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Factual Geotechnical Investigation of Former Pond Area at Plot B, Wentworth Park, Tankersley

Final Report

Prepared by

Richard Brown

for

Gladman Developments Limited

Hydrock Ref: R/06862/006

October 2008

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Project: PLOT B, WENTWORTH PARK, TANKERSLEY

Title: FACTUAL GEOTECHNICAL INVESTIGATION OF FORMER POND AREA

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CONTENTS

APPENDICES

EXECUTIVE SUMMARY AND CONCEPTUAL SITE MODEL

SITE SETTING & OBJECTIVES	**Client**	Gladman Developments Limited.
	Site	Plot B, Wentworth Park, Tankersley.
	Site Location	Tankerlsey, South Yorkshire, approximate NGR 433300E, 399800N.
	Current Land Use	The site is currently under redevelopment for industrial usage.
	Development	The development comprises four industrial portal frame units with associated infrastructure.
	Objectives	The objectives of this investigation are to provide factual geotechnical data in respect of an area of soft clay soil identified at depth in the northeast of the site in previous ground investigations. The area is coincident with two former ponds that are shown in the northeast of the site on historical maps.
BACKGROUND INFORMATION	**Previous Reports**	To date a number of reports on the site have been presented by Hydrock and by others. These are: • Fugro report, "Geophysical Survey, Wentworth Park, Tankersley" presented 13th February 2006, (ref: GEO064005-1 (01)); • Hydrock report, "Desk Study and Ground Investigation at Plot B, Wentworth Park, Tankersley" presented April 2006, (ref R/06862/001); • Hydrock report, "Further Investigation and Stabilisation of Old Shallow Mineworkings at Plot B, Wentworth Park, Tankersley" presented May 2007, (ref: R/06862/003); • Hydrock report, "Treatment Philosophy for the Stabilisation of Old Shallow Mineworkings at Plot B, Wentworth Park, Tankersley" presented June 2007, (ref:R/06862/004); and • Hydrock report, "Factual Geotechnical Investigation at Plot B, Wentworth Park, Tankersley" presented March 2008, (ref: R/06862/005).
	Historic Site Usage	Historically the site has been used for quarrying, brick making, coal mining and storage of commercial vehicles.
	Ground Conditions from Previous Investigation	In the area of the former ponds, previous investigation (BH105, Hydrock report reference R/06862/005) proved the following geological strata: **Made Ground -** variable sandy gravelly clay with horizons of sand and gravel and occasional cobbles and boulders. Gravel is typically carbonaceous mudstone, mudstone, sandstone, coal, burnt shale, ash and brick; and **Middle Coal Measures -** interbedded mudstones and siltstones. A thickness of 9.0m of Made Ground (colliery spoil, soft becoming firm and stiff sandy gravelly clay) was proven overlying a horizon of very soft clay of 4.5m thickness, becoming soft with occasional mudstone and siltstone fragments noted below 13.5m below ground level (bgl). Rockhead was proven at 14.0m bgl (very weak siltstone and mudstone). Groundwater was struck at 8.3m bgl and rose to 6.9m bgl after 20 minutes. It should be noted that the previous investigation of the area predates earthworks on site and hence ground levels have changed.

GROUND INVESTIGATION	**Boreholes**	Three cable percussive shell and auger boreholes (BH201 to BH203) were drilled during October 2008 to a maximum depth of 15.20m below existing ground level (begl). SPT tests were carried out in all the boreholes at 1.00m intervals. Upon encountering soft soils, thick walled open drive U100 undisturbed samples were taken. Boreholes were then continued to refusal with SPT tests at 1.00m intervals.
	Ground Conditions Encountered	BH201 was sunk in the area of the easternmost pond shown on historic mapping. A thickness of 8.7m Made Ground was proven, comprising firm friable sandy gravelly clay and very dense to dense gravelly sand with pockets of soft sandy gravelly clay. Weathered Coal Measures were proven below 8.7m bgl, with rockhead (siltstone) noted below 9.0m bgl. No horizons of very soft clay were encountered in this borehole. Boreholes BH202 and BH203 were drilled within the footprint of Unit 1 and the area of the westernmost former pond shown on historical maps. BH202 proved a total thickness of 12.7m Made Ground. The Made Ground consisted of firm and stiff friable sandy gravelly clay to a depth of 7.9m bgl. From 7.9m bgl to 12.7m bgl, soft becoming very soft slightly sandy clay was proven, with occasional sand and gravelly lenses noted. The very soft soils were underlain by very stiff clay of the weathered Coal Measures. Rockhead was proven at 15.0m bgl. Groundwater was encountered at 11.5m bgl in the very soft strata and rose to 11.45m bgl after 20 minutes. BH203 proved a total thickness of Made Ground of 13.6m. Soft becoming firm and in parts stiff sandy gravelly clay was encountered to a depth of 10.0m bgl. Between 10.0m bgl to 10.6m bgl, soft sandy gravelly clay was encountered, underlain by very soft slightly sandy clay to 12.0m bgl. Loose to medium dense very silty sand was proven underlying the soft and very soft clay to a depth of 13.6m bgl. Weathered Coal Measures were proven at 13.6m bgl, with rockhead encountered at 14.0m bgl. Groundwater was struck at 10.4m bgl and rose to 10.3m bgl after 20 minutes. The investigation has proven soft and very soft in parts sandy and gravelly clay at depths of between 7.9m bgl and 10.0m bgl and with a thickness of 4.8m in BH202 and 2.0m in BH203. In BH203, the soft material was underlain by a further 1.6m of loose to medium dense silty sand and occasional sand lenses were noted within soft clay in BH202.
	Geotechnical Testing	A schedule of geotechnical testing was scheduled on samples retrieved from boreholes. The testing was undertaken by a UKAS accredited laboratory and comprised the following: • 19 natural moisture contents; • 19 Atterberg limits; • 10 particle size distribution analyses with sedimentation of fine fraction; • 1 particle size distribution analyses without sedimentation of fine fraction; • 5 quick undrained triaxial shear strength tests; and • 5 consolidation tests by oedometer.

This Executive Summary forms part of Hydrock Consultants Limited report number R/06862/006 (Issue 1) and should not be used as a separate document.

Hydrock Consultants Limited

1.0 INTRODUCTION

1.1 Terms of Reference

In September 2008, Hydrock Consultants Limited (Hydrock) was commissioned by Gladman Developments Limited to undertake a factual geotechnical investigation at Plot B, Wentworth Park, Tankersley, South Yorkshire. NGR co-ordinates at the approximate centre of the development area are 433300E, 399800N.

The site is currently under redevelopment for industrial usage. The development comprises four industrial portal frame units with associated infrastructure. Historically the site has been used for quarrying, brick making, coal mining and storage of commercial vehicles.

A site location plan (Drawing 06862/D001), a site survey plan and a proposed development layout are presented in Appendix A.

1.2 Objectives

The objectives of this investigation are to provide factual geotechnical data in respect of an area of soft clay soil identified at depth in the northeast of the site in previous ground investigations. The area is coincident with two former ponds that are shown in the northeast of the site on historical maps.

The investigation has been undertaken in accordance with recommendations from Keller Ground Engineering in respect of proposals for ground improvement.

1.3 Scope

The scope of work for this commission comprises:

- a factual geotechnical investigation in the area of the former ponds consisting of cable percussive boring and laboratory testing; and
- a factual report presenting the findings of the investigation.

The scope of works does not include:

- desk study information (presented previously);
- interpretation of the findings (to be undertaken by others);
- geo-environmental investigation or recommendations (presented previously);
- recommendations regarding mining related issues (presented previously); or
- recommendations regarding earthworks.

1.4 Limitations

This report details the findings of work carried out in September and October 2008. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, all potential environmental constraints or liabilities associated with the site may not have been revealed.

The report has been prepared for the exclusive benefit of Gladman Developments Limited and those parties designated by them for the purpose of providing geotechnical recommendations for the site. The report contents should only be used in that context. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

Hydrock has used reasonable skill, care and diligence in the design of the investigation of the site. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths of boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred. Information provided by third parties has been used in good faith and is taken at face value, however Hydrock cannot guarantee its accuracy or completeness.

1.5 Previous Reports

To date a number of reports on the site have been presented by Hydrock and by others. These are:

- Fugro report, “Geophysical Survey, Wentworth Park, Tankersley” presented 13th February 2006, (ref: GEO064005-1 (01));
- Hydrock report, “Desk Study and Ground Investigation at Plot B, Wentworth Park, Tankersley” presented April 2006, (ref R/06862/001);
- Hydrock report, “Further Investigation and Stabilisation of Old Shallow Mineworkings at Plot B, Wentworth Park, Tankersley” presented May 2007, (ref: R/06862/003);
- Hydrock report, “Treatment Philosophy for the Stabilisation of Old Shallow Mineworkings at Plot B, Wentworth Park, Tankersley” presented June 2007, (ref:R/06862/004); and
- Hydrock report, “Factual Geotechnical Investigation at Plot B, Wentworth Park, Tankersley” presented March 2008, (ref: R/06862/005).

1.6 Summary of Proposed Development

The proposed development is to comprise 4 portal frame industrial units with associated infrastructure. A proposed development plan is included in Appendix A.

1.7 Ground Conditions

Reference should be made to Hydrock report reference R/06862/001 for desk study information and full details of the ground conditions prevalent at the site. Further geotechnical investigation was undertaken and presented in Hydrock report R/06862/005.

For the purposes of this factual investigation the geological sequence in the area of the former ponds in the northeast of the site is summarised in Table 1.1 below:

Table 1.1: Geology

Age	Stratigraphic Name	Description
Recent	Made Ground	Variable sandy gravelly clay with horizons of sand and gravel and occasional cobbles and boulders. Gravel is typically carbonaceous mudstone, mudstone, sandstone, coal, burnt shale, ash and brick
Carboniferous	Middle Coal Measures	Interbedded mudstones and siltstones.

Previous investigation (BH105 undertaken and presented as part of the works in report reference R/06862/005) proved a thickness of 9.0m of Made Ground (colliery spoil, soft becoming firm and stiff sandy gravelly clay) overlying a horizon of very soft clay of 4.5m thickness, becoming soft with occasional mudstone and siltstone fragments noted below 13.5m below ground level (bgl). Rockhead was proven at 14.0m bgl (very weak siltstone and mudstone).

Groundwater was struck at 8.3m bgl and rose to 6.9m bgl after 20 minutes.

Previous investigation suggested the very soft clay horizon originated from weathering of the Coal Measures strata due to the former pond/groundwater.

It should be noted that site levels have been raised in the period between March 2008 and October 2008, and as such the ground levels indicated on exploratory logs in Hydrock reports R/06862/001 and R/06862/005 are redundant.

Current site levels are congruent with proposed levels following earthworks.

Detailed descriptions of the strata encountered as part of this investigation are included on the exploratory logs in Appendix C.

2.0 GROUND INVESTIGATION

2.1 Investigation Rationale

The ground investigation comprised 3 cable percussive boreholes depths of between 10.10m and 15.20m below existing ground level (begl) to confirm the depth to rockhead across the site and to allow in-situ geotechnical testing and sampling.

2.2 Boreholes

Three cable percussive shell and auger boreholes were drilled during October 2008 to a maximum depth of 15.20m begl.

SPT tests were carried out in all the boreholes at 1.00m intervals. Upon encountering soft soils, thick walled open drive U100 undisturbed samples were taken. Boreholes were then continued to refusal with SPT tests at 1.00m intervals.

Boreholes were backfilled with arisings upon completion.

The borehole locations (as determined by Hydrock and set out by a surveyor from Gladman Developments Limited) are shown on the Ground Investigation Plan in Appendix B. The borehole logs are also presented in Appendix C.

2.3 Geotechnical Testing

Geotechnical testing has been carried out to provide design parameters in relation to proposals for a vibro-piling scheme at the site in accordance with a specification provided by the Client on behalf of Keller Ground Engineering.

2.3.1 In Situ Testing

SPT results were performed in the boreholes and the results are included on the exploratory logs presented in Appendix C.

2.3.2 Laboratory Testing

A schedule of geotechnical testing was scheduled on samples retrieved from boreholes.

The testing was undertaken in accordance with BS1377 by a UKAS accredited laboratory and comprised the following:

- 19 natural moisture contents;
- 19 Atterberg limits;

- 10 particle size distribution analyses with sedimentation of fine fraction;
- 1 particle size distribution analyses without sedimentation of fine fraction;
- 5 quick undrained triaxial shear strength tests; and
- 5 consolidation tests by oedometer.

The geotechnical test results are provided in Appendix D.

2.4 Ground Conditions Encountered

BH201 was sunk in the area of the easternmost pond shown on historic mapping.

A thickness of 8.7m Made Ground was proven, comprising firm friable sandy gravelly clay and very dense to dense gravelly sand with pockets of soft sandy gravelly clay. Weathered Coal Measures were proven below 8.7m bgl, with rockhead (siltstone) noted below 9.0m bgl. No horizons of very soft clay were encountered in this borehole.

Boreholes BH202 and BH203 were drilled within the footprint of Unit 1 and the area of the westernmost former pond shown on historical maps.

BH202 proved a total thickness of 12.7m Made Ground. The Made Ground consisted of firm and stiff friable sandy gravelly clay to a depth of 7.9m bgl. From 7.9m bgl to 12.7m bgl, soft becoming very soft slightly sandy clay was proven, with occasional sand and gravelly lenses noted. The very soft soils were underlain by very stiff clay of the weathered Coal Measures. Rockhead was proven at 15.0m bgl.

Groundwater was encountered at 11.5m bgl in the very soft strata and rose to 11.45m bgl after 20 minutes.

BH203 proved a total thickness of Made Ground of 13.6m. Soft becoming firm and in parts stiff sandy gravelly clay was encountered to a depth of 10.0m bgl. Between 10.0m bgl to 10.6m bgl, soft sandy gravelly clay was encountered, underlain by very soft slightly sandy clay to 12.0m bgl. Loose to medium dense very silty sand was proven underlying the soft and very soft clay to a depth of 13.6m bgl. Weathered Coal Measures were proven at 13.6m bgl, with rockhead encountered at 14.0m bgl.

Groundwater was struck at 10.4m bgl and rose to 10.3m bgl after 20 minutes.

The investigation has proven soft and very soft in parts sandy and gravelly clay at depths of between 7.9m bgl and 10.0m bgl and with a thickness of 4.8m in BH202 and 2.0m in BH203. In BH203, the soft material was underlain by a further 1.6m of loose to medium dense silty sand and occasional sand lenses were noted within soft clay in BH202.

Contrary to the previous investigation, it has been concluded that the soft soil is Made Ground and is not residual soil arising from weathering of the Coal Measures.

3.0 REFERENCES

BRITISH STANDARDS INSTITUTION. 1990. Methods of test for soils for civil engineering purposes. *BS 1377.* BSI, London.

BRITISH STANDARDS INSTITUTION. 1999. Code of practice for Site Investigations. *BS 5930.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2001. Code of Practice for Investigation of Potentially Contaminated sites. *BS 10175.* BSI, London.

Hydrock Consultants Limited

Appendix A

SITE LOCATION PLAN & CURRENT SITE SURVEY

Rev	00/00/00	Description	ACS	ACS

Project
PLOT B, WENTWORTH PARK, TANKERSLEY

Title
SITE LOCATION PLAN

Client
GLADMAN DEVELOPMENTS

Drawing Status
INFORMATION

Job No.
CO6862

Drawn	Checked	Scale at A4	Date	Issue Date
-	-	See Attached	03/04/06	03/04/06

Hydrock Consultants
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Drawing No.
CO6862/D001

Revision
-

N
Air Shaft
BM 148.89m
146.0m
148.4m
BM 169.26m
169.5m
169.2m
170.1m
173.7m
171.9m
Path (um)
UNIT 001
Warehouse Gross Area
8,456 sqm / 91,023 sqft
Office Gross Area
900 sqm / 9,688 sqft
FFL = 157.425
27m Turning
UNIT 002
Warehouse Gross Area
6,343 sqm / 68,278 sqft
Office Gross Area
720 sqm / 7,750 sqft
FFL = 161.175
27m Turning
UNIT 003
Warehouse Gross Area
4,008 sqm / 43,143 sqft
Office Gross Area
765 sqm / 8,235 sqft
FFL = 165.425
28m Turning
27m Turning
UNIT 004
Warehouse Gross Area
7,437 sqm / 80,054 sqft
Office Gross Area
900 sqm / 9,688 sqft
FFL = 167.425
Docking Bays
Trailer Parking
office
Tank

AREA SCHEDULE			
1		sqm	sqft
Unit		8,456	91,023
Offices		900	9,688
TOTAL		**9,356**	**100,711**
2			
Unit		6,343	68,278
Offices		720	7750
TOTAL		**7,063**	**76,028**
3			
Unit		4,008	43,143
Offices		765	8,235
TOTAL		**4,773**	**51,378**
4			
Unit		7,437	80,054
Offices		900	9,688
TOTAL		**8,337**	**89,742**
GRAND TOTAL		**29,529**	**317,859**

Rev	Date	Revision notes	By
A	21.11.07	[illegible]	[illegible]

DO NOT SCALE

Status

PLANNING

Project

DCUK WENTWORTH WAY
WENTWORTH INDUSTRIAL PARK
TANKERSLEY

Title

SITE LAYOUT

Drawn By	Publish Date	Scale(s)
NJS	14.12.2007	1:1000 @ A1

Project no.	Drawing no.	Revision
2940	2940-001	A

Appendix B

GROUND INVESTIGATION PLAN

Notes:

1. Based on Site Layout drawing 2940-001 Rev A (14/12/07) provided by the Client.

LEGEND

Area of Former Pond as Indicated on 1957 1:2500 Ordnance Survey Edition

Cable Percussion Borehole Location for Investigation of Pond Area

Rev	Date	Description	By	Chd
C	23/10/08	Renumbered from 06862/D011 to 06862/D014, Renamed Ground Investigation Plan	RB	AB
B	19/09/08	Updated with proposed boreholes to assess former pond	AB	MDH
A	11/09/08	First Issue	AB	MDH

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Client
GLADMAN DEVELOPMENTS

Project
PLOT B, WENTWORTH WAY, TANKERSLEY

Title
Ground Investigation Plan

Drawing Status
INFORMATION

Job No
C06862

Drawn	Checked	Scale at A1	Date	Issue Date
RB	AB	1:1000	11/09/08	23/10/08

Drawing No
06862/D014

Revision
C

Appendix C

EXPLORATORY LOGS

Hydrock Consultants
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Borehole No
BH201
Sheet 1 of 2

Project Name: Plot B, Wentworth Park.	Project No. : C06862	Co-ords: 433501E - 399923N	Hole Type Cable
Location: Tankersley, South Yorkshire.		Level: 152.00 m AOD	Scale 1:50
Client: Gladman Developments		Dates: 06/10/2008	Logged By RB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20	151.80		Stone and clay (driller's description). (MADE GROUND)
		0.30-1.20	B					Firm friable dark grey in parts grey-brown sandy gravelly CLAY. Gravel is angular to subangular fine to coarse carbonaceous mudstone, mudstone, sandstone and occasional coal. (MADE GROUND)
		1.00	SPT	N=11 (2,3,2,4,3,2)				
		1.20-1.65	S					
		1.70-2.00	B					
		2.00	SPT	N=15 (2,3,3,3,4,5)				
		2.00-2.45	S					
		2.50-3.00	B					
		3.00	SPT	N=70 (2,3,12,22,24,12)				
		3.00-3.45	S		3.20	148.80		Very dense red-brown occasionally dark grey SAND and GRAVEL with many soft sandy gravelly clay pockets. Gravel is angular fine to coarse brick and burnt shale. (MADE GROUND)
		3.50-4.00	B					
		4.00	SPT	N=43 (7,14,8,18,6,11)				... becoming dense below 4.00m.
		4.00-4.45	S					
		4.80-5.00	B					
		5.00	SPT	N=11 (4,3,2,3,3,3)				
		5.00-5.45	S					
					5.50	146.50		Firm red-brown sandy gravelly CLAY with many pockets of gravelly sand. Gravel is angular fine to coarse burnt shale, mudstone, ash and clinker. (MADE GROUND)
		5.50-6.00	B					
		6.00	SPT	N=8 (2,1,2,2,1,3)				
		6.00-6.45	S					
		6.50-7.00	D					
		7.00	SPT	N=20 (3,4,5,4,6,5)				... Possible elevation of SPT 'N' value at 7.00m due to gravel content.
		7.00-7.45	S					
		8.00	SPT	N=7 (2,1,3,2,1,1)				... becoming soft below approximately 8.00m.
		8.00-8.45	S/B					
					8.70	143.30		Stiff friable grey CLAY with many angular fine to coarse mudstone fragments and lithorelicts. (Weathered Coal Measures Strata)
		8.70-9.00	D					
		9.00	SPT	76/125mm (25,29,47)	9.00	143.00		Weak grey SILTSTONE. (Coal Measures Strata)
		9.00-9.20	S					
			Type	Results				

Continued next sheet

Remarks:
1. Excavate hand dug service avoidance pit to 1.20m.
2. Groundwater struck at 7.90m rising to 7.80m after 5 mins and remaining at this level after 20 mins with 7.50m of casing. Sealed off at 8.70m.
3. Chiselled from 9.60m to 10.00m for 1.00 hour.
4. Borehole backfilled with arisings.

In-situ Testing
SPT Standard Penetration Test (Split Spoon)
CPT Standard Penetration Test (Solid Cone)
HSV Hand Shear Vane
U Undisturbed Sample and number of blows

Borehole Types
DP Dynamic Sampling
Cable Cable Percussion
Rotary Rotary Core
RO Rotary Openhole

Sample Types
D Disturbed Sample
LB Large Bulk Sample
B Bulk Sample
AJ Amber Jar Sample
W Water Sample
V Vial
SPTLS SPT Sample

Hydrock Consultants
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Borehole No
BH201
Sheet 2 of 2

Project Name: Plot B, Wentworth Park.	Project No. : C06862	Co-ords: 433501E - 399923N	Hole Type Cable
Location: Tankersley, South Yorkshire.		Level: 152.00 m AOD	Scale 1:50
Client: Gladman Developments		Dates: 06/10/2008	Logged By RB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		10.00 10.00-10.10	SPT S	60/25mm (25,60)	10.10	141.90		Weak grey SILTSTONE. (Coal Measures Strata) End of Borehole at 10.10 m

Type	Results

Remarks:
1. Excavate hand dug service avoidance pit to 1.20m.
2. Groundwater struck at 7.90m rising to 7.80m after 5 mins and remaining at this level after 20 mins with 7.50m of casing. Sealed off at 8.70m.
3. Chiselled from 9.60m to 10.00m for 1.00 hour.
4. Borehole backfilled with arisings.

In-situ Testing
SPT Standard Penetration Test (Split Spoon)
CPT Standard Penetration Test (Solid Cone)
HSV Hand Shear Vane
U Undisturbed Sample and number of blows

Borehole Types
DP Dynamic Sampling
Cable Cable Percussion
Rotary Rotary Core
RO Rotary Openhole

Sample Types
D Disturbed Sample
LB Large Bulk Sample
B Bulk Sample
AJ Amber Jar Sample
W Water Sample
V Vial
SPTLS SPT Sample

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Borehole No
BH202
Sheet 1 of 2

Project Name: Plot B, Wentworth Park.	Project No. : C06862	Co-ords: 433457E - 399928N	Hole Type Cable
Location: Tankersley, South Yorkshire.		Level: 157.70 m AOD	Scale 1:50
Client: Gladman Developments		Dates: 03/10/2008-06/10/2008	Logged By RB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20	157.50		Clay, mudstone, shale, sandstone fill (driller's description). (MADE GROUND)
		0.20-1.00	B					Firm in parts friable sandy gravelly CLAY. Gravel is angular to subangular fine to coarse carbonaceous mudstone, mudstone, sandstone and occasional coal and wood. (MADE GROUND)
		1.00	SPT	N=16 (2,3,3,4,4,5)				... becoming stiff below approximately 1.00m.
		1.00-1.45	S					
		1.50-2.00	B					
		2.00	SPT	N=22 (3,5,7,6,5,4)				
		2.00-2.45	S					
		2.50-3.00	B					
		3.00	SPT	N=47 (6,8,7,10,16,14)				
		3.00-3.45	S					
		3.50-4.00	B					
		4.00	SPT	N=16 (4,3,4,4,3,5)				
		4.00-4.45	S					
		4.50-5.00	B					
		5.00	SPT	N=17 (7,4,4,4,5,4)				
		5.00-5.45	S					
		5.50-6.00	B					
		6.00	SPT	N=20 (5,3,5,6,4,5)				
		6.00-6.45	S					
		6.50-7.00	B					
		7.00	SPT	N=10 (3,4,2,3,2,3)	7.00	150.70		Firm dark grey sandy gravelly CLAY. Gravel is angular to subangular fine to coarse carbonaceous mudstone, mudstone and sandstone. (MADE GROUND)
		7.00-7.45	S					
					7.90	149.80		Soft dark grey slightly sandy CLAY. (MADE GROUND)
		8.00-8.45	U	8 blows 450mm rec				
		8.45-8.60	D		8.60	149.10		Dark grey clayey gravelly SAND. Gravel is angular fine to coarse carbonaceous mudstone and coal. (MADE GROUND)
		8.60-9.00	B					
					9.00	148.70		Very soft dark grey slightly sandy CLAY. (MADE GROUND)
		9.00-9.45	U	11 blows 450mm rec				
		9.45-9.60	D					
		Type		Results				

Continued next sheet

Remarks:
1. Groundwater struck at 11.50m rising to 11.45m after 5 mins, 11.40m after 10 mins and remaining at this level after 20 mins with 11.40m of casing. Sealed off at 12.00m.
2. Chiselled from 14.00m to 14.80m for 1.00 hour.
3. Borehole backfilled with arisings.

In-situ Testing
SPT Standard Penetration Test (Split Spoon)
CPT Standard Penetration Test (Solid Cone)
HSV Hand Shear Vane
U Undisturbed Sample and number of blows

Borehole Types
DP Dynamic Sampling
Cable Cable Percussion
Rotary Rotary Core
RO Rotary Openhole

Sample Types
D Disturbed Sample
LB Large Bulk Sample
B Bulk Sample
AJ Amber Jar Sample
W Water Sample
V Vial
SPTLS SPT Sample

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Borehole No
BH202
Sheet 2 of 2

Project Name: Plot B, Wentworth Park.	Project No. : C06862	Co-ords: 433457E - 399928N	Hole Type Cable
Location: Tankersley, South Yorkshire.		Level: 157.70 m AOD	Scale 1:50
Client: Gladman Developments		Dates: 03/10/2008-06/10/2008	Logged By RB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		10.00-10.45	U	8 blows 450mm rec				Very soft dark grey slightly sandy CLAY. (MADE GROUND)
		10.45-10.60	D					
		11.00-11.45	U	12 blows 450mm rec				
		11.45-11.60	D					... becoming sandy and gravelly in parts below 11.45m. Gravel is angular fine carbonaceous mudstone.
		12.00	SPT	N=7 (2,3,2,2,1,2)				... becoming soft below approximately 12.00m.
		12.00-12.45	S/D					
					12.70	145.00		Very stiff brown mottled grey sandy CLAY. (Weathered Coal Measures Strata)
		12.70-13.50	D					
		13.50	SPT	N=45 (10,11,10,9,12,14)				
		13.50-13.95	S					... many angular fine to coarse siltstone fragments and lithorelicts noted below approximately 14.00m.
		14.00-14.80	D					
		15.00	SPT	78/125mm (25,31,47)	15.00	142.70		Weak grey SILTSTONE. (Coal Measures Strata)
		15.00-15.20	S		15.20	142.50		End of Borehole at 15.20 m
		Type		Results				

Remarks:
1. Groundwater struck at 11.50m rising to 11.45m after 5 mins, 11.40m after 10 mins and remaining at this level after 20 mins with 11.40m of casing. Sealed off at 12.00m.
2. Chiselled from 14.00m to 14.80m for 1.00 hour.
3. Borehole backfilled with arisings.

In-situ Testing
SPT Standard Penetration Test (Split Spoon)
CPT Standard Penetration Test (Solid Cone)
HSV Hand Shear Vane
U Undisturbed Sample and number of blows

Borehole Types
DP Dynamic Sampling
Cable Cable Percussion
Rotary Rotary Core
RO Rotary Openhole

Sample Types
D Disturbed Sample
LB Large Bulk Sample
B Bulk Sample
AJ Amber Jar Sample
W Water Sample
V Vial
SPTLS SPT Sample

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Borehole No
BH203
Sheet 1 of 2

Project Name: Plot B, Wentworth Park.	Project No. : C06862	Co-ords: 433444E - 399954N	Hole Type Cable
Location: Tankersley, South Yorkshire.		Level: 157.70 m AOD	Scale 1:50
Client: Gladman Developments		Dates: 02/10/2008-03/10/2008	Logged By RB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20	157.50		Mudstone, shale, clay, sandstone, coal fill (driller's description). (MADE GROUND)
		0.20-1.00	B					Very soft grey sandy gravelly CLAY. Gravel is angular fine to coarse carbonaceous mudstone and mudstone. (MADE GROUND)
		1.00	SPT	N=12 (3,4,2,3,4,3)	1.00	156.70		Firm in parts friable dark grey sandy gravelly CLAY. Gravel is angular to subangular fine to coarse mudstone, carbonaceous mudstone and occasional coal and sandstone. (MADE GROUND)
		1.00-1.45	S					
		1.50-2.00	B					
		2.00	SPT	N=18 (2,3,3,5,4,6)				
		2.00-2.45	S					
		2.50-3.00	B					
		3.00	SPT	N=26 (6,10,4,7,9,6)				... becoming stiff and in parts firm to stiff below approximately 3.00m.
		3.00-3.45	S					
		3.50-4.00	B					
		4.00	SPT	N=15 (3,5,4,3,4,4)				
		4.00-4.45	S					
		4.50-5.00	B					
		5.00	SPT	N=22 (6,5,6,6,5,5)				
		5.00-5.45	S					
		6.00	SPT	N=17 (6,4,5,4,3,5)				
		6.00-6.45	S					
		6.50-7.00	B					
		7.00	SPT	N=24 (3,7,8,4,6,6)				
		7.00-7.45	S					
		8.00	SPT	N=21 (3,4,6,4,7,4)				
		8.00-8.45	S					
		9.00	SPT	N=11 (3,2,2,3,3,3)				... becoming firm below approximately 9.00m.
		9.00-9.45	S					
			Type	Results				Continued next sheet

Remarks:
1. Groundwater struck at 10.40m rising to 10.35m after 5 mins, 10.30m after 10 mins and remaining at this level after 20 mins with 10.30m of casing. Sealed off at 11.00m.
2. Chiselled from 13.60m to 14.00m for 1.00 hour.
3. Borehole backfilled with arisings.

In-situ Testing
SPT Standard Penetration Test (Split Spoon)
CPT Standard Penetration Test (Solid Cone)
HSV Hand Shear Vane
U Undisturbed Sample and number of blows

Borehole Types
DP Dynamic Sampling
Cable Cable Percussion
Rotary Rotary Core
RO Rotary Openhole

Sample Types
D Disturbed Sample
LB Large Bulk Sample
B Bulk Sample
AJ Amber Jar Sample
W Water Sample
V Vial
SPTLS SPT Sample

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Borehole No
BH203
Sheet 2 of 2

Project Name: Plot B, Wentworth Park.	Project No. : C06862	Co-ords: 433444E - 399954N	Hole Type Cable
Location: Tankersley, South Yorkshire.		Level: 157.70 m AOD	Scale 1:50
Client: Gladman Developments		Dates: 02/10/2008-03/10/2008	Logged By RB

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
		10.00	SPT	N=5	10.00	147.70		Soft dark grey sandy gravelly CLAY. Gravel is angular fine to medium carbonaceous mudstone and mudstone. (MADE GROUND)
	▼	10.00-10.45	S	(2,3,1,1,1,2)				
					10.60	147.10		Very soft dark grey slightly sandy CLAY. (MADE GROUND)
		10.60-11.25	U/B	5 blows rec failed				
		11.30-11.95	U/B	6 blows rec failed				
					12.00	145.70		Dark grey very silty SAND. (MADE GROUND)
		12.00-12.45	U	10 blows 450mm rec				
		13.00	SPT	N=10				... loose to medium dense below 13.00m.
		13.00-13.45	S	(1,2,2,3,2,3)				
					13.60	144.10		Very stiff grey CLAY with many angular fine to coarse mudstone fragments and lithorelicts. (Weathered Coal Measures Strata)
		13.60-14.00	D					
		14.00	SPT	88/150mm	14.00	143.70		Weak grey SILTSTONE. (Coal Measures Strata)
		14.00-14.22	S	(25,34,54)	14.22	143.48		End of Borehole at 14.22 m
			Type	Results				

Remarks:
1. Groundwater struck at 10.40m rising to 10.35m after 5 mins, 10.30m after 10 mins and remaining at this level after 20 mins with 10.30m of casing. Sealed off at 11.00m.
2. Chiselled from 13.60m to 14.00m for 1.00 hour.
3. Borehole backfilled with arisings.

In-situ Testing
SPT Standard Penetration Test (Split Spoon)
CPT Standard Penetration Test (Solid Cone)
HSV Hand Shear Vane
U Undisturbed Sample and number of blows

Borehole Types
DP Dynamic Sampling
Cable Cable Percussion
Rotary Rotary Core
RO Rotary Openhole

Sample Types
D Disturbed Sample
LB Large Bulk Sample
B Bulk Sample
AJ Amber Jar Sample
W Water Sample
V Vial
SPTLS SPT Sample

Appendix D

GEOTECHNICAL TEST RESULTS

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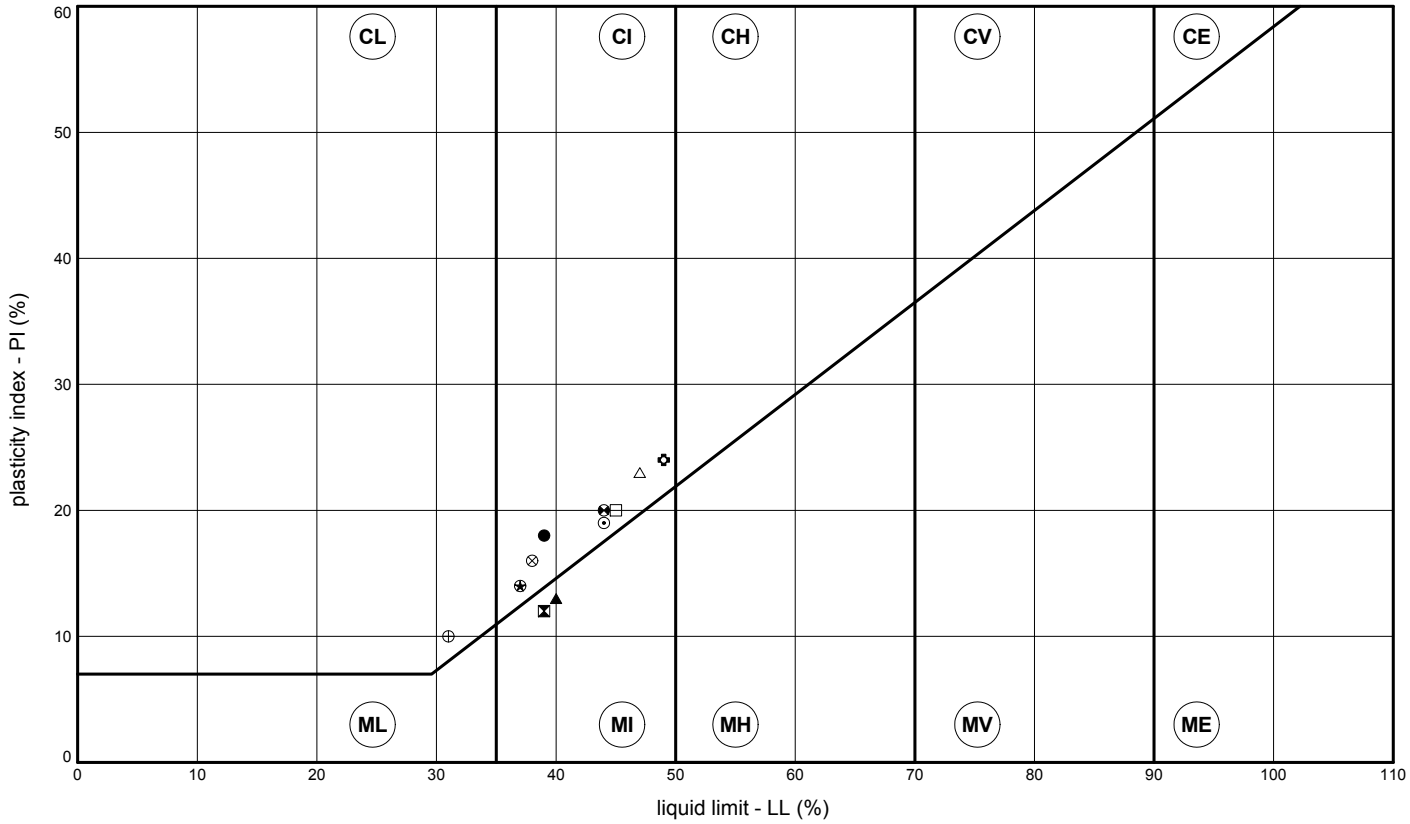
ATTERBERG LINE PLOT

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY



	BH/TP No.	depth (m)	LL	PL	PI	remarks
●	BH201	0.30	39	21	18	
⊠	BH201	5.50	39	27	12	
▲	BH201	8.00	40	27	13	
★	BH201	8.70	37	23	14	
⊙	BH202	2.50	44	25	19	
✪	BH202	6.50	49	25	24	
○	BH202	8.60	37	23	14	
△	BH202	10.45	47	24	23	
⊗	BH202	12.00	38	22	16	
⊕	BH202	12.70	31	21	10	
□	BH203	1.50	45	25	20	
❂	BH203	4.50	44	24	20	

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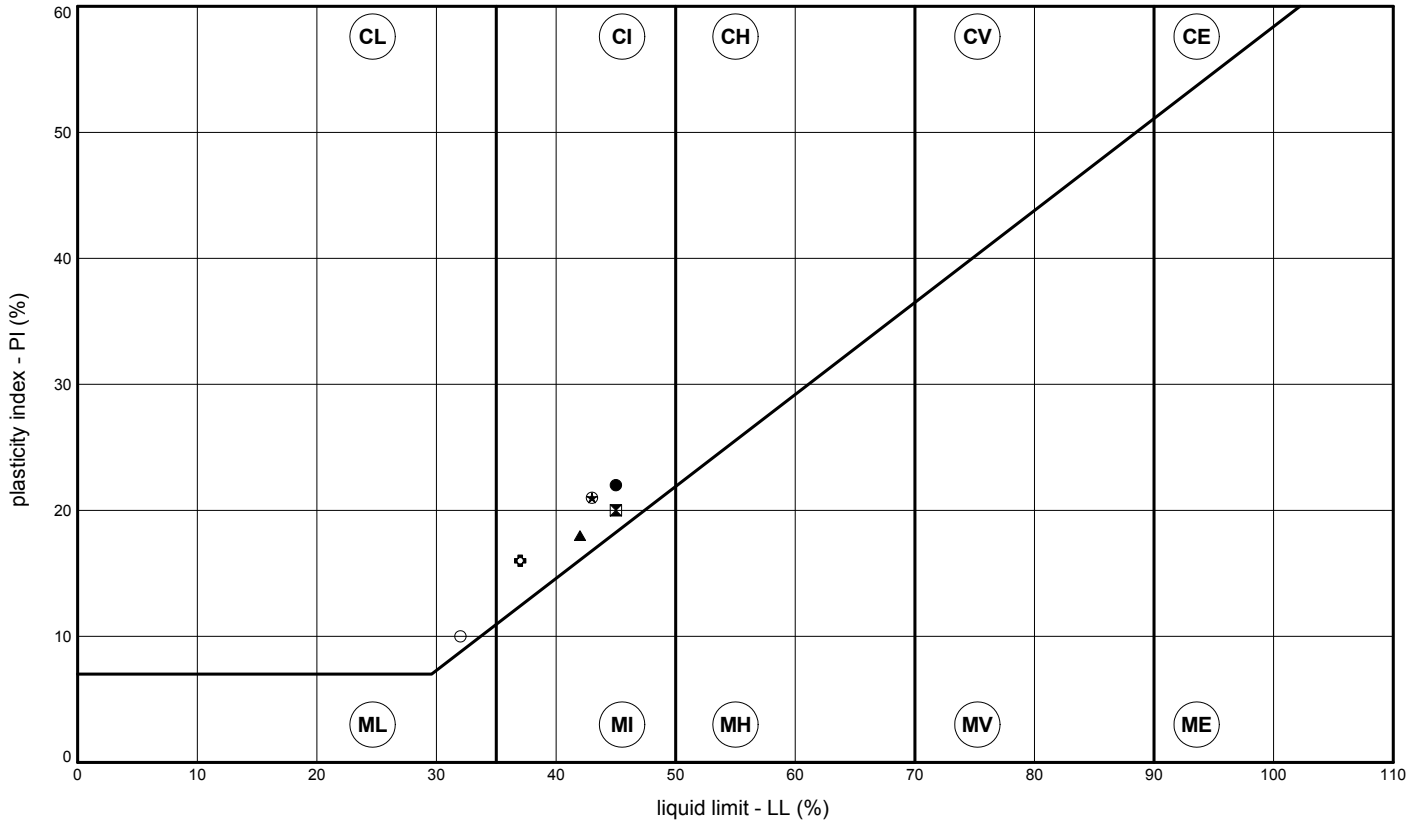
ATTERBERG LINE PLOT

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY



	BH/TP No.	depth (m)	LL	PL	PI	remarks
●	BH203	8.00	45	23	22	
⊠	BH203	9.00	45	25	20	
▲	BH203	10.00	42	24	18	
★	BH203	10.60	43	22	21	
⊙	BH203	11.30	43	22	21	
✿	BH203	13.60	37	21	16	
○	BH203	14.00	32	22	10	

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LIQUID AND PLASTIC LIMITS

BS.1377 : Part 2 : 1990 : 4 and 5

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

borehole /trial pit no.	sample no./type	sample depth (m)	specimen depth (m)	natural moisture content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
BH201	B	0.30	0.30	14	BXE	51	39	21	18	Grey very clayey very sandy GRAVEL
BH201	B	5.50	5.50	24	BXE	41	39	27	12	Grey sandy SILT with a little f-m gravel
BH201	B	8.00	8.00	27	BXE	50	40	27	13	Red-brown slightly sandy SILT with some f-c gravel
BH201	D	8.70	8.70	10	BXE	8	37	23	14	Grey slightly sandy CLAY with a little f-m gravel
BH202	B	2.50	2.50	21	BXE	40	44	25	19	Grey slightly sandy CLAY with a little f-c gravel
BH202	D	6.50	6.50	18	BZE	61	49	25	24	Brown slightly sandy CLAY with some f-c gravel
BH202	B	8.60	8.60	25	BXE	41	37	23	14	Brown very clayey SAND with some f-c gravel and occasional cobbles
BH202	D	10.45	10.45	36	AXE	0	47	24	23	Grey sandy CLAY
BH202	B	12.00	12.00	39	AXE	0	38	22	16	Brown slightly sandy CLAY
BH202	D	12.70	12.70	17	BXE	16	31	21	10	Brown slightly sandy CLAY with a little f-m gravel
BH203	B	1.50	1.50	20	BXE	41	45	25	20	Grey slightly sandy CLAY with a little f-c gravel
BH203	B	4.50	4.50	21	BXE	41	44	24	20	Brown slightly sandy CLAY with a little f-m gravel
BH203	D	8.00	8.00	17	BZE #	39	45	23	22	Brown slightly sandy CLAY with some f-m gravel
BH203	D	9.00	9.00	18	BZE #	41	45	25	20	Brown slightly sandy CLAY with some f-m gravel
BH203	D	10.00	10.00	24	BXE	51	42	24	18	Grey slightly sandy CLAY with some f-m gravel
BH203	B	10.60	10.60	32	AXE	0	43	22	21	Grey slightly sandy CLAY
BH203	B	11.30	11.30	39	AXE	1	43	22	21	Grey slightly sandy CLAY
BH203	D	13.60	13.60	13	BYE #	51	37	21	16	Grey slightly sandy CLAY with some f-m gravel

general remarks:
natural moisture content determined in accordance with BS1377 : Part 2 : 1990 : 3.2 (unless specified)
NP denotes non-plastic
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

ORIGINATOR

specimen preparation:
A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (50°C)
E - oven dried (105°C)
F - not known

test method:
X - cone penetrometer (test 4.3)
Y - one point cone penetrometer (test 4.4)
Z - Casagrande apparatus (test 4.5)

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LIQUID AND PLASTIC LIMITS

BS.1377 : Part 2 : 1990 : 4 and 5

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

borehole /trial pit no.	sample		specimen depth (m)	natural moisture content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
BH203	D	14.00	14.00	5.4	BZE #	8	32	22	10	Grey slightly sandy CLAY with a little f-m gravel

general remarks:
natural moisture content determined in accordance with BS1377 : Part 2 : 1990 : 3.2 (unless specified)
NP denotes non-plastic
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

ORIGINATOR

specimen preparation:
A - as received
B - washed on 0.425mm sieve
C - air dried
D - oven dried (50°C)
E - oven dried (105°C)
F - not known

test method:
X - cone penetrometer (test 4.3)
Y - one point cone penetrometer (test 4.4)
Z - Casagrande apparatus (test 4.5)

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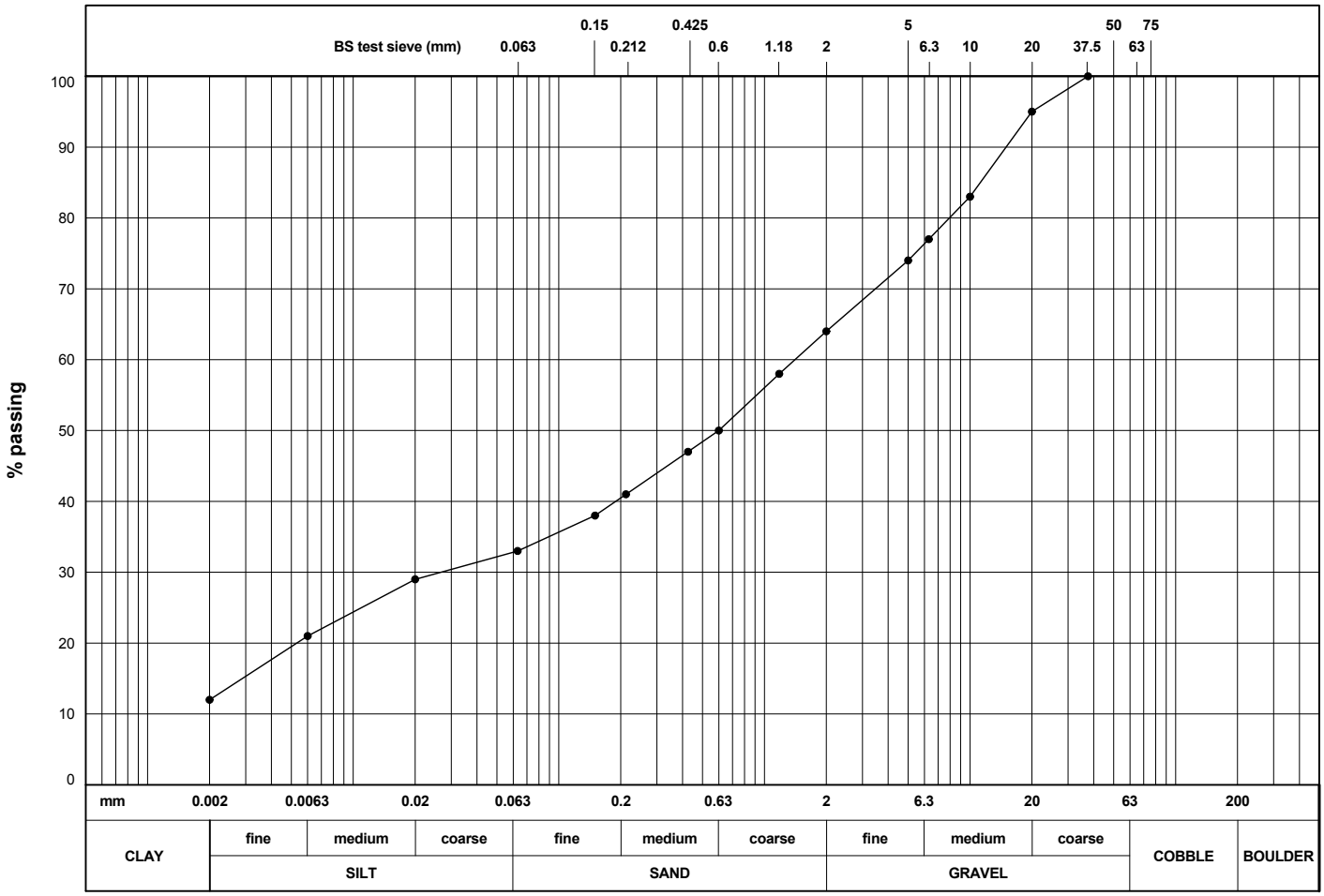
BS.1377 : Part 2 : 1990 : 9

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

DESCRIPTION Grey very clayey very sandy GRAVEL

BH/TP No.	BH201
SAMPLE No./TYPE	B
SAMPLE DEPTH (m)	0.30
SPECIMEN DEPTH (m)	0.30



soil type	% fraction
CLAY	12
SILT	21
SILT & CLAY	33
SAND	31
GRAVEL	36
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	95
10	83
6.3	77

BS test sieve (mm)	% passing
5	74
2	64
1.18	58
0.6	50
0.425	47
0.212	41
0.15	38
0.063	33

particle size (μm)	% finer
20	29
6	21
2	12

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

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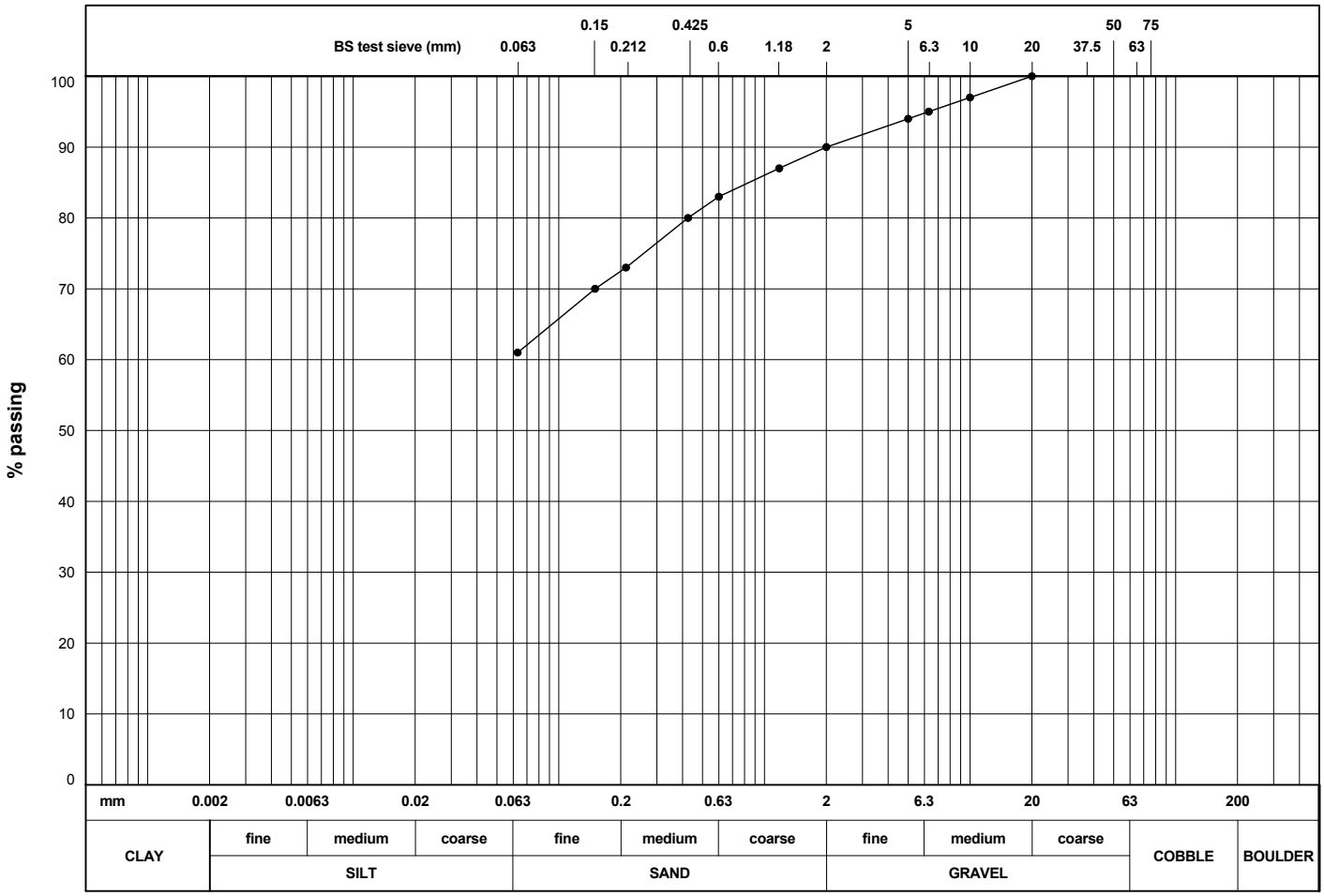
CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH201
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	3.50
DESCRIPTION	Grey slightly sandy CLAY with a little f-m gravel	SPECIMEN DEPTH (m)	3.50



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	61
SAND	29
GRAVEL	10
COBBLE & BOULDER	0
test method(s)	9.2

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	particle size (μm)	% finer
150		5	94	20	
75		2	90	6	
63		1.18	87	2	
50		0.6	83		
37.5		0.425	80		
20	100	0.212	73		
10	97	0.15	70		
6.3	95	0.063	61		

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

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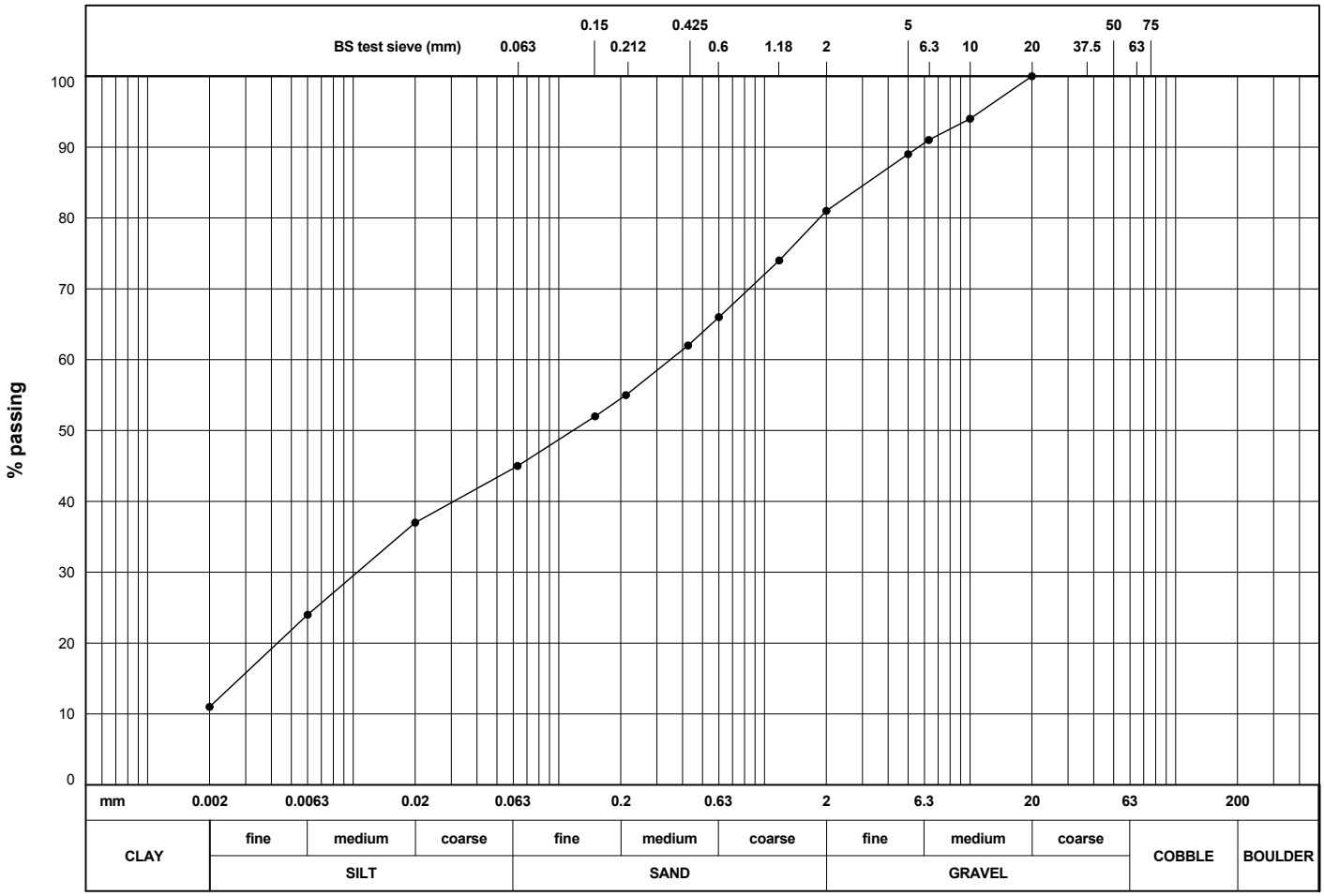
PARTICLE SIZE DISTRIBUTION

BS.1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH201
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	5.50
DESCRIPTION	Grey sandy SILT with a little f-m gravel	SPECIMEN DEPTH (m)	5.50



soil type	% fraction
CLAY	11
SILT	34
SILT & CLAY	45
SAND	36
GRAVEL	19
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	particle size (μm)	% finer
150		5	89	20	37
75		2	81	6	24
63		1.18	74	2	11
50		0.6	66		
37.5		0.425	62		
20	100	0.212	55		
10	94	0.15	52		
6.3	91	0.063	45		

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

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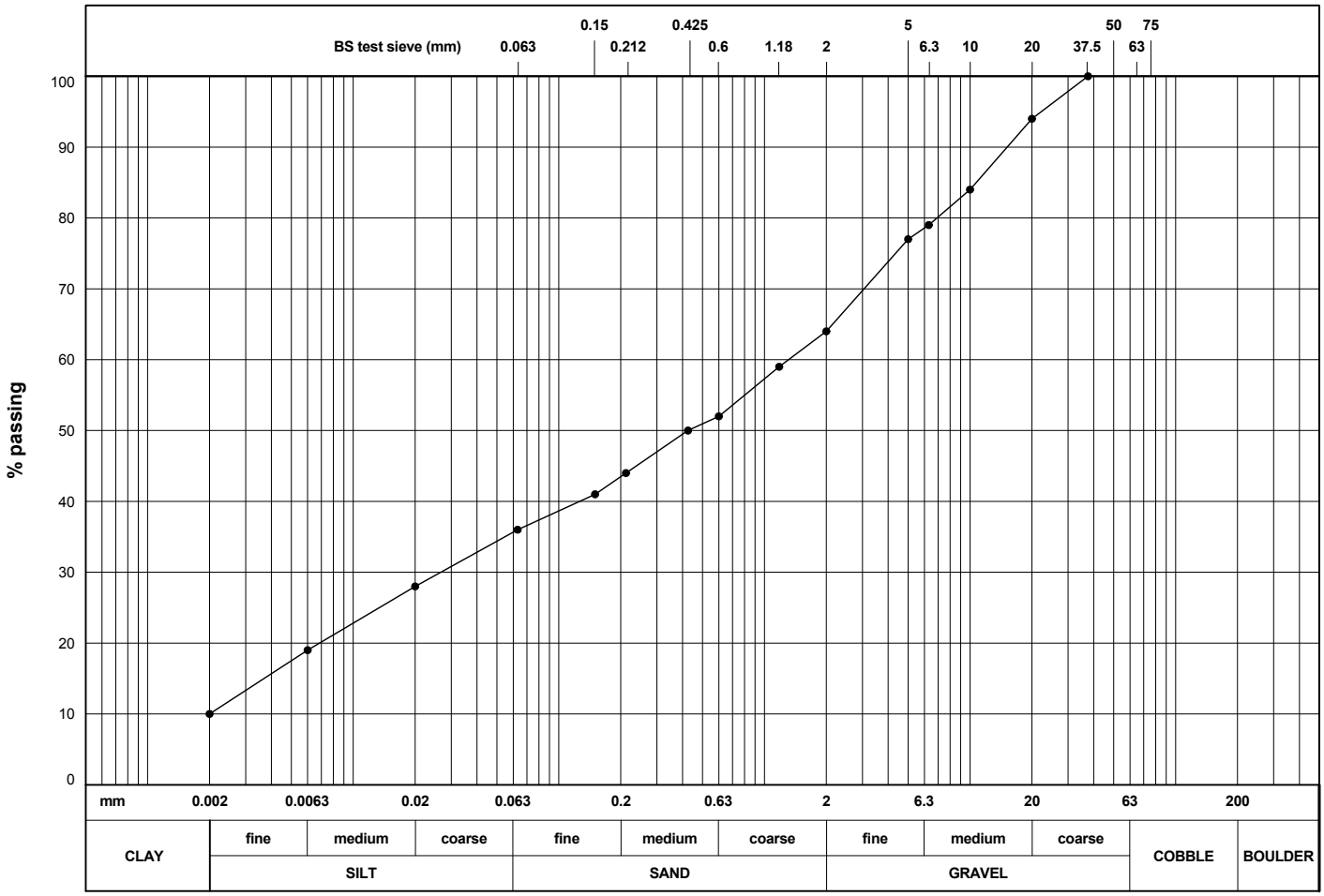
PARTICLE SIZE DISTRIBUTION

BS.1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH201
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	8.00
DESCRIPTION	Red-brown slightly sandy SILT with some f-c gravel	SPECIMEN DEPTH (m)	8.00



soil type	% fraction
CLAY	10
SILT	26
SILT & CLAY	36
SAND	28
GRAVEL	36
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	particle size (μm)	% finer
150		5	77	20	28
75		2	64	6	19
63		1.18	59	2	10
50		0.6	52		
37.5	100	0.425	50		
20	94	0.212	44		
10	84	0.15	41		
6.3	79	0.063	36		

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

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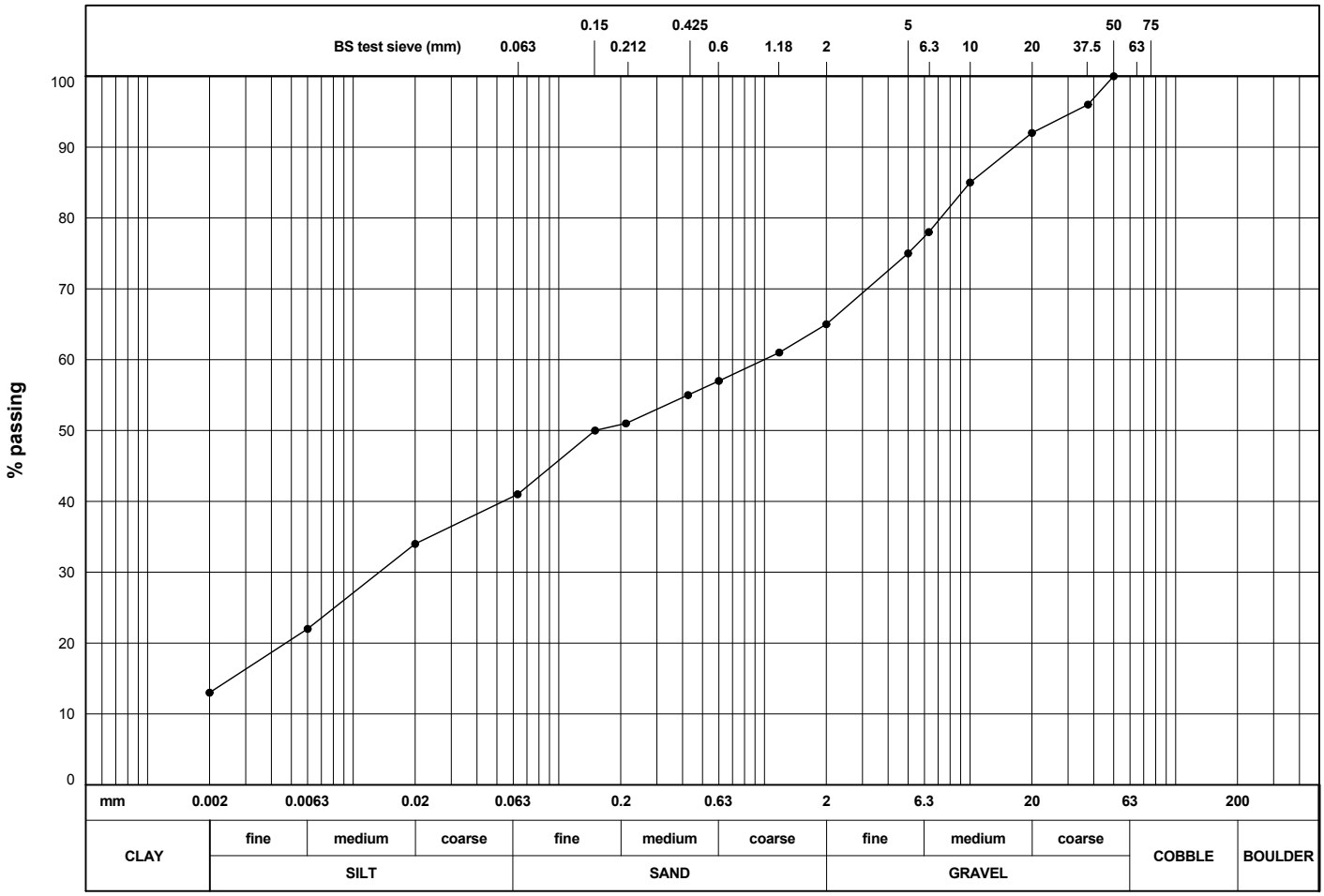
PARTICLE SIZE DISTRIBUTION

BS.1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH202
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	2.50
DESCRIPTION	Grey slightly sandy CLAY with a little f-c gravel	SPECIMEN DEPTH (m)	2.50



soil type	% fraction
CLAY	13
SILT	28
SILT & CLAY	41
SAND	24
GRAVEL	35
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing
150	
75	
63	
50	100
37.5	96
20	92
10	85
6.3	78

BS test sieve (mm)	% passing
5	75
2	65
1.18	61
0.6	57
0.425	55
0.212	51
0.15	50
0.063	41

particle size (μm)	% finer
20	34
6	22
2	13

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

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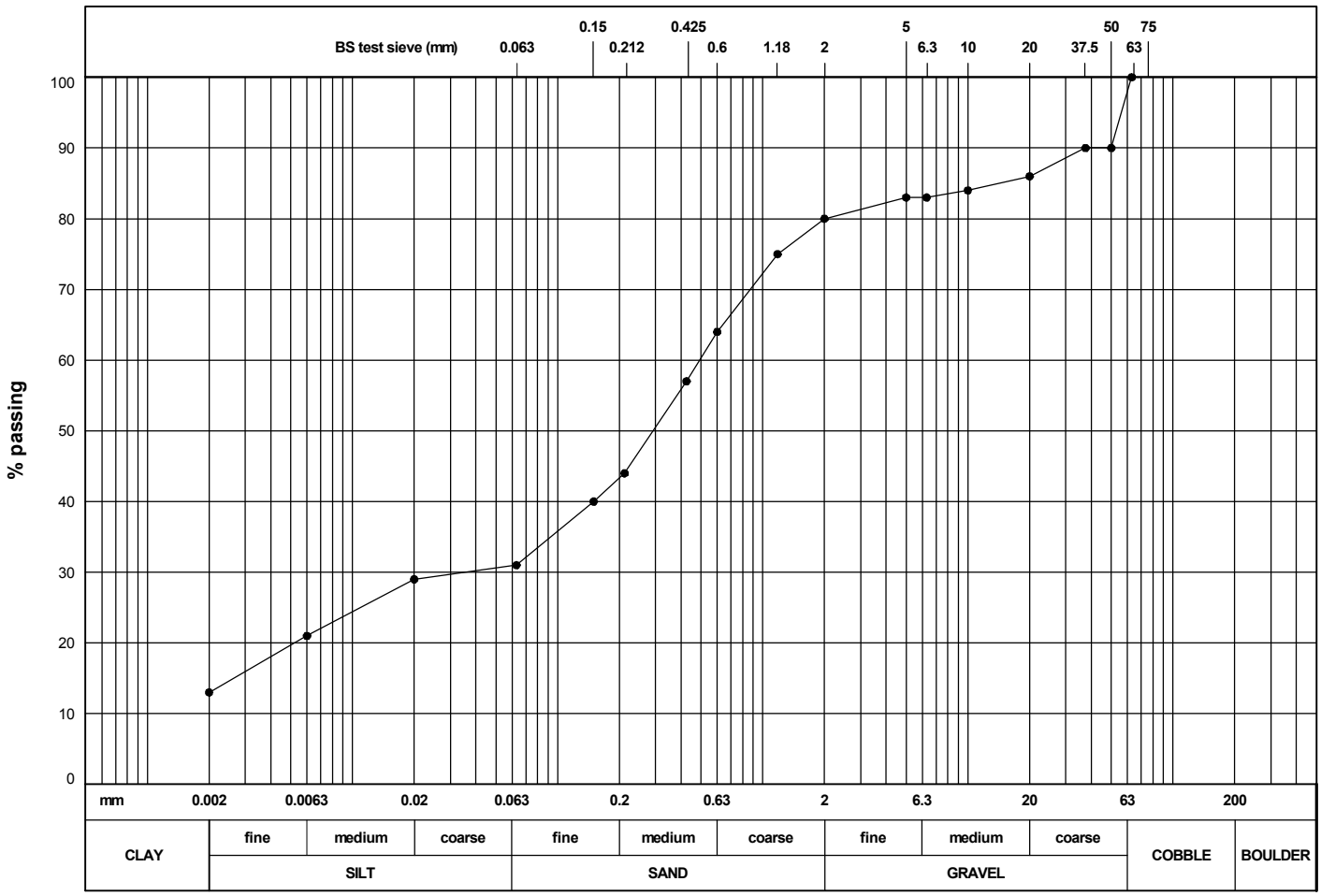
PARTICLE SIZE DISTRIBUTION

BS.1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH202
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	8.60
DESCRIPTION	Dark grey very clayey SAND with some f-c gravel	SPECIMEN DEPTH (m)	8.60



soil type	% fraction
CLAY	13
SILT	18
SILT & CLAY	31
SAND	49
GRAVEL	18
COBBLE & BOULDER	2
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing
150	
75	
63	100
50	90
37.5	90
20	86
10	84
6.3	83

BS test sieve (mm)	% passing
5	83
2	80
1.18	75
0.6	64
0.425	57
0.212	44
0.15	40
0.063	31

particle size (μm)	% finer
20	29
6	21
2	13

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
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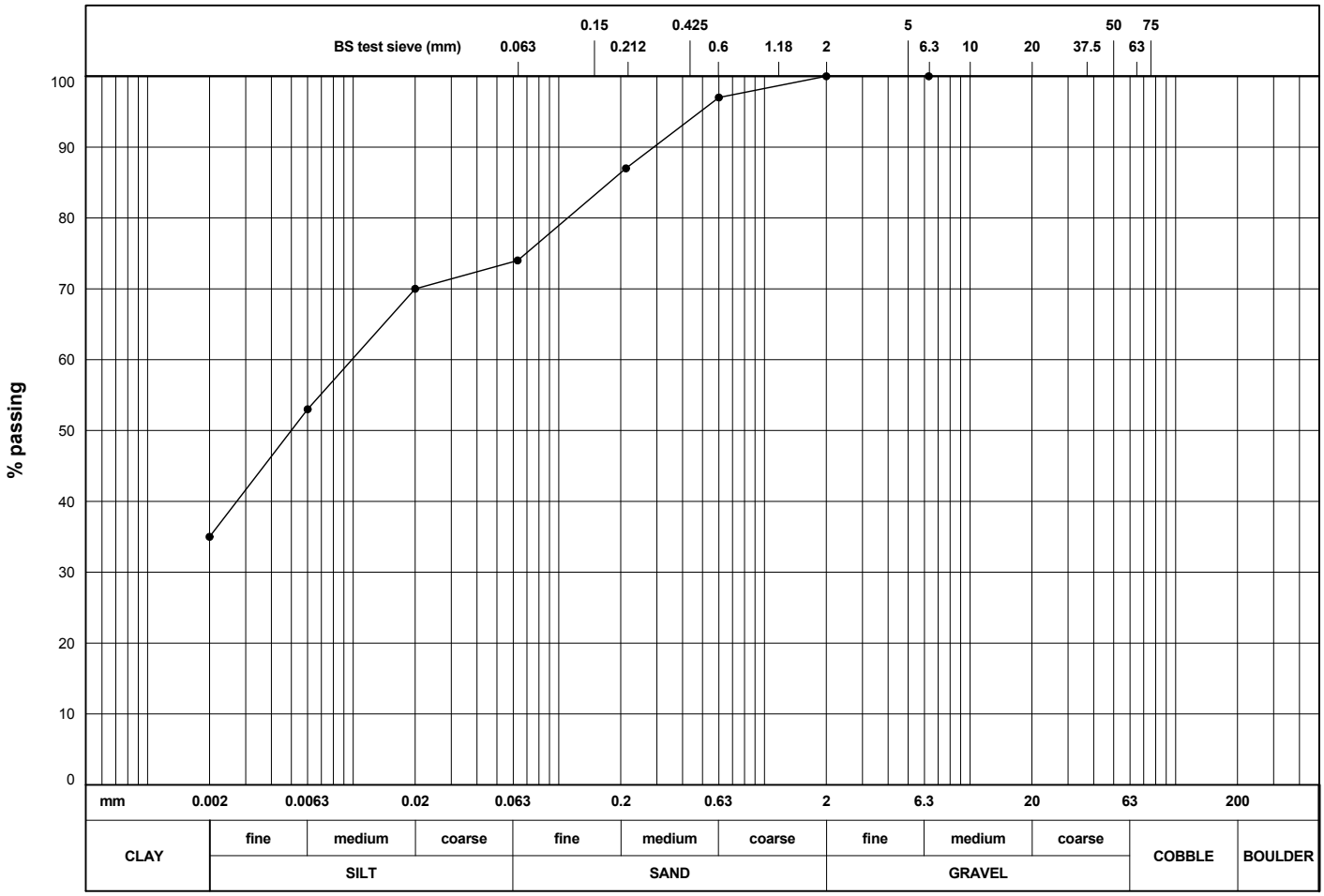
PARTICLE SIZE DISTRIBUTION

BS.1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH202
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	12.00
DESCRIPTION	Brown slightly sandy CLAY	SPECIMEN DEPTH (m)	12.00



soil type	% fraction
CLAY	35
SILT	39
SILT & CLAY	74
SAND	26
GRAVEL	0
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	
20	
10	
6.3	100

BS test sieve (mm)	% passing
5	
2	100
1.18	
0.6	97
0.425	
0.212	87
0.15	
0.063	74

particle size (μm)	% finer
20	70
6	53
2	35

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

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PARTICLE SIZE DISTRIBUTION

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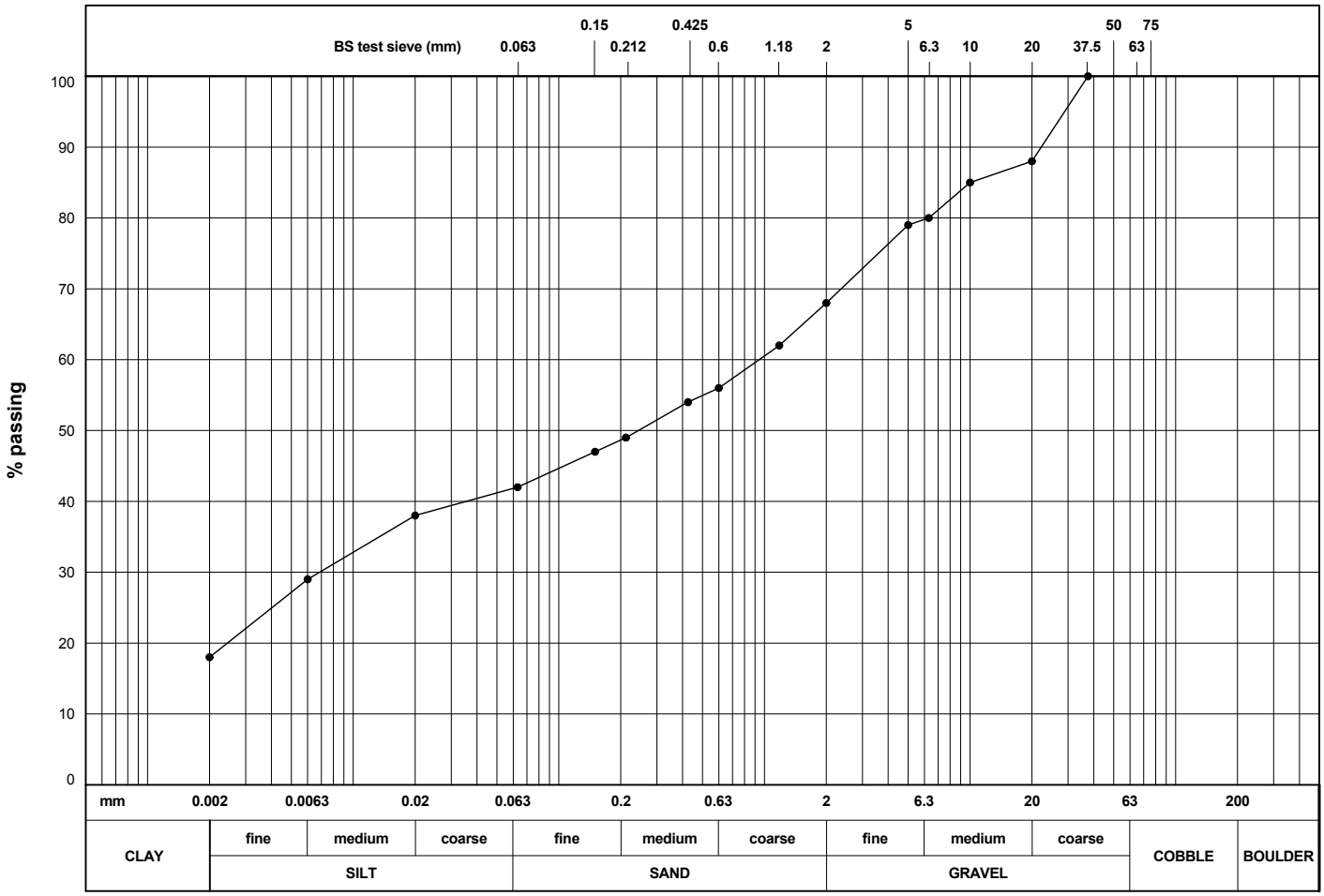
CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH203
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.50
DESCRIPTION	Grey slightly sandy CLAY with a little f-c gravel	SPECIMEN DEPTH (m)	1.50



soil type	% fraction
CLAY	18
SILT	24
SILT & CLAY	42
SAND	26
GRAVEL	32
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	100
20	88
10	85
6.3	80

BS test sieve (mm)	% passing
5	79
2	68
1.18	62
0.6	56
0.425	54
0.212	49
0.15	47
0.063	42

particle size (μm)	% finer
20	38
6	29
2	18

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
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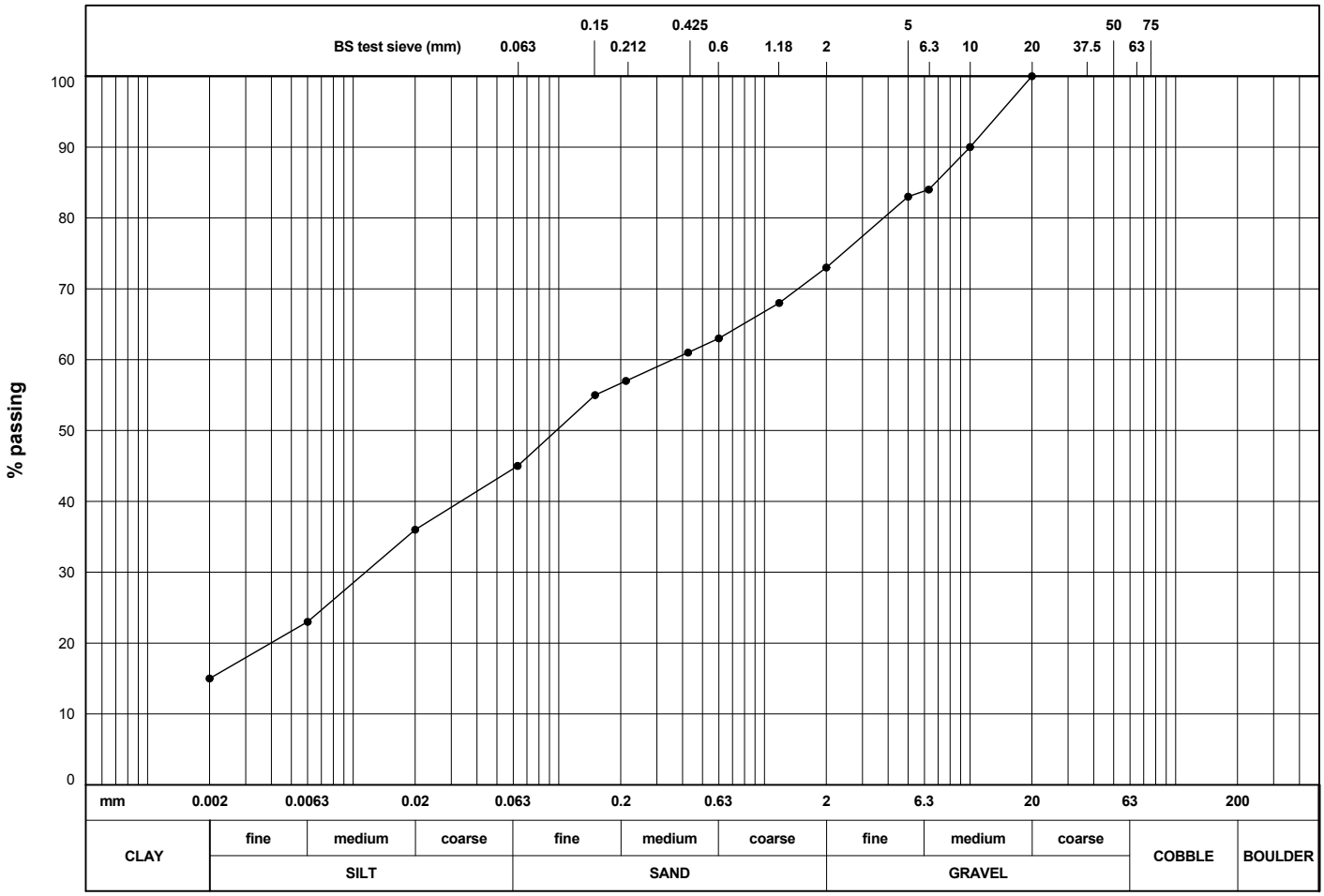
PARTICLE SIZE DISTRIBUTION

BS.1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH203
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	4.50
DESCRIPTION	Brown slightly sandy CLAY with a little f-m gravel	SPECIMEN DEPTH (m)	4.50



soil type	% fraction
CLAY	15
SILT	30
SILT & CLAY	45
SAND	28
GRAVEL	27
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	
20	100
10	90
6.3	84

BS test sieve (mm)	% passing
5	83
2	73
1.18	68
0.6	63
0.425	61
0.212	57
0.15	55
0.063	45

particle size (μm)	% finer
20	36
6	23
2	15

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
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PARTICLE SIZE DISTRIBUTION

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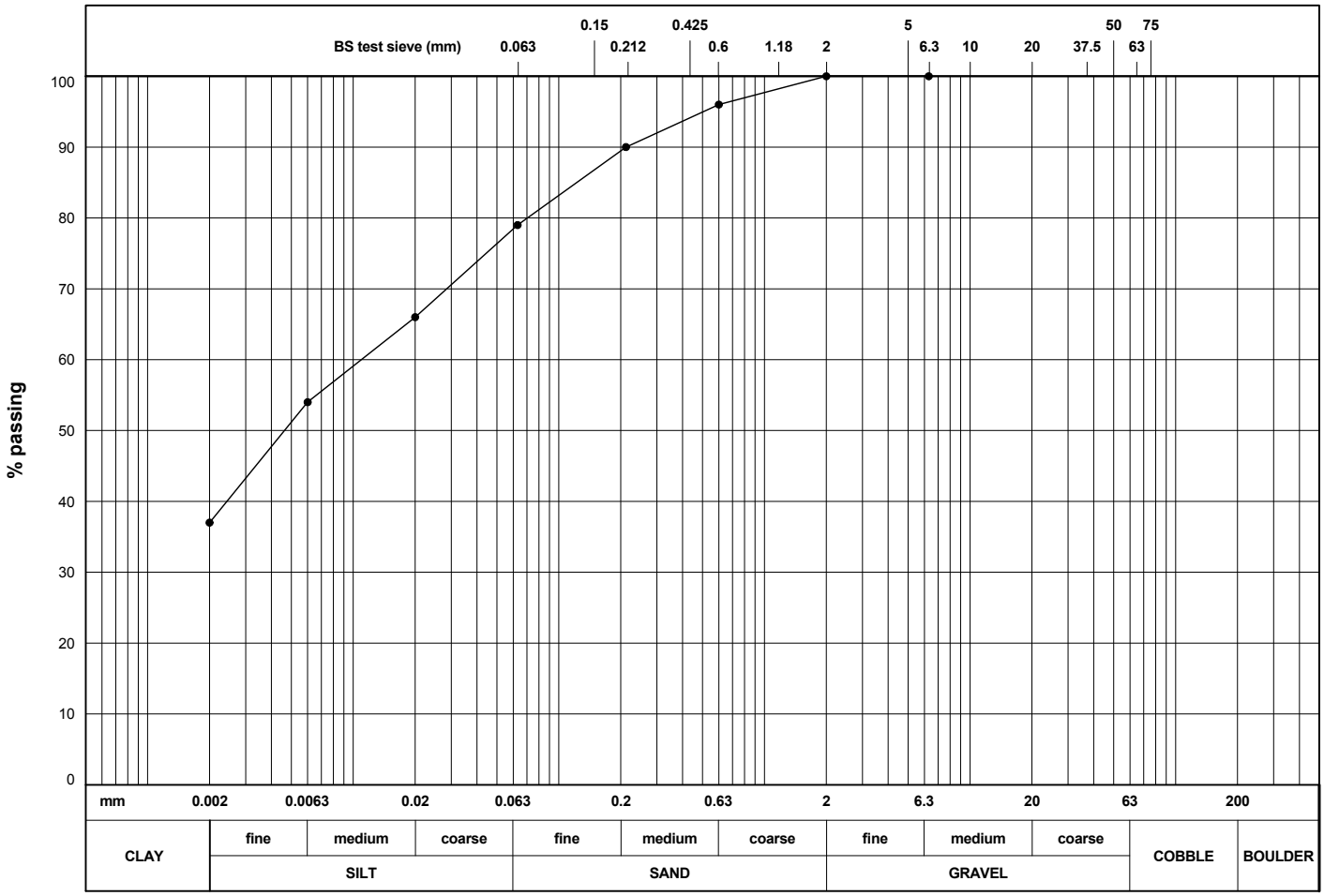
CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH203
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	10.60
DESCRIPTION	Grey slightly sandy CLAY	SPECIMEN DEPTH (m)	10.60



soil type	% fraction
CLAY	37
SILT	42
SILT & CLAY	79
SAND	21
GRAVEL	0
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

BS test sieve (mm)	% passing
150	
75	
63	
50	
37.5	
20	
10	
6.3	100

BS test sieve (mm)	% passing
5	
2	100
1.18	
0.6	96
0.425	
0.212	90
0.15	
0.063	79

particle size (μm)	% finer
20	66
6	54
2	37

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
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PARTICLE SIZE DISTRIBUTION

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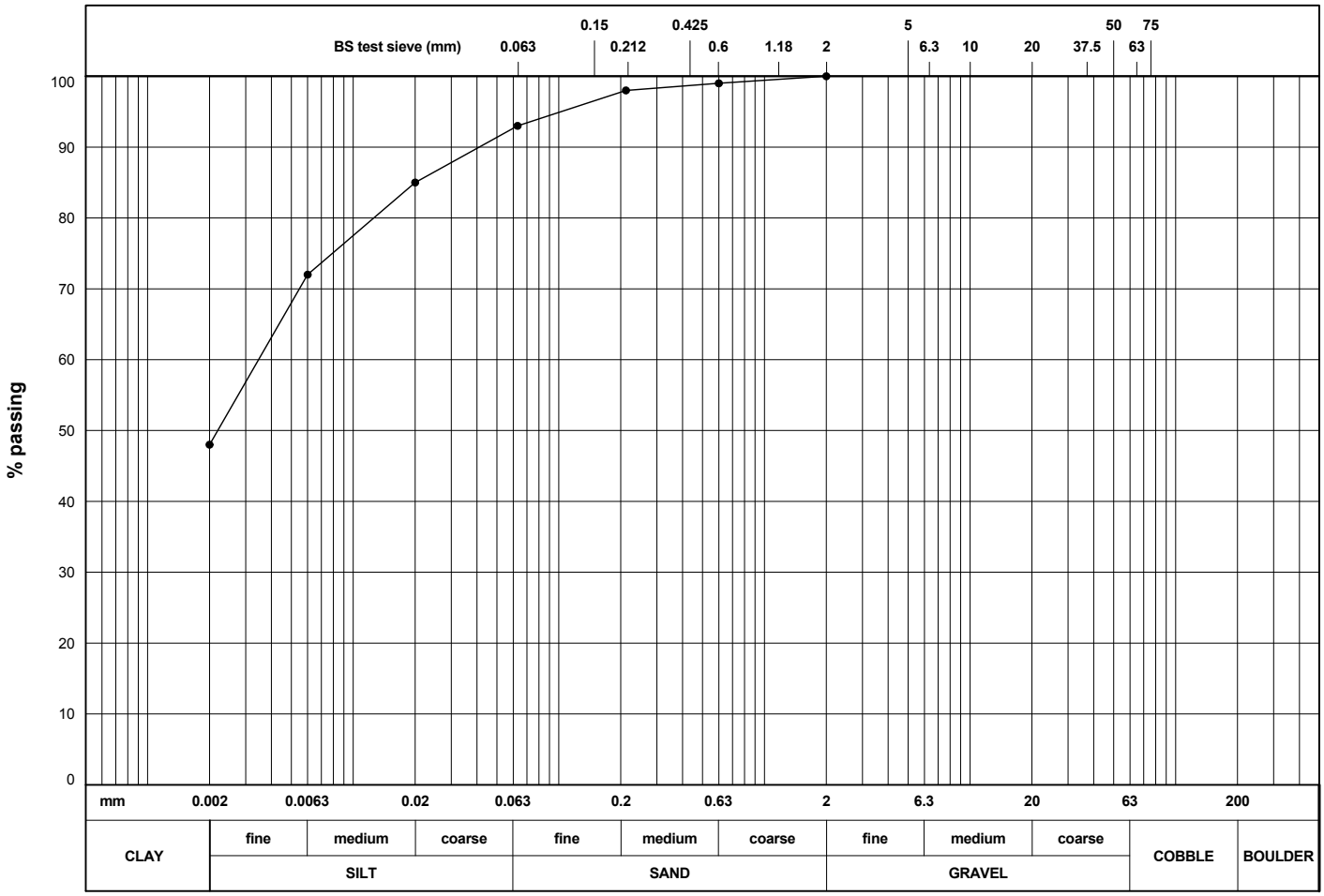
CLIENT	HYDROCK CONSULTANTS	BH/TP No.	BH203
SITE	TANKERSLEY	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	11.30
DESCRIPTION	Grey slightly sandy CLAY	SPECIMEN DEPTH (m)	11.30



soil type	% fraction
CLAY	48
SILT	45
SILT & CLAY	93
SAND	7
GRAVEL	0
COBBLE & BOULDER	0
test method(s)	9.2 & 9.2

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	particle size (μm)	% finer
150		5		20	85
75		2	100	6	72
63		1.18		2	48
50		0.6	99		
37.5		0.425			
20		0.212	98		
10		0.15			
6.3		0.063	93		

test method:
9.2 - wet sieving
9.3 - dry sieving
9.4 - sedimentation by pipette
9.5 - sedimentation by hydrometer

ORIGINATOR

remarks:
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

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UNDRAINED TRIAXIAL COMPRESSION

BS.1377 : Part 7 : 1990 : 8 and 9

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

borehole /trial pit no.	sample no./ type	sample depth (m)	specimen depth (m)	code	moisture content (%)	density bulk (Mg/m^3)	density dry (Mg/m^3)	cell pressure (kPa)	deviator stress (kPa)	failure strain (%)	failure mode	shear strength* (kPa)	description and remarks
BH202	U	8.00	8.15	UU100	28.5	1.35	1.05	160	43	17.6	B	22	Grey sandy CLAY
BH202	U	9.00	9.10	UU100	35.1	1.67	1.24	180	31	20.0	B	16	Grey slightly sandy CLAY
BH202	U	10.00	10.15	UU100	38.8	1.65	1.19	200	12	18.0	B	6	Grey slightly sandy CLAY
BH202	U	11.00	11.10	UU100	44.5	1.67	1.16	220	15	8.2	B	8	Grey slightly sandy CLAY
BH203	U	12.00	12.15	UU100	42.0	1.29	0.91	240	292	13.8	I	146	Grey silty SAND

general remarks: * shear strength taken as half deviator stress at failure for each stage.
# denotes sample unsuitable to test.

code:
CD - Consolidated drained
CU - Consolidated undrained
UU - Unconsolidated undrained
M - Multistage
S - Set of 3 specimens
R - Remoulded
38 - 38mm dia. x 76mm
70 - 69mm dia. x 140mm
100 - 106mm dia. x 200mm

failure mode:
B - barrelling (plastic failure)
S - shear (brittle failure)
I - intermediate
O - other (see remarks)

membrane correction applied
sample taken vertically (unless specified)
rate of strain = 2%/min (unless specified)

membrane thickness:
38 - 0.2mm 70 - 0.4mm
106 - 0.4mm

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CONSOLIDATION TEST

BS.1377 : Part 5 : 1990 : 3

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

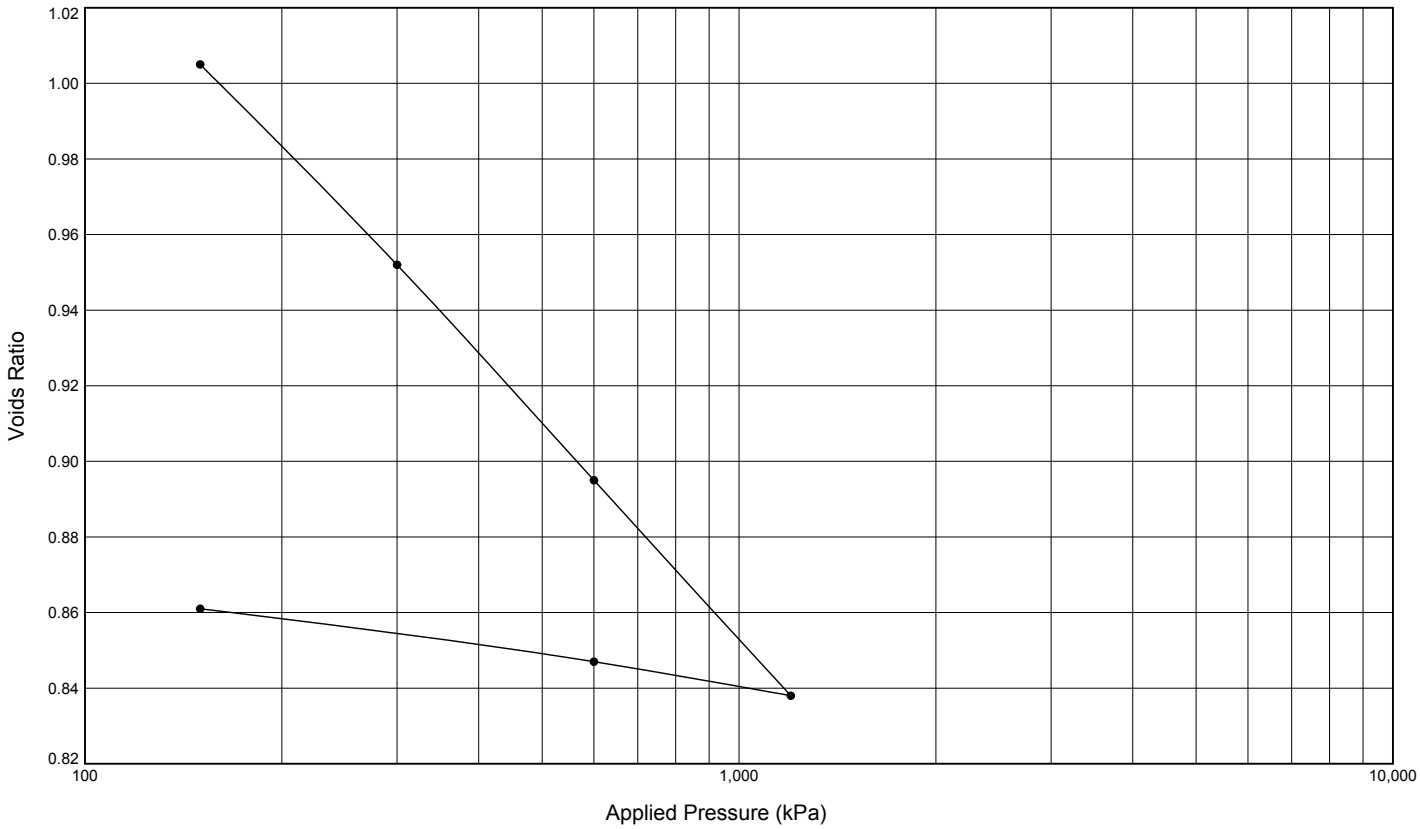
DESCRIPTION Grey sandy CLAY

BH/TP No. BH202

SAMPLE No./TYPE U

SAMPLE DEPTH (m) 8.00

SPECIMEN DEPTH (m) 8.00



Test and sample details		
specimen diameter	(mm)	63.49
specimen height	(mm)	19.01
initial moisture content	(%)	30.2
final moisture content	(%)	20.8
initial bulk density	(Mg/m^3)	1.59
initial dry density	(Mg/m^3)	1.22
initial voids ratio		1.207
initial degree of saturation	(%)	68
particle density	(Mg/m^3)	#2.70
swelling pressure	(kPa)	<150
P'o to P'o +100 kPa	(kPa)	
laboratory temperature	(^{o}C)	21
method of time fitting		root time

Test results

pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility (m^2/MN)	laboratory coefficients of consolidation (m^2/year)
150	1.005	0.609	3.96
300	0.952	0.176	1.12
600	0.895	0.097	1.68
1200	0.838	0.051	3.18
600	0.847	0.008	
150	0.861	0.017	

remarks: # denotes particle density has been assigned an assumed value.

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CONSOLIDATION TEST

BS.1377 : Part 5 : 1990 : 3

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

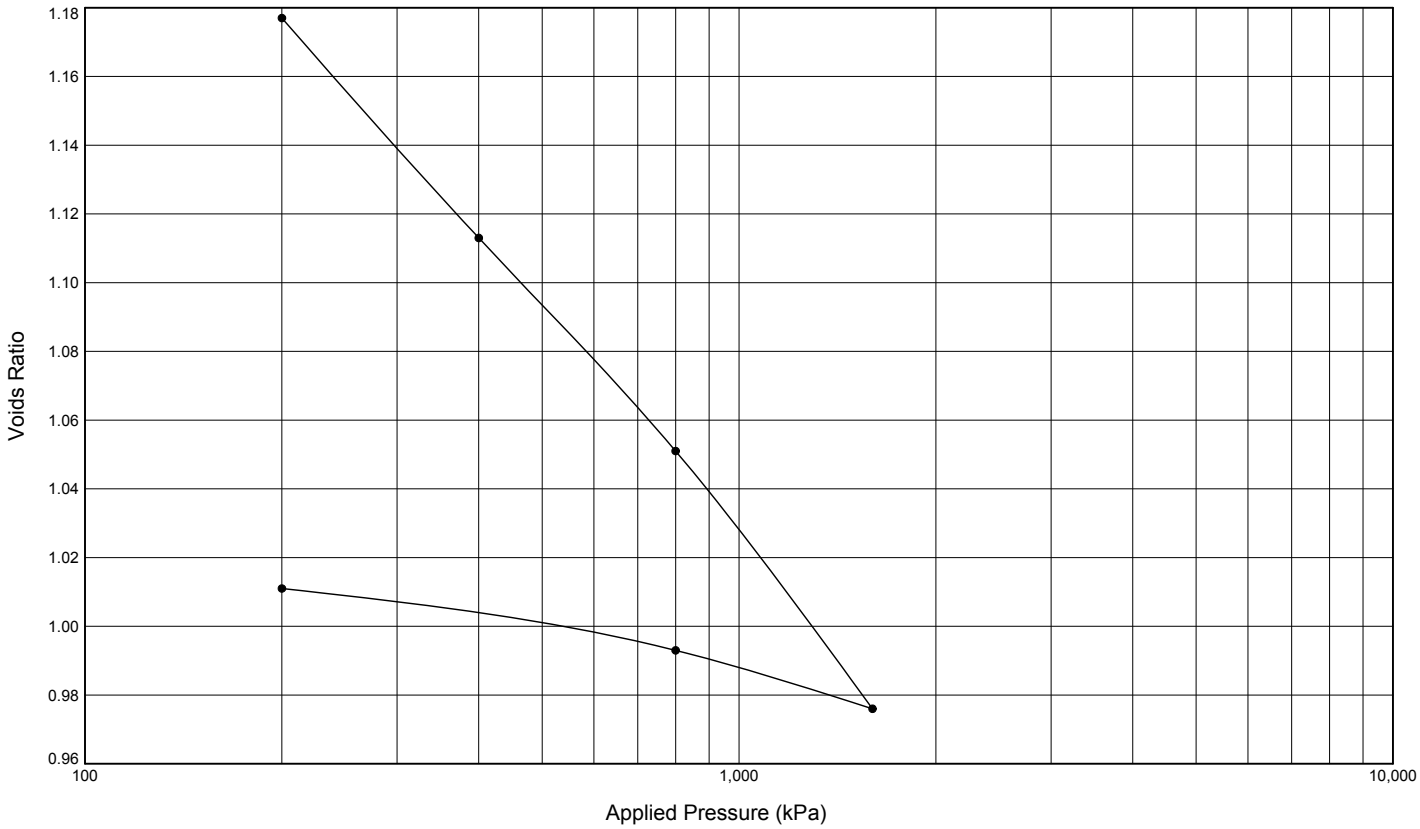
DESCRIPTION Grey slightly sandy CLAY

BH/TP No. BH202

SAMPLE No./TYPE U

SAMPLE DEPTH (m) 9.00

SPECIMEN DEPTH (m) 9.00



Test and sample details		
specimen diameter	(mm)	63.50
specimen height	(mm)	18.91
initial moisture content	(%)	36.4
final moisture content	(%)	23.9
initial bulk density	(Mg/m^3)	1.51
initial dry density	(Mg/m^3)	1.10
initial voids ratio		1.445
initial degree of saturation	(%)	68
particle density	(Mg/m^3)	#2.70
swelling pressure	(kPa)	<200
P'o to P'o +100 kPa	(kPa)	
laboratory temperature	(^oC)	21
method of time fitting		root time

Test results

pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility (m^2/MN)	laboratory coefficients of consolidation (m^2/year)
200	1.177	0.548	4.54
400	1.113	0.146	2.78
800	1.051	0.074	1.12
1600	0.976	0.046	2.45
800	0.993	0.011	
200	1.011	0.015	

remarks: # denotes particle density has been assigned an assumed value.

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CONSOLIDATION TEST

BS.1377 : Part 5 : 1990 : 3

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

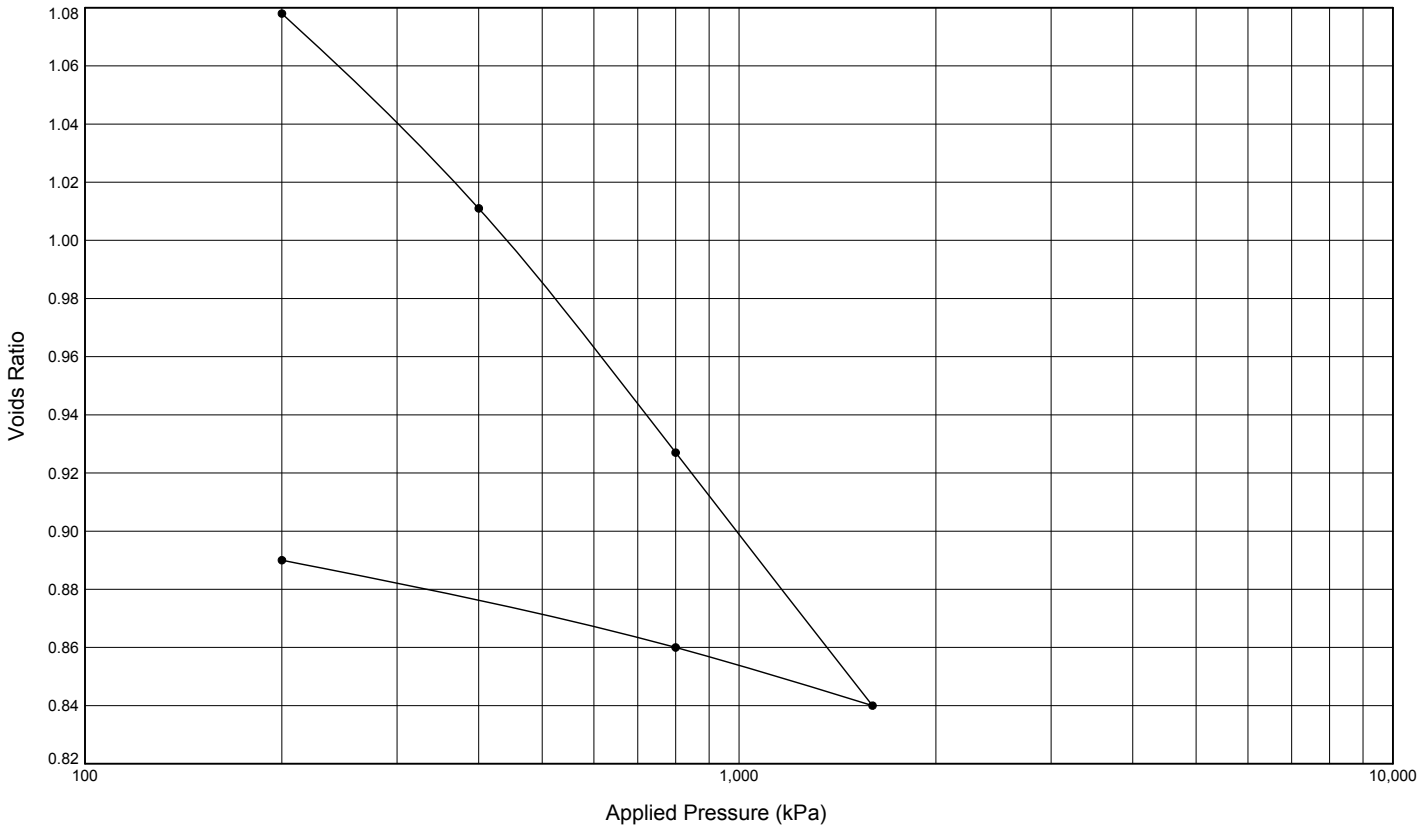
DESCRIPTION Grey slightly sandy CLAY

BH/TP No. BH202

SAMPLE No./TYPE U

SAMPLE DEPTH (m) 10.00

SPECIMEN DEPTH (m) 10.00



Test and sample details		
specimen diameter	(mm)	63.47
specimen height	(mm)	19.03
initial moisture content	(%)	42.6
final moisture content	(%)	25.5
initial bulk density	(Mg/m^3)	1.64
initial dry density	(Mg/m^3)	1.15
initial voids ratio		1.342
initial degree of saturation	(%)	86
particle density	(Mg/m^3)	#2.70
swelling pressure	(kPa)	<200
P'o to P'o +100 kPa	(kPa)	
laboratory temperature	(^{o}C)	21
method of time fitting		root time

Test results

pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility (m^2/MN)	laboratory coefficients of consolidation (m^2/year)
200	1.078	0.565	2.83
400	1.011	0.160	2.20
800	0.927	0.105	2.11
1600	0.840	0.056	1.00
800	0.860	0.013	
200	0.890	0.027	

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT	ORIGINATOR	CHECKED
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CONSOLIDATION TEST

BS.1377 : Part 5 : 1990 : 3

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

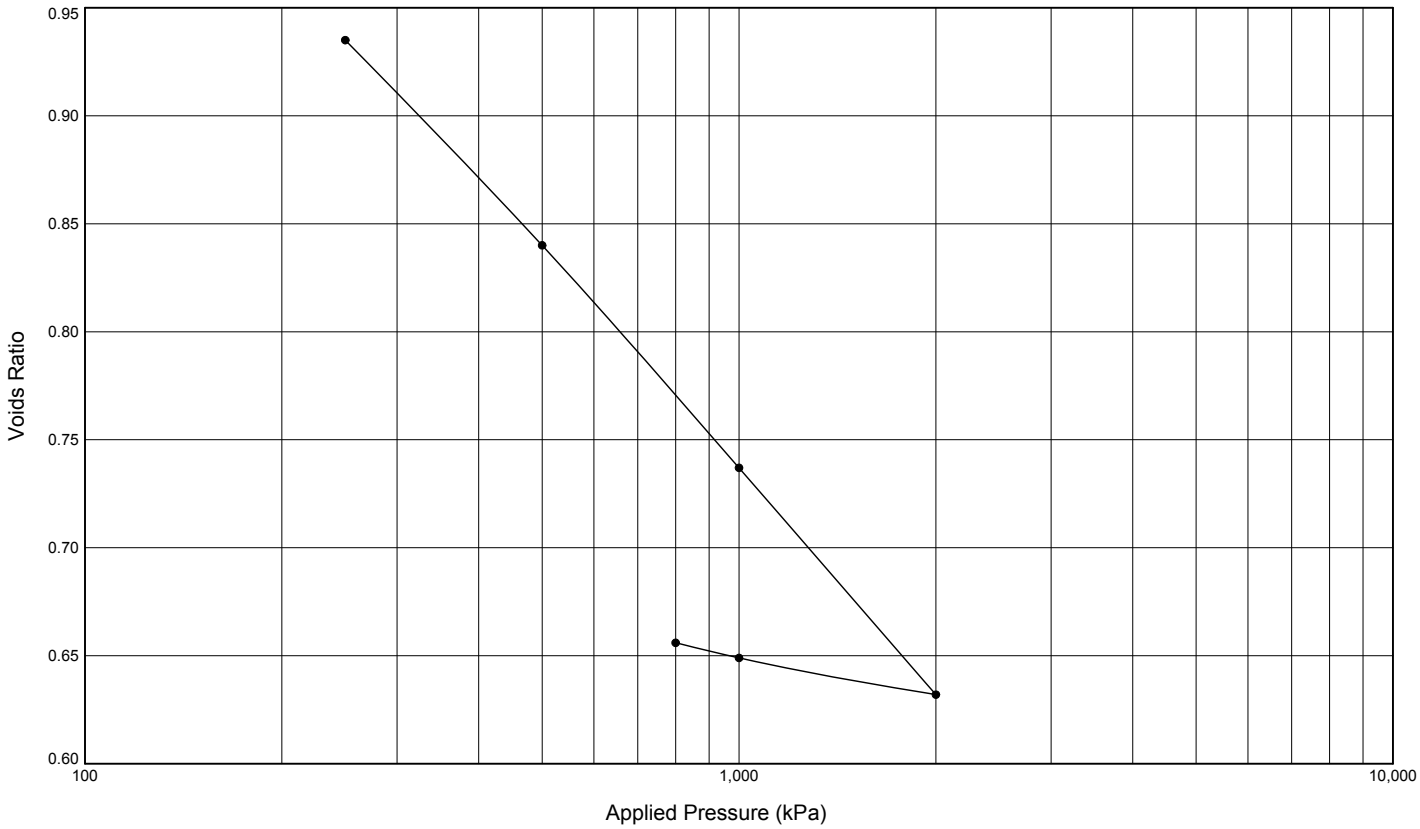
DESCRIPTION Grey slightly sandy CLAY

BH/TP No. BH202

SAMPLE No./TYPE U

SAMPLE DEPTH (m) 11.00

SPECIMEN DEPTH (m) 11.00



Test and sample details		
specimen diameter	(mm)	63.46
specimen height	(mm)	19.07
initial moisture content	(%)	45.0
final moisture content	(%)	28.1
initial bulk density	(Mg/m^3)	1.73
initial dry density	(Mg/m^3)	1.19
initial voids ratio		1.264
initial degree of saturation	(%)	96
particle density	(Mg/m^3)	#2.70
swelling pressure	(kPa)	<250
P'o to P'o +100 kPa	(kPa)	
laboratory temperature	(^{o}C)	21
method of time fitting		root time

Test results

pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility (m^2/MN)	laboratory coefficients of consolidation (m^2/year)
250	0.935	0.581	1.36
500	0.840	0.196	1.49
1000	0.737	0.112	2.07
2000	0.632	0.060	1.78
1000	0.649	0.010	
800	0.656	0.020	

remarks: # denotes particle density has been assigned an assumed value.

CONTRACT	ORIGINATOR	CHECKED
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CONSOLIDATION TEST

BS.1377 : Part 5 : 1990 : 3

CLIENT HYDROCK CONSULTANTS

SITE TANKERSLEY

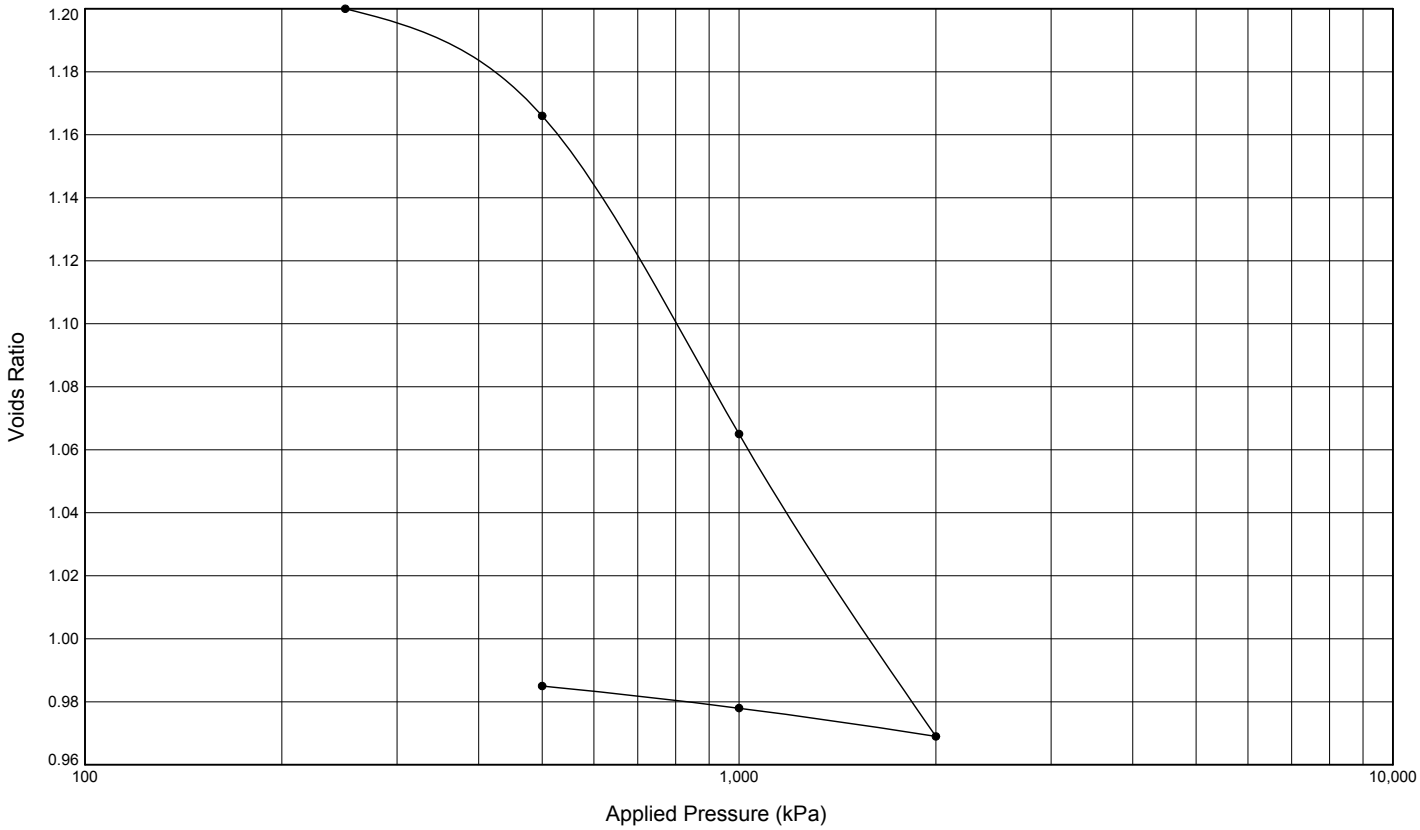
DESCRIPTION Grey silty SAND

BH/TP No. BH203

SAMPLE No./TYPE U

SAMPLE DEPTH (m) 12.00

SPECIMEN DEPTH (m) 12.00



Test and sample details		
specimen diameter	(mm)	63.59
specimen height	(mm)	19.07
initial moisture content	(%)	32.5
final moisture content	(%)	25.7
initial bulk density	(Mg/m^3)	1.56
initial dry density	(Mg/m^3)	1.17
initial voids ratio		1.300
initial degree of saturation	(%)	67
particle density	(Mg/m^3)	#2.70
swelling pressure	(kPa)	<250
P'o to P'o +100 kPa	(kPa)	
laboratory temperature	(^{o}C)	21
method of time fitting		root time

Test results

pressure stage (kPa)	voids ratio	laboratory coefficients of compressibility (m^2/MN)	laboratory coefficients of consolidation (m^2/year)
250	1.200	0.173	6.17
500	1.166	0.062	6.42
1000	1.065	0.093	4.34
2000	0.969	0.046	3.59
1000	0.978	0.005	
500	0.985	0.007	

remarks: # denotes particle density has been assigned an assumed value.

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