Operations Manager
27/04/2015

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Project Name:
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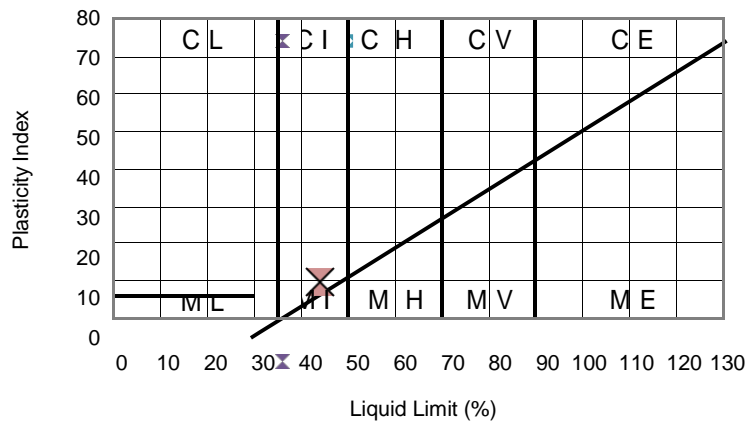
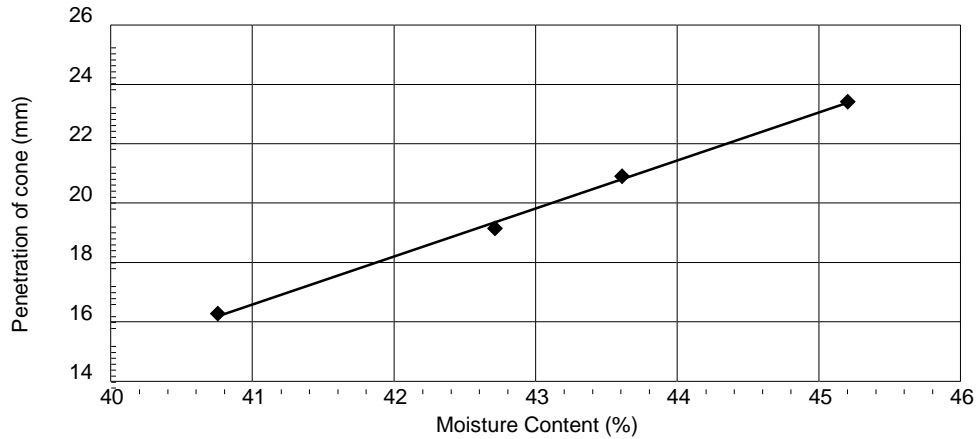
Liquid & Plastic Limits

Hole ID	BH2
Depth (m)	1.00-1.50
Sample Type	B

Description:
Grey brown gravelly sandy silty CLAY. Gravel is mudstone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	37 %
Percentage passing 425µm sieve :	80 %
Liquid Limit :	43 %
Plastic Limit :	23 %
Plasticity Index :	20
Equivalent moisture content of material passing 425µm sieve :	46 %
Liquidity Index :	1.17



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27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



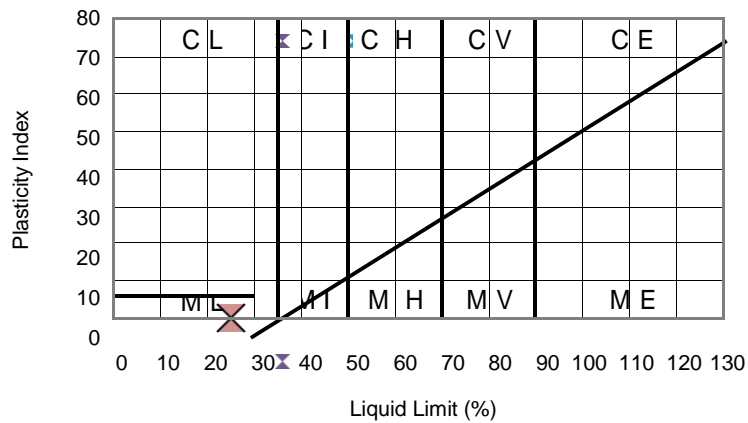
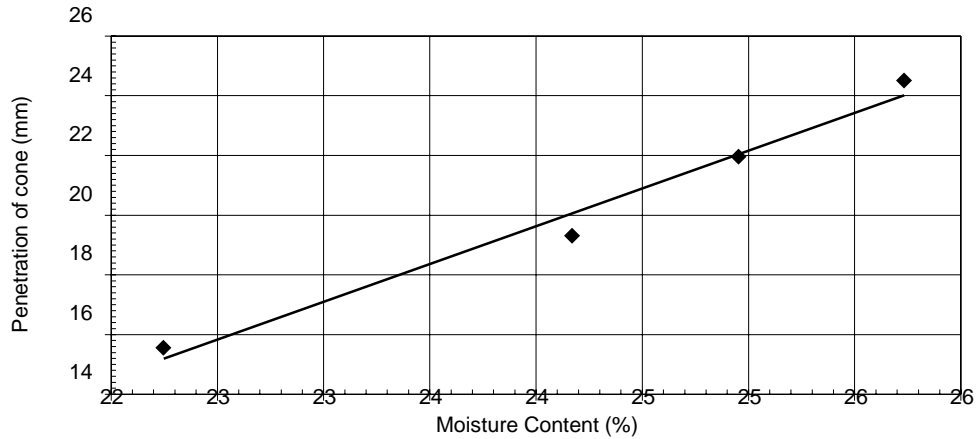
Liquid & Plastic Limits

Hole ID	BH2
Depth (m)	3.50-3.80
Sample Type	B

Description:
 Grey brown sandy silty clayey GRAVEL. Gravel is fine to cobble sized limestone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	4.9 %
Percentage passing 425µm sieve :	28 %
Liquid Limit :	24 %
Plastic Limit :	13 %
Plasticity Index :	11
Equivalent moisture content of material passing 425µm sieve :	18 %
Liquidity Index :	0.42



Checked and Approved by:

 Operations Manager
 27/04/2015

Project Number: **GEO / 22476**
 Project Name: **C2099 CLITHEROE**



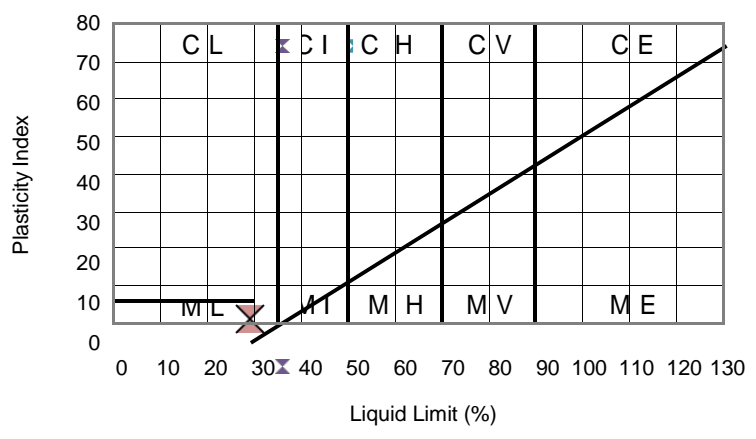
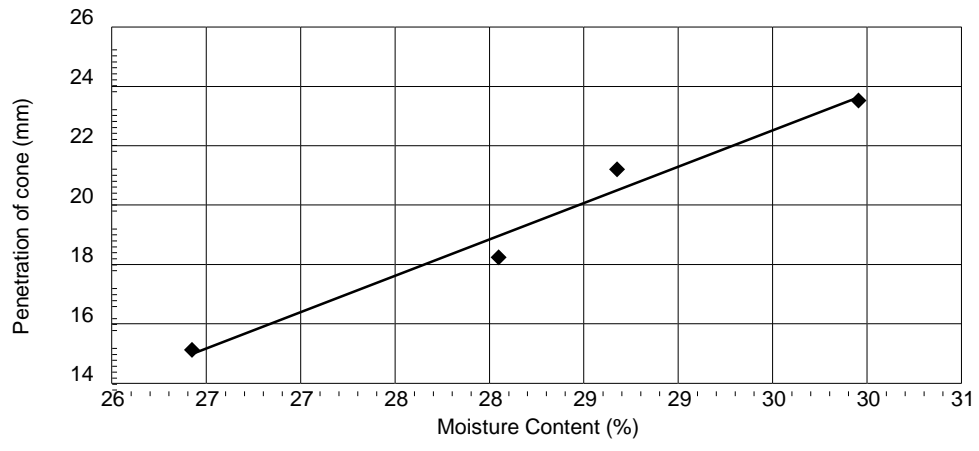
Liquid & Plastic Limits

Hole ID	BH3
Depth (m)	1.10-1.60
Sample Type	B

Description:
Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	14 %
Percentage passing 425µm sieve :	54 %
Liquid Limit :	28 %
Plastic Limit :	16 %
Plasticity Index :	12
Equivalent moisture content of material passing 425µm sieve :	26 %
Liquidity Index :	0.84



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Operations Manager
27/04/2015

Project Number:
GEO / 22476

Project Name:
C2099 CLITHEROE



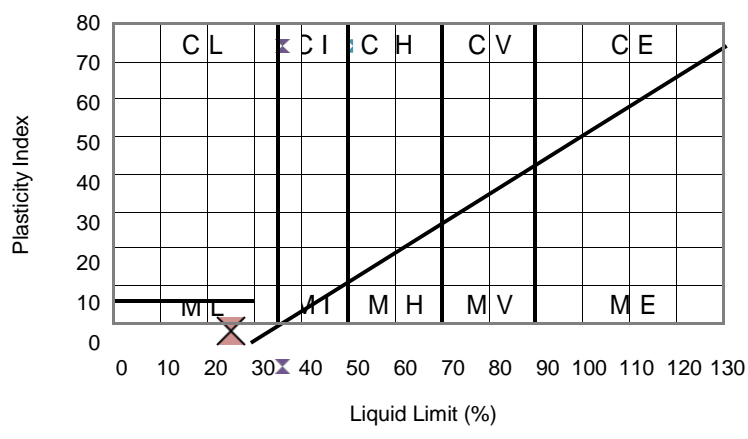
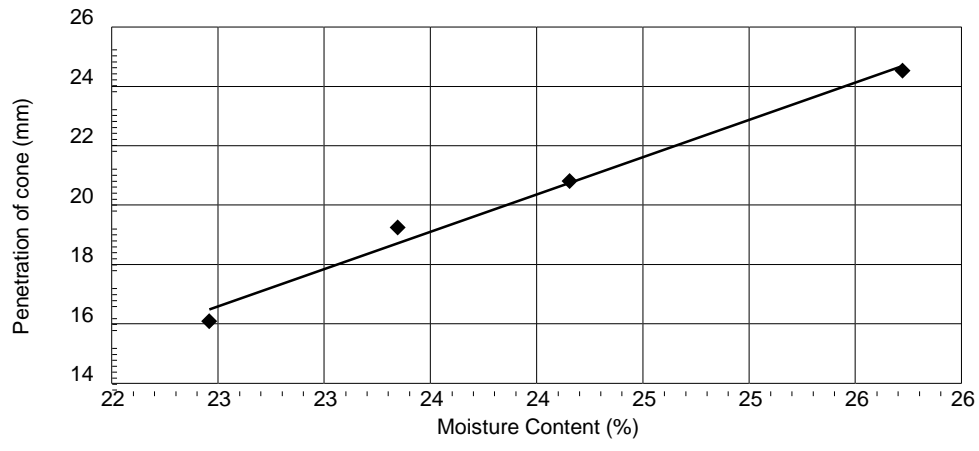
Liquid & Plastic Limits

Hole ID	BH3
Depth (m)	1.80-2.20
Sample Type	U

Description:
Firm grey silty CLAY with abundant gravel

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	9.5 %
Percentage passing 425µm sieve :	60 %
Liquid Limit :	24 %
Plastic Limit :	15 %
Plasticity Index :	9.0
Equivalent moisture content of material passing 425µm sieve :	16 %
Liquidity Index :	0.08



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Operations Manager
27/04/2015

Project Number:
GEO / 22476

Project Name:
C2099 CLITHEROE



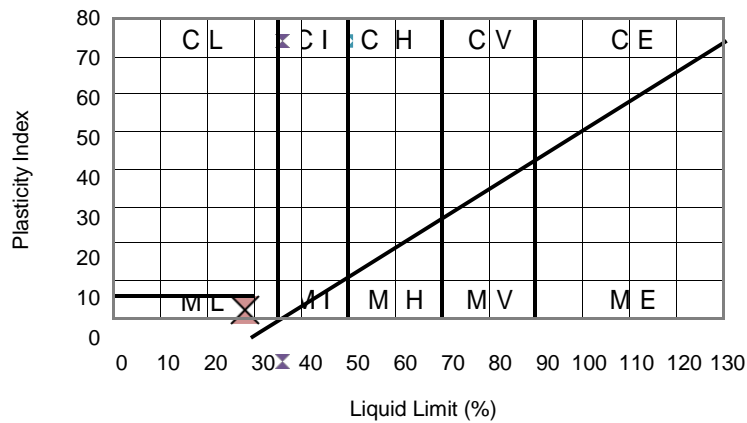
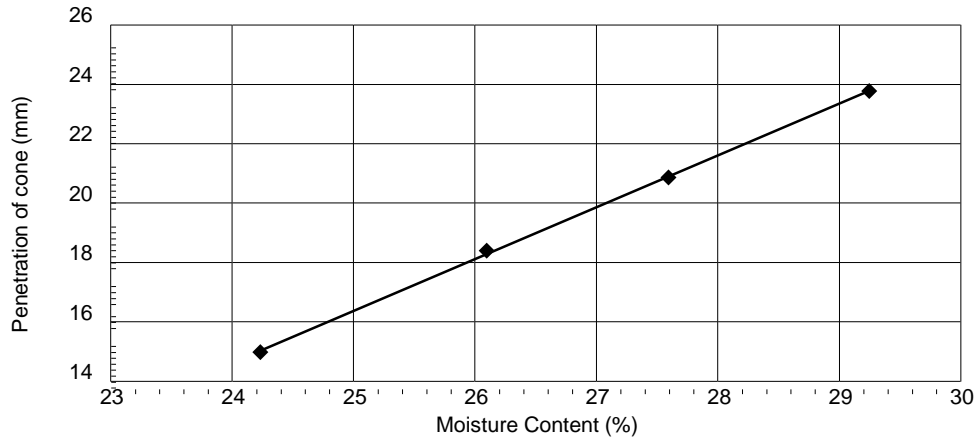
Liquid & Plastic Limits

Hole ID	BH3
Depth (m)	2.70-3.20
Sample Type	B

Description:
Dark grey-brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	10 %
Percentage passing 425µm sieve :	47 %
Liquid Limit :	27 %
Plastic Limit :	14 %
Plasticity Index :	13
Equivalent moisture content of material passing 425µm sieve :	21 %
Liquidity Index :	0.57



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Operations Manager
27/04/2015

Project Number:
GEO / 22476

Project Name:
C2099 CLITHEROE



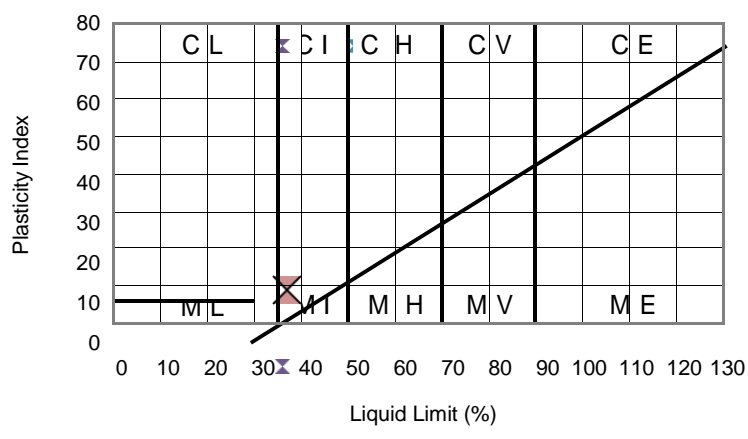
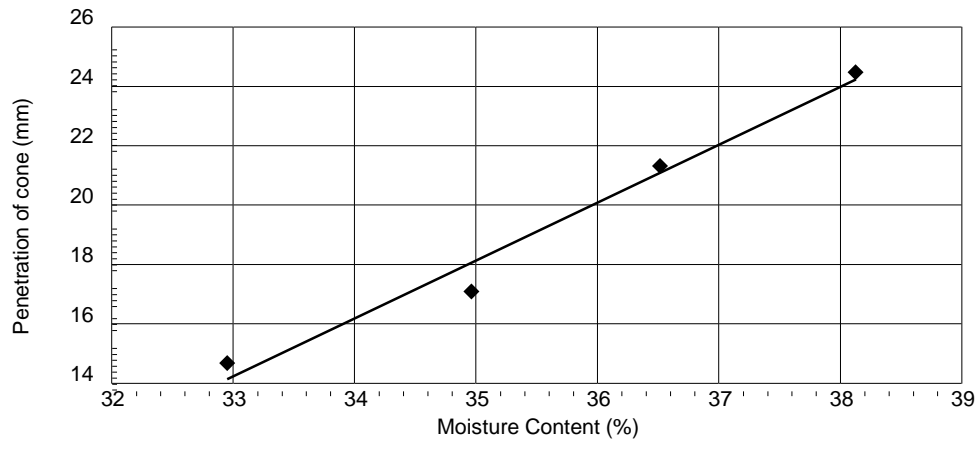
Liquid & Plastic Limits

Hole ID	TP10
Depth (m)	1.50
Sample Type	B

Description:
Brown sandy very gravelly silty CLAY. Gravel includes cobble sized gravel.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	18 %
Percentage passing 425µm sieve :	56 %
Liquid Limit :	36 %
Plastic Limit :	17 %
Plasticity Index :	19
Equivalent moisture content of material passing 425µm sieve :	32 %
Liquidity Index :	0.79



Checked and Approved by:

Operations Manager
27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



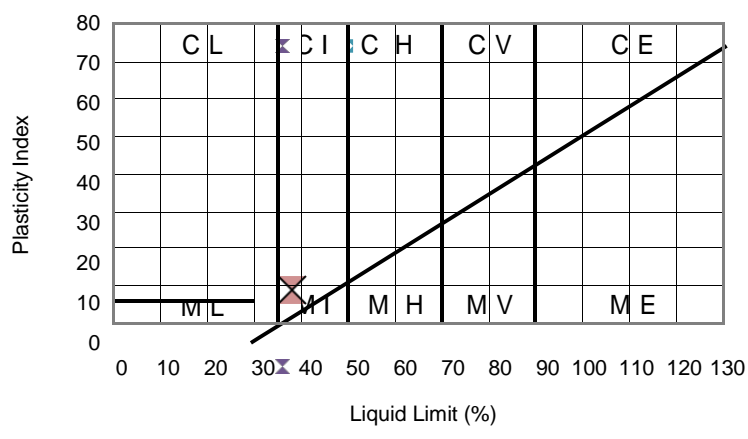
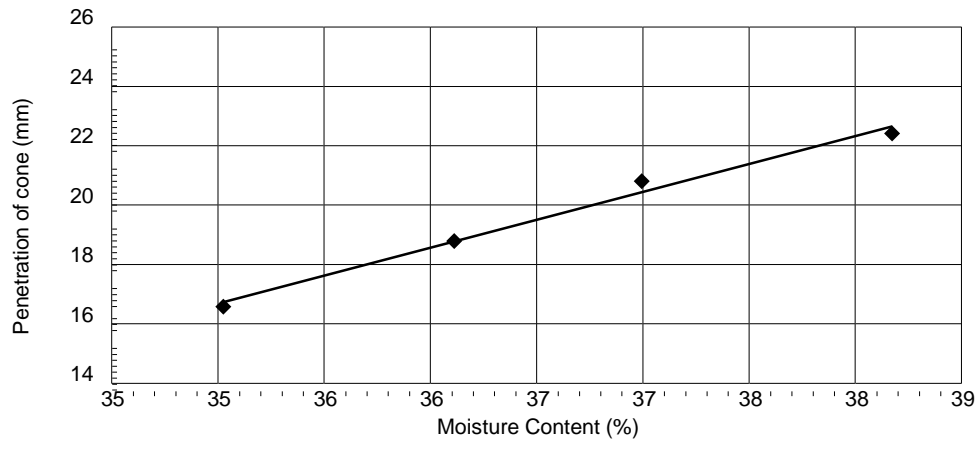
Liquid & Plastic Limits

Hole ID	TP3
Depth (m)	1.50
Sample Type	B

Description:
Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	17 %
Percentage passing 425µm sieve :	56 %
Liquid Limit :	37 %
Plastic Limit :	18 %
Plasticity Index :	19
Equivalent moisture content of material passing 425µm sieve :	31 %
Liquidity Index :	0.66



Checked and Approved by:

Operations Manager
27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



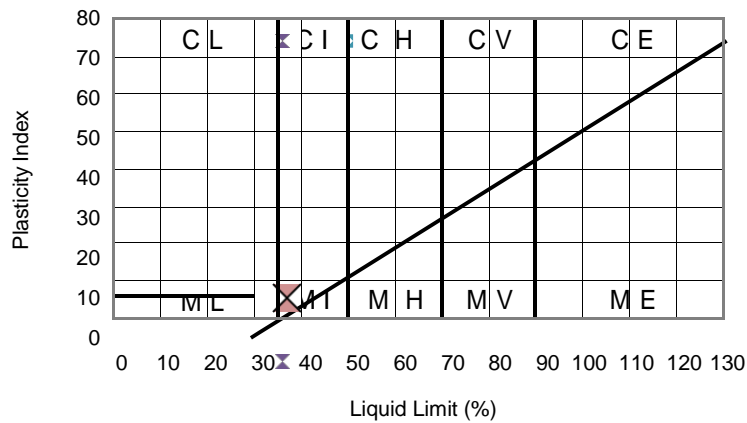
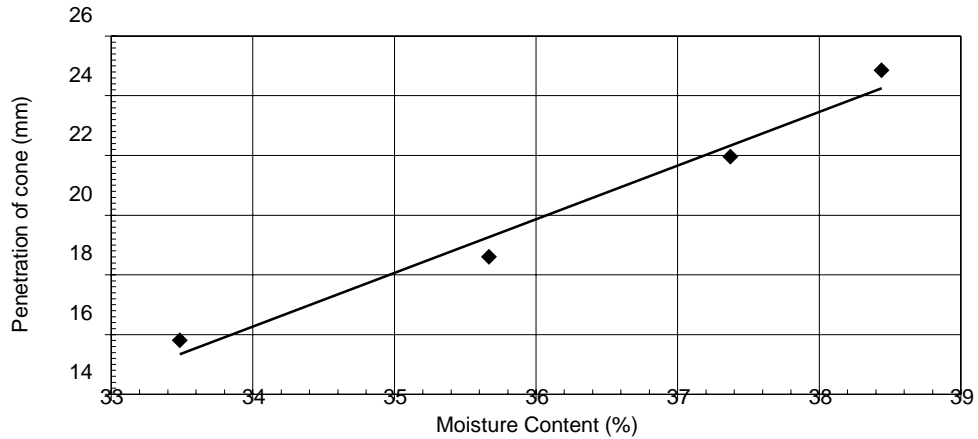
Liquid & Plastic Limits

Hole ID	TP5
Depth (m)	1.60
Sample Type	B

Description:
Brown mottled orange sandy gravelly silty CLAY. Gravel includes cobble sized gravel with rare rootlets.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	17 %
Percentage passing 425µm sieve :	67 %
Liquid Limit :	36 %
Plastic Limit :	20 %
Plasticity Index :	16
Equivalent moisture content of material passing 425µm sieve :	25 %
Liquidity Index :	0.33



Checked and Approved by:

Operations Manager
27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



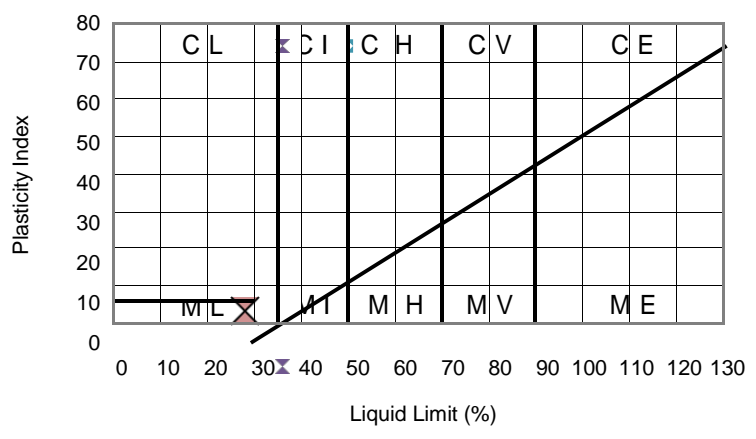
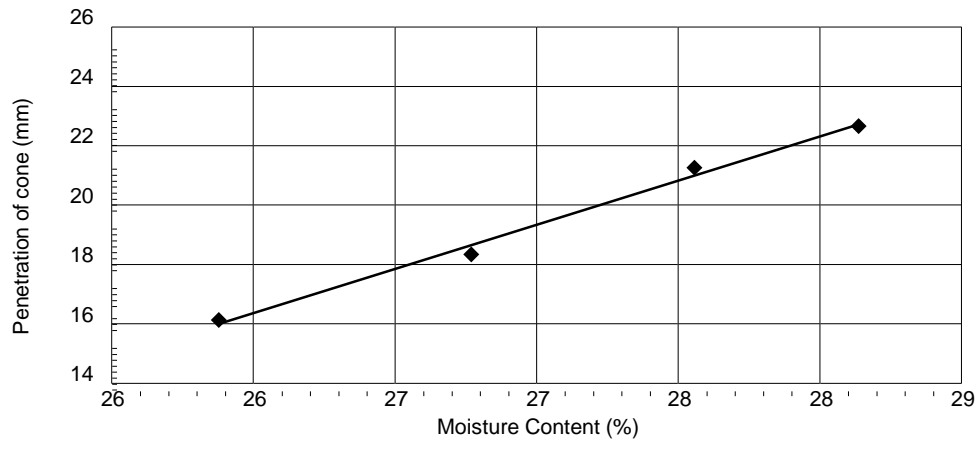
Liquid & Plastic Limits

Hole ID	TP5
Depth (m)	1.90
Sample Type	D

Description:
Brown sandy gravelly silty CLAY.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	8.4 %
Percentage passing 425µm sieve :	44 %
Liquid Limit :	27 %
Plastic Limit :	13 %
Plasticity Index :	14
Equivalent moisture content of material passing 425µm sieve :	19 %
Liquidity Index :	0.42



Checked and Approved by:

Operations Manager
27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



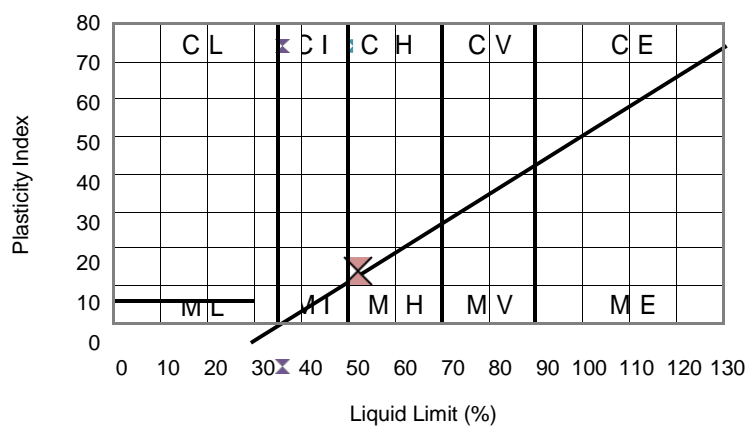
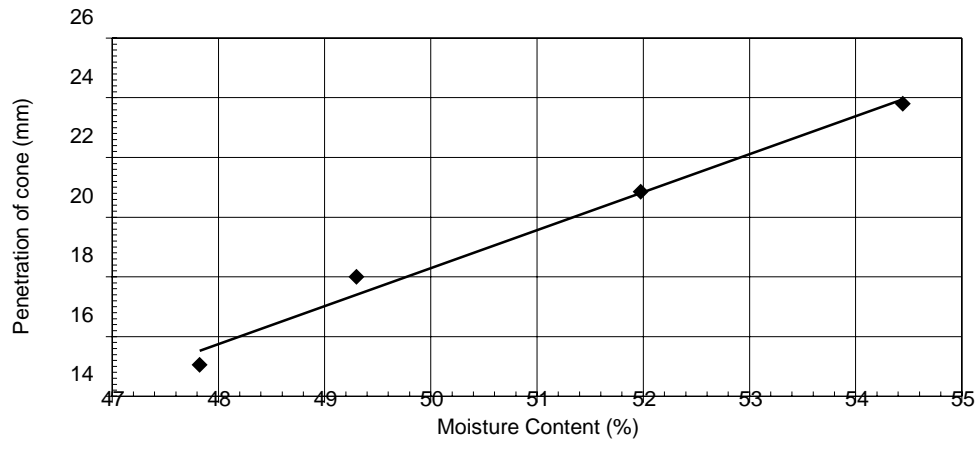
Liquid & Plastic Limits

Hole ID	TP7
Depth (m)	0.50
Sample Type	D

Description:
Mottled brown grey and dark orange silty CLAY with rare rootlets.

Preparation : Sample as received

Moisture content : (BS1377:Part 2:Clause 3:1990)	28 %
Percentage passing 425µm sieve :	100 %
Liquid Limit :	51 %
Plastic Limit :	27 %
Plasticity Index :	24
Equivalent moisture content of material passing 425µm sieve :	28 %
Liquidity Index :	0.04



Checked and Approved by:

Operations Manager
27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



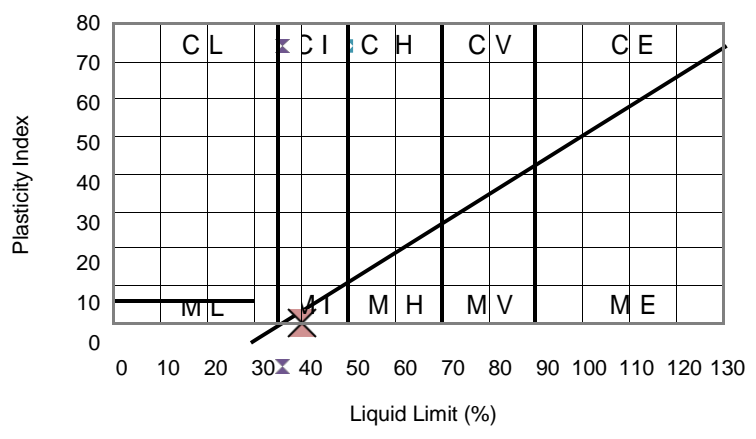
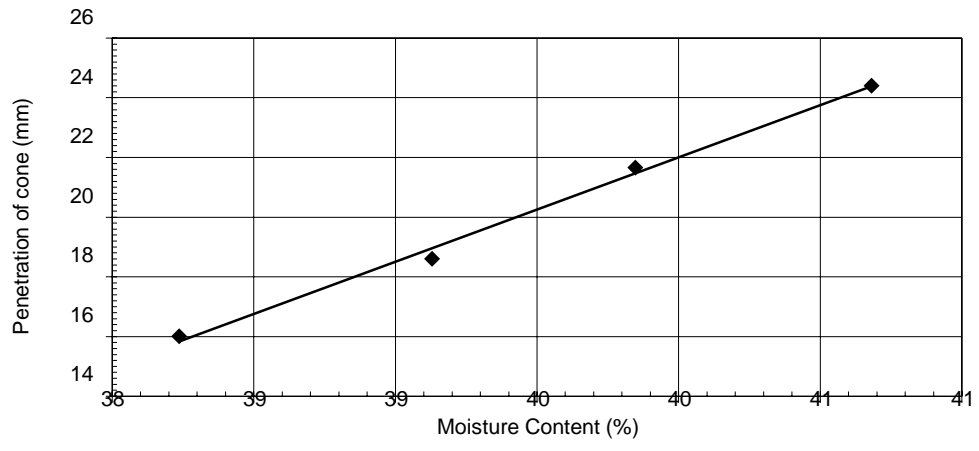
Liquid & Plastic Limits

Hole ID	TP9
Depth (m)	0.60
Sample Type	B

Description:
Brown gravelly sandy silty CLAY. Gravel is sandstone.

Preparation : Sample washed and air dried

Moisture content : (BS1377:Part 2:Clause 3:1990)	30 %
Percentage passing 425µm sieve :	73 %
Liquid Limit :	39 %
Plastic Limit :	28 %
Plasticity Index :	11
Equivalent moisture content of material passing 425µm sieve :	41 %
Liquidity Index :	1.19



Checked and Approved by:

Operations Manager
27/04/2015

Project Number: **GEO / 22476**
Project Name: **C2099 CLITHEROE**



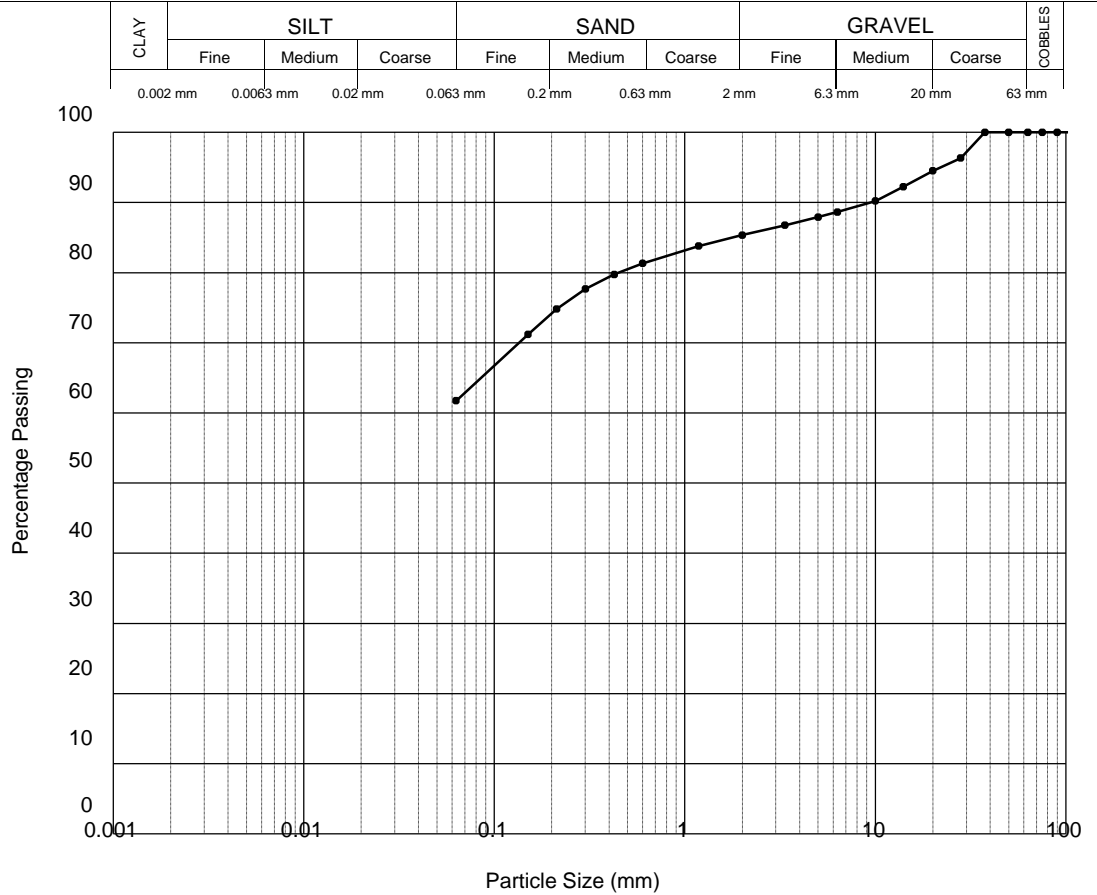
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH2
 Depth (m): 1.00-1.50
 Sample Type: B

Description:
 Grey brown gravelly sandy silty CLAY. Gravel is mudstone.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	96
20	94
14	92
10	90
6.3	89
5	88
3.35	87
2	85
1.18	84
0.6	81
0.425	80
0.3	78
0.212	75
0.15	71
0.063	62



Particle Proportions	
Cobbles	0.0 %
Gravel	14.7 %
Sand	23.6 %
Silt & Clay	61.8 %

Checked and Approved by

Operations Manager
 27/04/2015

Project Number:

GEO / 22476

Project Name:

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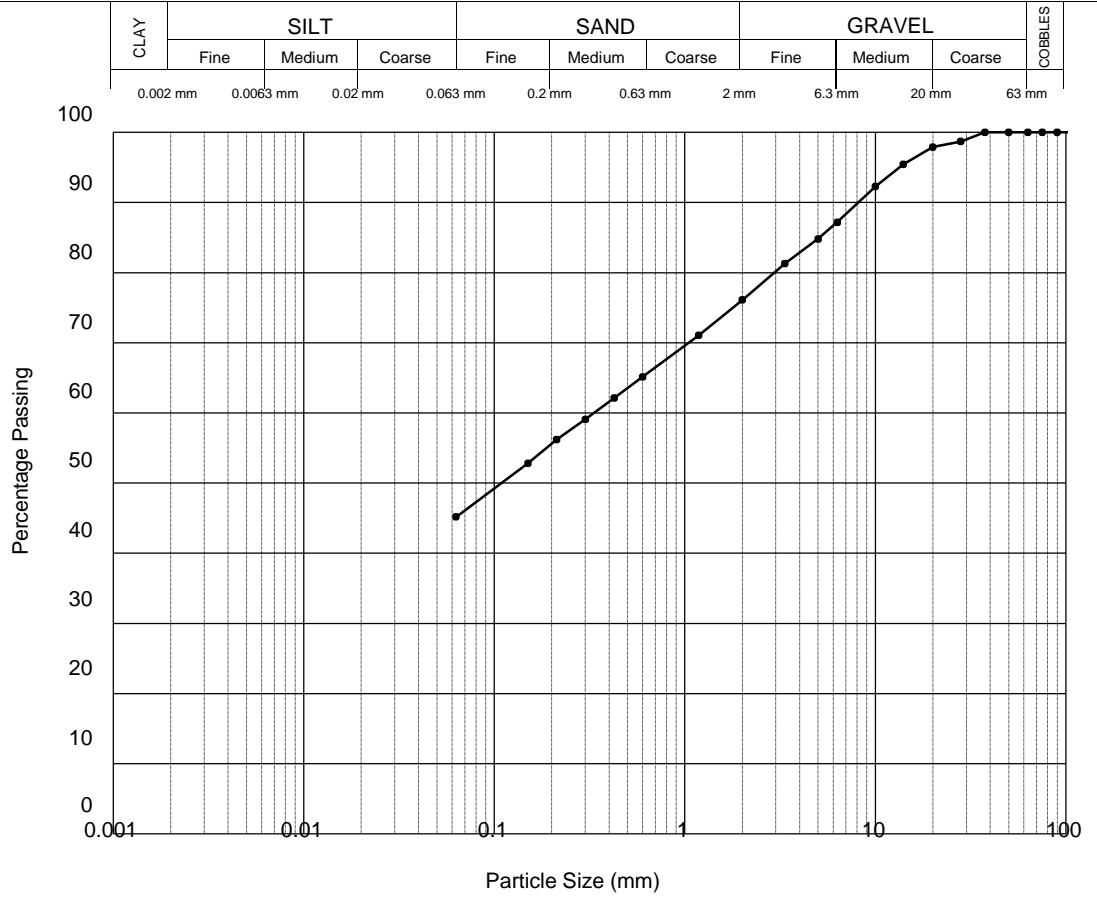
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH2
 Depth (m): 2.70-3.20
 Sample Type: B

Description:
 Grey brown gravelly sandy silty CLAY

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	99
20	98
14	95
10	92
6.3	87
5	85
3.35	81
2	76
1.18	71
0.6	65
0.425	62
0.3	59
0.212	56
0.15	53
0.063	45



Particle Proportions	
Cobbles	0.0 %
Gravel	23.9 %
Sand	30.9 %
Silt & Clay	45.2 %

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Project Name:

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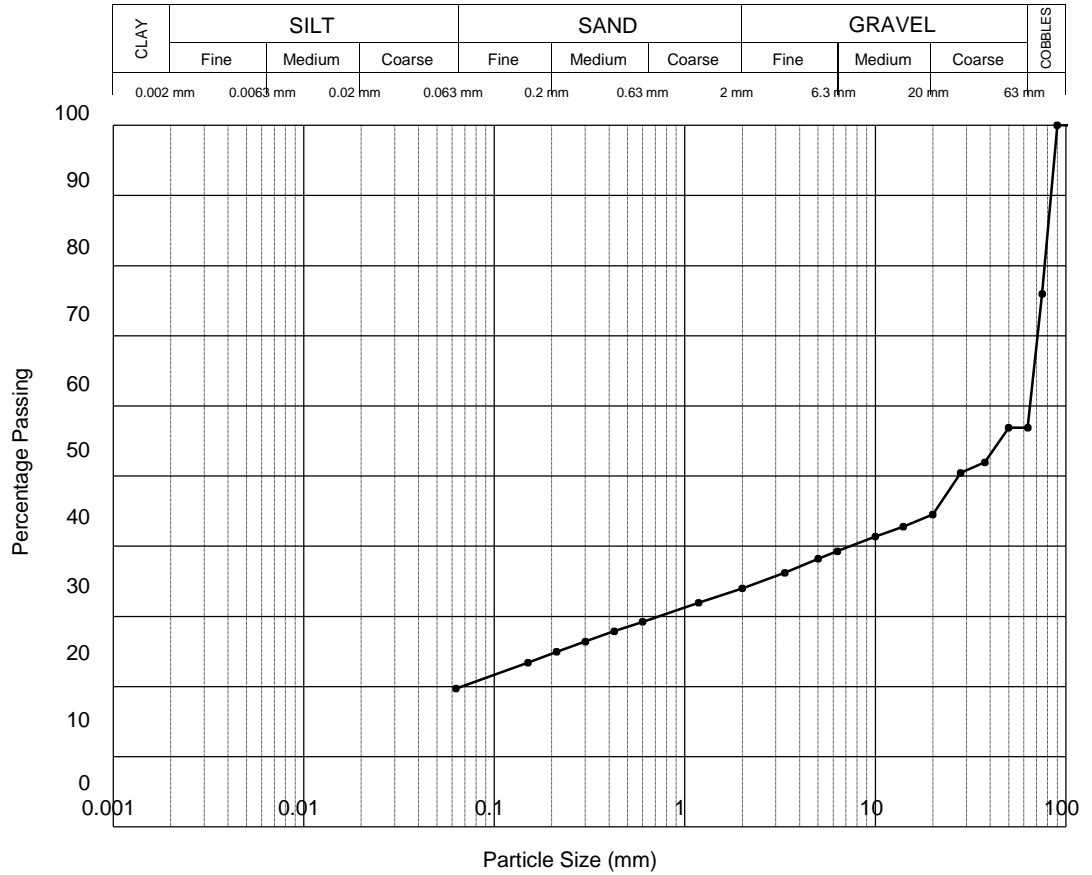
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH2
 Depth (m): 3.50-3.80
 Sample Type: B

Description:
 Grey brown sandy silty clayey GRAVEL. Gravel is fine to cobble sized limestone.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	76
63	57
50	57
37.5	52
28	50
20	45
14	43
10	41
6.3	39
5	38
3.35	36
2	34
1.18	32
0.6	29
0.425	28
0.3	26
0.212	25
0.15	23
0.063	20



Particle Proportions	
Cobbles	43.1 %
Gravel	22.9 %
Sand	14.3 %
Silt & Clay	19.7 %

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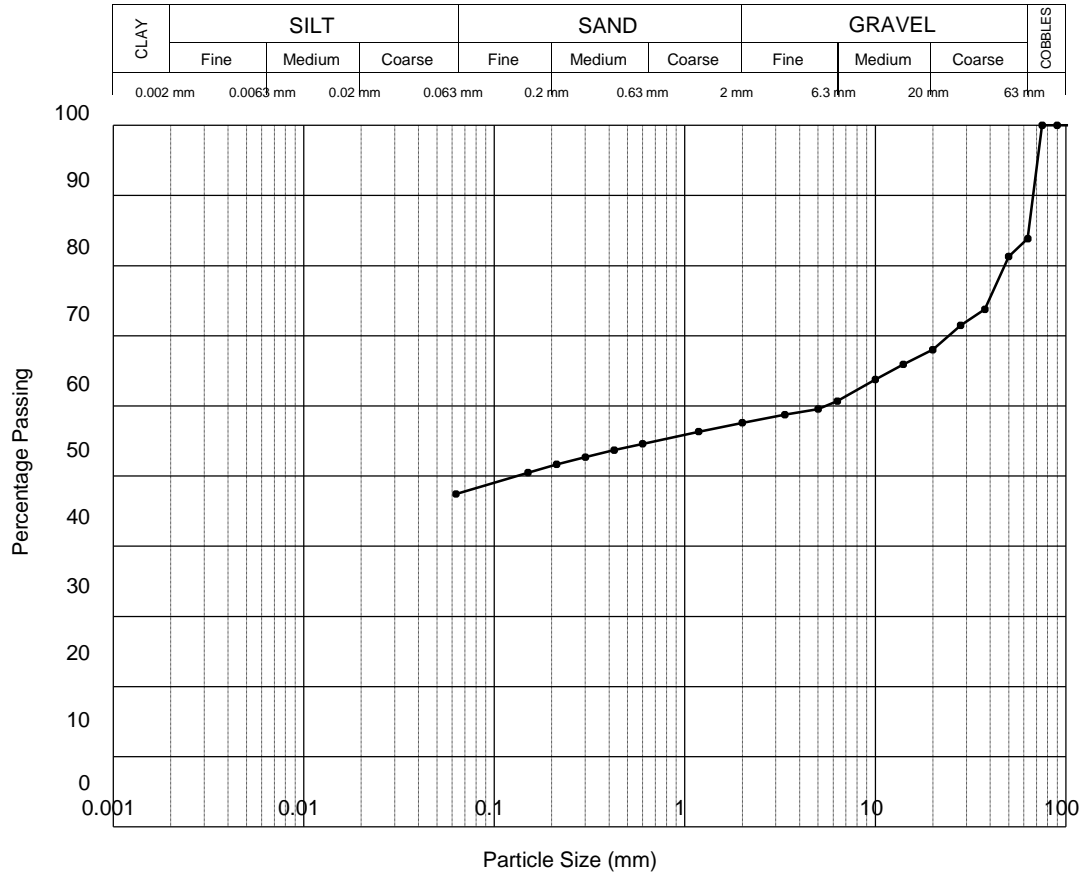
PARTICLE SIZE DISTRIBUTION

BH/TP No: BH3
 Depth (m): 1.10-1.60
 Sample Type: B

Description:
 Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	84
50	81
37.5	74
28	71
20	68
14	66
10	64
6.3	61
5	60
3.35	59
2	58
1.18	56
0.6	55
0.425	54
0.3	53
0.212	52
0.15	50
0.063	47



Particle Proportions	
Cobbles	16.2 %
Gravel	26.2 %
Sand	10.1 %
Silt & Clay	47.5 %

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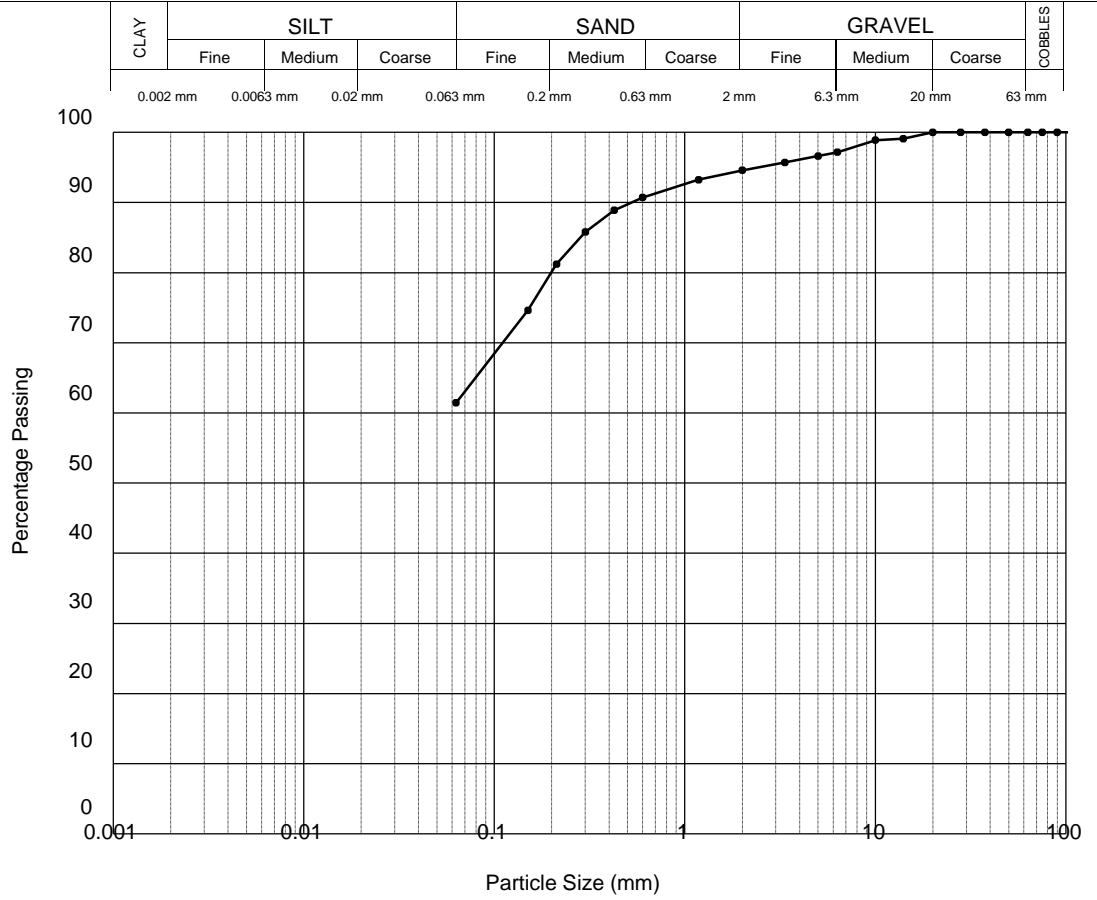
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP10
 Depth (m): 0.60
 Sample Type: B

Description:
 Brown sandy silty CLAY with rare fine to medium gravel

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	99
6.3	97
5	97
3.35	96
2	95
1.18	93
0.6	91
0.425	89
0.3	86
0.212	81
0.15	75
0.063	61



Particle Proportions	
Cobbles	0.0 %
Gravel	5.4 %
Sand	33.1 %
Silt & Clay	61.5 %

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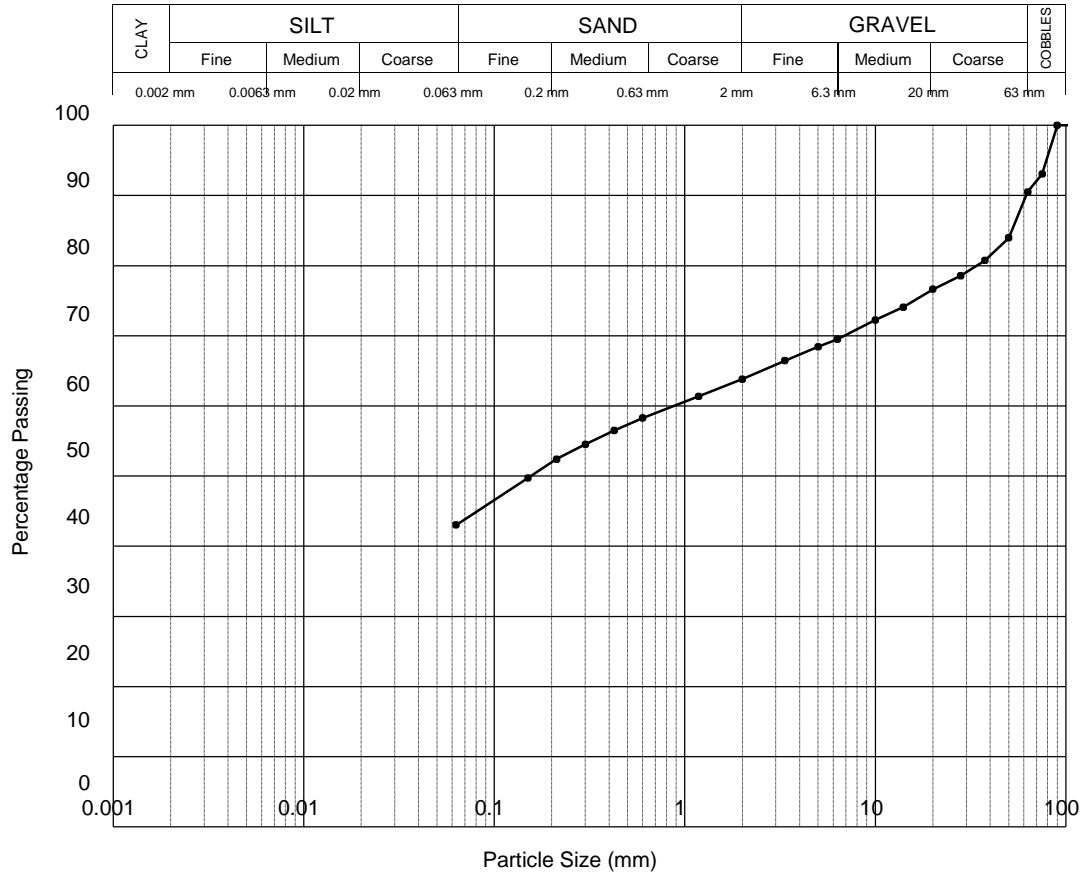
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP10
 Depth (m): 2.40
 Sample Type: B

Description:
 Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	93
63	91
50	84
37.5	81
28	79
20	77
14	74
10	72
6.3	70
5	68
3.35	66
2	64
1.18	61
0.6	58
0.425	56
0.3	55
0.212	52
0.15	50
0.063	43



Particle Proportions	
Cobbles	9.5 %
Gravel	26.7 %
Sand	20.8 %
Silt & Clay	43.0 %

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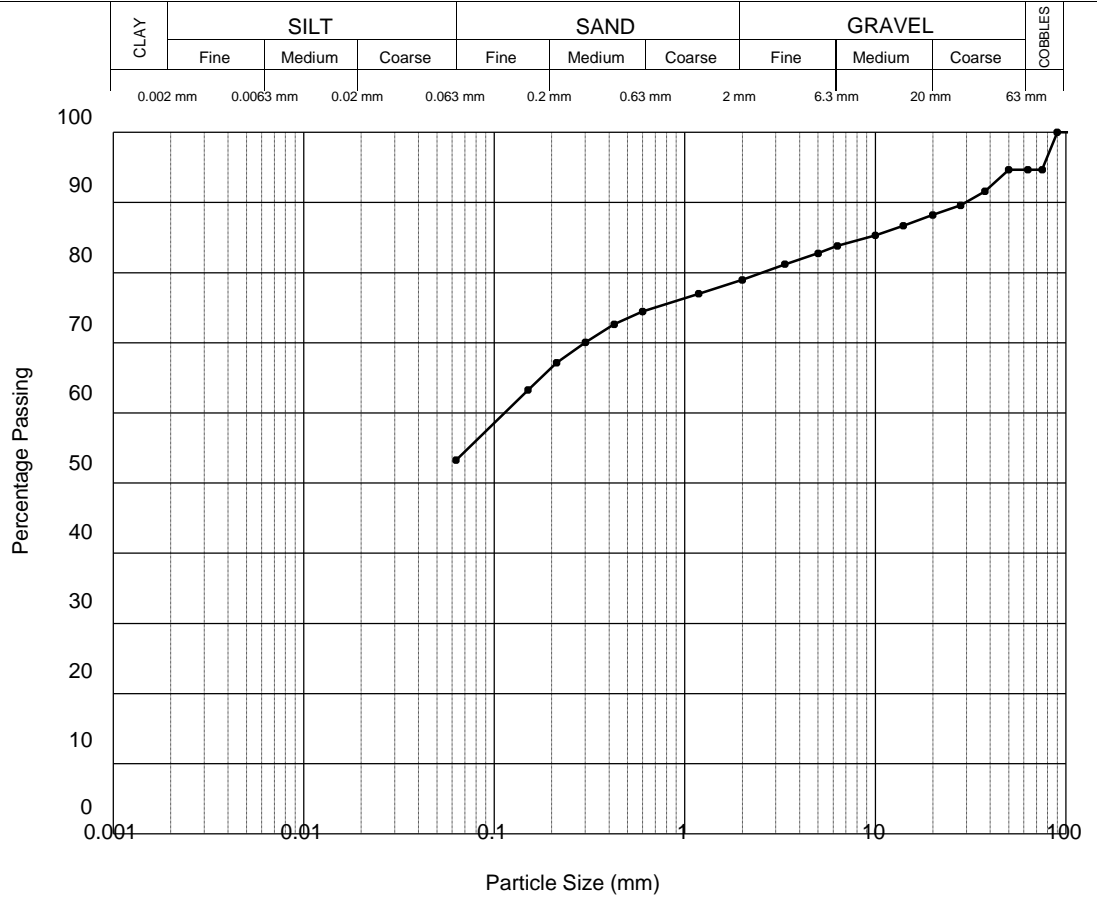
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP3
 Depth (m): 0.50
 Sample Type: B

Description:
 Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized limestone.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	95
63	95
50	95
37.5	92
28	90
20	88
14	87
10	85
6.3	84
5	83
3.35	81
2	79
1.18	77
0.6	74
0.425	73
0.3	70
0.212	67
0.15	63
0.063	53



Particle Proportions	
Cobbles	5.3 %
Gravel	15.7 %
Sand	25.7 %
Silt & Clay	53.3 %

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PARTICLE SIZE DISTRIBUTION

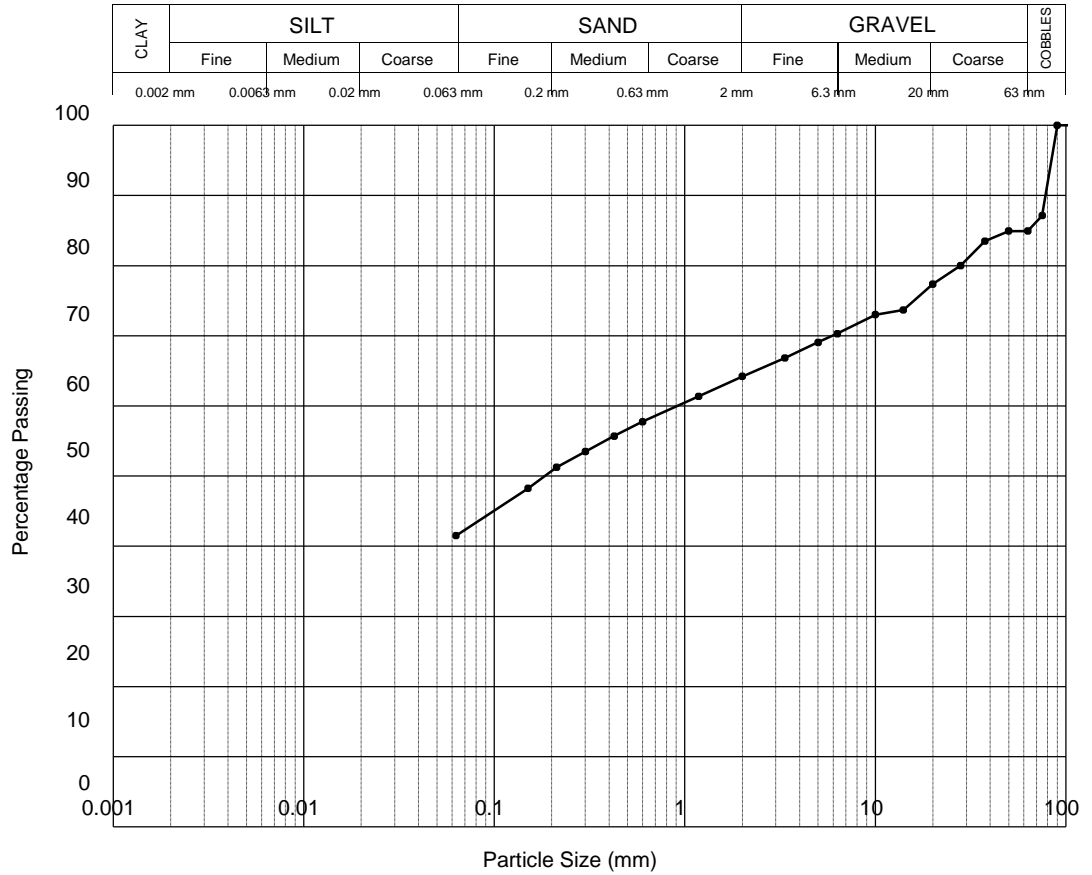
BH/TP No:
Depth (m):
Sample Type

TP3
1.50
B

Description:
Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized limestone.
Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	87
63	85
50	85
37.5	83
28	80
20	77
14	74
10	73
6.3	70
5	69
3.35	67
2	64
1.18	61
0.6	58
0.425	56
0.3	53
0.212	51
0.15	48
0.063	42



Particle Proportions	
Cobbles	15.1 %
Gravel	20.7 %
Sand	22.7 %
Silt & Clay	41.5 %

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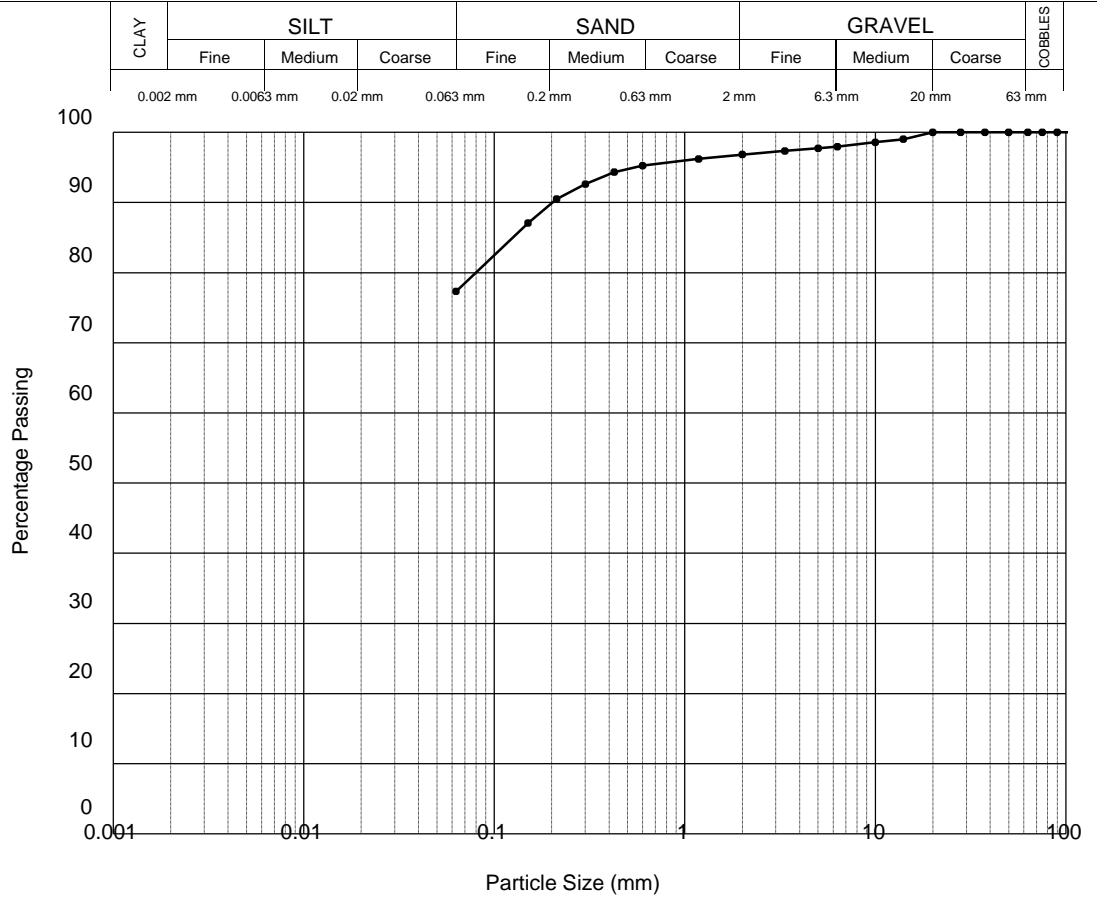
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP5
 Depth (m): 0.50
 Sample Type: B

Description:
 Brown sandy silty CLAY with rare fine to medium gravel

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	100
37.5	100
28	100
20	100
14	99
10	99
6.3	98
5	98
3.35	97
2	97
1.18	96
0.6	95
0.425	94
0.3	93
0.212	90
0.15	87
0.063	77



Particle Proportions	
Cobbles	0.0 %
Gravel	3.2 %
Sand	19.5 %
Silt & Clay	77.3 %

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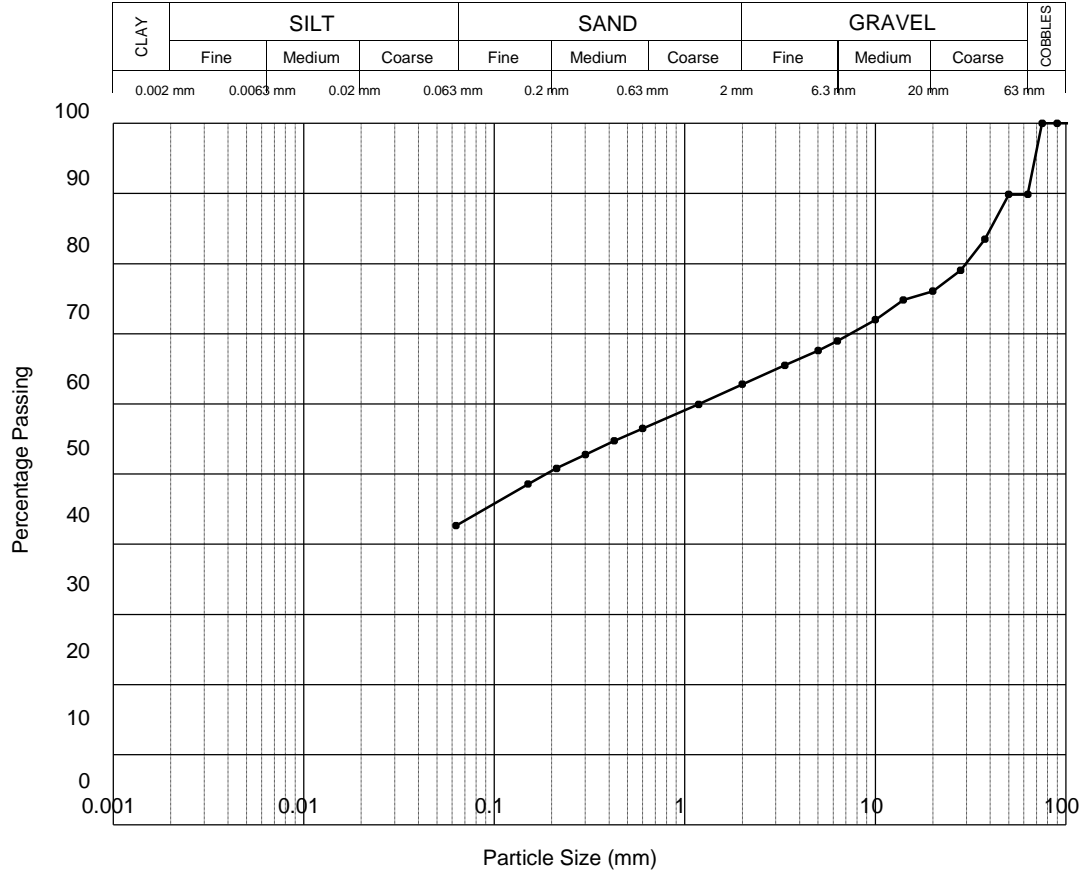
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP6
 Depth (m): 1.50
 Sample Type: B

Description:
 Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.
 Insufficient material supplied to be representative in accordance with BS1377 requirements.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	90
50	90
37.5	83
28	79
20	76
14	75
10	72
6.3	69
5	68
3.35	66
2	63
1.18	60
0.6	57
0.425	55
0.3	53
0.212	51
0.15	49
0.063	43



Particle Proportions	
Cobbles	10.2 %
Gravel	27.0 %
Sand	20.2 %
Silt & Clay	42.6 %

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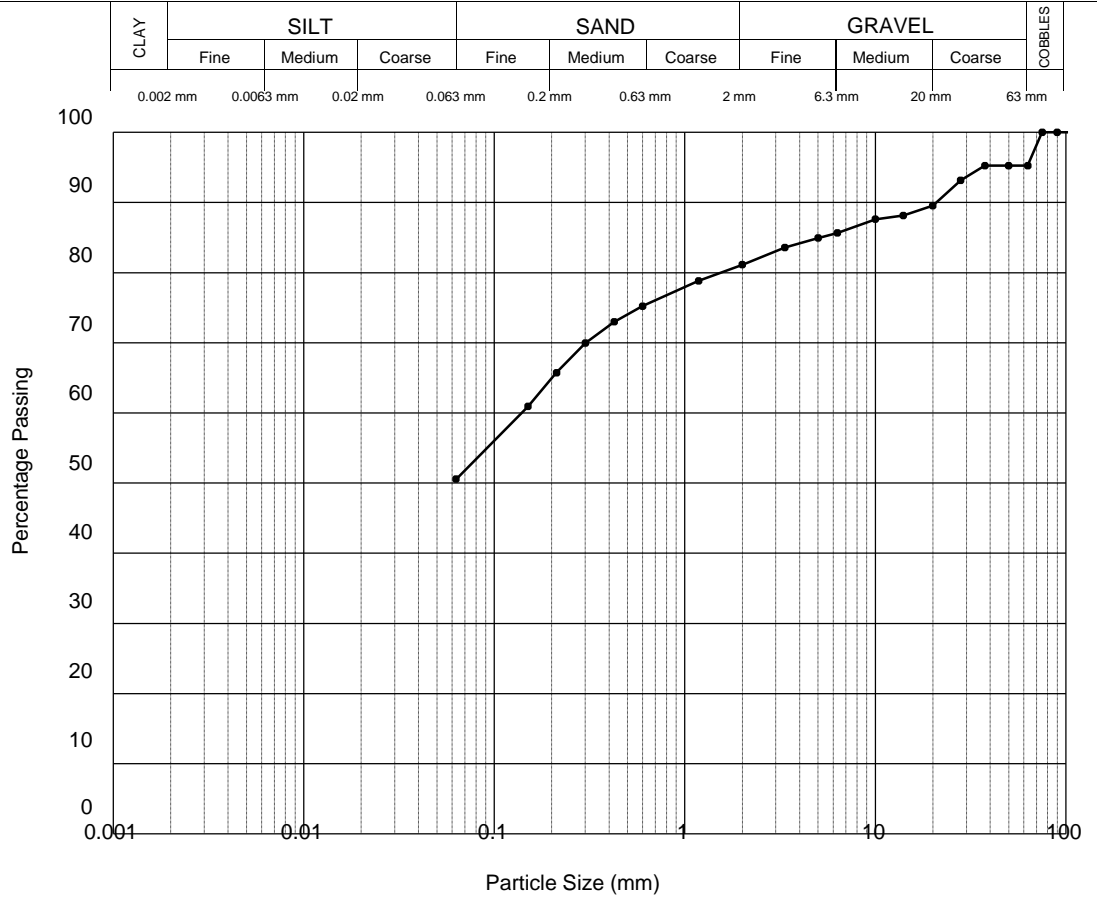
PARTICLE SIZE DISTRIBUTION

BH/TP No: TP9
 Depth (m): 0.60
 Sample Type: B

Description:
 Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	95
50	95
37.5	95
28	93
20	90
14	88
10	88
6.3	86
5	85
3.35	84
2	81
1.18	79
0.6	75
0.425	73
0.3	70
0.212	66
0.15	61
0.063	51



Particle Proportions	
Cobbles	4.7 %
Gravel	14.1 %
Sand	30.6 %
Silt & Clay	50.6 %

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PARTICLE SIZE DISTRIBUTION

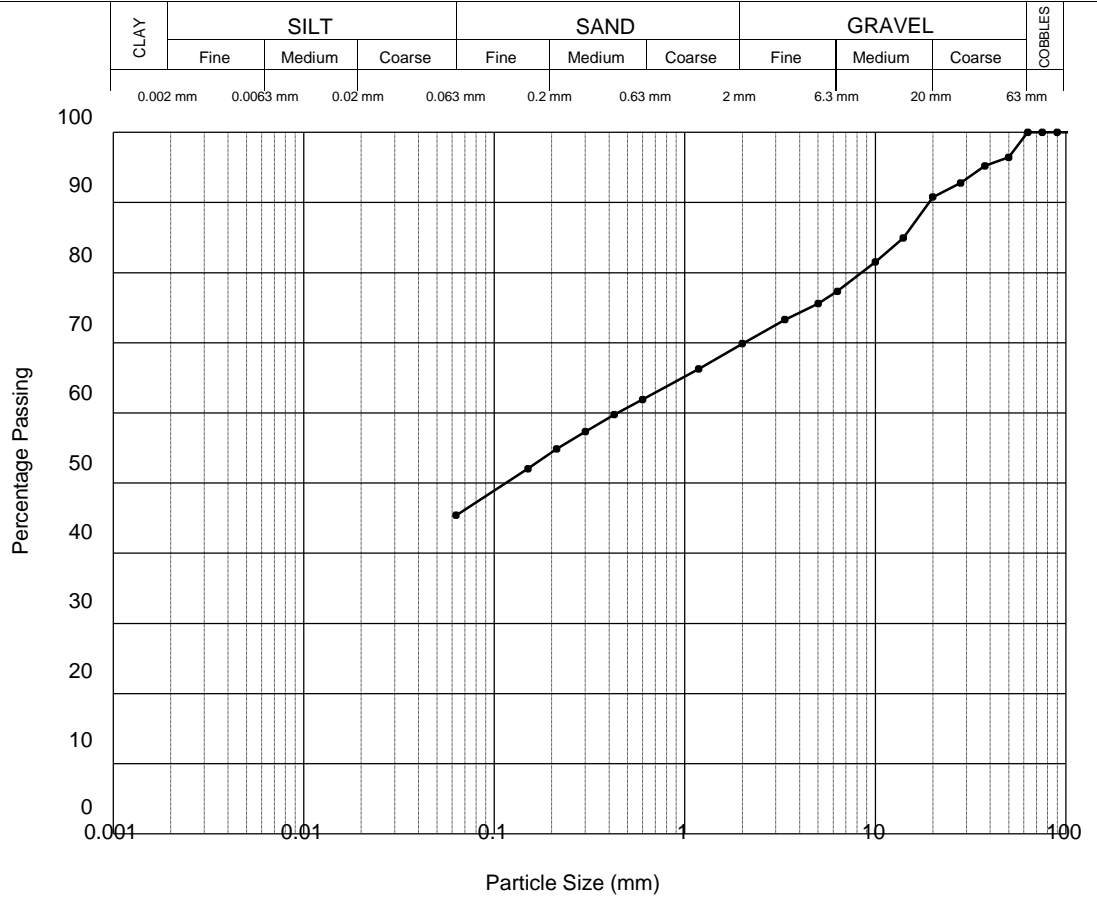
BH/TP No:
Depth (m):
Sample Type

TP9
1.50
B

Description:
Grey brown sandy gravelly silty CLAY.

BS1377 : Part 2 : Clause 9.2 : 1990 Wet Sieving Method

Sieve	
Sieve (mm)	% pass
200	100
125	100
90	100
75	100
63	100
50	96
37.5	95
28	93
20	91
14	85
10	82
6.3	77
5	76
3.35	73
2	70
1.18	66
0.6	62
0.425	60
0.3	57
0.212	55
0.15	52
0.063	45



Particle Proportions	
Cobbles	0.0 %
Gravel	30.1 %
Sand	24.5 %
Silt & Clay	45.4 %

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Moisture Content / Dry Density Relationship

BH/TP BH1
 Depth (m) 2.80-3.30
 Sample Type B

Description:

Grey sandy silty CLAY with abundant gravel

Preparation

Air dried / Oven dried

Test Method

2.5kg Rammer for soils with some coarse gravel-size particles

Samples Used

Single / Multiple

Mass Retained on 37.5 mm Sieve

%

9

Mass Retained on 20.0 mm Sieve

%

15

Particle Density - Assumed

Mg/m³

2.72

Maximum Dry Density

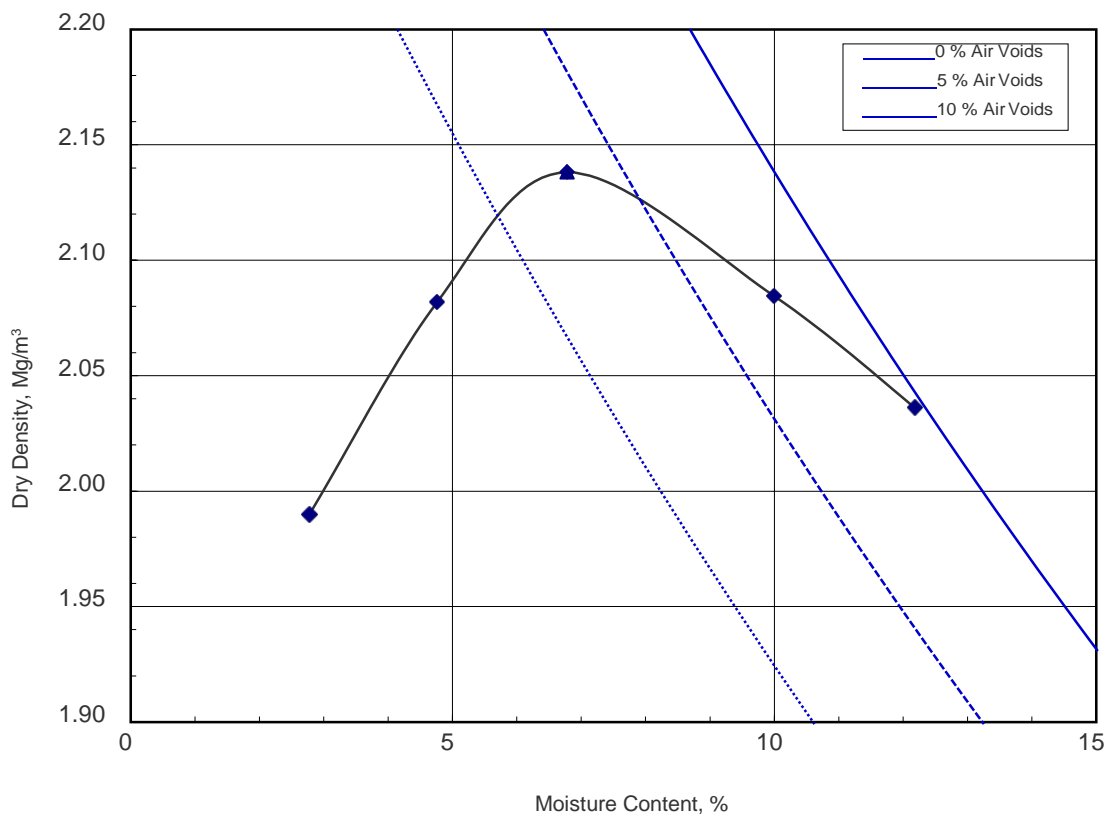
Mg/m³

2.14

Optimum Moisture Content

%

6.8



Determination	1	2	3	4	5	
Moisture Content	%	2.8	4.8	6.8	10.0	12
Dry Density	Mg/m ³	1.99	2.08	2.14	2.08	2.04

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Moisture Content / Dry Density Relationship

BH/TP
Depth (m)
Sample Type

BH2
1.00-1.50
B

Description:

Brown sandy silty CLAY with rare gravel

Preparation

Air dried / Oven dried

Test Method

2.5kg Rammer for soils with some coarse gravel-size particles

Samples Used

Single / Multiple

Mass Retained on 37.5 mm Sieve

%

9

Mass Retained on 20.0 mm Sieve

%

15

Particle Density - Assumed

Mg/m³

2.72

Maximum Dry Density

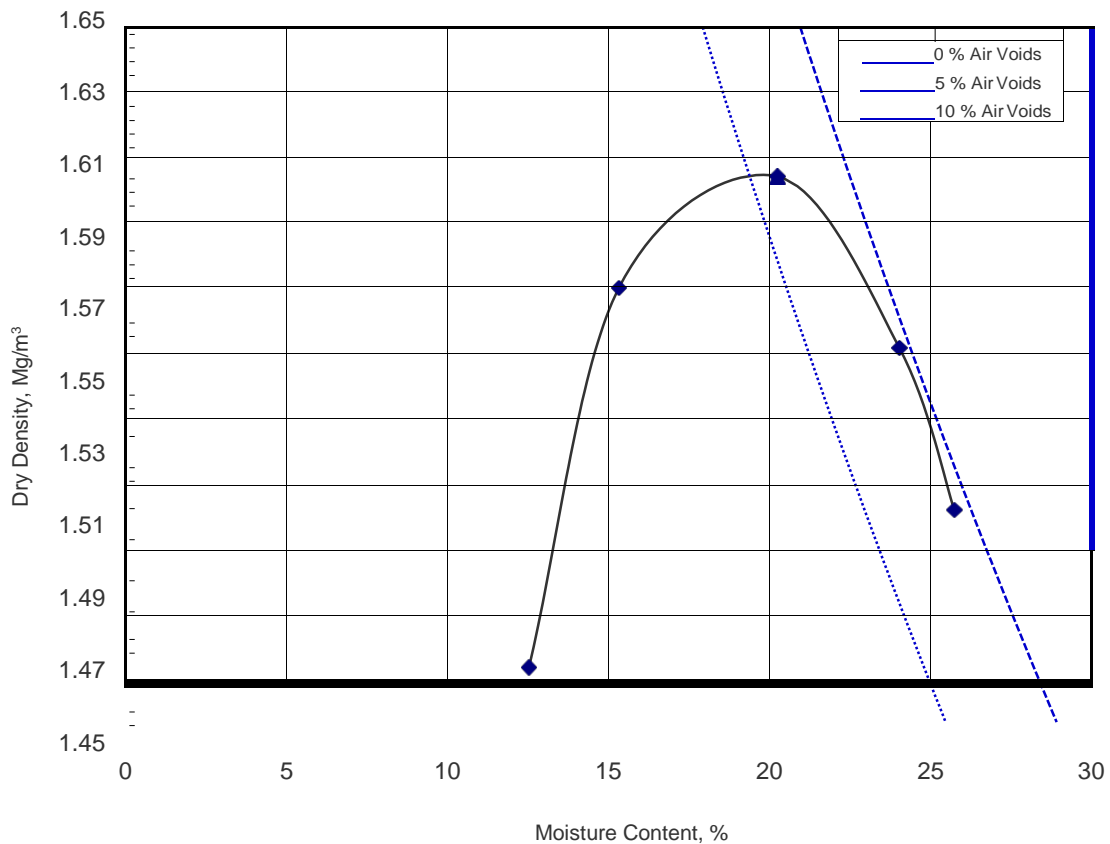
Mg/m³

1.61

Optimum Moisture Content

%

20.1



Determination	1	2	3	4	5	
Moisture Content	%	12	15	20	24	26
Dry Density	Mg/m ³	1.47	1.57	1.61	1.56	1.51

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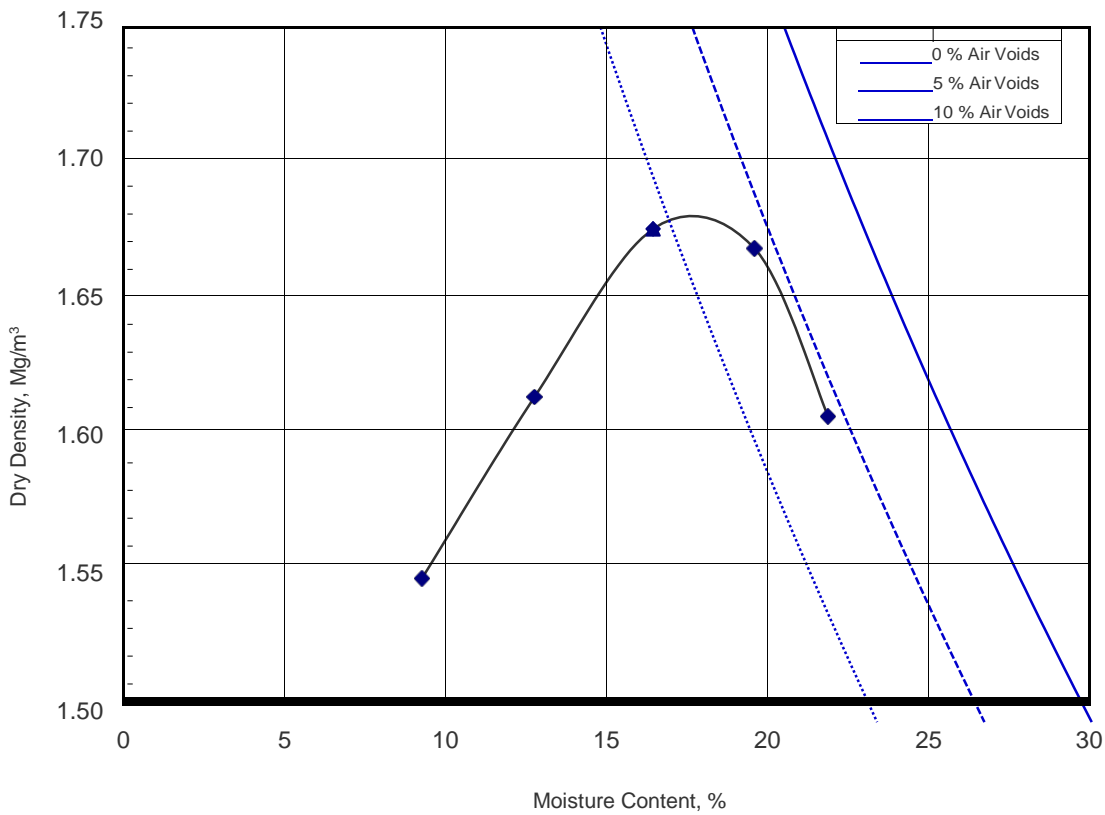


Moisture Content / Dry Density Relationship

BH/TP TP9
 Depth (m) 0.60
 Sample Type B

Description:
 Brown sandy silty CLAY with occasional gravel sized sandstone.

Preparation	Air dried / Oven dried	
Test Method	2.5kg Rammer for soils with some coarse gravel-size particles	
Samples Used	Single / Multiple	
Mass Retained on 37.5 mm Sieve	%	5
Mass Retained on 20.0 mm Sieve	%	6
Particle Density - Assumed	Mg/m ³	2.72
Maximum Dry Density	Mg/m ³	1.68
Optimum Moisture Content	%	16.3



Determination	1	2	3	4	5	
Moisture Content	%	9.1	13	16	19	22
Dry Density	Mg/m ³	1.55	1.62	1.68	1.67	1.61

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1410 - Comp TP9 00.60 B - 22476-113797.xls

GL:Version 1.14 - 10/12/2014

Determination of California Bearing Ratio

BH/TP No.: TP10
 Depth (m): 0.6
 Sample Type: B

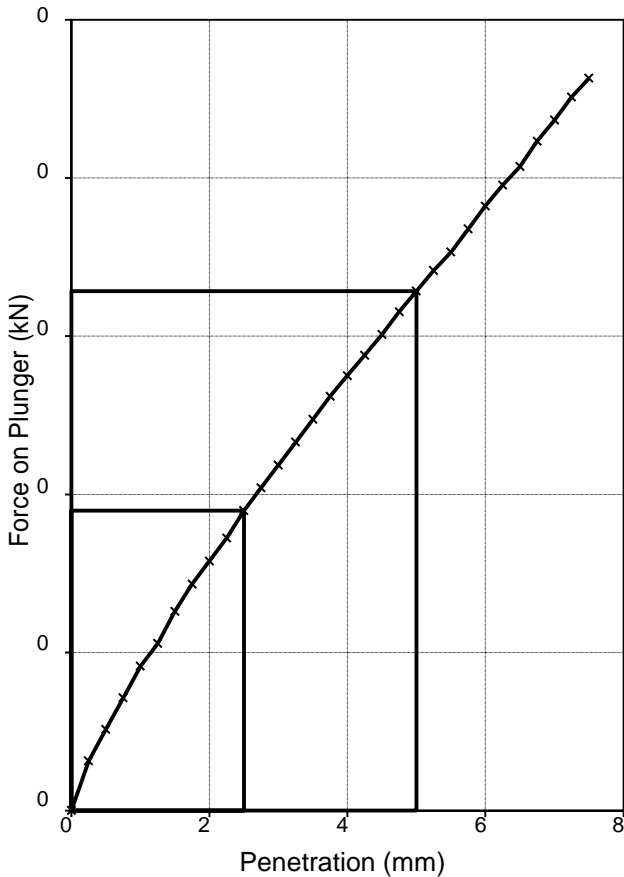
Description:
 Brown very sandy silty CLAY

PREPARATION DETAILS

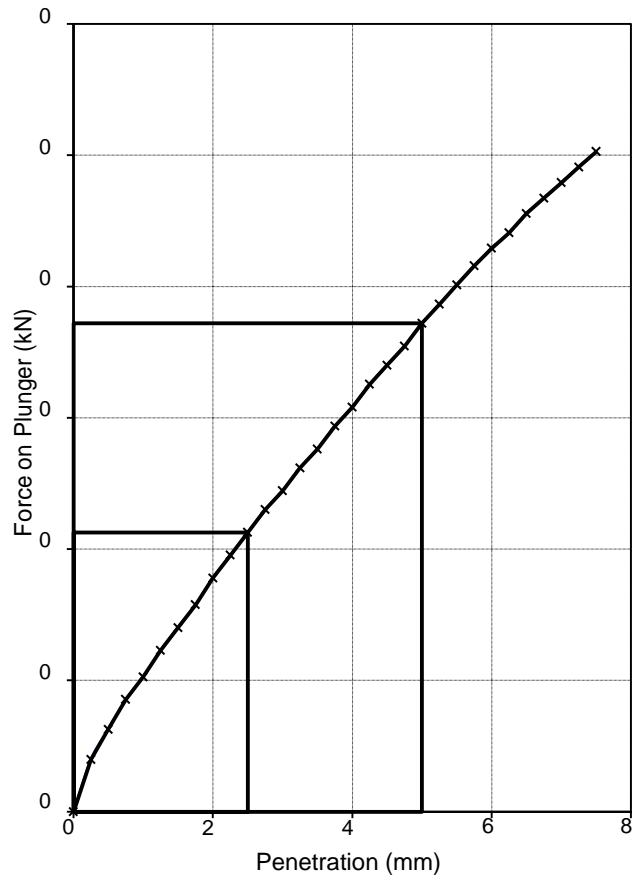
The specimen was tested in an unsoaked condition.
 The specimen was initially air dried
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.87 Mg/m³
 Prepared dry density 1.45 Mg/m³
 0.0 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	29 %	29 %
CBR Value	0.8 %	0.9 %

Top of Specimen



Base of Specimen



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1441 - CBR TP10.00.60.B - 22476-113784.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP2
 Depth (m): 0.8
 Sample Type: B

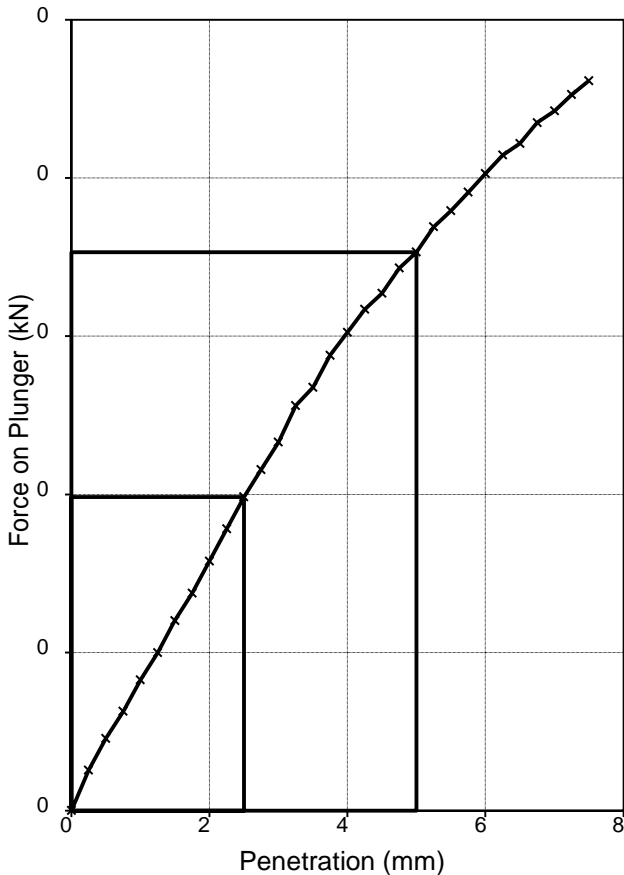
Description:
 Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized

PREPARATION DETAILS

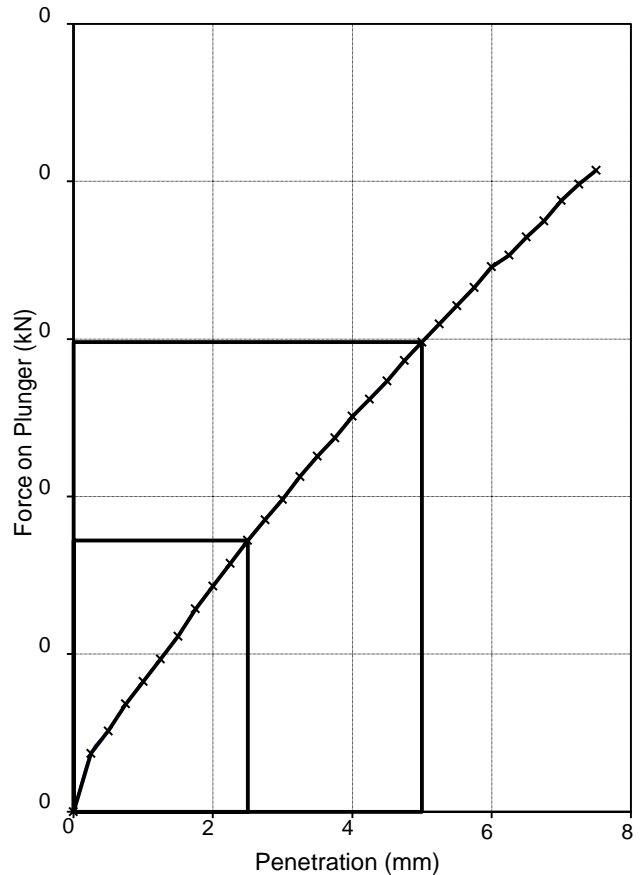
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.98 Mg/m³
 Prepared dry density 1.61 Mg/m³
 10.8 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	23 %	22 %
CBR Value	0.9 %	0.7 %

Top of Specimen



Base of Specimen



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1441 - CBR TP2 00.80 B - 22476-113801.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP3
 Depth (m): 0.5
 Sample Type: B

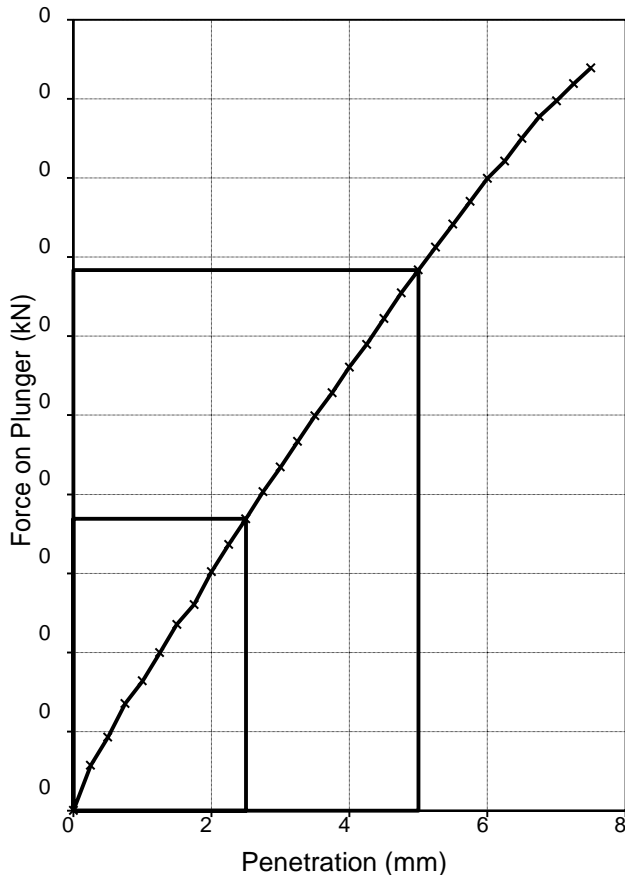
Description:
 Brown gravelly sandy silty CLAY. Gravel is fine to cobble sized limestone.

PREPARATION DETAILS

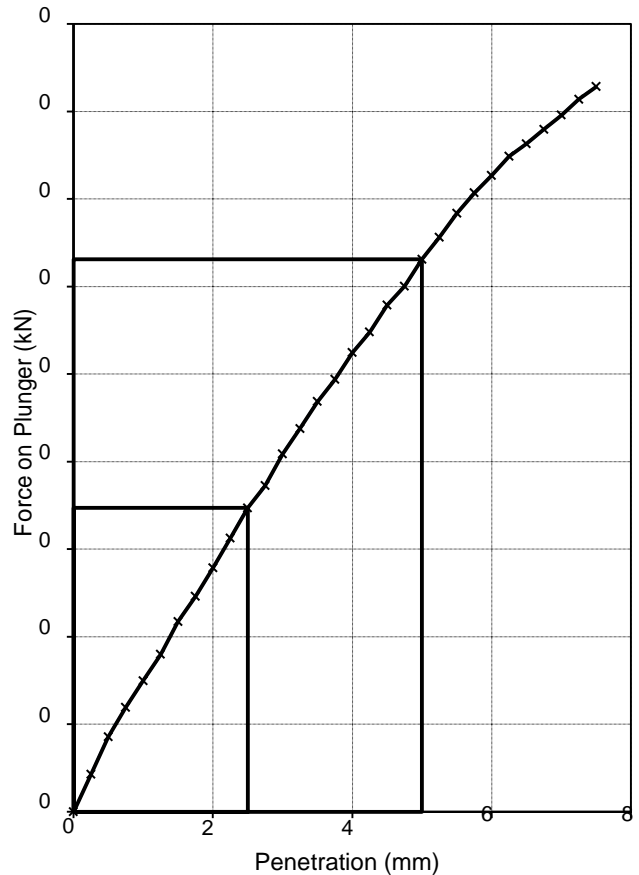
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.88 Mg/m³
 Prepared dry density 1.46 Mg/m³
 10.3 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	30 %	29 %
CBR Value	0.7 %	0.6 %

Top of Specimen



Base of Specimen



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1441 - CBR-TP3.00.50.B - 22476-113799.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP4
 Depth (m): 0.6
 Sample Type: B

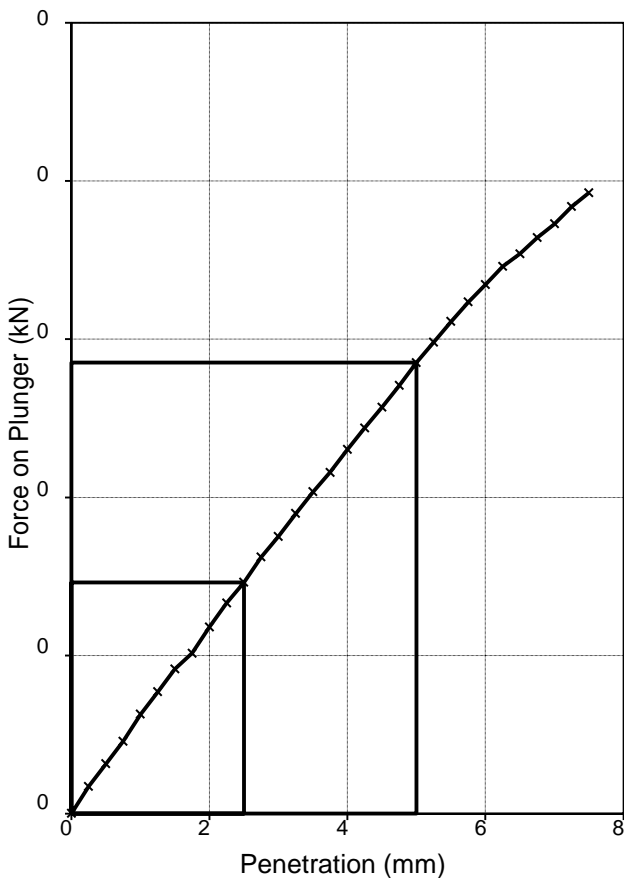
Description:
 Grey brown sandy gravelly silty CLAY. Gravel is fine to cobble sized sandstone.

PREPARATION DETAILS

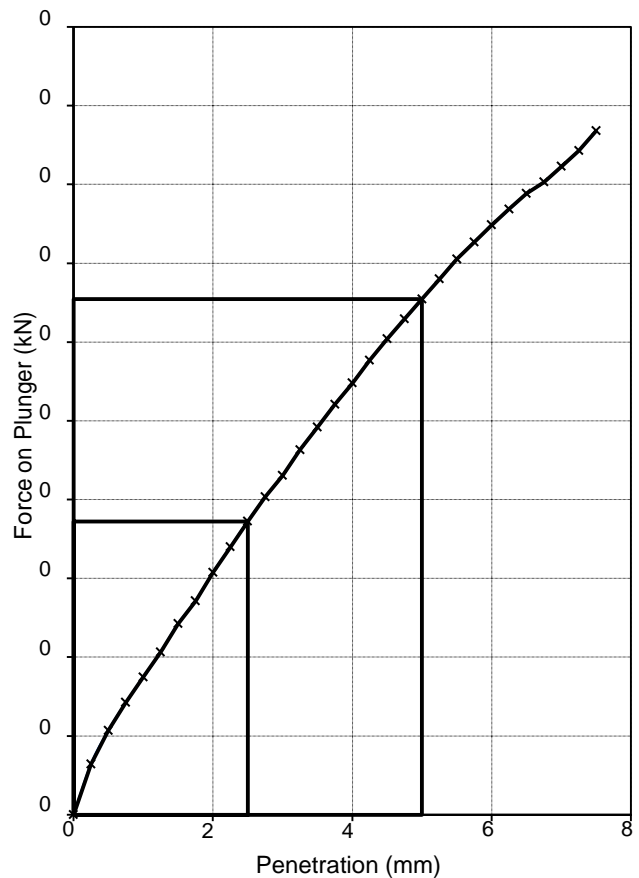
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.91 Mg/m³
 Prepared dry density 1.54 Mg/m³
 14.1 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	23 %	25 %
CBR Value	0.7 %	0.7 %

Top of Specimen



Base of Specimen



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1441 - CBR-TP4.00.60.B - 22476-113814.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP6
 Depth (m): 0.5
 Sample Type: B

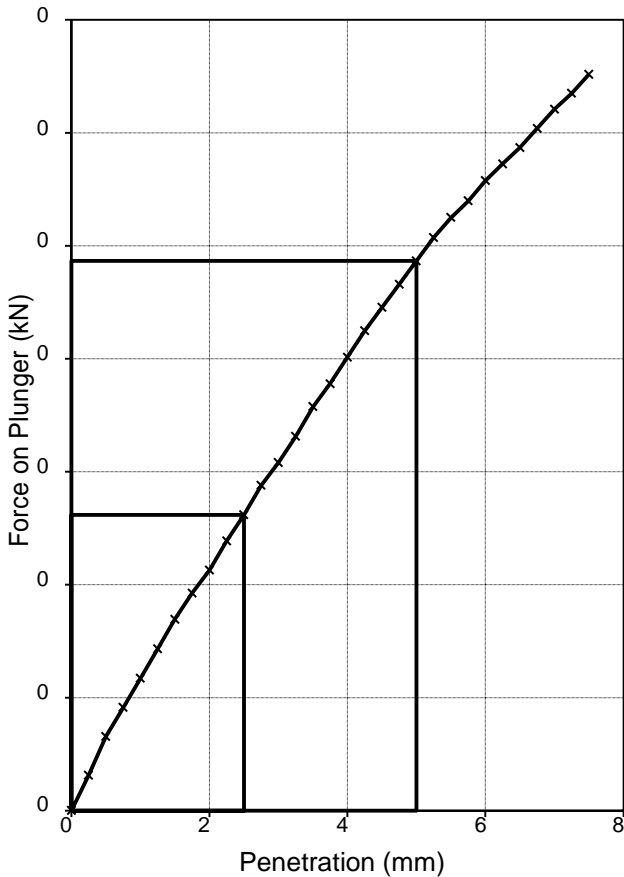
Description:
 Brown sandy gravelly silty CLAY. Gravel is fine to cobble sized.

PREPARATION DETAILS

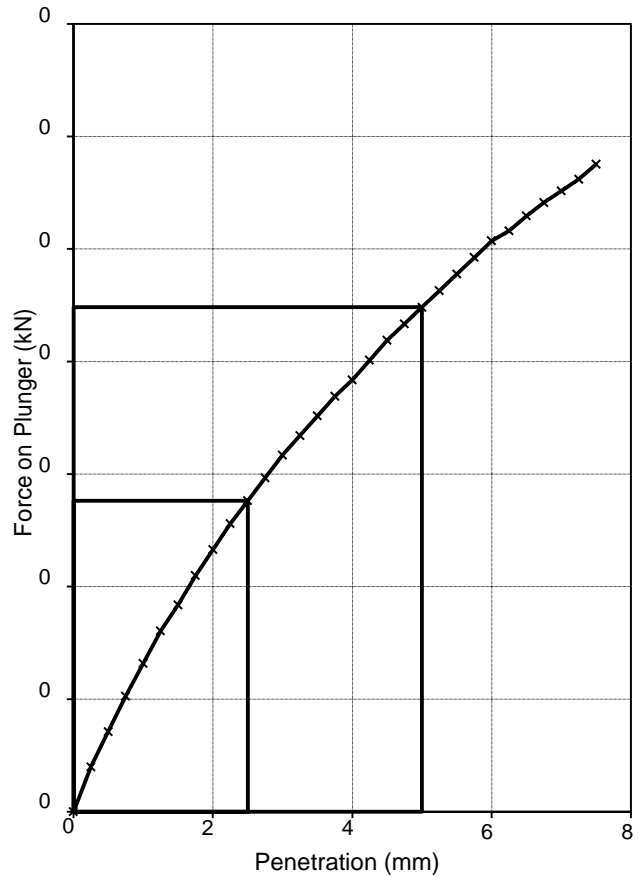
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.87 Mg/m³
 Prepared dry density 1.46 Mg/m³
 3.8 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	28 %	28 %
CBR Value	1.2 %	1.1 %

Top of Specimen



Base of Specimen



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Project Number:

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Project Name:

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1441 - CBR TP6 00.50 B - 22476-113805.xls

GL:Version 1.12 - 26/02/2015

Determination of California Bearing Ratio

BH/TP No.: TP8
 Depth (m): 0.5
 Sample Type: B

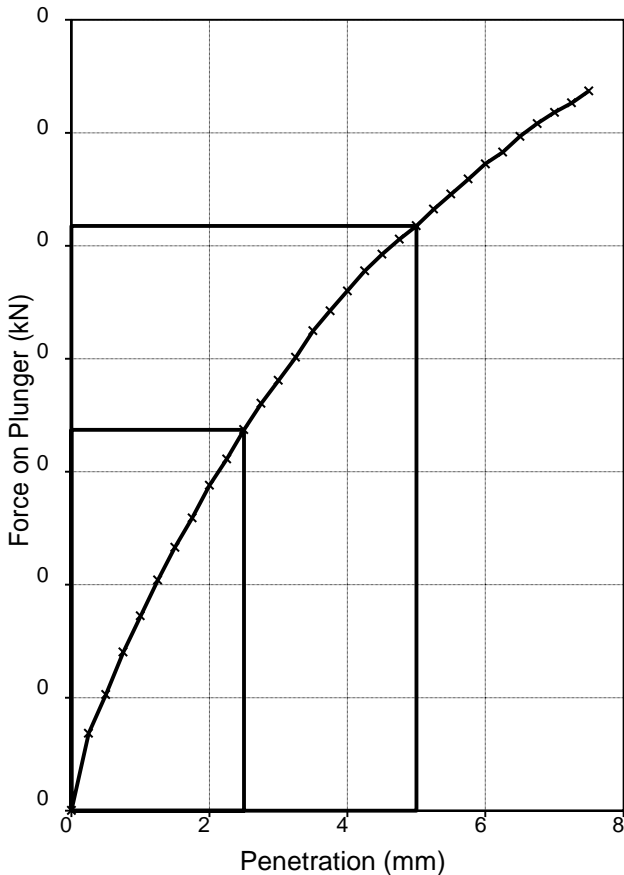
Description:
 Brown sandy gravelly silty CLAY. Gravel is sandstone.

PREPARATION DETAILS

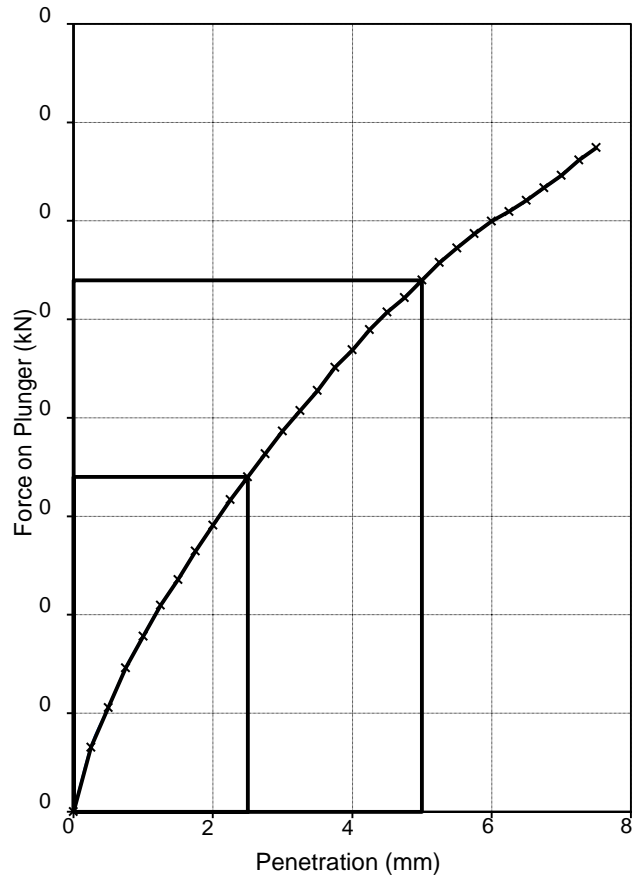
The specimen was tested in an unsoaked condition.
 The specimen was tested at its existing moisture content
 The specimen was prepared by dynamic compaction using a 2.5 kg rammer
 Prepared bulk density 1.84 Mg/m³
 Prepared dry density 1.41 Mg/m³
 2.1 % of the sample was retained on a 20mm sieve

Test Details	Top	Base
Surcharge	8.0 kg	8.0 kg
Seating load	10 N	10 N
Moisture content	30 %	30 %
CBR Value	1.3 %	1.3 %

Top of Specimen



Base of Specimen



Checked and Approved by:

Operations Manager
 27/04/2015

Project Number:

GEO / 22476

Project Name:

C2099 CLITHEROE

GEOLABS



GL:Version 1.12 - 26/02/2015

1441 - CBR-TP8.00.50.B - 22476-113825.xls

Quick Undrained Triaxial Compression Test

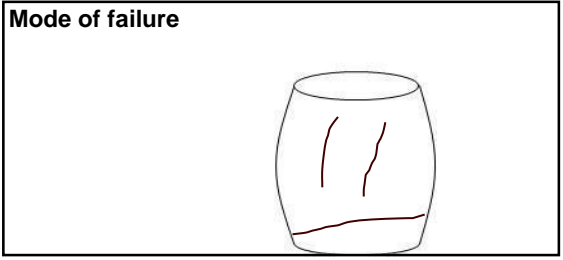
BH/TP No	BH2
Depth (m)	3.50
Sample Type	U

Description:	Firm to stiff grey sandy gravelly CLAY
Remarks :	Sample reached 20% strain on first stage of multistage test

Specimen Details

Specimen conditions		Undisturbed
Length	(mm)	201.6
Diameter	(mm)	102.1
Moisture Content	(%)	9.9
Bulk Density	(Mg/m ³)	2.29
Dry Density	(Mg/m ³)	2.08
Test Details		
Latex membrane thickness	(mm)	0.3
Membrane correction	(kPa)	1.1
Axial displacement rate	(%/min)	2.0
Cell pressure	(kPa)	35
Strain at failure	(%)	20.8
Maximum Deviator Stress	(kPa)	196
Shear Stress Cu	(kPa)	98

Mode of failure



Orientation of the sample	Vertical
Distance from top of tube mm	50

Checked and Approved by: _____ Project Number: _____


 Operations Manager
 27/04/2015

GEO / 22476

Project Name:

C2099 CLITHEROE



1731 - UUTXL BH3 03.70 U - 22476-113830.xls

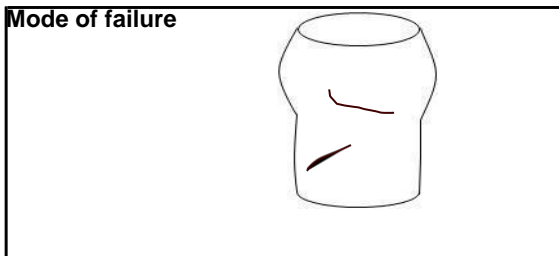
Quick Undrained Triaxial Compression Test

BH/TP No BH3
 Depth (m) 3.70-4.15
 Sample Type U

Description:
 Soft to firm grey brown sandy gravelly silty CLAY. Gravel is fine to medium.
 Remarks : Sample went to 20% on second stage of multistage test

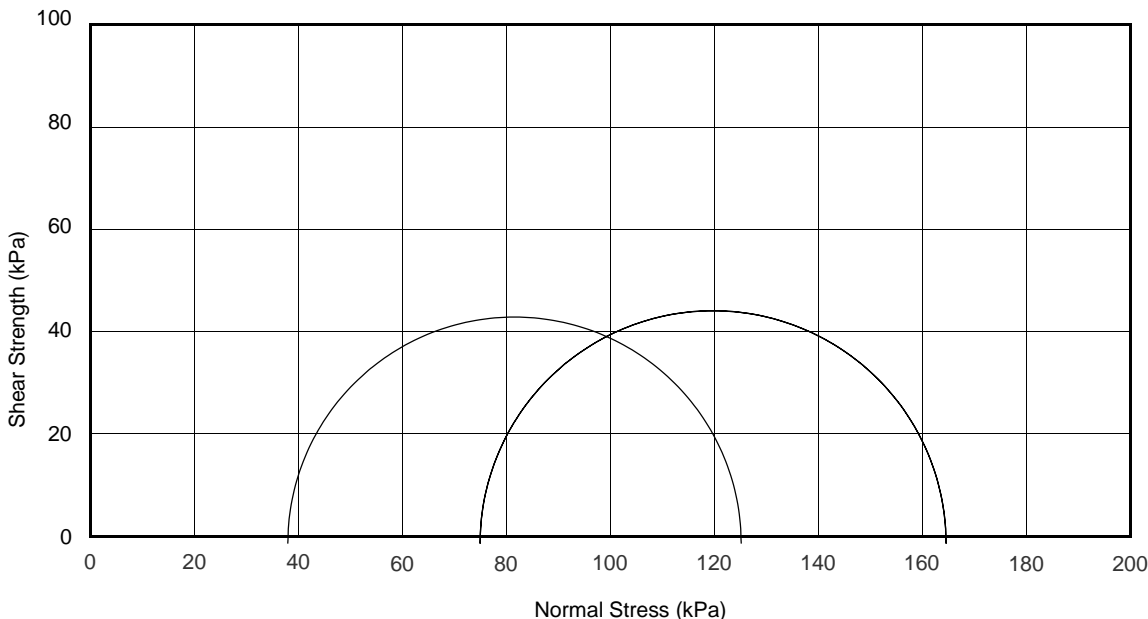
Specimen Details

Specimen conditions		Undisturbed	
Length	(mm)	202.5	
Diameter	(mm)	101.7	
Moisture Content	(%)	12	
Bulk Density	(Mg/m ³)	2.39	
Dry Density	(Mg/m ³)	2.13	
Test Details		1	2
Latex membrane thickness	(mm)	0.3	0.3
Membrane correction	(kPa)	1.0	1.1
Axial displacement rate	(%/min)	1.0	1.0
Cell pressure	(kPa)	37	74
Strain at failure	(%)	17.3	20.7
Maximum Deviator Stress	(kPa)	87	90
Shear Stress Cu	(kPa)	44	45



Orientation of the sample	Vertical
Distance from top of tube mm	80

Shear Strength Parameters
 Cohesion (kPa) 41
 Angle of Shear Resistance (°) 2.0



Checked and Approved by:

Operations Manager
 27/04/2015

Project Number:

GEO / 22476

Project Name:

C2099 CLITHEROE

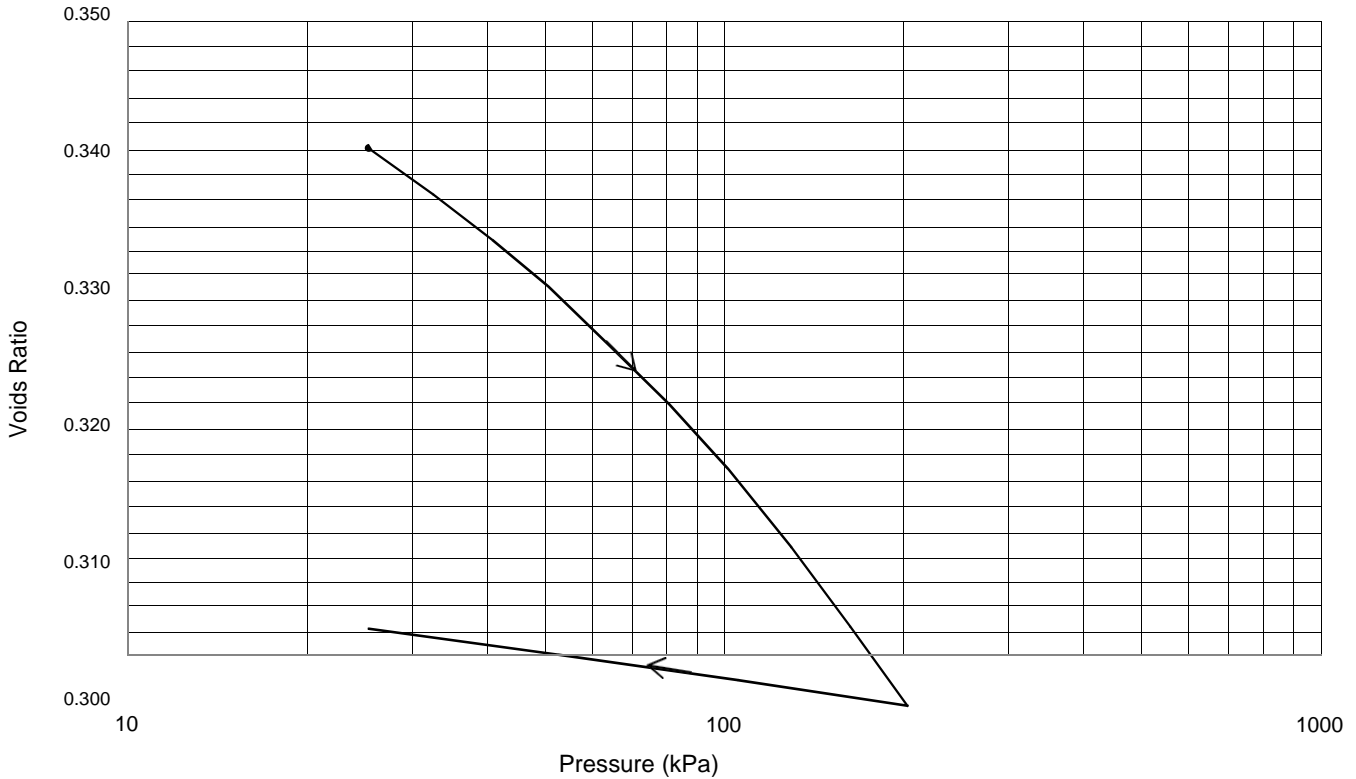
GEOLABS®



GL:Version 1.44 - 16/03/2015

Determination of One Dimensional Consolidation Properties of Soil

Borehole No.: BH2 Sample Ref.: - Depth (m): 1.90 Depth within original: 1.94 Orientation within original: Vertical Specimen preparation: Undisturbed	Description: Soft to firm brown silty CLAY with abundant gravel and roots Oedometer taken from base of sample due to amount of gravel present
---	---



Initial Conditions:

					Initial
Height	(mm)	18.7	Moisture Content	(%)	14
Diameter	(mm)	76.1	Voids Ratio		0.364
Area	(mm ²)	4550.8	Bulk Density	(Mg/m ³)	2.26
Volume	(cm ³)	85.1	Dry Density	(Mg/m ³)	1.98
Laboratory Temperature	(°C)	20	Particle density	(Mg/m ³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m ² /MN)	c_v (m ² /year)	Time Fitting Method	Void Ratio
0 - 25	0.65	2.4	t50	0.342
25 - 50	0.28	6.8	t50	0.333
50 - 100	0.18	5.6	t50	0.321
100 - 200	0.12	5.8	t50	0.305
200 - 25	0.010	7.0 (Sv)	t50	0.307

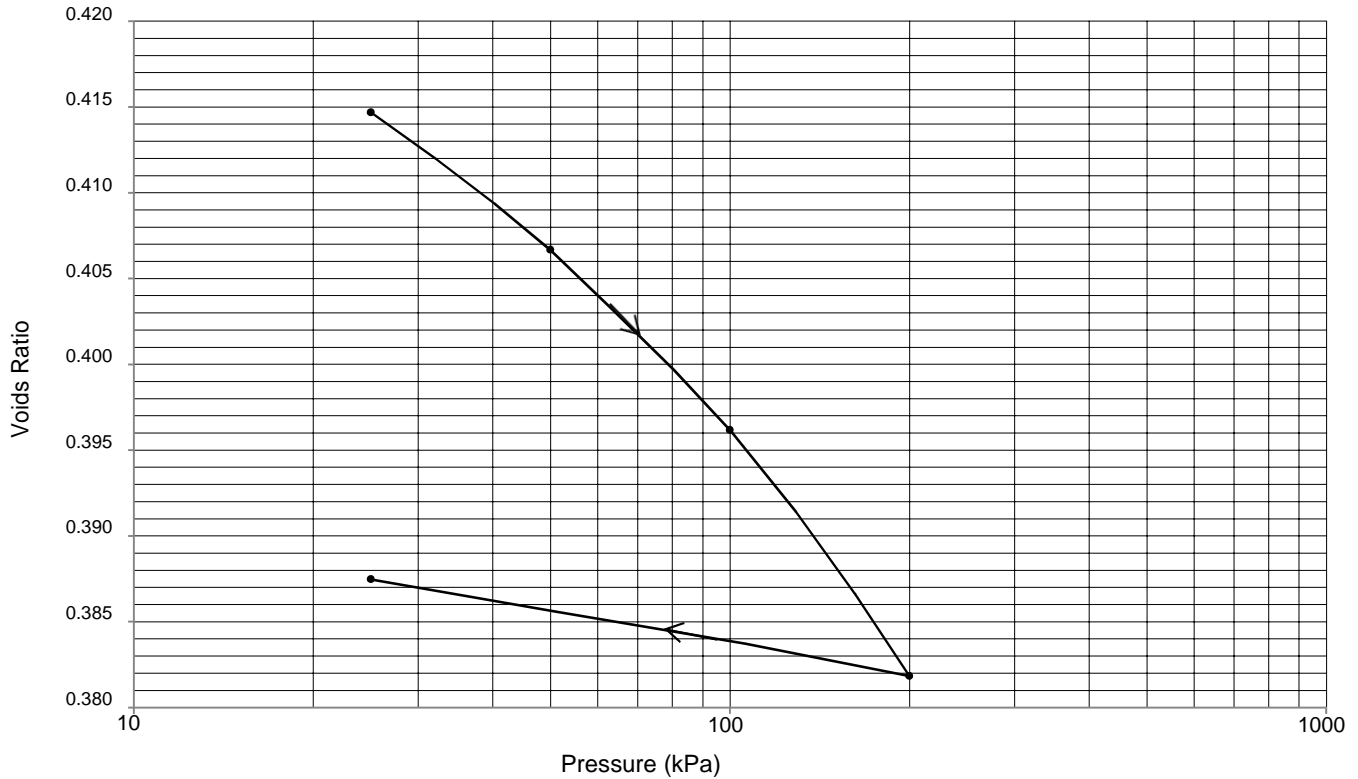
Checked and Approved by J Sturges (Ops Mgr) Date: 23/04/2015	Project Number: GEO / 22476 Project Name: C2099 Clitheroe	
--	--	------

Determination of One Dimensional Consolidation Properties of Soil

Borehole No.: BH3
 Sample Ref.: -
 Depth (m): 1.80
 Depth within original: 1.84
 Orientation within original: Vertical
 Specimen preparation: Undisturbed

Description:

Firm grey silty CLAY with abundant gravel



Initial Conditions:

Height	(mm)	18.4	Moisture Content	(%)	11
Diameter	(mm)	76.2	Voids Ratio		0.418
Area	(mm ²)	4556.8	Bulk Density	(Mg/m ³)	2.11
Volume	(cm ³)	83.8	Dry Density	(Mg/m ³)	1.90
Laboratory Temperature	(°C)	20	Particle density	(Mg/m ³)	2.7 (Assumed)

Pressure Range (kPa)	m_v (m ² /MN)	c_v (m ² /year)	Time Fitting Method	Void Ratio
0 - 25	0.015	0.72	t90	0.417
25 - 50	0.16	9.8	t90	0.412
50 - 100	0.10	5.8	t90	0.404
100 - 200	0.086	7.2	t90	0.392
200 - 25	-0.0073	4.3 (Sv)	t90	0.391

Checked and Approved by

J Sturges (Ops Mgr)

Date: 23/04/2015

Project Number:

GEO / 22476

Project Name:

C2099 Clitheroe



Appendix V



Final Report

Report Number: 15-06828 Issue-1

Initial Date of Issue: 31-Mar-2015

Client: HSP Consulting Engineers Limited

Client Address: Lawrence House
Meadowbank Way
Eastwood
Nottinghamshire
NG16 3SB

Contact(s): Luke Bradley

Project: C2099 -Clitheroe


Quotation No.: **Date Received:** 25-Mar-2015

Order No.: **Date Instructed:** 25-Mar-2015

No. of Samples: 15

Turnaround: (Wkdays) 5 **Results Due Date:** 31-Mar-2015

Date Approved: 31-Mar-2015

Approved By:


Details: Keith Jones, Technical Manager

Results Summary - Soil

Project: C2099 - Clitheroe

Client: HSP Consulting Engineers Limited		Chemtest Job No.: 15-06828										
Quotation No.:		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Top Depth (m):										
		Bottom Depth(m):										
		Date Sampled:										
Determinand	Accred.	SOP	Units	LOD	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828
Moisture	N	2030	%	0.02	17	26	44	21	19	24	22	31
Soil Colour	N				Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N				Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N				Clay	Clay	Sand	Clay	Clay	Clay	Clay	Clay
pH	M	2010			6.9	7.2	5.7	7.4	6.5	7.5	7.0	6.2
Boron (Hot Water Soluble)	M	2120	mg/kg	0.4	< 0.40	0.41	1.9	0.66	0.51	0.52	< 0.40	1.8
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.01	0.017	0.032	0.082	0.036	0.023	0.085	0.028	0.21
Total Sulphur	M	2175	%	0.01	< 0.010		0.070	< 0.010		< 0.010		
Sulphur (Elemental)	M	2180	mg/kg	1	< 1.0	< 1.0	4.2	4.0	< 1.0	< 1.0	< 1.0	6.5
Cyanide (Total)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Free)	M	2300	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Sulphide (Easily Liberatable)	M	2325	mg/kg	0.5	1.6	1.7	1.3	1.8	1.4	0.96	1.3	1.1
Sulphate (Acid Soluble)	M	2430	%	0.01	0.021		0.17	0.046		0.080		
Arsenic	M	2450	mg/kg	1	54	10	13	4.2	8.8	6.9	15	9.9
Cadmium	M	2450	mg/kg	0.1	< 0.10	0.21	0.77	0.41	0.85	0.42	2.3	0.50
Chromium	M	2450	mg/kg	1	28	29	33	19	26	23	29	25
Copper	M	2450	mg/kg	0.5	54	20	32	4.1	14	11	23	21
Mercury	M	2450	mg/kg	0.1	0.15	< 0.10	0.20	< 0.10	< 0.10	< 0.10	< 0.10	0.13
Nickel	M	2450	mg/kg	0.5	15	31	22	8.6	21	16	55	18
Lead	M	2450	mg/kg	0.5	85	27	100	23	45	31	56	65
Selenium	M	2450	mg/kg	0.2	0.52	0.25	0.72	0.27	0.38	0.23	1.0	0.34
Zinc	M	2450	mg/kg	0.5	75	80	130	68	130	95	280	100
Chromium (Hexavalent)	N	2490	mg/kg	0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.4	0.90	1.7	15	1.5	1.1	1.7	1.1	7.8
Aliphatic TPH >C5-C6	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	M	2675	mg/kg	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0

Results Summary - Soil

Project: C2099 - Clitheroe

Client: HSP Consulting Engineers Limited		Chemtest Job No.: 15-06828										
Quotation No.:		Chemtest Sample ID.:										
Order No.:		Client Sample Ref.:										
		Client Sample ID.:										
		Sample Type:										
		Top Depth (m):										
		Bottom Depth(m):										
		Date Sampled:										
Determinand	Accred.	SOP	Units	LOD	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828
Aromatic TPH >C5-C7	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	M	2675	mg/kg	0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	M	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	M	2675	mg/kg	1	< 1.0	< 1.0	3.9	< 1.0	< 1.0	< 1.0	< 1.0	2.6
Aromatic TPH >C21-C35	M	2675	mg/kg	1	< 1.0	< 1.0	11	< 1.0	< 1.0	< 1.0	< 1.0	11
Aromatic TPH >C35-C44	N	2675	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	M	2675	mg/kg	5	< 5.0	< 5.0	15	< 5.0	< 5.0	< 5.0	< 5.0	15
Total Petroleum Hydrocarbons	M	2675	mg/kg	10	< 10	< 10	15	< 10	< 10	< 10	< 10	15
Naphthalene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.44	< 0.10	< 0.10	< 0.10	< 0.10	0.48
Acenaphthylene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.34	< 0.10	< 0.10	< 0.10	< 0.10	0.39
Acenaphthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.16	< 0.10	< 0.10	< 0.10	< 0.10	0.34
Fluorene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.15	< 0.10	< 0.10	< 0.10	< 0.10	0.45
Phenanthrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.3	< 0.10	< 0.10	< 0.10	< 0.10	3.5
Anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.33	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	3.1	< 0.10	< 0.10	< 0.10	< 0.10	5.5
Pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	3.2	< 0.10	< 0.10	< 0.10	< 0.10	5.5
Benzo[a]anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.6	< 0.10	< 0.10	< 0.10	< 0.10	2.6
Chrysene	M	2700	mg/kg	0.1	< 0.10	< 0.10	2.3	< 0.10	< 0.10	< 0.10	< 0.10	3.3
Benzo[b]fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.9	< 0.10	< 0.10	< 0.10	< 0.10	3.5
Benzo[k]fluoranthene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.34	< 0.10	< 0.10	< 0.10	< 0.10	2.0
Benzo[a]pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	1.7	< 0.10	< 0.10	< 0.10	< 0.10	2.3
Indeno(1,2,3-c,d)Pyrene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.54	< 0.10	< 0.10	< 0.10	< 0.10	0.78
Dibenz(a,h)Anthracene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.44	< 0.10	< 0.10	< 0.10	< 0.10	0.43
Benzo[g,h,i]perylene	M	2700	mg/kg	0.1	< 0.10	< 0.10	0.45	< 0.10	< 0.10	< 0.10	< 0.10	0.47
Total Of 16 PAH's	M	2700	mg/kg	2	< 2.0	< 2.0	18	< 2.0	< 2.0	< 2.0	< 2.0	32
Benzene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Results Summary - Soil

Project: C2099 - Clitheroe

Client: HSP Consulting Engineers Limited	Chemtest Job No.:		15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828	15-06828
Quotation No.:	Chemtest Sample ID.:		120111	120112	120113	120114	120115	120116	120117	120118
Order No.:	Client Sample Ref.:									
	Client Sample ID.:		WS1	WS2	WS3A	WS6	WS7	WS8	WS5	WS5
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.5	0.5	0.1	0.5	0.5	0.6	0.5	0.1
	Bottom Depth(m):									
	Date Sampled:		17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15	17-Mar-15
Determinand	Accred.	SOP	Units	LOD						
Total Phenols	M	2920	mg/kg	0.3	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at our Coventry laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 60 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk



Final Report

Report Number: 15-06833 Issue-1

Initial Date of Issue: 31-Mar-2015

Client: HSP Consulting Engineers Limited

Client Address: Lawrence House
Meadowbank Way
Eastwood
Nottinghamshire
NG16 3SB

Contact(s): Luke Bradley

Project: C2099 -Clitheroe


Quotation No.: **Date Received:** 25-Mar-2015

Order No.: **Date Instructed:** 25-Mar-2015

No. of Samples: 2

Turnaround: (Wkdays) 5 **Results Due Date:** 31-Mar-2015

Date Approved: 31-Mar-2015

Approved By:


Details: Darrell Hall, Laboratory Director

Results Summary - 2 Stage WAC

Project: C2099 - Clitheroe

Chemtest Job No: 15-06833 Chemtest Sample ID: 120134 Sample Ref: Sample ID: WS2 Top Depth(m): 0.5 Bottom Depth(m): Sampling Date: 17-Mar-2015							Landfill Waste Acceptance Criteria Limits			
							Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	U	%				0.92	3	5	6
Loss on Ignition	2610	U	%				4.3	--	--	10
Total BTEX	2760	U	mg/kg				< 0.01	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg				< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg				< 10	500	--	--
Total (of 17) PAHs	2700	N	mg/kg				< 2.0	100	--	--
pH	2010	U					7.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				0.003	--	To evaluate	To evaluate
Eluate Analysis			2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg			
Arsenic	1450	U	< 0.001	0.002	< 0.050	< 0.050	0.5	2	25	
Barium	1450	U	0.003	0.008	< 0.50	< 0.50	20	100	300	
Cadmium	1450	U	0.00068	0.0035	< 0.010	0.033	0.04	1	5	
Chromium	1450	U	0.004	0.011	< 0.050	0.11	0.5	10	70	
Copper	1450	U	0.003	0.011	< 0.050	< 0.050	2	50	100	
Mercury	1450	U	< 0.0005	< 0.0005	< 0.001	< 0.005	0.01	0.2	2	
Molybdenum	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.5	10	30	
Nickel	1450	U	0.002	0.006	< 0.050	0.054	0.4	10	40	
Lead	1450	U	0.001	0.005	< 0.010	0.048	0.5	10	50	
Antimony	1450	U	< 0.001	< 0.001	< 0.010	< 0.010	0.06	0.7	5	
Selenium	1450	U	0.001	< 0.001	< 0.010	< 0.010	0.1	0.5	7	
Zinc	1450	U	0.033	0.14	< 0.50	1.3	4	50	200	
Chloride	1220	U	4.6	1.3	< 10	14	800	15000	25000	
Fluoride	1220	U	0.19	0.14	< 1.0	1.4	10	150	500	
Sulphate	1220	U	4.9	< 1.0	< 10	< 10	1000	20000	50000	
Total Dissolved Solids	1020	N	48	17	93	180	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	31	18	60	190	500	800	1000	

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	23

Leachate Test Information	
Leachant volume 1st extract/l	0.296
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.084

Results Summary - 2 Stage WAC

Project: C2099 - Clitheroe

Chemtest Job No: 15-06833 Chemtest Sample ID: 120135 Sample Ref: Sample ID: WS4 Top Depth(m): 0.1 Bottom Depth(m): Sampling Date: 17-Mar-2015							Landfill Waste Acceptance Criteria Limits			
							Inert Waste Landfill	Stable Non-reactive Hazardous waste in non-hazardous	Hazardous Waste Landfill	
Determinand	SOP	Accred.	Units							
Total Organic Carbon	2625	U	%				3.5	3	5	6
Loss on Ignition	2610	U	%				9.4	--	--	10
Total BTEX	2760	U	mg/kg				< 0.01	6	--	--
Total PCBs (7 congeners)	2815	U	mg/kg				< 0.10	1	--	--
TPH Total WAC (Mineral Oil)	2670	U	mg/kg				37	500	--	--
Total (of 17) PAHs	2700	N	mg/kg				34	100	--	--
pH	2010	U					7.2	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg				0.003	--	To evaluate	To evaluate
Eluate Analysis				2:1 mg/l	8:1 mg/l	2:1 mg/kg	Cumulative 10:1 mg/kg	Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
Arsenic	1450	U	0.002	0.001	< 0.050	< 0.050	0.5	2	25	
Barium	1450	U	0.014	0.019	< 0.50	< 0.50	20	100	300	
Cadmium	1450	U	0.0021	0.0015	< 0.010	0.015	0.04	1	5	
Chromium	1450	U	0.005	0.007	< 0.050	0.064	0.5	10	70	
Copper	1450	U	0.01	0.012	< 0.050	< 0.050	2	50	100	
Mercury	1450	U	< 0.0005	< 0.0005	< 0.001	< 0.005	0.01	0.2	2	
Molybdenum	1450	U	< 0.001	< 0.001	< 0.050	< 0.050	0.5	10	30	
Nickel	1450	U	0.005	0.004	< 0.050	< 0.050	0.4	10	40	
Lead	1450	U	0.01	0.012	0.019	0.12	0.5	10	50	
Antimony	1450	U	< 0.001	< 0.001	< 0.010	< 0.010	0.06	0.7	5	
Selenium	1450	U	0.001	0.001	< 0.010	0.011	0.1	0.5	7	
Zinc	1450	U	0.077	0.05	< 0.50	0.51	4	50	200	
Chloride	1220	U	4.1	2	< 10	21	800	15000	25000	
Fluoride	1220	U	0.13	0.085	< 1.0	< 1.0	10	150	500	
Sulphate	1220	U	15	2.2	29	28	1000	20000	50000	
Total Dissolved Solids	1020	N	60	19	120	210	4000	60000	100000	
Phenol Index	1920	U	< 0.030	< 0.030	< 0.30	< 0.50	1	-	-	
Dissolved Organic Carbon	1610	U	83	22	160	250	500	800	1000	

Soild Information	
Dry mass of test portion/kg	0.175
Moisture (%)	18

Leachate Test Information	
Leachant volume 1st extract/l	0.313
Leachant volume 2nd extract/l	1.4
Eluant recovered from 1st extract/l	0.086

Report Information

Key

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

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

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

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at our Coventry laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 60 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk

Appendix VI

Gas Monitoring Certificate



Project Number C2099
 Project Name Land off ChatburnRoad, Clitheroe
 Client Oakmere Homes

Hole Number	Gas Flow Rate. (l/hr)	Detection Limit						Depth of Installation. (mbgl)	Depth of Groundwater (mbgl)
		<0.1	<0.1	<0.1	<0.1	<1	<1		
		Methane. (%LEL)	Methane. (%vol)	Oxygen. (%vol)	Carbon Dioxide. (%vol)	Carbon Monoxide. (ppm)	Hydrogen Sulphide. (ppm)		
CP1	<0.1	<0.1	<0.1	19.2	0.5	<1	1	4.22	4.16
CP2	<0.1	<0.1	<0.1	20.1	0.0	13	2	5.75	2.00
CP3	1.2	<0.1	<0.1	20.2	0.4	5	2	6.65	1.10
WS2	<0.1	<0.1	<0.1	17.6	1.6	<1	<1	2.55	DRY
WS6	<0.1	<0.1	<0.1	20.8	0.2	8	<1	1.82	0.62
WS8	<0.1	<0.1	<0.1	20.1	0.8	5	1	1.94	1.80

Date	Notes:		Barometric Pressure, mbar	986
27.03.2015	Engineer	DRS	Pressure Trend	Rising
	Equipment	GFM430	Air Temperature	8°C

Gas Monitoring Certificate



Project Number C2099
 Project Name Land off ChatburnRoad, Clitheroe
 Client Oakmere Homes

Hole Number	Gas Flow Rate. (l/hr)	Detection Limit						Depth of Installation. (mbgl)	Depth of Groundwater (mbgl)
		<0.1	<0.1	<0.1	<0.1	<1	<1		
		Methane. (%LEL)	Methane. (%vol)	Oxygen. (%vol)	Carbon Dioxide. (%vol)	Carbon Monoxide. (ppm)	Hydrogen Sulphide. (ppm)		
CP1	<0.1	<0.1	<0.1	19.6	0.5	13	1	8.97	1.40
CP2	<0.1	<0.1	<0.1	18.0	<0.1	13	0	9.58	2.05
CP3	<0.1	<0.1	<0.1	17.9	1.1	0	0	9.57	0.90
WS2	<0.1	<0.1	<0.1	16.3	2.2	5	0	2.55	DRY
WS6	<0.1	<0.1	<0.1	20.3	0.6	0	0	1.82	0.76
WS8	<0.1	<0.1	<0.1	19.2	1.2	5	3	1.94	1.38

Date	Notes:		Barometric Pressure, mbar	1020
16.04.2015	Engineer	HJD	Pressure Trend	Rising
	Equipment	GFM430	Air Temperature	13°C

Gas Monitoring Certificate



Project Number C2099
 Project Name Land off ChatburnRoad, Clitheroe
 Client Oakmere Homes

Hole Number	Gas Flow Rate. (l/hr)	Detection Limit						Depth of Installation. (mbgl)	Depth of Groundwater (mbgl)
		<0.1	<0.1	<0.1	<0.1	<1	<1		
		Methane. (%LEL)	Methane. (%vol)	Oxygen. (%vol)	Carbon Dioxide. (%vol)	Carbon Monoxide. (ppm)	Hydrogen Sulphide. (ppm)		
CP1	<0.1	<0.1	<0.1	19.7	0.6	<1	1	4.20	1.47
CP2	<0.1	<0.1	<0.1	20.4	0.0	11	2	5.75	2.10
CP3	<0.1	<0.1	<0.1	12.1	2.9	8	1	6.55	1.35
WS2	<0.1	<0.1	<0.1	16.9	2.5	5	<1	2.55	DRY
WS6	<0.1	<0.1	<0.1	19.6	1.2	8	<1	1.95	1.44
WS8	<0.1	<0.1	<0.1	20.7	0.5	8	2	1.80	0.85

Date	Notes:		Barometric Pressure, mbar	996
24.04.2015	Engineer	DRS	Pressure Trend	Falling
	Equipment	GFM430	Air Temperature	13°C

Gas Monitoring Certificate



Project Number C2099
 Project Name Land off ChatburnRoad, Clitheroe
 Client Oakmere Homes

Hole Number	Gas Flow Rate. (l/hr)	Detection Limit						Depth of Installation. (mbgl)	Depth of Groundwater (mbgl)
		<0.1	<0.1	<0.1	<0.1	<1	<1		
		Methane. (%LEL)	Methane. (%vol)	Oxygen. (%vol)	Carbon Dioxide. (%vol)	Carbon Monoxide. (ppm)	Hydrogen Sulphide. (ppm)		
CP1	<0.1	<0.1	<0.1	20.8	<0.1	<1	2	4.18	0.52
CP2	<0.1	<0.1	<0.1	18.1	0.3	<1	3	5.72	1.82
CP3	<0.1	<0.1	<0.1	10.0	4.4	13	2	6.55	1.06
WS2	<0.1	<0.1	<0.1	18.0	2.1	5	<1	2.54	2.46
WS6	<0.1	<0.1	<0.1	21.0	<0.1	8	2	1.96	0.95
WS8	<0.1	<0.1	<0.1	19.8	0.5	<1	13	1.82	0.70

Date	Notes:		Barometric Pressure, mbar	1001
08.05.2015	Engineer	DRS	Pressure Trend	Falling
	Equipment	GFM430	Air Temperature	12°C

Gas Monitoring Certificate



Project Number C2099
 Project Name Land off ChatburnRoad, Clitheroe
 Client Oakmere Homes

Hole Number	Gas Flow Rate. (l/hr)	Detection Limit						Depth of Installation. (mbgl)	Depth of Groundwater (mbgl)
		<0.1	<0.1	<0.1	<0.1	<1	<1		
		Methane. (%LEL)	Methane. (%vol)	Oxygen. (%vol)	Carbon Dioxide. (%vol)	Carbon Monoxide. (ppm)	Hydrogen Sulphide. (ppm)		
CP1	<0.1	<0.1	<0.1	20.6	0.2	8	<1	4.20	1.27
CP2	<0.1	<0.1	<0.1	18.0	<0.1	<1	<1	5.73	1.97
CP3	<0.1	<0.1	<0.1	13.4	2.4	<1	<1	6.55	0.85
WS2	<0.1	<0.1	<0.1	17.2	2.3	<1	3	2.33	2.46
WS6	<0.1	<0.1	<0.1	20.8	0.1	<1	5	1.77	0.73
WS8	<0.1	<0.1	<0.1	19.1	1.0	<1	<1	1.95	1.27

Date	Notes:		Barometric Pressure, mbar	1008
26.05.2015	Engineer	DRS	Pressure Trend	Steady
	Equipment	GFM430	Air Temperature	15°C

Gas Monitoring Certificate



Project Number C2099
 Project Name Land off ChatburnRoad, Clitheroe
 Client Oakmere Homes

Hole Number	Gas Flow Rate. (l/hr)	Detection Limit						Depth of Installation. (mbgl)	Depth of Groundwater (mbgl)
		<0.1	<0.1	<0.1	<0.1	<1	<1		
		Methane. (%LEL)	Methane. (%vol)	Oxygen. (%vol)	Carbon Dioxide. (%vol)	Carbon Monoxide. (ppm)	Hydrogen Sulphide. (ppm)		
CP1	<0.1	<0.1	<0.1	13.9	2.1	2	1	4.17	1.42
CP2	<0.1	<0.1	<0.1	18.4	<0.1	<1	1	5.76	2.13
CP3	<0.1	<0.1	<0.1	13.1	4.2	2	2	6.37	1.40
WS2	<0.1	<0.1	<0.1	18.5	3.3	2	1	2.54	2.43
WS6	<0.1	<0.1	<0.1	20.1	0.8	<1	2	1.75	0.86
WS8	<0.1	<0.1	<0.1	19.7	1.4	<1	1	1.93	1.46

Date	Notes:		Barometric Pressure, mbar	1007
24.06.2015	Engineer	DRS	Pressure Trend	Steady
	Equipment	GFM430	Air Temperature	17°C

Gas Testing Summary



Project Number	C2099
Project Name	Land off Chatburn Road,
Client	Clitheroe Oakmere Homes

	Methane (%LEL)					
CP1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CP2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CP3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

	Methane (%Vol)					
CP1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CP2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CP3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

	Oxygen. (%vol)					
CP1	19.2	19.6	19.7	20.8	20.6	13.9
CP2	20.1	18	20.4	18.1	18	18.4
CP3	20.2	17.9	12.1	10	13.4	13.1
WS2	17.6	16.3	16.9	18	17.2	18.5
WS6	20.8	20.3	19.6	21	20.8	20.1
WS8	20.1	19.2	20.7	19.8	19.1	19.7

Gas Testing Summary



Project Number	C2099
Project Name	Land off Chatburn Road,
Client	Clitheroe Oakmere Homes

	Carbon Dioxide. (%vol)					
CP1	0.5	0.5	0.6	<0.1	0.2	2.1
CP2	0	<0.1	0	0.3	<0.1	<0.1
CP3	0.4	1.1	2.9	4.4	2.4	4.2
WS2	1.6	2.2	2.5	2.1	2.3	3.3
WS6	0.2	0.6	1.2	<0.1	0.1	0.8
WS8	0.8	1.2	0.5	0.5	1	1.4

	Carbon Monoxide. (ppm)					
CP1	<1	13	<1	<1	8	2
CP2	13	13	11	<1	<1	<1
CP3	5	0	8	13	<1	2
WS2	<1	5	5	5	<1	2
WS6	8	0	8	8	<1	<1
WS8	5	5	8	<1	<1	<1

	Hydrogen Sulphide. (ppm)					
CP1	1	1	1	2	<1	1
CP2	2	0	2	3	<1	1
CP3	2	0	1	2	<1	2
WS2	<1	0	<1	<1	3	1
WS6	<1	0	<1	2	5	2
WS8	1	3	2	13	<1	1

Gas Testing Summary



Project Number	C2099
Project Name	Land off Chatburn Road,
Client	Clitheroe Oakmere Homes

	Gas Flow Rate (l/hr)					
CP1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CP2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
CP3	1.2	<0.1	<0.1	<0.1	<0.1	<0.1
WS2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
WS8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

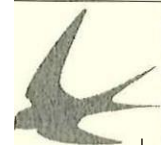
	Atmospheric Pressure Range					
	986	1020	996	1001	1008	1007

Max Methane Concentration (%vol)	0.1
Max Carbon Dioxide Concentration (%vol)	4.4
Max Carbon Monoxide Concentration (ppm)	13
Max Hydrogen Sulphide Concentration (ppm)	13
Max Flow Rate (l/hr)	1.2
Methane Gas Screening Value	0.0012
Carbon Dioxide Gas Screening Value	0.0528
Carbon Monoxide Gas Screening Value	0.156
Hydrogen Sulphide Gas Screening Value	0.156
Maximum Gas Screening Value	0.0528
Characteristic Situation 1	PASS
Characteristic Situation 2	PASS
Characteristic Situation 3	PASS
Characteristic Situation 4	PASS
Characteristic Situation 5	PASS
Characteristic Situation 6	PASS

TEST DATE AND CONDITIONS	
Date	17/06/15
Atmospheric Pressure	1010mB
Ambient Temp	24.3°C
Enviro-nics Serial No.	2633

GAS DATA LTD

Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV34LB



Tel 02476303311 Fax 02476307711

GFM430-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

PRESSURE CHECKS							
Calibration Pressure		Instrument Pressure Channels Read					
Pressure @	Applied Pressure	Atmospheric rApl (mB)	tol. (mB)				
All Potts	Cunent Atmospheric	1011	+/-2.0				
Ap Port (Internal)	+800mB(a)	797	+/-5.0				
	+1200mB(a)	1199	+/-5.0				

FLOW CHECKS					
Calibration Flow		Instrument Flow Channels Read			
Applied Flow (l/hour)	Applied Pressure (Pa)	Flow fFlowl (l/hour)	tol. (l/hour)	Differential Pressure fDpl (Pa)	tol. (Pa)
-30.0	319	-30.1	+/-3.0	-325	+/-50
-3.0	-15	-3.1	+/-1.0	-16	+/-6
0.0	0	0.0	0.0	0	0.0
+3.0	14	3.0	+/-0.5	13	+/-3
+15.0	115	15.1	+/-1.5	115	+/-20
+30.0	320	30.0	+/-3.0	320	+/-50
+60.0	981	60.8	+/-6.0	994	+/-130
+90.0	1931	91.3	+/-9.0	1989	+/-250

TEMPERATURE CHECK		
Calibration Temperature	Instrument Temperature Channel Read	
Applied Equivalent Temperature (°C)	Temperature rTempl (°C)	tol. (oc)
-10.0	-10.5	+/- 2.0
0.0	0.0	+/- 1.0
30.0	30.0	+/- 1.0
60.0	60.0	+/- 1.0
100.0	99.5	+/- 1.0

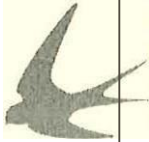
Notes:

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2008 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated. The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2008. Certificate NQA 8374. Valid until 20/03/2016

TEST DATE AND CONDITIONS	
Date	17/06/15
Atmospheric Pressure	IOIOmB
Ambient Temp	24.3°C
EnviroNics Serial No.	2633

GAS DATA LTD
Pegasus House
Seven Stars Estate
Wheler Rd
Coventry
CV34LB
Tel 02476303311 Fax 02476307711



GFM430-1 FINAL INSPECTION & CALIBRATION CHECK CERTIFICATE

INSTRUMENT DETAILS	
Serial No	Customer
10152	HSP Consulting Engineers Limited

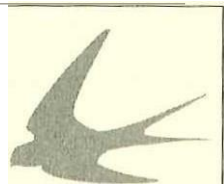
INSTRUMENT CHECKS			
Keyboard	/	Pump Flow	500cc/min
Display Contrast	/	Pump Flow (a) -200mB	450cc/min
Clock Set / Running	/	S/W Version	G430.0024/0013
Labels Fitted	/	Recalibration Date	17/06/16

GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Cone.	CH4 (%)	tol. (% vol.)	CO2 (%)	tol. (% vol.)	O2 (%)	tol. (% vol.)
N2	100%	0.0	0.0	0.0	0.0	0.0	+0.1
CH4	5%	5.1	+/-0.3	0.0	0.0	0.0	+0.1
	60%	60.1	+/-3.0	0.0	0.0	0.0	+0.1
CO2	5%	0.0	0.0	4.9	+/-0.3	0.0	+0.1
	40%	0.0	0.0	40.3	+/-3.0	0.0	+0.1
Air (20.9% O2, 400ppm CO2)	100%	0.0	0.0	0.1	+0.1	20.9	+/-0.5

OPTIONAL GAS CHECKS							
Calibration Gas		Instrument Gas Channels Read					
Gas Type	Applied Cone.	Label Range	H2S 2000ppm	co 2000ppm			tol. (% vol.)
N2	100%		0	0			0.0
H2S	1500ppm		1500	0			+/- 5.0
co	1000ppm		35	1000			+/- 5.0
							+/- 5.0
							+/- 5.0
							+/- 5.0

TEST DATE AND CONDITIONS	
Date	1 st , 6 (t.)
Atmospheric Pressure	(QIQ) mB
Ambient Temp	20.1 OC
EnviroNics Serial No.	3268

CS DATA LTD
 ePasus House
 eSen Stars Estate
 hwer Rd.
 Coventry
 CV3 4LB
 ct: 024 76 303311 Fax: 024 76 307711



GFM430-1 OUTWARD INSPECTION & QUALITY CHECK SHEET

INSTRUMENT DETAILS			
SO Number	Instrument Type	Instrument Serial Number+ SW Version	Job Number(s)
P:J1cl-h	C.,F-tvtu?)	101S2.., JJ.-1	L(D) --- 1-

Calibration Technician 7 DATE ..?.f ..(15....
 6
Inspection Technician DATE p ..,S

Function	INSTRUMENT CHECKS	Pass (P), Fail (F) or not applicable (NA)	INSTRUMENT PACKING LIST	Tick if included
Function Tests	Bust Caps Fitted	-f)	Instrument	✓
	Keyboard Test (All Keys)	-r;)	Leather Case	✓
	Backlight Test	-r;)	Instrument Strap	✓
	Lock Set / Running	-r;)	AC Battery Charger (UK)	✓
	Ohms Test	-r)	AC Battery Charger (EURO)	✓
	Pump Flow Test (In & Out)	/J	AC Battery Charger (US)	✓
	Overall Leak Test (30mB)	NA	AC Battery Charger (AUS)	✓
	Battery Charge Test		Gas Sample Pipe	
	Service Date set to?	t, 7 6. (f..)	any Case	✓
2 channel Test	Data Logging Enabled?	NR	Spares Pot	✓
	Verify CH4/LEL	r;)	Allen Key	✓
	Verify CO2		Flow Sample Pipe	✓
	Verify O2	J	Temperature Probe	✓
	Verify LEL	J	Vane Anemometer	X
	Verify 1st Option gas	H/'"-J	USB Cable	✓
	Verify 2nd Option gas	rn	USB Memory stick	✓
	Verify 3rd Option gas	rNA	SiteMan Software	Ver
	Verify 4th Option gas	Nft	Internal Filter Pack	Qty
	Verify atmospheric pressure	(.)	External Filter Pack	Qty
	Verify static pressure	IJA	Field Guide	✓
	Verify differential pressure	tu)	Operation Manual (hard copy)	✓
Verify flow		Extra Helms:		
Verify temperature probe input	V			
Verify vane anemometer input	IJ			
DataBase Checks	Jobcard(s) completed and signed	f.)		
	Jobcard(s) booked off database	I		
	Calibration certificate completed	{-J		
	Complete & print QI record	NA-	Comments:	
Label Checks	No. of Calibration label fitted	1; J,-H		
	Warranty label fitted	V		
H2S Range	H2S Range from Sales Order	1/ (.....)		
	H2S Range from Cal Cert	j - JI..)		
	Over-range value correct?	μ		