

FAIRHURST

THURNSCOE, BARNSELY

**FACTUAL REPORT ON
GROUND INVESTIGATION**

Contract: 41976

Date: December 2016

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**FACTUAL REPORT ON
GROUND INVESTIGATION**

carried out at
THURNSCOE, BARNLEY

Prepared for
**FAIRHURST
51a St. Pauls Street,
Leeds
LS1 2TE**

Contract No: 41976

Date: December 2016

Issue & Revision Record			
Contract Number:		41976	
Contract Name:		Thurnscoe, Barnsley	
Client:		Fairhurst	
Engineer:		Fairhurst	
Report Title:		Factual Report on Ground Investigation	
Version	Issue Date	Report / revision details	Distribution
V1	15/12/2016	Complete report on ground investigation. Gas monitoring on going.	PDF copy to Fairhurst

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1.0 INTRODUCTION

- 1.1 On the instructions of Fairhurst, a ground investigation was undertaken to determine ground and groundwater conditions at the site.
- 1.2 This report has been prepared for the sole use of the Client for the purpose described and no extended duty of care to any third party is implied or offered. Third parties using any information contained within this report do so at their own risk.
- 1.3 Any comments given in this report and the opinions expressed herein are based on the information received, the conditions encountered during site works, and on the results of tests made in the field and laboratory. However, there may be conditions prevailing at the site which have not been disclosed by the investigation and which have not been taken into account in the report.
- 1.4 Groundwater observations may be made at the time the site work was carried out or during subsequent monitoring. It should be noted that groundwater levels may vary outside the limits of these observations due to seasonal or other effects.

2.0 THE SITE

2.1 Site Location

2.1.1 The site is situated off Barrowfield Road approximately 1km to the southeast of Thurnscoe town centre.

2.1.2 The site may be located by National Grid reference SE 463 052

2.1.3 A site location plan is included in Appendix 1, Figure A1.1.

2.2 Site Description

2.2.1 The site comprised of a level rectangular area of grassland.

2.2.2 The approximate site area was 2.956Ha.

2.2.3 Access to the site was south off Barrowfield Road. A bund was located across the site access.

2.2.4 The site comprised areas of waterlogging.

2.2.5 Two concrete circles located to the southeast of the site possibly represent historical mine shafts.

2.2.6 The site was bound to the north by Barrowfield Road, and to the south, east and west by Phoenix Park.

2.2.7 A site plan is included in Appendix 1, Figure A1.2.

3.0 SITE WORK

- 3.1 The site work was carried out between 17th and 25th October 2016.
- 3.2 The locations of exploratory holes were agreed on site with the Engineer.
- 3.3 The site works were carried out on the basis of the practices set out in and BS 5930:2015 (ref. 5.1), BS EN ISO 14688-1:2002+A1:2013 (ref. 5.2), BS EN ISO 14689-1:2003 (ref. 5.3) and BS 10175:2011+A1:2013 (ref. 5.4).
- 3.4 The following exploratory holes were undertaken:
- BH01 to BH06: Cable percussion boreholes
 - TP01 to TP10: Machine excavated trial pits
 - P01, P02 and P07: Rotary open hole boreholes
- 3.5 A site plan showing the position of the exploratory holes is presented in Appendix 1 as Figure A1.2.
- 3.6 The depths of the exploratory holes, descriptions of strata encountered and comments on groundwater conditions are presented on the records in Appendix 2
- 3.7 A photographic record of the trial pits (TP01 to TP10) are presented in Appendix 6.
- 3.8 A Cable Avoidance Tool (CAT) survey was undertaken at each exploratory hole location prior to excavation. At the location of boreholes an inspection pit was excavated by hand to a depth of 1.20m below ground level to check for buried services.
- 3.9 Representative disturbed and undisturbed samples were taken at the depths shown on the exploratory hole records. Samples for environmental purposes were collected in appropriate containers and kept in cool boxes for daily despatch to the analytical laboratory.
- 3.10 Standard penetration tests (SPT) (ref. 5.4) were carried out in boreholes in the various strata to assess the relative density or consistency. The values of penetration resistance are presented on the borehole records. Energy ratio calibration certification for SPT hammers used on site are presented in Appendix 2.
- 3.11 A perforated standpipe, surrounded by pea shingle was installed in boreholes BH01, BH04 and BH06. The details of the installation are presented on the borehole record in Appendix 2.
- 3.12 The standpipe was protected at surface by a lockable flush stopcock cover.
- 3.13 Gas and groundwater monitoring visits have been undertaken upon completion of site works.

4.0 LABORATORY TESTS

4.1 Geotechnical Testing

4.1.1 Schedules for geotechnical testing were prepared by Fairhurst.

4.1.2 Soil samples for testing were prepared in accordance with BS1377: Part One: 1990 (ref. 5.6) and representative sub-samples were taken for testing. The following tests were carried out:

- 12 No. Moisture contents
- 4 No. Atterberg Limits (Liquid and Plastic Limit)
- 1 No. Particle Density
- 1 No. Particle size distribution (sieve analysis)
- 2 No. Compaction using 4.5kg rammer
- 4 No. Remoulded California Bearing Ratio
- 1 No. Undrained single stage triaxial
- 1 No. Moisture Condition Value (MCV)

4.1.3 The results of the soil tests are presented in Appendix 3, Test Report 41976/1 and 41976C/1.

4.2 Chemical Testing

4.2.1 Schedules for chemical testing were prepared by Fairhurst.

4.2.2 Chemical analysis was carried out on fifteen samples of soil and one sample of water. The nature of the analysis is detailed below:

4.2.3 General suite comprises:

- arsenic, cadmium, chromium IV and hexavalent, lead, mercury, selenium, boron (water soluble), copper, nickel, zinc
- pH, total sulphate, water soluble sulphate, sulphur
- total phenols, total, complex and free cyanide, sulphide
- speciated PAH, total petroleum hydrocarbons (TPH)
- organic matter, asbestos screen and quantification
- caloric value

4.2.4 General concrete suite comprises (soil):

- total sulphate, water soluble sulphate, sulphide, total sulphur, water soluble magnesium, ammonium ion, pH, chloride ions, nitrate ions, all tested in accordance with BRE Special Digest No.1 2005.

4.2.5 General Water suite comprises:

- arsenic, cadmium, chromium IV and hexavalent, lead, mercury, selenium, boron (water soluble), copper, nickel, zinc
- pH, total sulphate, water soluble sulphate, sulphur
- total phenols, total, complex and free cyanide, sulphide
- speciated PAH, total petroleum hydrocarbons (TPH)
- total organic content

4.2.6 General concrete suite comprises (water):

- total sulphate, water soluble sulphate, sulphide, total sulphur, water soluble magnesium, ammonium ion, pH, chloride ions, nitrate ions, all tested in accordance with BRE Special Digest No.1 2005.

4.2.7 The results of chemical analysis on soil samples are presented in Appendix 4, Test Report 16-82190.

4.2.8 The results of chemical analysis on water samples are presented in Appendix 4, Test Report 16-83137.

5.0 REFERENCES

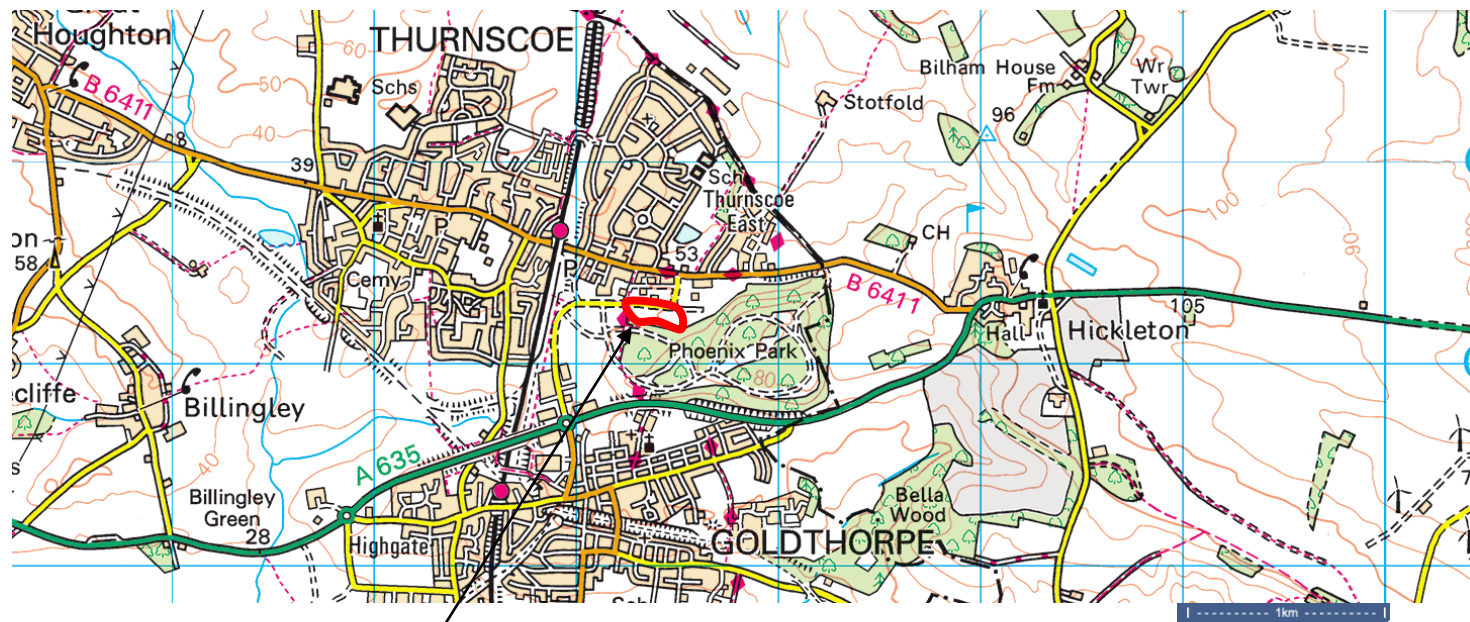
- 5.1 British Standards Institution: BS 5930:2015 'Code of practice for ground investigations.' BSI 2015.
- 5.2 British Standards Institution: BS EN ISO 14688-1:2002+A1:2013. 'Geotechnical investigation and testing – Identification and Classification of Soil – Part 1 Identification and description.' BSI 2013.
- 5.3 British Standards Institution: BS EN ISO 14689-1:2003. 'Geotechnical investigation and testing – Identification and Classification of Rock – Part 1 Identification and description.' BSI 2003. Incorporating Corrigendum No. 1 February 2007.
- 5.4 British Standards Institute: BS 10175 'The investigation of potentially contaminated sites. Code of practice', BSI:2011+A1:2013.
- 5.5 British Standards Institute: BS EN ISO 22476-3: 2005 + A1: 2011. 'Geotechnical investigation and testing. Field testing. Standard penetration test.'
- 5.6 British Standard 1377:1990, Part 1-9, 'Methods of Test for Soils for Civil Engineering Purposes'.

For and on behalf of Ian Farmer Associates (1998) Limited

H L Hadwin
BSc (Hons) MSc FGS
Engineering Geologist

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Director

APPENDIX 1
DRAWINGS



Site

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PROJECT: 41976 Thurnscoe, Barnsley

FIGURE No. A1.1

SCALE: As Indicated

TITLE: Site Location Plan

IAN FARMER ASSOCIATES
Geotechnical & Environmental Specialists

APPENDIX 2

SITE WORK

APPENDIX 2

GENERAL NOTES ON SITE WORKS

A2.1 SITE WORK

A2.1.1 Rotary Drilling

For exploration within rock rotary drilling methods are employed, where the drill bit is rotated on the bottom of the borehole. This method is occasionally used for drilling within soils. The drilling fluid is transferred from the surface through hollow drilling rods to the bit cooling and lubricating. Drilling fluids commonly comprise clean water, air, foam, mud or polymers which aid the transportation of drill cuttings to the surface and maximise core recovery.

There are two basic types of rotary drilling:

- Open hole where the drill bit cuts all the material within the diameter of the borehole. This technique is sometimes used in soils and weak rocks as a rapid and economical means of making holes for taking soil samples, carrying out insitu soil tests, installing instruments and probing for voids such as mine workings or solution cavities. The only samples recovered are the poor quality drill cuttings.
- Core drilling where an annular bit fixed to the bottom of the core barrel cuts a core, which is recovered within the innermost tube of the core barrel. Coring is normally carried out by triple tube core barrels. At the end of the core run the core barrel assembly is brought to the surface. The core is prevented from dropping out of the barrel by a core catcher made of spring steel. The non-rotating inner barrel contains a removable sample tube or liner. At the end of each coring run the liner is extracted from the barrel and stored in a core box, where it can be photographed, described and tested.

A2.1.2 Light Cable Percussion Boring

For routine soil exploration to depths in excess of 3m, the light cable percussion rig is generally employed for boring through soils and weak rocks. It consists of a powered winch and tripod frame, with running wheels that are permanently attached so that the rig may be towed behind a suitable vehicle. The rig is towed into position and set up using its own winching system.

The locations of services are checked to make sure the borehole is not situated unacceptably near any services. Regardless of the proximity of services, a CAT scan is undertaken at the borehole location and a trial hole dug to 1.20m by hand.

Boreholes are advanced in soil by the percussive action of the cable tool. The force of the cylindrical tool as it is dropped a short distance cuts a plug of cohesive soil that is removed by the tool.

In non-cohesive soils, the borehole is advanced by a 'shell', otherwise known as a 'bailer' or 'sand pump', which incorporates a clack valve. Material is transferred into the shell and retained by the clack valve. The water level in a borehole is maintained above that in the surrounding granular soil to allow for temporary reductions in the head of water as the shell is withdrawn from the borehole. Water should flow from the borehole into the surrounding soil at all times to prevent 'piping' and loosening the soil at the base of the hole. The casing is always advanced with the borehole in granular soil so that material is drawn from the base rather than the borehole sides.

Obstructions to boring are overcome by fitting a serrated chiselling ring to the base of the percussion tool. For large obstructions, a heavy chisel with a hardened cutting edge may have to be used.

Disturbed samples are taken in polythene bags, jars or tubs that are sealed against air or water loss.

Undisturbed samples are generally taken in cohesive materials at changes in strata and at one metre intervals to 5 metres then at 1.5 metre intervals to the full depths of the borehole. The general purpose open-tube sampler is suitable for firm to stiff clays, but is often used to retrieve disturbed samples of weak rocks, soft or hard clay and also clayey sand or silts. This has been adopted for routine use, and usually consists of a 100mm internal diameter tube (U100), which is capable of taking soil samples up to 450mm in length. The undisturbed samples are sealed at each end using micro-crystalline wax to prevent drying.

Standard penetration tests are generally carried out in non-cohesive soils but also in stiff clays and soft rocks at frequencies similar to that of undisturbed sampling.

A2.1.3 Trial Pits

Shallow trial pits are generally dug by mechanical excavator, however, in difficult access locations or adjacent to structures, such pits may be hand dug. Pits are best used where the ground will stand unsupported and generally, the maximum depth of machine dug pits is 4m to 5m. Where personnel are required to enter pits, it is essential that side support is provided. Entry by personnel into unsupported pits deeper than 1.2m is not allowed for health and safety reasons.

Trial pits allow the in-situ condition of the ground to be examined both laterally and vertically and also allow discontinuities to be recorded. The field record should give the orientation of the pit with details of which face was logged, assessment of stability of sides of pit and groundwater as well as the strata encountered. Photographs of the pit should also be taken.

In-situ testing, such as hand penetrometer, hand vane, Macintosh probe, or similar, can be undertaken in the sides or base of pits while both disturbed and undisturbed samples recovered.

It is generally advisable to backfill the pits as soon as possible, open pits should not be left unattended.

A2.2 IN-SITU TESTS

A2.2.1 Standard Penetration Test

The Standard Penetration Test is carried out in accordance with the proposals recommended in ref 5.4.

The standard penetration test, **SPT**, covers the determination of the resistance of soils to the penetration of a split barrel sampler. A 50mm diameter split barrel sampler is driven 450mm into the soil using a 65kg hammer with a 760mm drop. The penetration resistance is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm through any disturbed ground at the bottom of the borehole. The number of blows to achieve the standard penetration of 300mm is reported as the 'N' value.

The test is generally carried out in fine soils, however, it may also be carried out in coarse granular soils, weak rocks and glacial tills using the same procedure as for the SPT but with a 50mm diameter, 60° apex solid cone replacing the split spoon sampler, **CPT**.

When attempting the standard penetration test in very dense material or weathered rocks it may be necessary to terminate the test before completion to prevent damage to the equipment. In these circumstances it is important to distinguish how the blow count relates to the penetration of the sampler. This may be achieved in the following manner:

- Where the seating drive has been completed, the test drive is terminated if 50 blows are reached before the full penetration of 300mm is achieved. The penetration for 50 blows is recorded and an approximate N value obtained by linear extrapolation of the number of blows for the partial test drive.
- If the seating drive of 150mm is not achieved within the first 25 blows, the penetration after 25 blows is recorded and the test drive then commenced.
- For tests in soft rocks, the test drive should be terminated after 100 blows where the penetration of 300mm has not been achieved.

The N-value obtained from the Standard Penetration Test may be used to assess the relative density of sands and gravels as follows:

Term	SPT N-Value : Blows/300mm Penetration
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	Over 50

A2.3 SAMPLES

U(x) represents undisturbed 100mm diameter sample with (x) being the number of blows required to obtain sample.

U NR| indicates undisturbed sample not recovered

B represents large bulk disturbed samples

D represents small disturbed sample

ES represents environmental sample

W represents water sample

▽ represents water strike

▼ represents level to which water rose

A2.4 DESCRIPTION OF SOILS

A2.4.1 General

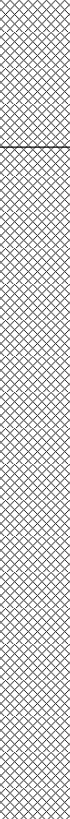
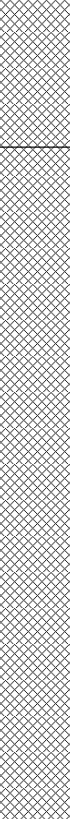
The procedures and principles given in Section 6 of BS 5930:2015, (ref. 5.1) and BS EN ISO 14688-1:2002+A1:2013 (ref. 5.2) have been used in the soil descriptions contained within this report.

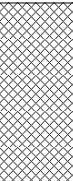
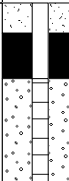
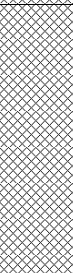
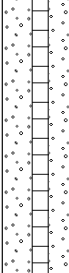
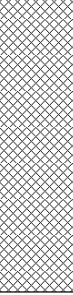
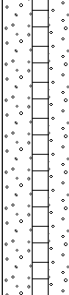
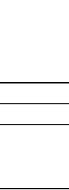
Borehole Records

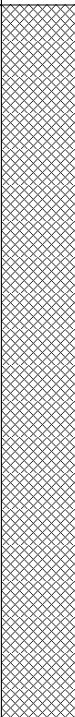
	Contract Name: Thurnscoe			Client: Fairhurst			Borehole ID: BH01		
	Contract Number: 41976	Date Started: 17/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT				
Cable Percussion Borehole Log	Easting:	Northing:	Ground Level:	Plant Used:	Print Date: 15/12/2016	Sheet 1 of 1 Scale: 1:50			
	Weather:		Termination:		SPT Hammer: N/R, Energy Ratio: N/R				
Samples & In Situ Testing			Strata Details					Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill/Installation
0.20	ES1					MADE GROUND: Dense, black, sandy, angular, fine to coarse GRAVEL including ash, brick and concrete			
0.40	ES2								
0.50 - 1.00	B3								
0.80	ES4	SPT(S) N=30 (5,7/9,9,6,6)						1	
1.20	B5								
1.20 - 1.65	D6								
2.00	ES7 B8 D9	SPT(S) N=30 (6,8/7,7,8,8)		(4.90)				2	
2.00									
2.00 - 2.45									
3.00	ES10 B11 D12	SPT(S) N=30 (5,5/5,7,9,9)						3	
3.00									
3.00 - 3.45									
4.00	ES13 B14 D15	SPT(S) N=25 (4,5/5,7,7,6)				At 4.00m: medium dense.		4	
4.00									
4.00 - 4.45									
5.00 - 5.45	U16	23 blows. 60% recovery		4.90		Soft, light brownish grey to brown CLAY At 5.00m: medium strength		5	
5.50	D17			(0.80)					
5.70	B18								
6.00									
6.00	B19 D20	SPT(S) 50 (9,13/50 for 225mm)		(0.90)		Light brown and grey MUDSTONE.		6	
6.00									
6.30									
6.30	D21	SPT(S) 50 (10,15/50 for 150mm)		6.60		End of Borehole at 6.60m		7	
6.30									
								8	
								9	
								10	
Start & End of Shift Observations			Borehole Diameter		Casing Diameter		Remarks:		
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Service inspection pit hand excavated from GL to 1.20m.
24-10-2016	16:30	20.00			6.30	150	6.00	150	
Chiselling			Installation		Water Strikes				
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)
6.00	6.30	00:30		0.00	0.50	PLAIN			
				0.50	5.00	SLOTTED			
					Sealed (m)				
					Time (mins)				
					Rose to (m)				
					Remarks				
IFA CP Template Issue Number: 5a Issue Date: 30/11/16									

	Contract Name: Thurnscoe		Client: Fairhurst		Borehole ID: BH02			
	Contract Number: 41976	Date Started: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1		
Cable Percussion Borehole Log	Easting:	Northing:	Ground Level:	Plant Used:	Print Date: 15/12/2016	Scale: 1:50		
Weather:		Termination:		SPT Hammer: N/R, Energy Ratio: N/R				
Samples & In Situ Testing			Strata Details			Groundwater		
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	ES1	SPT(C) 50 (26,30/50 for 225mm)		(0.50)		MADE GROUND: Black, sandy, clayey, angular to subangular, fine to coarse GRAVEL including brick and concrete (topsoil).	1	
0.50	ES2							
0.50 - 1.00	B3							
0.90	ES4							
1.20								
1.20 - 1.65	B5	SPT(C) N=38 (14,10/10,12,8,8)		(2.10)		MADE GROUND: Soft, dark brown, very gravelly CLAY with low cobble content. Gravel is angular to subangular, fine to coarse including brick, concrete and ash.	2	
2.00								
2.00	ES6							
2.00 - 2.45	B7							
3.00		SPT(S) 49 (18 for 75mm/49 for 150mm)		2.60		MADE GROUND: Black, clayey, angular to subangular, fine and medium GRAVEL including ash, brick and mudstone	3	
3.00	ES8							
3.00 - 3.45	B9							
3.00 - 3.45	D10							
4.00		SPT(S) 50 (25 for 75mm/50 for 75mm)		(2.90)			4	
4.00	ES11							
4.00 - 4.45	B12							
4.00 - 4.45	D13							
5.00		SPT(C) 50 (16,14/50 for 150mm)					5	
5.00 - 5.45	B14							
5.70		SPT(S) 50 (20,18/50 for 225mm)		5.50		Orangish brown MUDSTONE, recovered as stiff, friable clay.	6	
5.70	D15							
				6.38		End of Borehole at 6.38m	7	
							8	
							9	
							10	

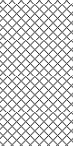
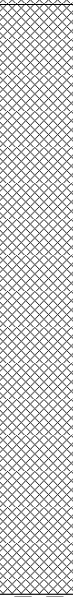
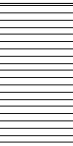
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks: Service inspection pit hand excavated from GL to 1.20m.	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)		
25-10-2016	16:30	20.00			6.08	150	5.70	150		
									Water Strikes	
					Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
Chiselling					Installation					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)		
1.20	1.30	01:00			0.00	10.00	PLAIN			
3.00	4.00	00:30			10.00	20.00	SLOTTED			
5.50	5.70	01:00								
IFA CP Template Issue Number: 5a Issue Date: 30/11/16										

	Contract Name: Thurnscoe			Client: Fairhurst			Borehole ID: BH03					
	Contract Number: 41976		Date Started: 18/10/2016		Logged By: BL		Checked By: HH		Status: DRAFT			
	Easting:		Northing:		Ground Level:		Plant Used:		Print Date: 15/12/2016			
Cable Percussion Borehole Log									Scale: 1:50			
Weather:			Termination:			SPT Hammer: N/R, Energy Ratio: N/R						
Samples & In Situ Testing				Strata Details					Groundwater			
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description			Water Strike	Backfill/ Installation		
0.30 0.50 - 1.00 0.60	ES1 B2 ES3	SPT(C) N=29 (4,6/6,8,7,8)		(1.00)		MADE GROUND: Grass over, brown, gravelly, fine and medium SAND. Gravel is angular, fine to coarse including brick and glass.			1			
1.00 1.20 1.20 - 1.65	ES4 B5			MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL with low cobble content. Gravel includes coal and mudstone.								
2.00 2.00 2.00 - 2.45	ES6 B7			SPT(C) N=34 (3,6/10,8,7,9)								
3.00 3.00 - 3.45 3.00 - 3.45	B8 D9			SPT(S) N=30 (3,6/9,7,8,6)								
4.00 4.00 - 4.45 4.00 - 4.45	B10 D11	SPT(S) N=33 (6,4/7,7,9,10)		(4.45)		Below 3.00m: dense.			3			
5.00 5.00 5.00	B13 ES12	SPT(C) N=48 (7,10/13,18,14,3)		End of Borehole at 5.45m			4					
									5			
									6			
									7			
									8			
									9			
									10			
Start & End of Shift Observations			Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Service inspection pit hand excavated from GL to 1.20m.			
					5.45	150	5.00	150				
							Water Strikes					
							Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
Chiselling					Installation							
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)				
1.30	1.40	00:30										
4.50	4.70	00:30										
5.00	5.10	01:00										
IFA CP Template Issue Number: 5a Issue Date: 30/11/16												

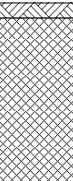
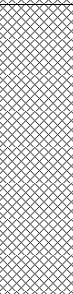
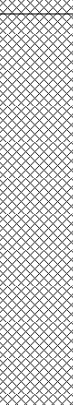
	Contract Name: Thurnscoe		Client: Fairhurst			Borehole ID: BH04								
	Contract Number: 41976	Date Started: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1								
Cable Percussion Borehole Log	Easting:	Northing:	Ground Level:	Plant Used:	Print Date: 15/12/2016	Scale: 1:50								
Weather:		Termination:		SPT Hammer: N/R, Energy Ratio: N/R										
Samples & In Situ Testing			Strata Details				Groundwater							
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation						
0.20	ES1	SPT(C) N=20 (4,4/3,5,6,6)		(1.20)		MADE GROUND: Soft, brown, gravelly CLAY with low cobble content. Gravel is angular to subangular, fine to coarse including brick and concrete.	1							
0.50	ES2													
0.50 - 1.00	B3													
0.80	ES4													
1.20	B5	SPT(C) N=21 (2,4/5,5,4,7)		1.20		MADE GROUND: Medium dense, black, clayey, angular to subangular, fine to coarse GRAVEL with low cobble content and including ash, coal, and brick.	2							
1.20 - 1.65														
2.00	ES6 B7	SPT(C) N=30 (3,5/7,7,8,8)		(3.70)		At 3.00m: dense.	3							
2.00														
2.00 - 2.45	ES8 B9	SPT(C) N=25 (6,6/4,7,7,7)					4							
3.00														
3.00	ES10 B11	SPT(S) 50 (8,14/50 for 225mm)		(1.05)		Dark brown grey banded MUDSTONE recovered as gravelly clay.	5							
3.00 - 3.45														
4.00	D12	SPT(S) 50 (25 for 75mm/50 for 75mm)		5.95		End of Borehole at 5.95m	6							
4.00 - 4.45														
5.00	D13						7							
5.00 - 5.45														
5.80							8							
5.80														
Start & End of Shift Observations			Borehole Diameter		Casing Diameter		Remarks:							
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Service inspection pit hand excavated from GL to 1.20m.					
					5.95	150	5.80	150						
Chiselling					Installation					Water Strikes				
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
5.00	5.80	01:00			0.00	0.50	PLAIN							
					0.50	5.00	SLOTTED							
IFA CP Template Issue Number: 5a Issue Date: 30/11/16														

		Contract Name: Thurnscoe			Client: Fairhurst			Borehole ID: BH05													
		Contract Number: 41976	Date Started: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT															
Cable Percussion Borehole Log		Easting:		Northing:		Ground Level:		Plant Used:		Print Date: 15/12/2016		Sheet 1 of 1 Scale: 1:50									
Weather:				Termination:				SPT Hammer: N/R, Energy Ratio: N/R													
Samples & In Situ Testing						Strata Details						Groundwater									
Depth		Sample ID		Test Result		Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description				Water Strike	Backfill/ Installation							
0.40 0.40 0.50 - 1.00 0.60 0.60 0.80 0.80 1.20 1.20 - 1.65		D2 ES1 B7 D3 ES4 D6 ES5 B8		SPT(C) N=15 (2,2/4,2,4,5)					MADE GROUND: Grass over, medium dense, black, clayey, sandy, angular to subangular, fine and medium GRAVEL including mudstone and brick. Between 0.50m and 1.00m: layer of multicoloured, clayey gravel including mudstone and brick.				1								
2.00 2.00 2.00 - 2.45		ES10 B9		SPT(C) N=26 (3,3/5,7,7,7)			(4.73)						2								
3.00 3.00 3.00 - 3.45		ES11 B12		SPT(C) N=19 (2,4/3,5,5,6)									3								
4.00 4.00 - 4.45 4.50 4.50 - 4.73		B13 B14		SPT(C) N=41 (2,4/9,10,10,12) SPT(C) 70 (20 for 75mm/70 for 150mm)			4.73		Below 4.00m: dense				4								
									End of Borehole at 4.73m				5								
													6								
													7								
													8								
													9								
													10								
Start & End of Shift Observations						Borehole Diameter		Casing Diameter		Remarks:											
Date		Time		Depth (m)		Casing (m)		Water (m)		Depth (m)		Dia (mm)		Depth (m)		Dia (mm)		Service inspection pit hand excavated from GL to 1.20m.			
																		Obstruction at 4.73m			
Chiselling						Installation						Water Strikes									
Strike (m)		Casing (m)		Sealed (m)		Time (mins)		Rose to (m)		Remarks											
From (m)		To (m)		Duration		Remarks		Top (m)		Base (m)		Type		Dia (mm)							
3.30		3.70		00:30																	
4.40		4.50		01:00																	
IFA CP Template																		Issue Number: 5a		Issue Date: 30/11/16	

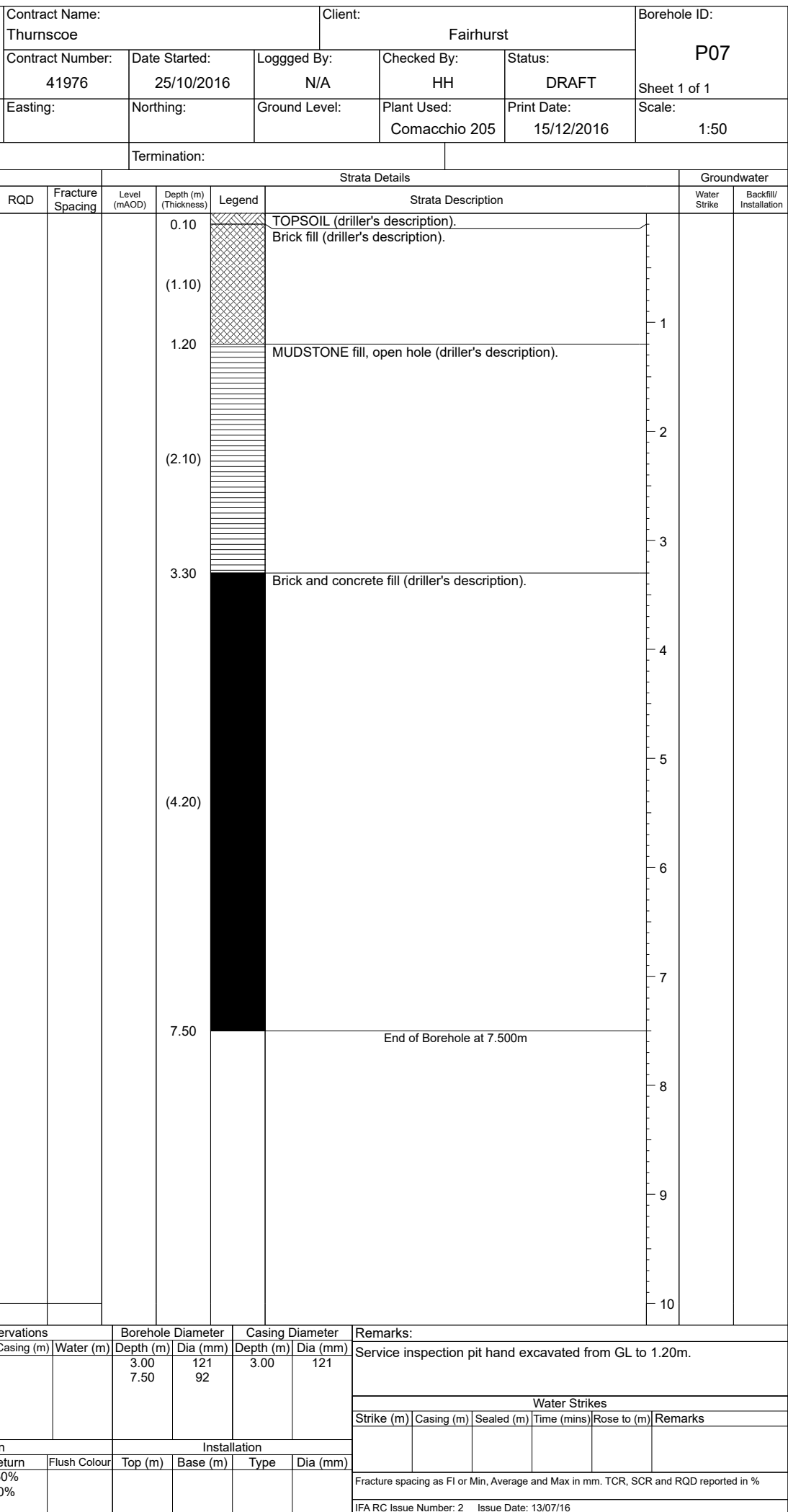
		Contract Name: Thurnscoe		Client: Fairhurst		Borehole ID: BH06																	
		Contract Number: 41976	Date Started: 20/10/2016	Logged By: BL	Checked By: HH			Status: DRAFT															
Cable Percussion Borehole Log		Easting:		Northing:		Ground Level:		Plant Used:		Print Date: 15/12/2016		Sheet 1 of 1 Scale: 1:50											
Weather:				Termination:				SPT Hammer: N/R, Energy Ratio: N/R															
Samples & In Situ Testing						Strata Details						Groundwater											
Depth		Sample ID		Test Result		Level (mAOD)		Depth (m) (Thickness)		Legend		Strata Description		Water Strike		Backfill/ Installation							
0.20 0.30 0.50 - 1.00 0.70		ES1 ES2 B3 ES4		SPT(C) N=15 (3,3/5,4,3,3)				(0.70)				MADE GROUND: Grass over, medium dense, light brown, dark brown, clayey, angular to subangular, fine to coarse GRAVEL including brick and ash.											
1.20 1.20 - 1.65		B5										MADE GROUND: Medium dense, black, clayey, angular to subangular, fine and medium GRAVEL including ash, mudstone, coal and occasional brick.											
2.00 2.00 2.00 - 2.45		ES6 B7		SPT(C) N=19 (4,4/4,3,5,7)										1									
3.00 3.00 3.00 - 3.45		ES8 B9		SPT(C) N=21 (2,5/5,4,6,6)				(5.25)						3									
4.00 4.00 - 4.45		B10		SPT(C) N=29 (4,6/6,6,7,10)								Below 4.00m: low cobble content of brick.		4									
5.00 5.00		B11		SPT(C) N=32 (8,6/6,8,9,9)										5									
5.50 5.50		B12		SPT(C) N=55 (4,5/5,10,25,15)				5.95				At 5.50m: very dense											
												End of Borehole at 5.95m		6									
														7									
														8									
														9									
														10									
Start & End of Shift Observations						Borehole Diameter		Casing Diameter		Remarks:													
Date		Time		Depth (m)		Casing (m)		Water (m)		Depth (m)		Dia (mm)		Depth (m)		Dia (mm)		Service inspection pit hand excavated from GL to 1.20m.					
										5.95		150		5.50		150							
Chiselling						Installation						Water Strikes											
Strike (m)		Casing (m)		Sealed (m)		Time (mins)		Rose to (m)		Remarks													
From (m)		To (m)		Duration		Remarks		Top (m)		Base (m)		Type		Dia (mm)									
4.50		4.80		00:30				0.00		0.50		PLAIN											
5.00		5.50		01:00				0.50		5.00		SLOTTED											
IFA CP Template																		Issue Number: 5a		Issue Date: 30/11/16			

	Contract Name: Thurnscoe		Client: Fairhurst			Borehole ID: P01					
	Contract Number: 41976	Date Started: 24/10/2016	Logged By: N/A	Checked By: HH	Status: DRAFT	Sheet 1 of 2					
Rotary Core Drilling Log	Easting:	Northing:	Ground Level:	Plant Used: Comacchio 205	Print Date: 15/12/2016	Scale: 1:50					
	Weather:		Termination:								
Coring Details					Strata Details			Groundwater			
Depth	TCR	SCR	RQD	Fracture Spacing	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
						0.20		Grass over TOSPOIL (drillers description).			
						(1.00)			MADE GROUND: brick fill (drillers description).		
						1.20			MADE GROUND: Mudstone fill (drillers description).		
						(3.90)					
						5.10		Soft, brown CLAY (drillers description).			
						(1.90)					
						7.00		Weak, brown MUDSTONE (drillers description).			
						(1.40)					
						8.40		Weak, grey MUDSTONE (drillers description).			
						(2.10)					
								Continued next sheet			
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:		
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Service inspection pit hand excavated from GL to 1.20m.		
					7.00	121	7.00	121			
					20.00	92					
Flush Information					Installation				Water Strikes		
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)
10.70	1.20	Water	100%						Time (mins)	Rose to (m)	Remarks
16.60	10.70	Water	80%								
20.00	16.60	Water	100%								
Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %											
IFA RC Issue Number: 2 Issue Date: 13/07/16											

	Contract Name: Thurnscoe				Client: Fairhurst				Borehole ID: P01		
	Contract Number: 41976		Date Started: 24/10/2016		Logged By: N/A		Checked By: HH		Status: DRAFT		
	Easting:		Northing:		Ground Level:		Plant Used: Comacchio 205		Print Date: 15/12/2016		
Rotary Core Drilling Log										Scale: 1:50	
Weather:				Termination:							
Coring Details					Strata Details					Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill/Installation
						10.50		Weak COAL (drillers description).			
						10.70		Weak, grey MUDSTONE (drillers description).			
										11	
										12	
										13	
						(5.90)				14	
										15	
										16	
						16.60		Weak, grey SANDSTONE (drillers description).			
										17	
										18	
						(3.40)				19	
										20	
						20.00		End of Borehole at 20.000m			
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:		
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Service inspection pit hand excavated from GL to 1.20m.		
					7.00	121	7.00	121			
					20.00	92					
									Water Strikes		
									Strike (m)	Casing (m)	Sealed (m)
									Time (mins)	Rose to (m)	Remarks
Flush Information					Installation						
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)			
10.70	1.20	Water	100%						Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %		
16.60	10.70	Water	80%								
20.00	16.60	Water	100%						IFA RC Issue Number: 2 Issue Date: 13/07/16		

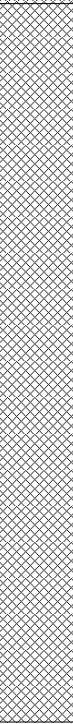
	Contract Name: Thurnscoe			Client: Fairhurst			Borehole ID: P02				
	Contract Number: 41976	Date Started: 25/10/2016	Logged By:	Checked By: HH	Status: DRAFT	Sheet 1 of 2					
	Rotary Core Drilling Log		Easting:	Northing:	Ground Level:	Plant Used:	Print Date: 15/12/2016	Scale: 1:50			
			Termination:								
Coring Details					Strata Details					Groundwater	
Depth	TCR	SCR	RQD	Fracture Spacing	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
						0.10		Grass over TOPSOIL (drillers description). MADE GROUND: Brick fill (drillers description).			
						(1.10)					
						1.20					
						(2.00)		MADE GROUND: Mudstone fill (drillers description).			
						3.20					
						(2.60)		MADE GROUND: Brick fill (drillers description).			
						5.80					
						(1.20)		Firm, brown CLAY (drillers description).			
						7.00					
						(1.80)					
						8.80		Weak, grey MUDSTONE (drillers description).			
						(1.50)					
								Continued next sheet	10		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:		
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Service inspection pit hand excavated from GL to 1.20m.		
					7.00	121	7.00	121			
					20.00	92					
									Water Strikes		
									Strike (m)	Casing (m)	Sealed (m)
									Time (mins)	Rose to (m)	Remarks
Flush Information					Installation						
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)			
12.10	1.20	Water	100%		0.00	10.00	PLAIN		Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %		
12.20	12.10	Water	75%		10.00	20.00	SLOTTED				
15.80	12.20	Water	75%						IFA RC Issue Number: 2 Issue Date: 13/07/16		

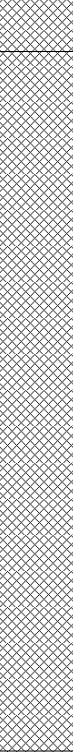
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	Contract Number: 41976	Date Started: 25/10/2016	Logged By:	Checked By: HH	Status: DRAFT									
	Rotary Core Drilling Log		Easting:	Northing:	Ground Level:	Plant Used:	Print Date: 15/12/2016	Sheet 2 of 2 Scale: 1:50						
				Termination:										
Coring Details					Strata Details					Groundwater				
Depth	TCR	SCR	RQD	Fracture Spacing	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill/Installation			
						10.30 (0.30)		Weak COAL (drillers description).						
						10.60		Weak, dark grey MUDSTONE (drillers description).						
						(1.50)				11				
						12.10		Weak COAL (drillers description).						
						12.20		Weak, grey MUDSTONE (drillers description).						
										12				
										13				
						(3.60)				14				
										15				
						15.80		Weak, grey SANDSTONE (drillers description).						
										16				
										17				
						(4.20)				18				
										19				
						20.00		End of Borehole at 20.000m		20				
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	Service inspection pit hand excavated from GL to 1.20m.					
					7.00	121	7.00	121						
					20.00	92								
									Water Strikes					
									Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
Flush Information					Installation									
Top (m)	Base (m)	Flush Type	Return	Flush Colour	Top (m)	Base (m)	Type	Dia (mm)						
12.10	1.20	Water	100%		0.00	10.00	PLAIN		Fracture spacing as FI or Min, Average and Max in mm. TCR, SCR and RQD reported in %					
12.20	12.10	Water	75%		10.00	20.00	SLOTTED							
15.80	12.20	Water	75%						IFA RC Issue Number: 2 Issue Date: 13/07/16					

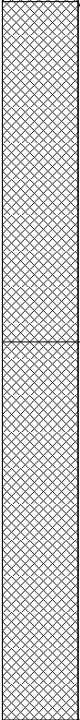


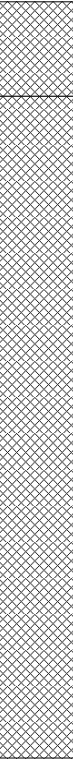
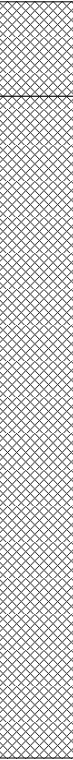
Trial Pit Records

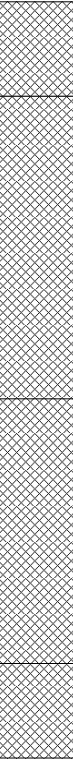
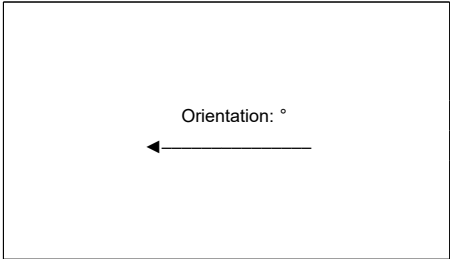
	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP01																	
	Contract Number: 41976	Date: 17/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1																	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40																	
	Weather:		Hole Termination:		Stability: Trial pit remained dry and stable during excavation.																		
Samples & In Situ Testing			Strata Details					Water															
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																	
0.10 0.10	D2 ES1			0.20		MADE GROUND: Grass over brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil).		1															
0.40 - 1.00 0.50 0.50	B3 D5 ES4					MADE GROUND: Black, sandy, angular to subangular, fine to coarse GRAVEL including brick, concrete, ash and coal.																	
0.90 - 1.00 1.10 1.10	B6 D8 ES7																						
1.50 1.50	B9 D10					Below 1.40m: Clayey																	
2.00 2.00	D12 ES11			(3.80)		Between 2.00m to 4.00m: Pockets of soft, laminated, yellowish brown clay																	
2.50 2.50 - 3.00	D14 B13																						
3.00 3.50 3.50 - 4.00	D15 D16 B19																						
4.00 4.00	D18 ES17			4.00		End of Trial Pit at 4.00m																	
Dimensions:			General Remarks:																				
Final Depth: 4.00m			← Length (m) → 2.50m ↑ Width (m) ↓ 0.60m Orientation: ° ← <table><tr><td colspan="4">Water Strikes</td></tr><tr><td>Strike (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>					Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks								
Water Strikes																							
Strike (m)	Time (mins)	Rose to (m)						Remarks															
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																							

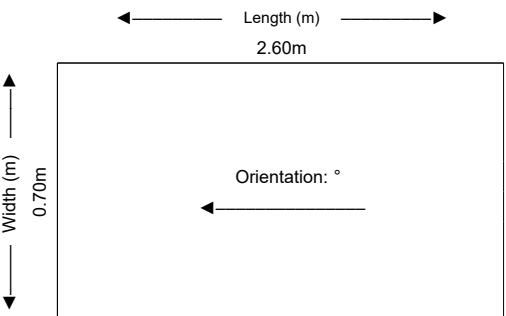
	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP02																	
	Contract Number: 41976	Date: 17/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1																	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40																	
	Weather:		Hole Termination:		Stability: Trial pit remained dry and stable during excavation.																		
Samples & In Situ Testing			Strata Details					Water															
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																	
0.10 0.10	D2 ES1			0.20		MADE GROUND: Brown, slightly gravelly, fine to coarse SAND. Gravel is angular to subrounded, fine to coarse including brick and concrete		1															
0.50 0.50	D4 ES3					MADE GROUND: Dark grey to black, sandy, angular to subangular, fine to coarse GRAVEL including ash, brick, concrete and coal.																	
1.00 1.00	D6 ES5																						
1.50	D7																						
2.00 2.00	D9 ES8			(3.80)		Below 1.80m: High cobble content of brick			2														
2.50	D10																						
3.00	D11								3														
3.50	D12																						
4.00 4.00	D14 ES13			4.00		End of Trial Pit at 4.00m			4														
									5														
							6																
Dimensions:			General Remarks:																				
Final Depth: 4.00m			← Length (m) → 2.50m ↑ Width (m) ↓ 0.70m Orientation: ° ← <table><tr><td colspan="4">Water Strikes</td></tr><tr><td>Strike (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>					Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks								
Water Strikes																							
Strike (m)	Time (mins)	Rose to (m)						Remarks															
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																							

	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP03																		
	Contract Number: 41976	Date: 17/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1																		
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40																		
	Weather:		Hole Termination:		Stability: Trial pit remained dry and stable during excavation.																			
Samples & In Situ Testing			Strata Details					Water																
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																		
0.20 0.20	D2 ES1			(0.30) 0.30		MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil).		1																
0.50 0.50 0.50 - 1.20	D5 ES3 B4					MADE GROUND: Black, sandy, angular to subangular, fine to coarse GRAVEL including ash, brick and mudstone.																		
1.00 1.00	D7 ES6																							
1.50	D8					Below 1.50m: Occasional pockets of clay.																		
2.00 2.00 2.00 - 3.00	D11 ES9 B10			(3.70)				2																
3.00	D12							3																
3.50	D13																							
4.00 4.00	D15 ES14			4.00		End of Trial Pit at 4.00m		4																
								5																
								6																
Dimensions:			General Remarks:																					
Final Depth: 4.00m			← Length (m) → 2.50m ↑ Width (m) ↓ 0.60m Orientation: ° ← <table><tr><td colspan="4">Water Strikes</td></tr><tr><td>Strike (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>						Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks								
Water Strikes																								
Strike (m)	Time (mins)	Rose to (m)							Remarks															
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																								

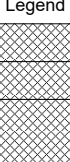
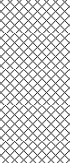
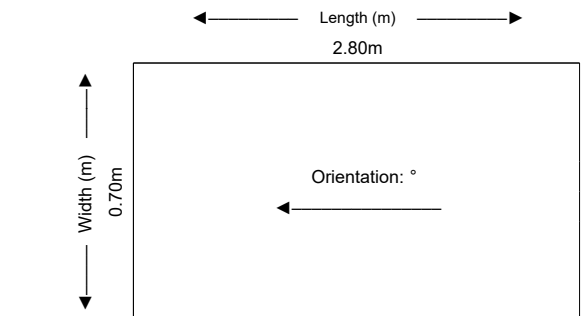
	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP04																		
	Contract Number: 41976	Date: 17/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1																		
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40																		
	Weather:		Hole Termination:		Stability: Slight spalling of trial pit sides between 2m and 4m. Trial pit remained dry during excavation.																			
Samples & In Situ Testing			Strata Details					Water																
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																		
0.10 0.10	D2 ES1			0.20		MADE GROUND: Brown, slightly gravelly, fine to coarse SAND with low cobble content. Gravel is angular to subangular, fine to coarse including brick.		1																
0.50 0.50	D4 ES3					MADE GROUND: Black, sandy, angular to subangular, fine to coarse GRAVEL including ash, brick and mudstone																		
1.00 1.00	D6 ES5			(1.80)																				
1.50 - 2.00	B7																							
2.00 2.00	D9 ES8			2.00		MADE GROUND: Black, sandy, angular to subangular, fine GRAVEL with low cobble content. Gravel includes brick.			2															
2.50 - 3.00	B10																							
3.00 3.00	D12 ES11			(2.00)					3															
3.50 - 4.00	B13																							
4.00	D14			4.00		End of Trial Pit at 4.00m			4															
									5															
							6																	
Dimensions:			General Remarks:																					
Final Depth: 4.00m			← Length (m) → 2.70m ↑ Width (m) ↓ 0.70m Orientation: ° ← <table><tr><td colspan="4">Water Strikes</td></tr><tr><td>Strike (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>						Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks								
Water Strikes																								
Strike (m)	Time (mins)	Rose to (m)							Remarks															
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																								

	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP05																		
	Contract Number: 41976	Date: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1																		
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40																		
	Weather:		Hole Termination:		Stability: Trial pit remained dry and stable during excavation.																			
Samples & In Situ Testing			Strata Details					Water																
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																		
0.10 0.10 0.10 - 0.40	D3 ES1 B2			(0.50)		MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil).		1																
0.50 0.50	D5 ES4			0.50		MADE GROUND: Black, slightly clayey, sandy, angular to subangular, fine to medium GRAVEL of mudstone, ash and coal.																		
1.00 1.00 1.00 - 2.00	D8 ES6 B7			(3.50)				2																
2.00 2.00	D10 ES9																							
3.00 3.00 - 4.00	D12 B11																							
4.00 4.00	D14 ES13			4.00		End of Trial Pit at 4.00m		4																
								5																
								6																
Dimensions:			General Remarks:																					
Final Depth: 4.00m			← Length (m) → 2.50m ↑ Width (m) ↓ 0.70m Orientation: ° ← <table><tr><td colspan="4">Water Strikes</td></tr><tr><td>Strike (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>						Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks								
Water Strikes																								
Strike (m)	Time (mins)	Rose to (m)							Remarks															
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																								

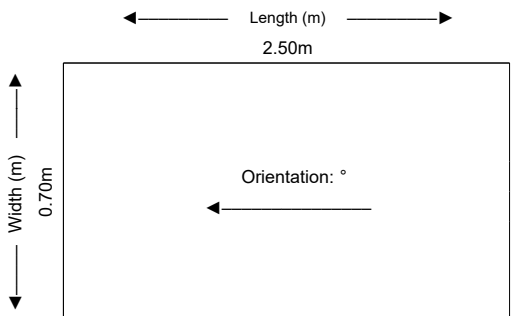
	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP06																	
	Contract Number: 41976	Date: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1																	
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40																	
	Weather:		Hole Termination:		Stability: Slight spalling of trial pit sides between 0.90m and 2.30m. Trial pit remained dry during excavation.																		
Samples & In Situ Testing			Strata Details					Water															
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description																	
0.10 0.10	D2 ES1			(0.50)		MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse of brick		1															
0.50 - 1.50	B3			0.50		MADE GROUND: Black, sandy, angular to subangular, fine and medium GRAVEL with low cobble content including brick, ash and coal.																	
1.00 1.00	D5 ES4			(1.60)																			
2.00 2.00 2.00 - 3.00	D8 ES6 B7			2.10		MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL including mudstone and coal.			2														
				(1.40)		At 3.00m: Band of grey clay																	
3.00 3.00	D10 ES9			3.50		MADE GROUND: Black, sandy, angular to subangular, fine and medium GRAVEL of ash, coal and mudstone			3														
				(0.50)																			
4.00	ES11			4.00		End of Trial Pit at 4.00m			4														
												5											
								6															
Dimensions:			General Remarks:																				
Final Depth: 4.00m			← Length (m) → 2.60m ↑ Width (m) ↓ 0.70m Orientation: ° ← <table><tr><td colspan="4">Water Strikes</td></tr><tr><td>Strike (m)</td><td>Time (mins)</td><td>Rose to (m)</td><td>Remarks</td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></table>					Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks								
Water Strikes																							
Strike (m)	Time (mins)	Rose to (m)						Remarks															
																							
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																							

		Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP07													
		Contract Number: 41976	Date: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1													
Trial Pit Log		Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40													
		Weather:			Hole Termination:		Stability: Trial pit remained dry and stable during excavation.													
Samples & In Situ Testing				Strata Details				Water												
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description														
0.10 0.10 0.30 - 0.40	D2 ES1 B3			(0.30)		MADE GROUND: Slightly gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick (Topsoil).		1												
0.50 0.50 0.50 - 1.50	D6 ES4 B5			0.30 0.40		MADE GROUND: Concrete, recovered as angular, medium to coarse GRAVEL.														
1.00 1.00	D8 ES7			(1.60)		MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL of coal, ash, mudstone and brick														
2.10 - 2.20 2.20 2.20	B9 D11 ES10			2.00 (0.30) 2.30		MADE GROUND: Firm, friable, multicoloured gravelly, sandy CLAY. Gravel is angular to subangular, fine to coarse including mudstone and coal			2											
3.00 3.00 3.00 - 4.00	D14 ES12 B13			(1.70)		MADE GROUND: Firm, friable, black, gravelly CLAY. Gravel is angular to subangular, fine to coarse including mudstone, coal and igneous lithologies.														
4.00	B15			4.00		End of Trial Pit at 4.00m			4											
						5														
							6													
Dimensions:				General Remarks:																
Final Depth: 4.00m																				
		<table><tr><th colspan="4">Water Strikes</th></tr><tr><th>Strike (m)</th><th>Time (mins)</th><th>Rose to (m)</th><th>Remarks</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>							Water Strikes				Strike (m)	Time (mins)	Rose to (m)	Remarks				
Water Strikes																				
Strike (m)	Time (mins)	Rose to (m)	Remarks																	

HBSI TP Template Issue Number: 2 Issue Date: 27/04/16

		Contract Name: Thurnscoe		Client: Fairhurst		Trial Pit ID: TP08		
		Contract Number: 41976	Date: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1	
Trial Pit Log		Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40	
Weather:			Hole Termination:			Stability: Trial pit remained dry and stable during excavation.		
Samples & In Situ Testing				Strata Details			Water	
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description		
0.10 0.10 0.30 0.30 0.40 - 0.90	D2 ES1 D4 ES3 B5			0.20 0.40 (0.50)		MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse include brick	1	
0.80 0.80	D7 ES6			0.90		MADE GROUND: Grey, friable, gravelly CLAY. Gravel is angular to subangular, fine to coarse including mudstone		
1.20 - 2.00	B8			1.10		MADE GROUND: Grey, angular to subangular, fine to coarse GRAVEL of mudstone.	2	
1.50	D9			(1.60)		MADE GROUND: Black, clayey, angular to subangular, fine to coarse GRAVEL including coal and mudstone.		
2.00 2.00	D11 ES10			2.70		MADE GROUND: Black, sandy, angular to subangular, fine and medium GRAVEL including ash and coal.	3	
2.50	D12			(1.30)				
3.00 3.00 3.00 - 4.00	D15 ES13 B14			4.00		End of Trial Pit at 4.00m	4	
4.00	D16						5	
							6	
Dimensions:					General Remarks:			
Final Depth: 4.00m								
								
					Water Strikes			
					Strike (m)	Time (mins)	Rose to (m)	Remarks
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16								

	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP09										
	Contract Number: 41976	Date: 18/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1										
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40										
	Weather:		Hole Termination:		Stability: Trial pit remained dry and stable during excavation.											
Samples & In Situ Testing			Strata Details					Water								
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description										
0.10 0.10	D2 ES1			0.20		MADE GROUND: Brown, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick.		1								
0.50 - 1.00	B3					MADE GROUND: Black, friable, gravelly CLAY. Gravel is angular to subangular, fine to coarse including mudstone and coal										
0.80 0.80	D5 ES4			(1.50)				2								
1.80	D6			1.70		MADE GROUND: Black, sandy fine to medium GRAVEL of ash and coal										
2.00 2.00	D8 ES7															
2.50 - 3.00	B9							3								
3.00 3.00	D11 ES10			(2.30)												
3.50 - 4.00	B12															
4.00 4.00	D14 ES13			4.00		End of Trial Pit at 4.00m		4								
								5								
								6								
Dimensions:			General Remarks:													
Final Depth: 4.00m			← Length (m) → 2.80m ↑ Width (m) ↓ 0.70m Orientation: ° ← Water Strikes <table><tr><th>Strike (m)</th><th>Time (mins)</th><th>Rose to (m)</th><th>Remarks</th></tr><tr><td></td><td></td><td></td><td></td></tr></table>						Strike (m)	Time (mins)	Rose to (m)	Remarks				
Strike (m)	Time (mins)	Rose to (m)							Remarks							
HBSI TP Template Issue Number: 2 Issue Date: 27/04/16																

	Contract Name: Thurnscoe		Client: Fairhurst			Trial Pit ID: TP10									
	Contract Number: 41976	Date: 17/10/2016	Logged By: BL	Checked By: HH	Status: DRAFT	Sheet 1 of 1									
Trial Pit Log	Easting:	Northing:	Ground Level:	Plant Used: JCB 3CX	Date Printed: 15/12/2016	Scale: 1:40									
	Weather:		Hole Termination:		Stability: Trial pit remained stable during excavation.										
Samples & In Situ Testing			Strata Details					Water							
Depths	Sample ID	Test Result	Reduced Level	Depth (m) (Thickness)	Legend	Strata Description									
0.10 0.10	D2 ES1			(0.30) 0.30		MADE GROUND: Brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is angular to subangular, fine and medium including brick and concrete (Topsoil).	1								
0.50 0.50 0.50 - 1.20	D5 ES3 B4			(1.30)		MADE GROUND: Dark grey, clayey, gravelly, fine to coarse SAND. Gravel is angular to subangular, fine to coarse including brick, ash and coal									
1.10 1.10	D7 ES6			1.60		MADE GROUND: Black, sandy, angular to subangular, fine GRAVEL of ash, coal, brick and concrete.	2								
1.70 - 2.00	B9			(0.50)		MADE GROUND: Dark grey, gravelly, clayey, fine and medium SAND. Gravel is angular to subangular, fine and medium brick, ash, coal and concrete									
2.00 2.00	D11 ES10			2.10		MADE GROUND: Dark grey, gravelly, clayey, fine and medium SAND. Gravel is angular to subangular, fine and medium brick, ash, coal and concrete	3								
2.40	D12			(0.80)		MADE GROUND: Black, gravelly, medium and coarse SAND. Gravel is angular to subangular, fine to coarse including ash, brick and coal									
2.90 - 3.50 3.00	B13 D14			2.90			4								
4.00 4.00	D16 ES15			(1.10) 4.00		End of Trial Pit at 4.00m									
							5								
							6								
Dimensions:				General Remarks:											
Final Depth: 4.00m															
															
				Water Strikes											
				<table border="1"><thead><tr><th>Strike (m)</th><th>Time (mins)</th><th>Rose to (m)</th><th>Remarks</th></tr></thead><tbody><tr><td>4.00</td><td>0</td><td>0.00</td><td>seepage</td></tr></tbody></table>				Strike (m)	Time (mins)	Rose to (m)	Remarks	4.00	0	0.00	seepage
Strike (m)	Time (mins)	Rose to (m)	Remarks												
4.00	0	0.00	seepage												

HBSI TP Template Issue Number: 2 Issue Date: 27/04/16

APPENDIX 3

GEOTECHNICAL LABORATORY TEST RESULTS

APPENDIX 3

GENERAL NOTES ON LABORATORY TESTS ON SOILS

A3.1 GENERAL

A3.1.1 Where applicable all tests are carried out in accordance with the relevant British Standard. The laboratory test procedures are as below:

Test Name	Procedures BS1377:1990 Part:Clause
Moisture Content	2:3
Liquid Limit	2:4
Plastic Limit and Plastic Index	2:5
Linear Shrinkage	2:6
Particle Size Distribution	2:9
Loss on Ignition	3:4*
Sulphate content	3:5
Chloride Content	3:7*
pH Value	3:9
Compaction Test	4:3*
Moisture condition Value	4:5
California Bearing Ratio	4:7
Consolidation	5:3
Bulk Density	7:2*
Laboratory Vane Tests	7:3*
Shear Box	7:4*
Triaxial Compression	
Total Stress Single-Stage	7:8
Total Stress Multi-Stage	7:9
Effective Stress	Note 1*
Permeability	Note 2*
Desiccation	Note 3*
In-situ density by Sand replacement	Part 9
Core Cutter	Part 9
Nuclear density	Part 9
	BS812 Part:Clause
Ten % fines (Dry and Soaked)	111
Aggregate crushing value	110
Particle density and water absorption	2
Particle size distribution	103
Moisture content – oven drying	109
Soundness	121

BS:1881
Part:Clause

Chloride Content	124:10.2
Sulphate content	124:10.3
Curing/density and compressive strength of concrete tubes	116-111-114
Location of reinforcement	204
Carbonation	Note 4
Resistivity	Note 5
Sampling of concrete dust by drilling	Note 6
Half cell potential	Note 7

Note 1 - Manual of soils laboratory testing volume 3: 1985, section 19.2 by K.H. Head

Note 2 - Manual of soils laboratory testing volume 2: 1985, section 10.7 by K.H. Head

Note 3 - BRE Information paper IP4 issued February 1993

Note 4 - BRE Information paper IP6/81

Note 5 - In-house document number 109

Note 6 - In-house document number 112

Note 7 - ASTM C876-91

* Tests are not included in UKAS accreditation

A3.1.2 Any discussion in this report is based on the values and results obtained from the appropriate tests. Due allowance should be made, when considering any result in isolation, of the possible inaccuracy of any such individual result. Details of the accuracy of results are included in this section, where applicable.

F.A.O.

Test Report - 41976 /1

Site: Thurnscoe
Job Number: 41976
Originating Client: Fairhurst
Originating Reference: 41976
Date Sampled: Not Given
Date Scheduled: 02/11/2016
Date Testing Started: 09/11/2016
Date Testing Finished: 23/11/2016
Remarks:

Authorised By:



Daniel Smith
Laboratory Supervisor

Date: 25/11/2016

Page. 1



Site: Thurnscoe

Job Number: 41976

Client: Fairhurst

Page: 2

**Determination of Water Content, Liquid Limit and Plastic Limit
and Derivation of Plasticity and Liquidity Index**

Borehole / Trial Pit	Depth (m)	Sample	Natural / Sieved	Natural Water Content %	Sample Passing 425 µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
					Percentage %	Water Content %						
BH01	5.00	U16		19.9								Grey CLAY
BH01	5.50	D17	Natural	18.9	100	19.0	42	21	21	-0.10	CI	Brown / Grey sandy CLAY
TP01	0.40	B3		13.9								Brown gravelly SAND
TP02	1.50	D7		12.8								Black gravelly SAND
TP03	0.50	B4		18								Black gravelly clayey SAND
TP05	0.10	B2		13.8								Brown clayey gravelly SAND
TP06	0.50	B3		18.5								Black clayey gravelly SAND
TP07	0.60	B		20.8								Brown sandy gravelly CLAY
TP08	0.30	D4		14.6								Grey sandy gravelly CLAY

Method of Preparation: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.1 Water content test preparation
BS 1377 : Part 1 : 2016 : Clause 8.4.3 Preparation of samples for plasticity tests
BS 1377 : Part 2 : 1990 : Clause 4.2 Preparation of samples for plastic limit tests

Method of Test: BS EN ISO 17892 : Part 1 : 2014 : Clause 5.2 Water content test execution
BS 1377 : Part 2 : 1990 : Clause 4.3 or 4.4 Determination of the liquid limit
BS 1377 : Part 2 : 1990 : Clause 5.3 Determination of the plastic limit and plasticity index



Job Number: 41976

Page: 3

Determination of Particle Density by Gas Jar Method

Borehole / Trial Pit	Depth (m)	Sample	Particle Density Mg/m3	Description / Remarks
TP09	0.50	B3	2.49	Brown sandy gravelly CLAY

Method of Preparation: BS 1377 : Part 1 : 2016 : Clause 8.3 Initial preparation of disturbed samples
BS 1377 : Part 1 : 2016 : Clause 8.4.4 Preparation of samples for particle density tests

Method of Test: BS 1377 : Part 2 : 1990 : Clause 8.2 Determination of particle density (Gas jar method)



Site: Thurnscoe

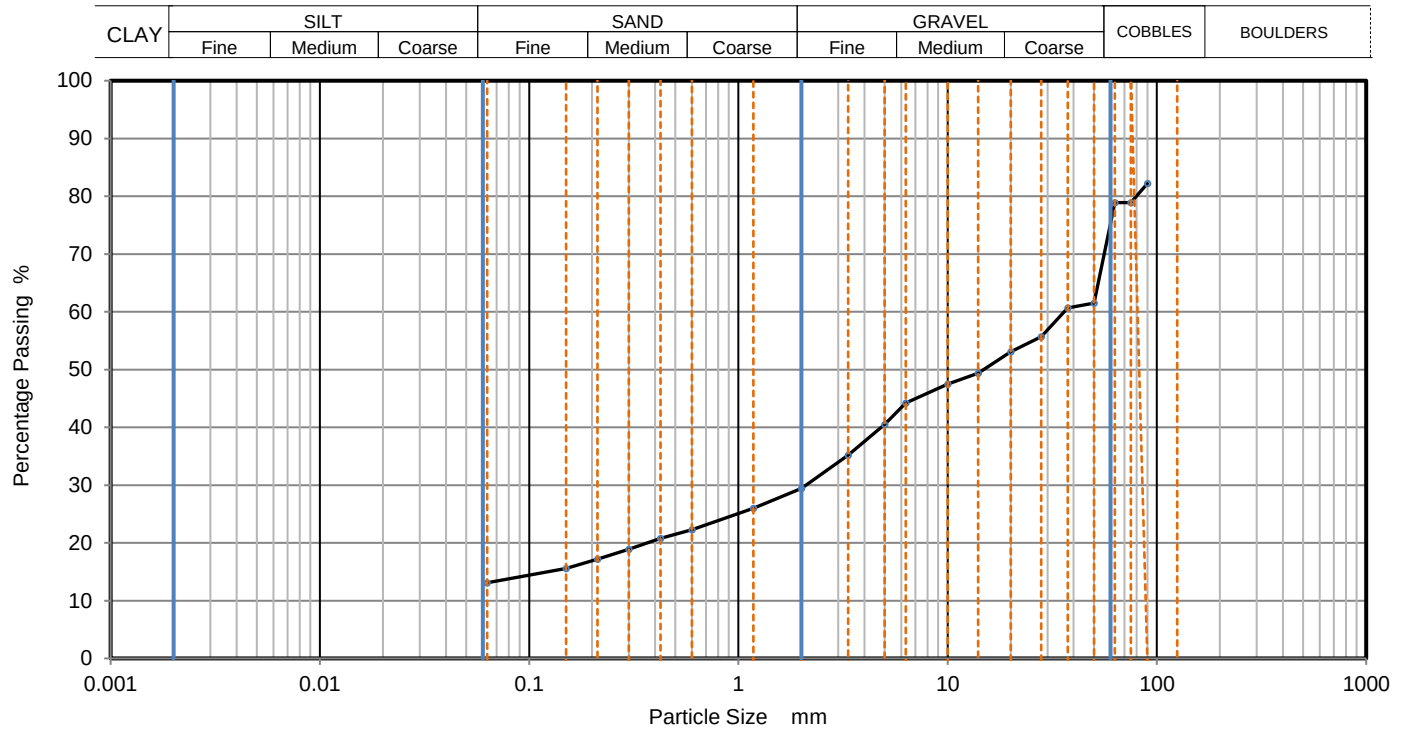
Job Number: 41976

Client: Fairhurst

Page: 4

DETERMINATION OF PARTICLE SIZE DISTRIBUTION

Borehole / Trial Pit	Depth (m)	Sample	Testing Type	Description
TP04	1.50	B7	Wet Sieve	Black gravelly SAND



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	82		
75	79		
63	79		
50	62		
37.5	61		
28	56		
20	53		
14	49		
10	48		
6.3	44		
5	41		
3.35	35		
2	29		
1.18	26		
0.6	22		
0.425	21		
0.3	19		
0.212	17		
0.15	16		
0.063	13		

Dry Mass of sample, g

10607

Sample Proportions	% dry mass
Very coarse	21
Gravel	50
Sand	16
Fines <0.063mm	13

Grading Analysis		
D100	mm	125
D60	mm	36
D30	mm	2.1
D10	mm	
Uniformity Coefficient		
Curvature Coefficient		

Remarks

Preparation and testing in accordance with BS1377 unless noted below

Method of Preparation: BS 1377:Part 1:1990, clause 7.3 Initial preparation
BS 1377:Part 1:1990, clause 7.4.5 Preparation of particle size tests

Method of Test: BS1377:Part 2:1990, clause 9.2 Determination of particle size distribution by wet sieving method



Site: Thurnscoe

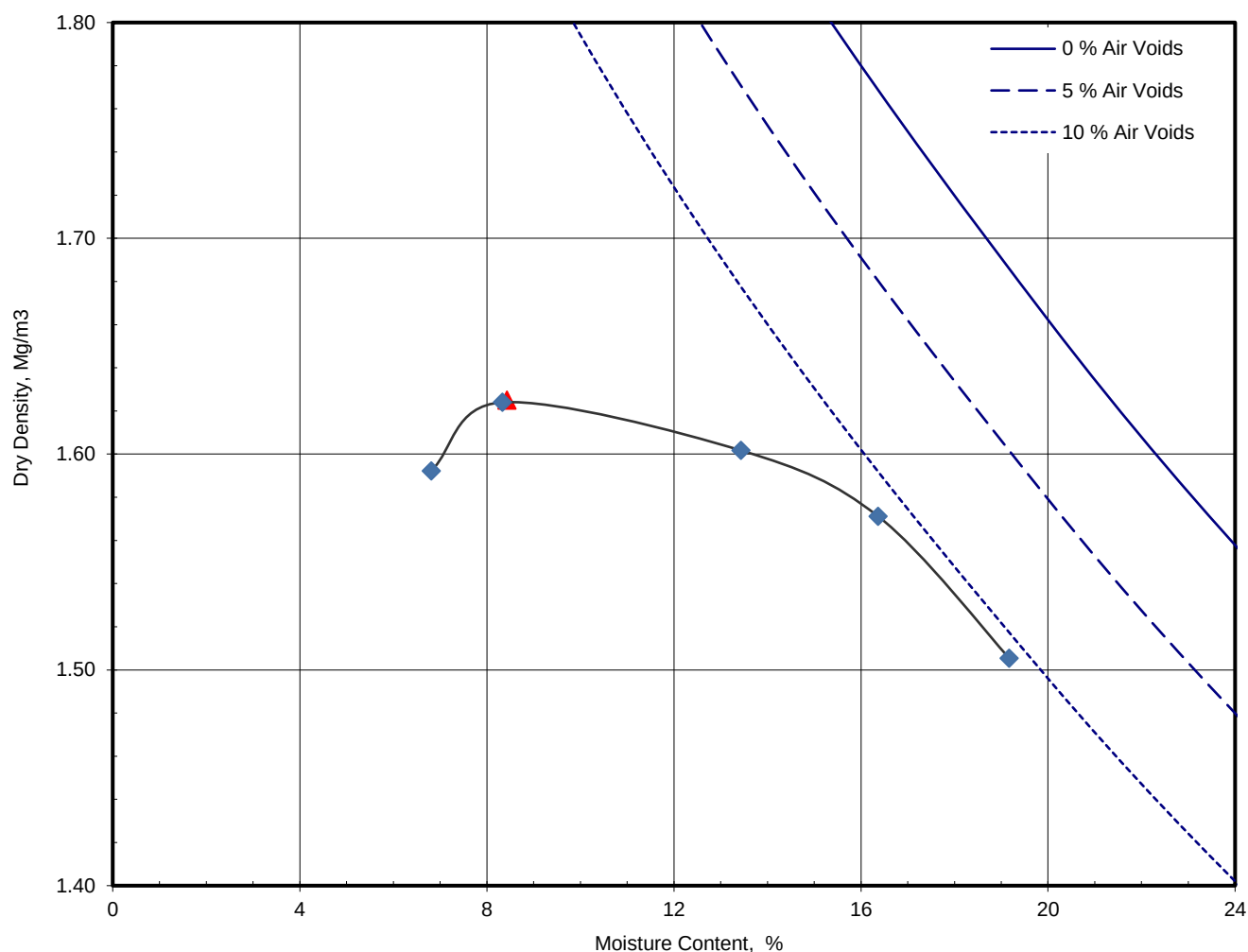
Job Number: 41976

Client: Fairhurst

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DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description		
TP03	0.5	B4	Black gravelly clayey SAND		
Percentage Retained 37.5mm		10 %			
Percentage Retained 20.0mm		9 %	Samples Used	Single sample tested	
Grading Zone		5	Particle Density	2.49 Mg/m ³	Assumed
Mould Type		CBR	Method of compaction	Compaction using 4.5kg rammer	
Maximum Dry Density		1.62 Mg/m ³	Optimum Moisture Content	8.4 %	



Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was air dried. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.4, 4.5kg rammer



1464

Site: Thurnscoe

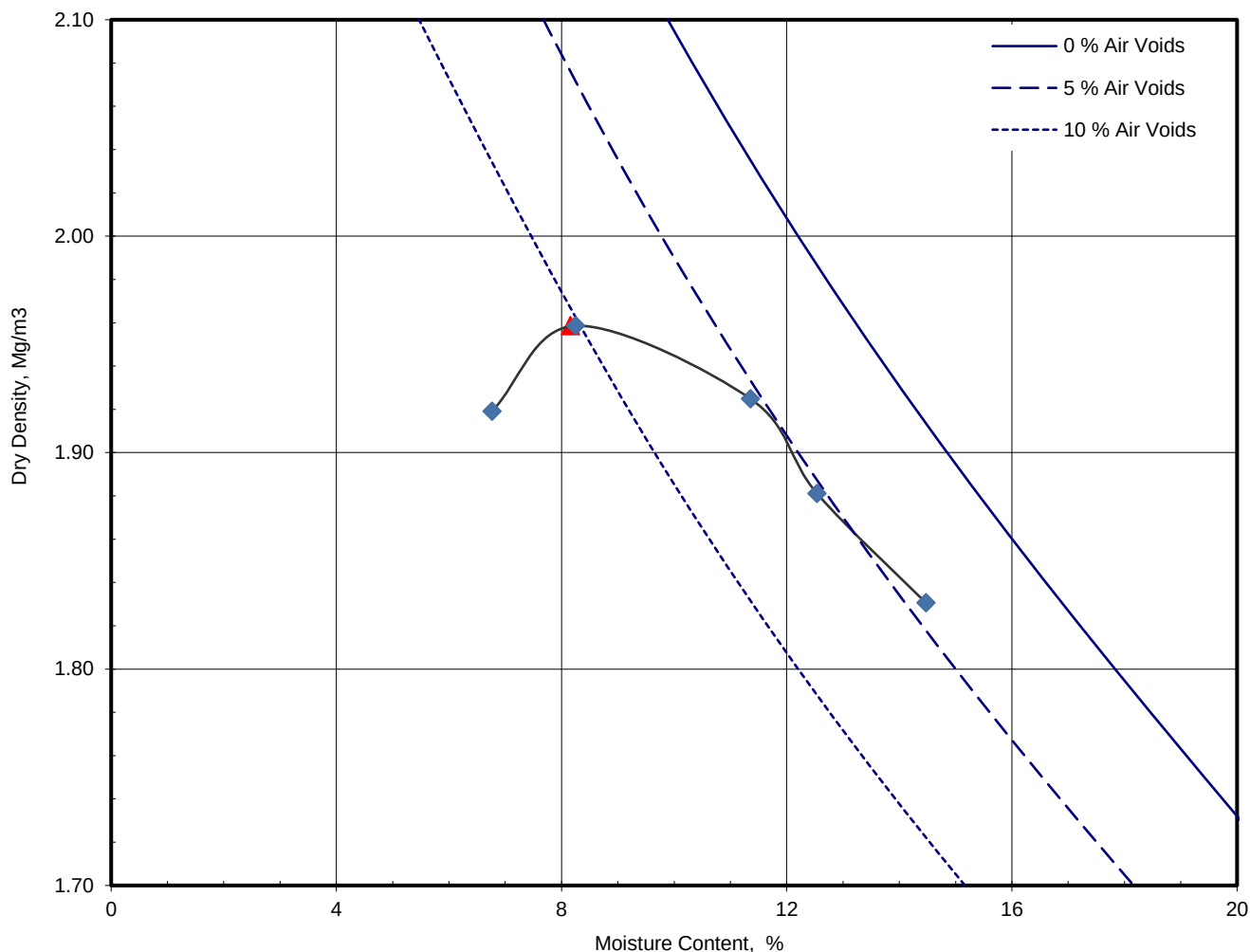
Job Number: 41976

Client: Fairhurst

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DETERMINATION OF DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description		
TP05	0.1	B2	Brown clayey gravelly SAND		
Percentage Retained 37.5mm		0 %			
Percentage Retained 20.0mm		7 %		Samples Used	Single sample tested
Grading Zone		3		Particle Density	2.65 Mg/m ³ Assumed
Mould Type		1 LITRE		Method of compaction	Compaction using 4.5kg rammer
Maximum Dry Density		1.96 Mg/m³		Optimum Moisture Content	8.2 %



Method of Preparation: BS 1377:PART 1:1990:7.6 Preparation of samples for compaction related test
BS 1377:PART 4:1990:3.2 Preparation of samples for compaction tests

Preparation Details: Material used was air dried. Single sample tested

Method of Test: BS1377:Part 4:1990, clause 3.3, 4.5kg rammer



1464

Site: Thurnscoe
Client: Fairhurst

Job Number: 41976
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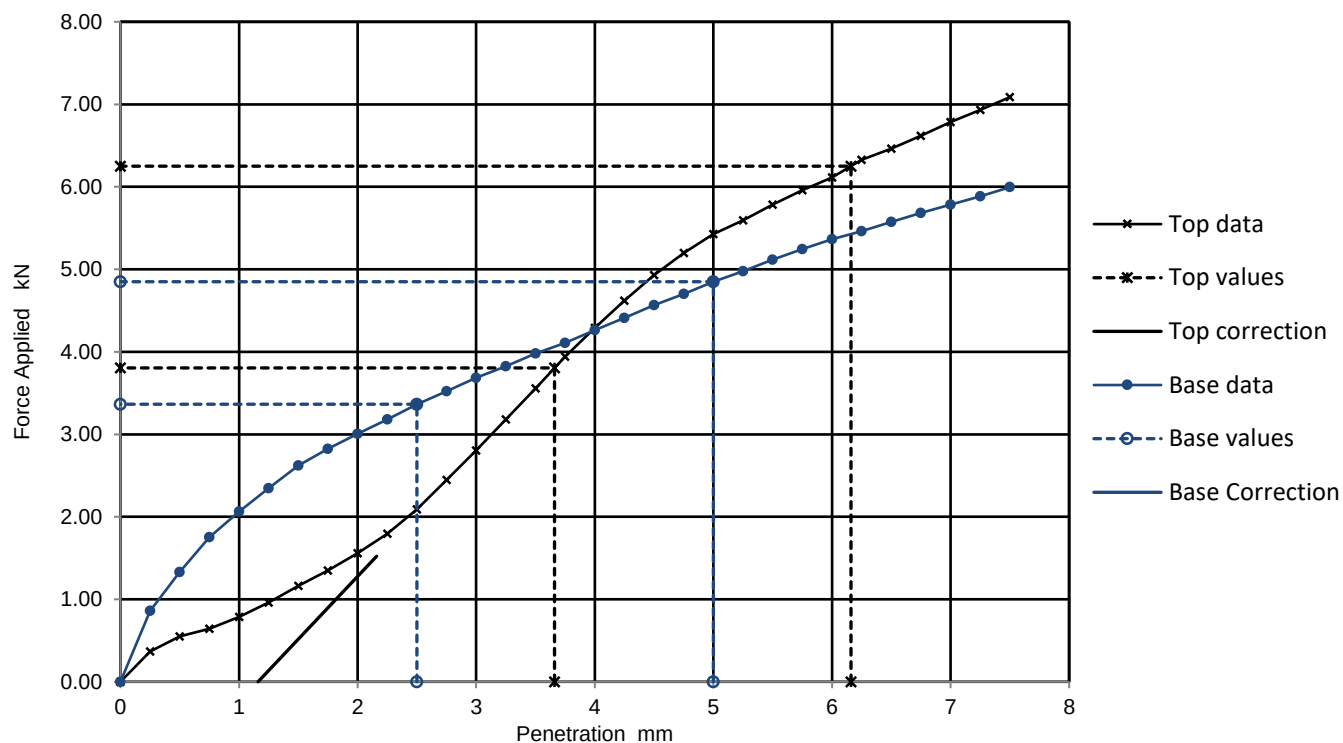
Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP01	0.40	B3	76.50%	Brown gravelly SAND

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Initial Specimen details	Bulk density	1.83	Mg/m ³
	Dry density	1.59	Mg/m ³
	Moisture content	14.9	%
	Surcharge applied	4.2	kg
		3	kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, %			
		2.5mm	5mm	Highest	Average
TOP	Yes	29.0	31.0	31.0	
BASE	No	25.0	24.0	25.0	

Moisture Content %
15.3
14.1

Approved
Daniel Smith

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

Site: Thurnscoe
Client: Fairhurst

Job Number: 41976
Page: 8

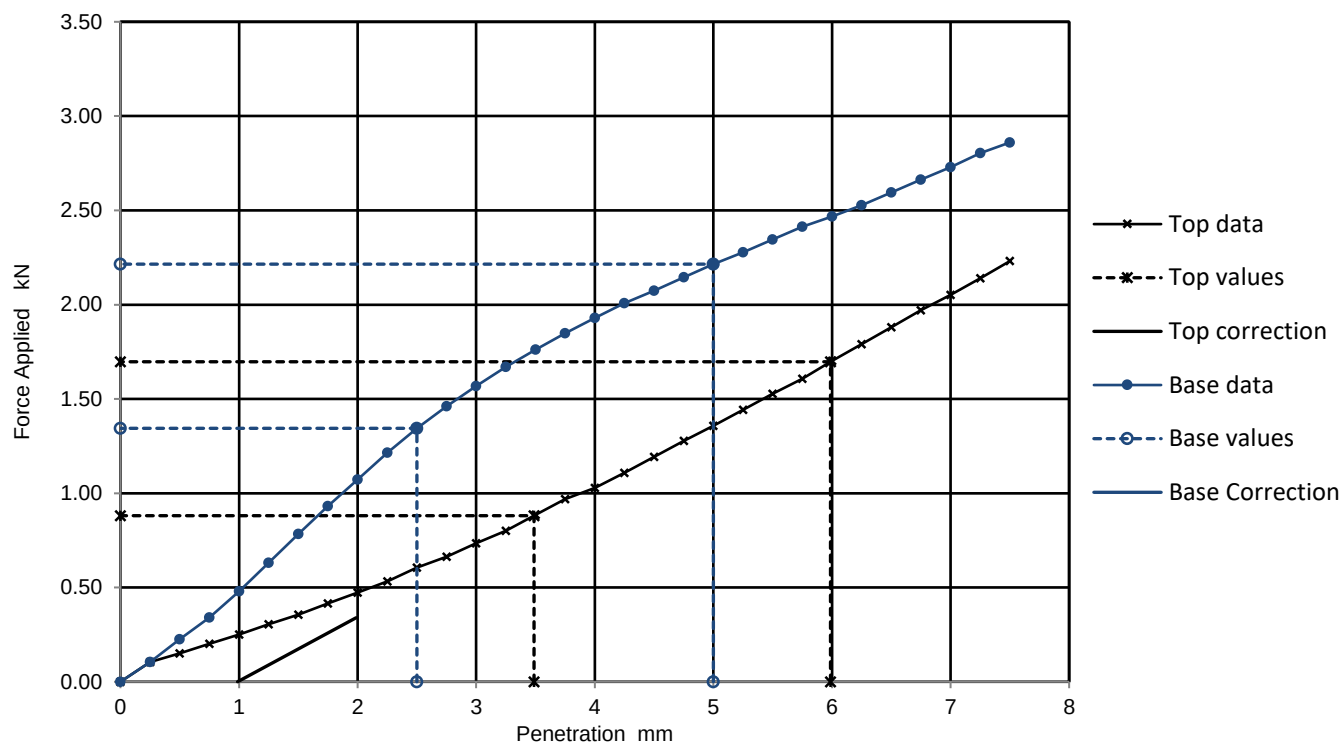
Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP06	0.50	B3	89.40%	Black clayey gravelly SAND

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Initial Specimen details	Bulk density	1.79	Mg/m3
	Dry density	1.51	Mg/m3
	Moisture content	18.7	%
	Surcharge applied	4.2	kg
		3	kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, %			
		2.5mm	5mm	Highest	Average
TOP	Yes	6.7	8.5	8.5	
BASE	No	10.0	11.0	11.0	

Moisture Content %
19.0
18.5

Approved
Daniel Smith

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

Site: Thurnscoe
Client: Fairhurst

Job Number: 41976
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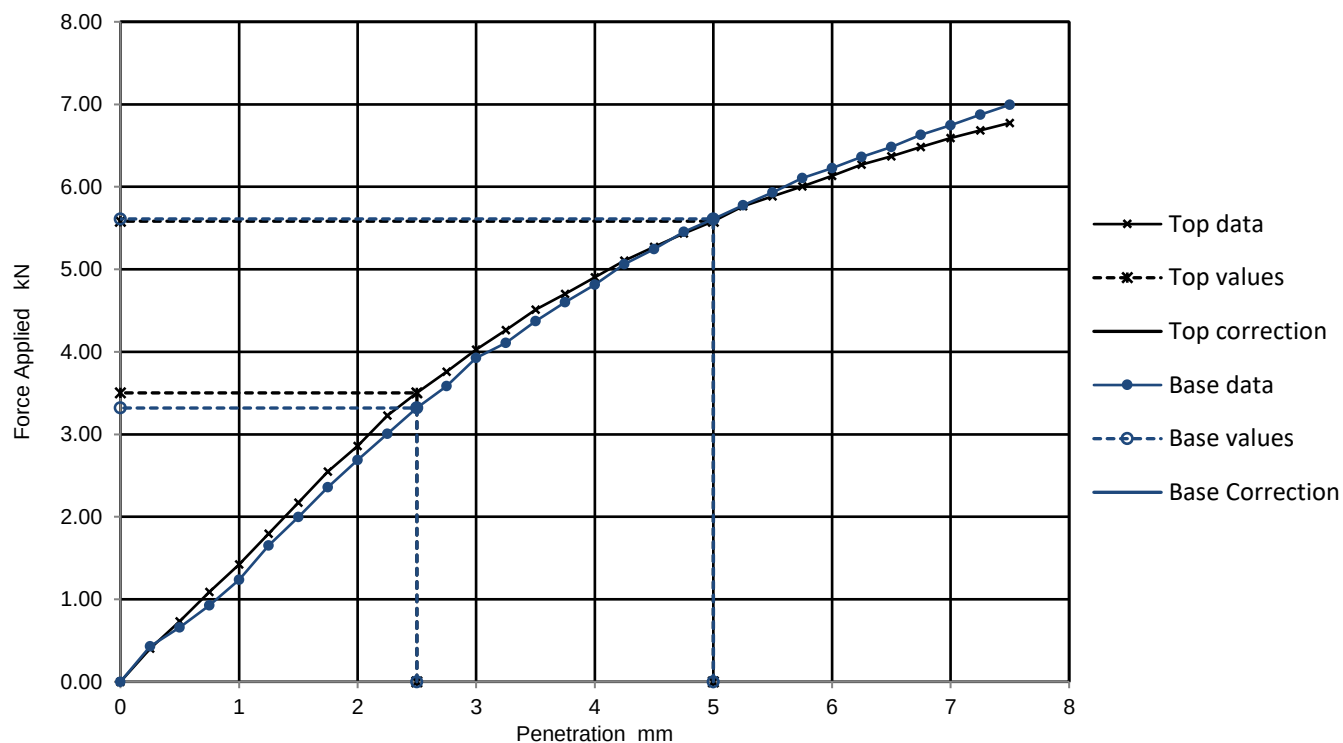
Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP07	0.60	B5	93.70%	Brown gravelly SAND

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Initial Specimen details	Bulk density	1.75	Mg/m3
	Dry density	1.45	Mg/m3
	Moisture content	20.8	%
	Surcharge applied	4.2	kg
		3	kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, %			
		2.5mm	5mm	Highest	Average
TOP	No	27.0	28.0	28.0	28.0
BASE	No	25.0	28.0	28.0	

Moisture Content %
22.3
23.6

Approved
Daniel Smith

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

Site: Thurnscoe
Client: Fairhurst

Job Number: 41976
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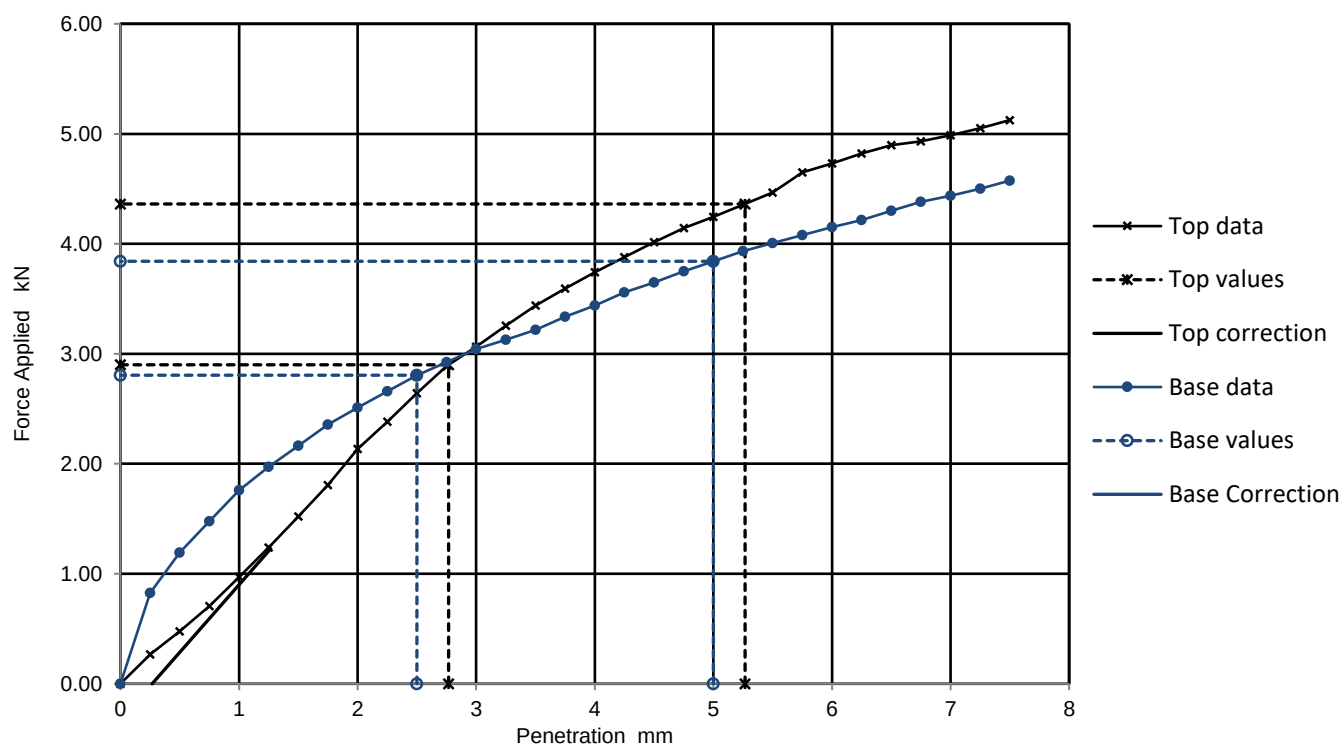
Determination of California Bearing Ratio (CBR)

Borehole / Trial Pit	Depth (m)	Sample	% Passing 20mm Sieve	Description
TP10	0.50	B4	91.10%	Grey sandy gravelly CLAY

Specimen Preparation

Condition	REMOULDED	Soaking details	Not soaked
Details	Recompacted with specified standard effort using 2.5kg rammer	Period of soaking	days
		Time to surface	days
		Amount of swell recorded	mm
Initial Specimen details	Bulk density	1.78	Mg/m3
	Dry density	1.54	Mg/m3
	Moisture content	15.3	%
	Surcharge applied	4.2	kg
		3	kPa

Force v Penetration Plots



RESULTS

	Curve correction applied	CBR Values, %				Moisture Content %
		2.5mm	5mm	Highest	Average	
TOP	Yes	22.0	22.0	22.0	22.0	15.9
BASE	No	21.0	19.0	21.0		16.4

Approved
Daniel Smith

Method of Preparation: BS1377 : Part 4 : 1990, clause 7. Recompacted with specified standard effort using 2.5kg rammer

Method of Test: BS1377 : Part 4 : 1990, clause 7. Determination of California Bearing Ratio (CBR)

Remarks:

Site: Thurnscoe

Job Number: 41976

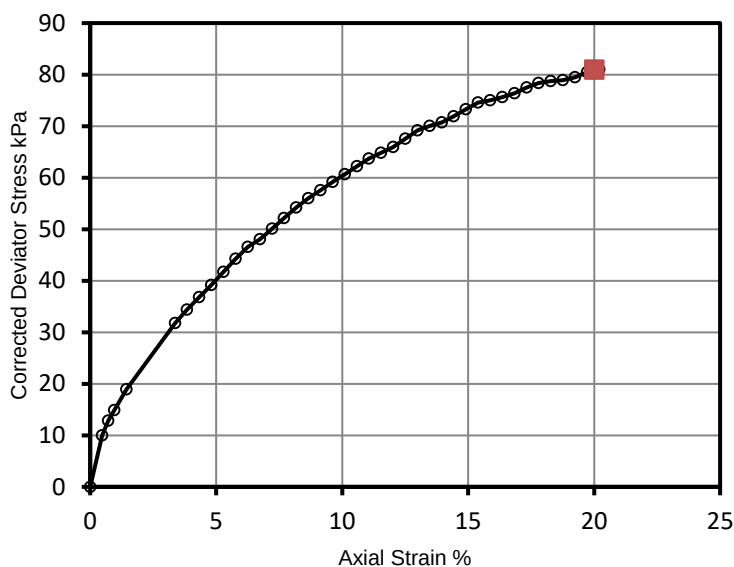
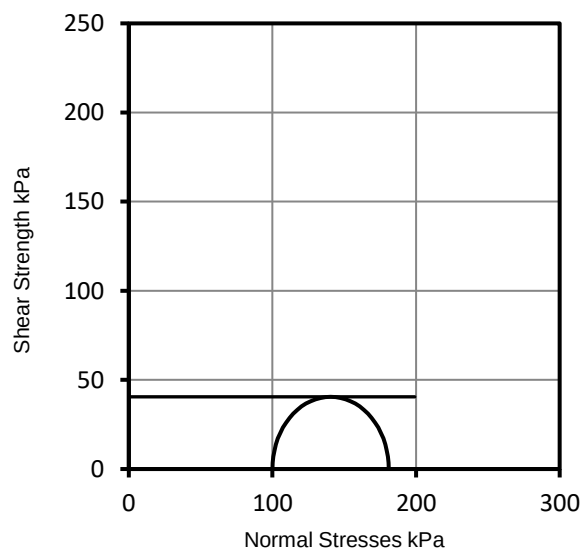
Client: Fairhurst

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Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen (Definitive Method)

Borehole / Trial Pit	Depth (m)	Sample	Description
BH01	5.00	U16	Grey CLAY

Initial Sample	Test Number	1
	Original Length (mm)	215.76
	Depth from Top (mm)	2.07
	Condition	Undisturbed
	Orientation	Vertical
Length (mm)		207.87
Diameter (mm)		102.34
Moisture Content (%)		19.90
Bulk Density (Mg/m ³)		2.12
Dry Density (Mg/m ³)		1.77
Membrane Thickness (mm)		0.29
Membrane Type		Latex
Rate of Strain (%/min)		1.9
Test Results	Cell Pressure (kPa)	100
	Axial Strain (%)	20
	Membrane Corr. (kPa)	1.1
	Deviator Stress, $(\sigma_1 - \sigma_3) f$ (kPa)	81
	Undrained Shear Strength, $c_u = \frac{1}{2}(\sigma_1 - \sigma_3) f$ (kPa)	40
	Mode of Failure	Plastic

Deviator Stress v Axial Strain

Mohr Circles


Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377. This is provided for information only.

Method of Preparation:

BS 1377:PT1:1990:8.3 Preparation of undisturbed samples for testing or
BS 1377:PT1:1990:7.7.5.2 Preparation of disturbed samples for testing

Method of Test:

BS 1377:PT2:1990:7.2 Determination of density by linear measurement.
BS 1377:PT7:1990:8.4 Determination of undrained shear strength in triaxial compression without measurement of pore pressure (Definitive method)

Site: Thurnscoe

Job Number: 41976

Client: Thurnscoe

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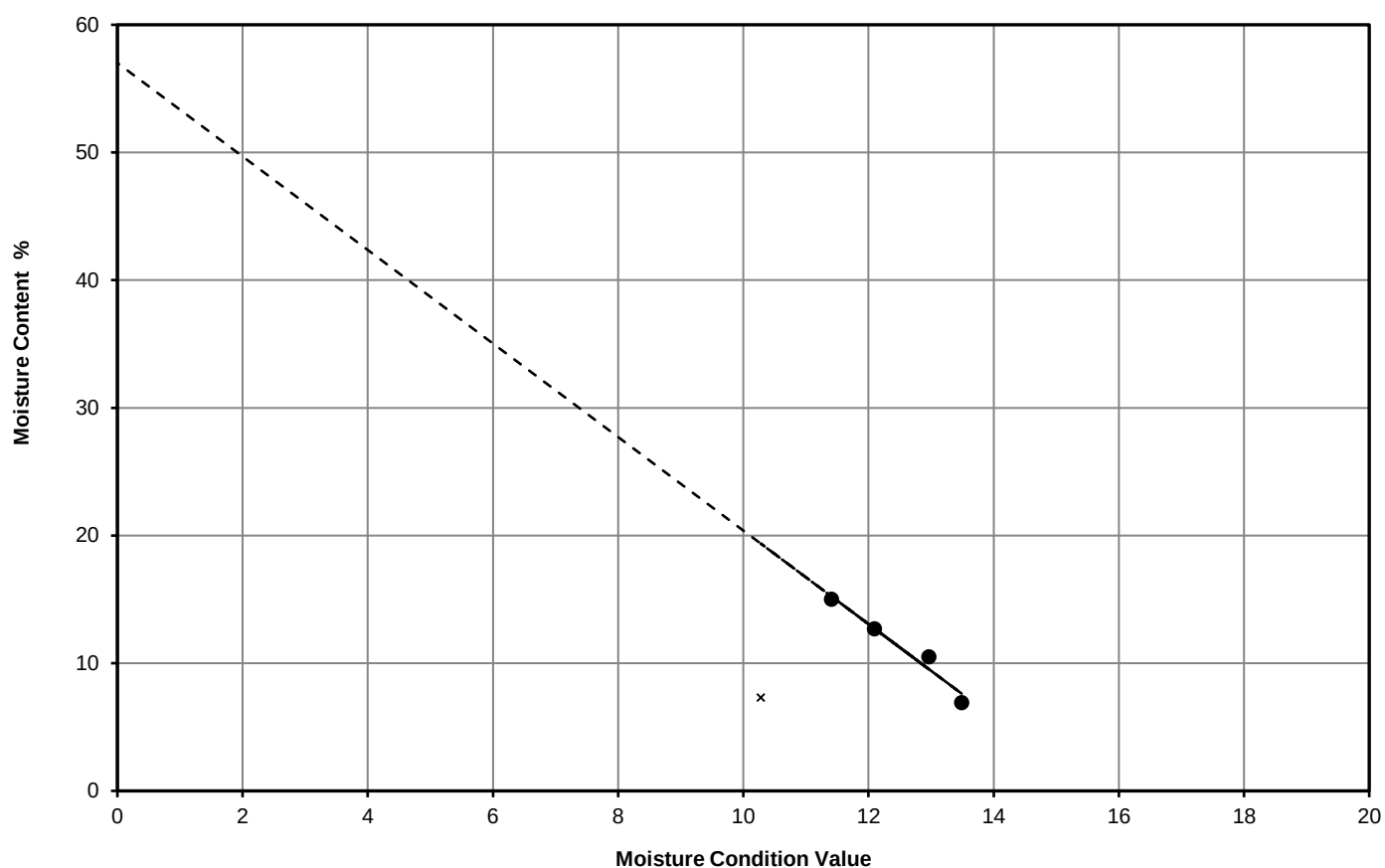
DETERMINATION OF MOISTURE CONDITION VALUE / MOISTURE CONTENT RELATIONSHIP

Borehole / Trial Pit	Depth (m)	Sample	Description
TP08	0.4	B5	Brown gravelly SAND

Sample preparation Amount of material larger than 20mm sieve removed 18 %

Sample Used: Single sample tested

● valid points × invalid points - - - - extended regression — linear regression


Table of results

 MCV Test Number
 Moisture Content, %
 Moisture Condition Value
 MCV report
 Effective / Valid data point

1	2	3	4	5
15.0	6.9	7.3	10.5	12.7
11.4	13.5	10.3	13.0	12.1
11.4	13.5	10.3	13	12.1
YES	YES	NO	YES	YES

 Method of Preparation: BS 1377:Part 1:1990:7.6 Preparation of samples for compaction-related tests
 BS 1377:Part 4:1990:5.5 Determination of the MCV / moisture content relation of a soil

Method of Test: BS 1377:Part 4:1990:5.5 Determination of the MCV / moisture content relation of a soil



Test Report - 41976 /1

Site: Thurnscoe

Job Number: 41976

Originating Client: Fairhurst

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

Date: 25/11/2016

F.A.O.

Test Report - 41976C /

Site: Thurnscoe
Job Number: 41976C
Originating Client: Fairhurst
Originating Reference: 41976
Date Sampled: Not Given
Date Scheduled: 07/11/2016
Date Testing Started: 15/11/2016
Date Testing Finished: 19/11/2016
Remarks:

Authorised By:



Daniel Smith
Laboratory Supervisor

Date: 23/11/2016

Page. 1

Page: 2

Borehole / Trial Pit	Depth (m)	Sample	Natural / Sieved	Natural Water Content %	Sample Passing 425 µm Sieve		Liquid Limit %	Plastic Limit %	Plasticity Index %	Liquidity Index	Class	Description / Remarks
					Percentage %	Water Content %						
BH02	2.00	B7	Sieved	21.5	41	46.0	43	27	16	1.17	MI	Brown sandy gravelly CLAY
BH04	0.20	ES1	Sieved	18.1	62	26.0	36	26	10	0.00	MI	Brown sandy gravelly CLAY
TP01	2.50	D14	Sieved	19.8	67	27.0	42	28	14	-0.06	MI	Black / Brown sandy gravelly CLAY





Test Report - 41976C /1

Site: Thurnscoe

Job Number: 41976C

Originating Client: Fairhurst

All opinions and interpretations contained within this report are outside of our Scope of Accreditation.

Date: 23/11/2016

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APPENDIX 4
CHEMICAL LABORATORY TEST RESULTS



Certificate of Analysis

Certificate Number 16-82190

02-Nov-16

Client Ian Farmer Associates
14-15 Rufford Court
Hardwick Grange
Woolston
Warrington
Cheshire
WA1 4RF

Our Reference 16-82190

Client Reference 41976

Order No 41622

Contract Title Thurnscoe

Description 15 Soil samples.

Date Received 26-Oct-16

Date Started 26-Oct-16

Date Completed 02-Nov-16

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

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

Approved By

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

Rob Brown
Business Manager



Summary of Chemical Analysis

Soil Samples

Our Ref 16-82190

Client Ref 41976

Contract Title Thurnscoe

Lab No	1073799	1073800	1073801	1073802	1073803	1073804
Sample ID	TP01	TP01	TP02	TP03	TP04	TP05
Depth	0.50	1.10	1.00	1.00	1.00	4.00
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	17/10/16	17/10/16	17/10/16	17/10/16	17/10/16	18/10/16
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	14		26	46		
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	0.9		1.2	2.1		
Cadmium	DETSC 2301#	0.1	mg/kg	0.2		0.1	0.2		
Chromium	DETSC 2301#	0.15	mg/kg	16		12	18		
Chromium III	DETSC 2301*	0.15	mg/kg	16		12	18		
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0		< 1.0	< 1.0		
Copper	DETSC 2301#	0.2	mg/kg	27		57	64		
Lead	DETSC 2301#	0.3	mg/kg	27		19	35		
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l		50				40
Mercury	DETSC 2325#	0.05	mg/kg	0.07		0.06	0.09		
Nickel	DETSC 2301#	1	mg/kg	14		23	25		
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5		< 0.5	0.9		
Zinc	DETSC 2301#	1	mg/kg	54		42	99		
Inorganics									
Loss on Ignition at 440oC	DETSC 2003#	0.01	%						
pH	DETSC 2008#			9.7	8.2	8.0	7.4		6.8
Calorific Value	DETSC 5008	1	MJ/kg		6.2			5.7	
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1		< 0.1	< 0.1		
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1		< 0.1	< 0.1		
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2		< 0.2	< 0.2		
Thiocyanate	DETSC 2130#	0.6	mg/kg	0.7		< 0.6	< 0.6		
Total Organic Carbon	DETSC 2002	0.1	%	1.8		6.1	5.1		
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l		< 10				< 10
Chloride Aqueous Extract	DETSC 2055	1	mg/l		13				19
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l		13				2.1
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	370	1100	770	1600		930
Sulphide	DETSC 2024#	10	mg/kg	16	52	44	44		32
Sulphur (free)	DETSC 3049#	0.75	mg/kg	3.9		1.9	14		
Sulphur as S, Total	DETSC 2320	0.01	%		0.29				0.53
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.27	0.49	0.36	0.73		0.71

Summary of Chemical Analysis

Soil Samples

Our Ref 16-82190

Client Ref 41976

Contract Title Thurnscoe

Lab No	1073799	1073800	1073801	1073802	1073803	1073804
Sample ID	TP01	TP01	TP02	TP03	TP04	TP05
Depth	0.50	1.10	1.00	1.00	1.00	4.00
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	17/10/16	17/10/16	17/10/16	17/10/16	17/10/16	18/10/16
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	0.03		0.03	0.02		
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	0.02		0.02	< 0.01		
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01		
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	< 1.5		
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2		< 1.2	< 1.2		
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5		< 1.5	< 1.5		
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4		< 3.4	< 3.4		
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10		< 10	< 10		
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01		
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01		
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		< 0.01	< 0.01		
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	16		15	< 0.9		
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	5.8		5.4	< 0.5		
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	8.0		6.1	< 0.6		
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	18		15	< 1.4		
Aromatic C5-C35	DETSC 3072*	10	mg/kg	47		42	< 10		
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	47		42	< 10		
EPH (C10-C40)	DETSC 3311#	10	mg/kg	120		67	96		
PAHs									
Acenaphthene	DETSC 3301	0.1	mg/kg	0.2		0.3	0.5		
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1		0.1	0.2		
Anthracene	DETSC 3301	0.1	mg/kg	0.1		0.1	0.2		
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	0.5		
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	0.4		
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	0.3		
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	0.2		
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	0.4		
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		
Fluoranthene	DETSC 3301	0.1	mg/kg	0.4		0.2	1.0		
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	0.3		
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1		< 0.1	< 0.1		
Naphthalene	DETSC 3301	0.1	mg/kg	0.6		1.0	1.0		
Phenanthrene	DETSC 3301	0.1	mg/kg	0.5		0.4	1.0		
Pyrene	DETSC 3301	0.1	mg/kg	0.6		0.4	1.0		
PAH Total	DETSC 3301	1.6	mg/kg	2.6		2.6	7.0		
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	< 0.3		0.4	0.5		

Summary of Chemical Analysis

Soil Samples

Our Ref 16-82190

Client Ref 41976

Contract Title Thurnscoe

Lab No	1073805	1073806	1073807	1073808	1073809	1073810
Sample ID	TP05	TP06	TP06	TP07	TP07	TP08
Depth	1.00	1.00	2.00	1.00	2.20	0.80
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	18/10/16	18/10/16	18/10/16	18/10/16	18/10/16	18/10/16
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg		40		72		41
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg		1.8		0.9		0.3
Cadmium	DETSC 2301#	0.1	mg/kg		0.1		0.1		< 0.1
Chromium	DETSC 2301#	0.15	mg/kg		14		13		18
Chromium III	DETSC 2301*	0.15	mg/kg		14		13		18
Chromium, Hexavalent	DETSC 2204*	1	mg/kg		< 1.0		< 1.0		< 1.0
Copper	DETSC 2301#	0.2	mg/kg		55		39		26
Lead	DETSC 2301#	0.3	mg/kg		22		23		14
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l	58				140	
Mercury	DETSC 2325#	0.05	mg/kg		0.23		0.13		< 0.05
Nickel	DETSC 2301#	1	mg/kg		21		22		22
Selenium	DETSC 2301#	0.5	mg/kg		0.8		< 0.5		< 0.5
Zinc	DETSC 2301#	1	mg/kg		53		43		56
Inorganics									
Loss on Ignition at 440oC	DETSC 2003#	0.01	%		31				
pH	DETSC 2008#			6.2	7.2		7.5	6.7	7.5
Calorific Value	DETSC 5008	1	MJ/kg			5.7			
Cyanide, Total	DETSC 2130#	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Cyanide, Free	DETSC 2130#	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Cyanide, Complex	DETSC 2130*	0.2	mg/kg		< 0.2		< 0.2		< 0.2
Thiocyanate	DETSC 2130#	0.6	mg/kg		< 0.6		1.6		< 0.6
Total Organic Carbon	DETSC 2002	0.1	%		> 15		0.5		0.9
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l	< 10				< 10	
Chloride Aqueous Extract	DETSC 2055	1	mg/l	9.0				79	
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l	< 1.0				< 1.0	
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	770	1600		1600	2000	980
Sulphide	DETSC 2024#	10	mg/kg	32	20		26	< 10	57
Sulphur (free)	DETSC 3049#	0.75	mg/kg		21		6.9		< 0.75
Sulphur as S, Total	DETSC 2320	0.01	%	1.9				2.1	
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.46	1.1		2.1	5.5	1.2

Summary of Chemical Analysis

Soil Samples

Our Ref 16-82190

Client Ref 41976

Contract Title Thurnscoe

Lab No	1073805	1073806	1073807	1073808	1073809	1073810
Sample ID	TP05	TP06	TP06	TP07	TP07	TP08
Depth	1.00	1.00	2.00	1.00	2.20	0.80
Other ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sampling Date	18/10/16	18/10/16	18/10/16	18/10/16	18/10/16	18/10/16
Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s

Test	Method	LOD	Units						
Petroleum Hydrocarbons									
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg		< 0.01		< 0.01		0.02
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg		< 0.01		< 0.01		< 0.01
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01		< 0.01		< 0.01
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg		< 1.5		< 1.5		< 1.5
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg		< 1.2		< 1.2		< 1.2
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg		2.3		< 1.5		< 1.5
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg		13		< 3.4		< 3.4
Aliphatic C5-C35	DETSC 3072*	10	mg/kg		15		< 10		< 10
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg		< 0.01		< 0.01		< 0.01
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg		< 0.01		< 0.01		< 0.01
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg		< 0.01		< 0.01		< 0.01
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg		13		< 0.9		< 0.9
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg		3.8		< 0.5		< 0.5
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg		5.9		< 0.6		< 0.6
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg		15		< 1.4		< 1.4
Aromatic C5-C35	DETSC 3072*	10	mg/kg		38		< 10		< 10
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg		53		< 10		< 10
EPH (C10-C40)	DETSC 3311#	10	mg/kg		230		70		12
PAHs									
Acenaphthene	DETSC 3301	0.1	mg/kg		1.0		0.4		< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg		< 0.1		0.2		< 0.1
Anthracene	DETSC 3301	0.1	mg/kg		0.3		< 0.1		< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg		0.3		< 0.1		< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Chrysene	DETSC 3301	0.1	mg/kg		0.3		< 0.1		< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg		0.3		< 0.1		< 0.1
Fluorene	DETSC 3301	0.1	mg/kg		< 0.1		0.1		< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg		< 0.1		< 0.1		< 0.1
Naphthalene	DETSC 3301	0.1	mg/kg		1.3		0.9		< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg		1.4		0.8		< 0.1
Pyrene	DETSC 3301	0.1	mg/kg		0.4		< 0.1		< 0.1
PAH Total	DETSC 3301	1.6	mg/kg		5.3		2.5		< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg		1.1		< 0.3		< 0.3

Summary of Chemical Analysis

Soil Samples

Our Ref 16-82190

Client Ref 41976

Contract Title Thurnscoe

Lab No	1073811	1075908	1075909
Sample ID	TP10	BH01	BH02
Depth	1.10	5.50	5.70
Other ID			
Sample Type	SOIL	SOIL	SOIL
Sampling Date	17/10/16	n/s	n/s
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Metals						
Arsenic	DETSC 2301#	0.2	mg/kg	37		
Boron, Water Soluble	DETSC 2123#	0.2	mg/kg	2.1		
Cadmium	DETSC 2301#	0.1	mg/kg	0.4		
Chromium	DETSC 2301#	0.15	mg/kg	15		
Chromium III	DETSC 2301*	0.15	mg/kg	15		
Chromium, Hexavalent	DETSC 2204*	1	mg/kg	< 1.0		
Copper	DETSC 2301#	0.2	mg/kg	55		
Lead	DETSC 2301#	0.3	mg/kg	100		
Magnesium Aqueous Extract	DETSC 2076*	10	mg/l		89	150
Mercury	DETSC 2325#	0.05	mg/kg	0.09		
Nickel	DETSC 2301#	1	mg/kg	22		
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5		
Zinc	DETSC 2301#	1	mg/kg	68		
Inorganics						
Loss on Ignition at 440oC	DETSC 2003#	0.01	%			
pH	DETSC 2008#			7.3	6.7	6.6
Calorific Value	DETSC 5008	1	MJ/kg	5.0		
Cyanide, Total	DETSC 2130#	0.1	mg/kg	< 0.1		
Cyanide, Free	DETSC 2130#	0.1	mg/kg	< 0.1		
Cyanide, Complex	DETSC 2130*	0.2	mg/kg	< 0.2		
Thiocyanate	DETSC 2130#	0.6	mg/kg	< 0.6		
Total Organic Carbon	DETSC 2002	0.1	%	3.0		
Ammonia Aqueous Extract as N	DETSC 2119	10	mg/l		< 10	< 10
Chloride Aqueous Extract	DETSC 2055	1	mg/l		27	52
Nitrate Aqueous Extract as NO3	DETSC 2055	1	mg/l		< 1.0	< 1.0
Sulphate Aqueous Extract as SO4	DETSC 2076#	10	mg/l	1600	1800	2100
Sulphide	DETSC 2024#	10	mg/kg	28	32	48
Sulphur (free)	DETSC 3049#	0.75	mg/kg	7.8		
Sulphur as S, Total	DETSC 2320	0.01	%		1.3	1.5
Sulphate as SO4, Total	DETSC 2321#	0.01	%	0.72	3.8	4.0

Summary of Chemical Analysis

Soil Samples

Our Ref 16-82190

Client Ref 41976

Contract Title Thurnscoe

Lab No	1073811	1075908	1075909
Sample ID	TP10	BH01	BH02
Depth	1.10	5.50	5.70
Other ID			
Sample Type	SOIL	SOIL	SOIL
Sampling Date	17/10/16	n/s	n/s
Sampling Time	n/s	n/s	n/s

Test	Method	LOD	Units			
Petroleum Hydrocarbons						
Aliphatic C5-C6	DETSC 3321*	0.01	mg/kg	0.04		
Aliphatic C6-C8	DETSC 3321*	0.01	mg/kg	< 0.01		
Aliphatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		
Aliphatic C10-C12	DETSC 3072#	1.5	mg/kg	< 1.5		
Aliphatic C12-C16	DETSC 3072#	1.2	mg/kg	< 1.2		
Aliphatic C16-C21	DETSC 3072#	1.5	mg/kg	< 1.5		
Aliphatic C21-C35	DETSC 3072#	3.4	mg/kg	< 3.4		
Aliphatic C5-C35	DETSC 3072*	10	mg/kg	< 10		
Aromatic C5-C7	DETSC 3321*	0.01	mg/kg	< 0.01		
Aromatic C7-C8	DETSC 3321*	0.01	mg/kg	< 0.01		
Aromatic C8-C10	DETSC 3321*	0.01	mg/kg	< 0.01		
Aromatic C10-C12	DETSC 3072#	0.9	mg/kg	< 0.9		
Aromatic C12-C16	DETSC 3072#	0.5	mg/kg	< 0.5		
Aromatic C16-C21	DETSC 3072#	0.6	mg/kg	< 0.6		
Aromatic C21-C35	DETSC 3072#	1.4	mg/kg	< 1.4		
Aromatic C5-C35	DETSC 3072*	10	mg/kg	< 10		
TPH Ali/Aro Total	DETSC 3072*	10	mg/kg	< 10		
EPH (C10-C40)	DETSC 3311#	10	mg/kg	150		
PAHs						
Acenaphthene	DETSC 3301	0.1	mg/kg	0.8		
Acenaphthylene	DETSC 3301	0.1	mg/kg	0.2		
Anthracene	DETSC 3301	0.1	mg/kg	0.4		
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	1.4		
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	1.4		
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	1.1		
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	0.9		
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	0.6		
Chrysene	DETSC 3301	0.1	mg/kg	1.3		
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	0.2		
Fluoranthene	DETSC 3301	0.1	mg/kg	2.9		
Fluorene	DETSC 3301	0.1	mg/kg	0.4		
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	1.0		
Naphthalene	DETSC 3301	0.1	mg/kg	1.6		
Phenanthrene	DETSC 3301	0.1	mg/kg	1.8		
Pyrene	DETSC 3301	0.1	mg/kg	3.0		
PAH Total	DETSC 3301	1.6	mg/kg	19		
Phenols						
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	0.4		

Summary of Asbestos Analysis

Soil Samples

Our Ref 16-82190

Client Ref 41976

Contract Title Thurnscoe

Lab No	Sample ID	Material Type	Result	Comment*	Analyst
1073799	TP01 0.50	SOIL	NAD	none	Michael Kay
1073801	TP02 1.00	SOIL	NAD	none	Michael Kay
1073802	TP03 1.00	SOIL	Chrysotile	Small bundle of Chrysotile	Michael Kay
1073806	TP06 1.00	SOIL	NAD	none	Michael Kay
1073808	TP07 1.00	SOIL	NAD	none	Michael Kay

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

Information in Support of the Analytical Results

Our Ref 16-82190
Client Ref 41976
Contract Thurnscoe

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1073799	TP01 0.50 SOIL	17/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073800	TP01 1.10 SOIL	17/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073801	TP02 1.00 SOIL	17/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073802	TP03 1.00 SOIL	17/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073803	TP04 1.00 SOIL	17/10/16	GJ 250ml, GV, PT 1L		
1073804	TP05 4.00 SOIL	18/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073805	TP05 1.00 SOIL	18/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073806	TP06 1.00 SOIL	18/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073807	TP06 2.00 SOIL	18/10/16	GJ 250ml, GV, PT 1L		
1073808	TP07 1.00 SOIL	18/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073809	TP07 2.20 SOIL	18/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073810	TP08 0.80 SOIL	18/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1073811	TP10 1.10 SOIL	17/10/16	GJ 250ml, GV, PT 1L	pH + Conductivity (7 days)	
1075908	BH01 5.50 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), Ammonia Aqueous Extract (1095 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	
1075909	BH02 5.70 SOIL		PT 1L	Sample date not supplied, Anions 2:1 (365 days), Ammonia Aqueous Extract (1095 days), Total Sulphur ICP (365 days), Total Sulphate ICP (730 days), Metals ICP Prep (365 days), pH + Conductivity (7 days)	

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

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

Soil Analysis Notes

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

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

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

Disposal

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

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



Certificate of Analysis

Certificate Number 16-83137

11-Nov-16

Client Ian Farmer Associates
14-15 Rufford Court
Hardwick Grange
Woolston
Warrington
Cheshire
WA1 4RF

Our Reference 16-83137

Client Reference 41976

Order No 41701

Contract Title Thurnscoe

Description One Water sample.

Date Received 05-Nov-16

Date Started 05-Nov-16

Date Completed 11-Nov-16

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

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

Approved By

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

Rob Brown
Business Manager



Summary of Chemical Analysis

Water Samples

Our Ref 16-83137

Client Ref 41976

Contract Title Thurnscoe

Lab No	1079383
Sample ID	P2
Depth	8.31
Other ID	
Sample Type	WATER
Sampling Date	04/11/16
Sampling Time	n/s

Test	Method	LOD	Units	
Metals				
Arsenic, Dissolved	DETSC 2306	0.16	ug/l	4.7
Boron	DETSC 2123	100	ug/l	1000
Cadmium, Dissolved	DETSC 2306	0.03	ug/l	0.06
Chromium, Dissolved	DETSC 2306	0.25	ug/l	0.27
Copper, Dissolved	DETSC 2306	0.4	ug/l	2.2
Lead, Dissolved	DETSC 2306	0.09	ug/l	0.31
Mercury, Dissolved	DETSC 2306	0.01	ug/l	0.02
Nickel, Dissolved	DETSC 2306	0.5	ug/l	5.0
Selenium, Dissolved	DETSC 2306	0.25	ug/l	3.3
Zinc, Dissolved	DETSC 2306	1.3	ug/l	240
Inorganics				
pH	DETSC 2008			7.5
Cyanide, Total	DETSC 2130	40	ug/l	< 40
Cyanide, Free	DETSC 2130	20	ug/l	< 20
Cyanide, Complex	DETSC 2130*	40	ug/l	< 40
Thiocyanate	DETSC 2130	40	ug/l	< 40
Ammoniacal Nitrogen as NH4	DETSC 2207	0.02	mg/l	< 0.02
Ammoniacal Nitrogen as NH3	DETSC 2207	0.4	mg/l	< 0.4
Sulphate as SO4	DETSC 2055	0.1	mg/l	1700
Sulphide	DETSC 2208	10	ug/l	21
Sulphur (free)	DETSC 3049	84	ug/l	< 84
Petroleum Hydrocarbons				
EPH (C10-C40)	DETSC 3311	10	ug/l	20
PAHs				
Acenaphthene	DETSC 3304	0.01	ug/l	< 0.01
Acenaphthylene	DETSC 3304	0.01	ug/l	< 0.01
Anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(a)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(a)pyrene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(b)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Benzo(g,h,i)perylene	DETSC 3304*	0.01	ug/l	< 0.01
Benzo(k)fluoranthene	DETSC 3304	0.01	ug/l	< 0.01
Chrysene	DETSC 3304	0.01	ug/l	< 0.01
Dibenzo(a,h)anthracene	DETSC 3304	0.01	ug/l	< 0.01
Fluoranthene	DETSC 3304	0.01	ug/l	0.01
Fluorene	DETSC 3304	0.01	ug/l	< 0.01
Indeno(1,2,3-c,d)pyrene	DETSC 3304*	0.01	ug/l	< 0.01
Naphthalene	DETSC 3304	0.01	ug/l	< 0.01
Phenanthrene	DETSC 3304	0.01	ug/l	0.01
Pyrene	DETSC 3304	0.01	ug/l	0.02
PAH Total	DETSC 3304	0.04	ug/l	< 0.04

Summary of Chemical Analysis

Water Samples

Our Ref 16-83137
Client Ref 41976
Contract Title Thurnscoe

Lab No	1079383
Sample ID	P2
Depth	8.31
Other ID	
Sample Type	WATER
Sampling Date	04/11/16
Sampling Time	n/s

Test	Method	LOD	Units
Phenols			
Phenol	*	0.5	ug/l
			< 0.50

Information in Support of the Analytical Results

Our Ref 16-83137
Client Ref 41976
Contract Thurnscoe

Containers Received & Deviating Samples

Lab No	Sample ID	Date Sampled	Containers Received	Holding time exceeded for tests	Inappropriate container for tests
1079383	P2 8.31 WATER	04/11/16	GB 1L x3, GV x2		
Key: G-Glass B-Bottle V-Vial DETS cannot be held responsible for the integrity of samples received whereby the laboratory did not undertake the sampling. In this instance samples received may be deviating. Deviating Sample criteria are based on British and International standards and laboratory trials in conjunction with the UKAS note 'Guidance on Deviating Samples'. All samples received are listed above. However, those samples that have additional comments in relation to hold time, inappropriate containers etc are deviating due to the reasons stated. This means that the analysis is accredited where applicable, but results may be compromised due to sample deviations. If no sampled date (soils) or date+time (waters) has been supplied then samples are deviating. However, if you are able to supply a sampled date (and time for waters) this will prevent samples being reported as deviating where specific hold times are not exceeded and where the container supplied is suitable.					

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :- Soils - 1 month, Liquids - 2 weeks, Asbestos (test portion) - 6 months

APPENDIX 5
MONITORING

Gas and Groundwater Monitoring Results

Contract Number:		41976				Gas Monitor:		GA5000				
Contract Name:		Thurnscoe				Readings Taken By:		NM				
Date:		4th November 2016				Checked By:		HH				
Background Readings:		Weather Conditions:				Dry, cloudy 9.1C		O ₂ %	CO ₂ %	CH ₄ %	CO	H ₂ S
		Ground Conditions (dry / wet etc):				Damp		v/v	v/v	v/v	ppm	ppm
		Atmospheric Pressure (Start):				1000mb		20.9	0.0	0.0	0.0	0.0
		Atmospheric Pressure (Finish):				1000mb						
		Time (Start): 12.00		Time (Finish):		13:00						
Hole No:	VOC ppm	O ₂ % v/v	CO ₂ % v/v	CH ₄ % v/v		CO ppm	H ₂ S ppm	Rel Pressure (mb)	Gas flow Rate (l/hr)	Depth to base of well	SWL	LNAPL or DNAPL
	Steady	Steady	Steady	Peak	Steady	Steady	Steady	Steady	Range	mBGL	mBGL	mBGL
BH01	0.0	3.0	3.9	0.0	0.0	0	0	0.00	0.0	4.75	Dry	n/d
BH04	0.0	3.3	5.8	0.1	0.1	0	0	0.00	0.0	5.39	Dry	n/d
P02	0.0	20.0	0.9	0.0	0.0	0	0	0.00	0.0	17.90	8.31	n/d
BH06	0.0	11.4	4.5	0.0	0.0	0	0	0.00	0.0	5.38	Dry	n/d
>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.												
Remarks:												

Gas and Groundwater Monitoring Results

Contract Number: 41976						Gas Monitor: GA5000								
Contract Name: Thurnscoe						Readings Taken By: DM								
Date: 16th November 2016						Checked By: HH								
Background Readings:						Weather Conditions:		Bright, windy, 10°c		O ₂ %	CO ₂ %	CH ₄ %	CO	H ₂ S
						Ground Conditions (dry / wet etc):		Wet		v/v	v/v	v/v	ppm	ppm
						Atmospheric Pressure (Start):		1003mb		21.0	0.0	0.0	0.0	0.0
						Atmospheric Pressure (Finish):		1002mb						
						Time (Start): 12:00 Time (Finish):		12:45						
Hole No:	VOC ppm	O ₂ % v/v	CO ₂ % v/v	CH ₄ % v/v		CO ppm	H ₂ S ppm	Rel Pressure (mb)	Gas flow Rate (l/hr)	Depth to base of well	SWL	LNAPL or DNAPL		
	Steady	Steady	Steady	Peak	Steady	Steady	Steady	Steady	Range	mBGL	mBGL	mBGL		
BH01	0.0	20.1	0.3	0.0	0.0	0	0	0.03	0.0	4.76	4.52	N/D		
BH04	0.0	20.8	0.1	0.0	0.0	0	0	-0.08	-0.1	5.41	5.17	N/D		
BH06	0.0	20.7	0.2	0.0	0.0	0	0	0.14	0.1	5.39	Dry	N/D		
P02	0.0	19.3	0.7	0.0	0.0	0	0	0.24	0.1	17.72	7.74	N/D		
>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.														
Remarks:														

>>>> = Flow above detection limit of 30 l/hr, <<< = Negative flow greater than -10 l/hr. >Max = In excess of lower explosive limit.

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APPENDIX 6
PHOTOGRAPHS

Trial Pit Photographs TP01



Trial Pit Photographs TP01



Trial Pit Photographs TP02



Trial Pit Photographs TP02



Trial Pit Photographs TP03



Trial Pit Photographs TP03



Trial Pit Photographs TP04



Trial Pit Photographs TP04



Trial Pit Photographs TP05



Trial Pit Photographs TP05



Trial Pit Photographs TP06



Trial Pit Photographs TP06



Trial Pit Photographs TP06



Trial Pit Photographs TP07



Trial Pit Photographs TP07



Trial Pit Photographs TP08



Trial Pit Photographs TP08



Trial Pit Photographs TP09



Trial Pit Photographs TP09



Trial Pit Photographs TP09



Trial Pit Photographs TP09

