

Project Name:

Location:

Client:

Land off Shawstead Road

Hale, Kent

KD Attwood & Partners

Project ID:

J13752

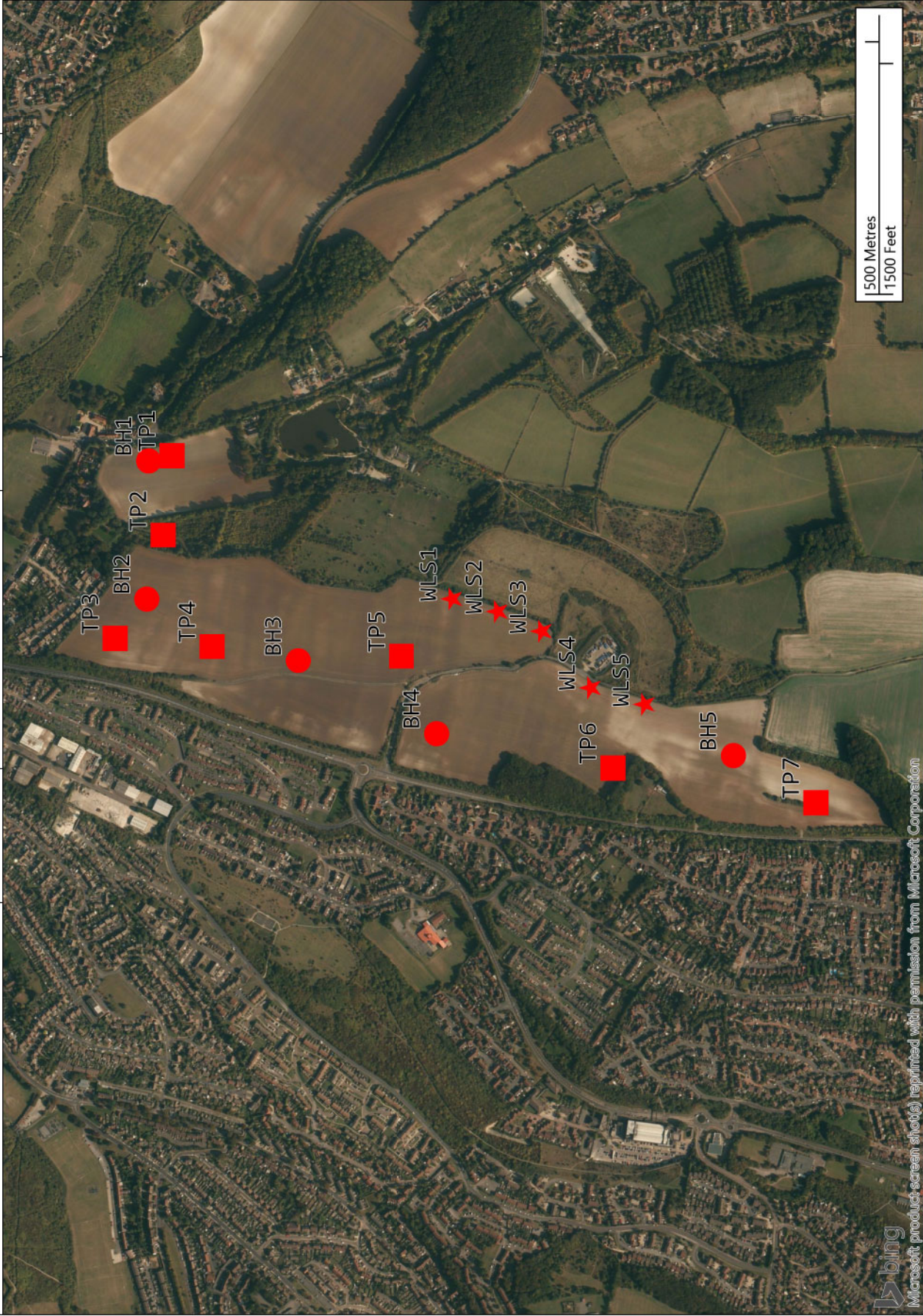
Engineer:

JMW

Scale:

1:11000

Site Plan Figure 3



Key to Exploratory Hole Logs


General

All soil & rock descriptions in general accordance with BS5930, BS EN ISO 14688 and BS EN ISO 14689
The Geology Code is only provided where positive identification of the sampled strata has been made.



Sampling

ES	Environmental Sample (taken in appropriate sampling container)
D	Disturbed Sample
B	Bulk Sample
LB	Large Bulk for Earthworks testing
C	Core Sample
U	Undisturbed Sample (number of blows indicated in results column)
SPTLS	SPT Liner Sampler
P	Piston Sample
W	Water Sample







In situ Tests

SPT	Standard Penetration Test in accordance with BS EN ISO 22476-3
SPT (C)	Cone Penetration Test in accordance with BS EN ISO 22476-3
PT	Penetration Test - STL documented equivalent SPT N Value
PPT	Perth Penetration Test - STL in house documented method (N Value)
UCS ()	Unconfined Compressive Strength measure by hand penetrometer (kN/m ²)
IVN	Hand Vane (kPa)
PID	Photo Ionisation Detector Results (ppm)
MEXE	Mexecon CBR Result




Drilling Records

Depth to standing water level	
Depth to water strike	
TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Index (%)
FI	Fracture Index








Backfill Symbols

Arisings	
Concrete	
Blacktop	
Bentonite Seal	
Gravel Filter	
Sand Filter	






Pipe Symbols

Plain Pipe	
Slotted Pipe	
Filter Tip	

Principal Soil Types

Topsoil	
Made Ground	
Clay	
Silt	
Sand	
Gravel	
Peat	

Principal Rock Types

Mudstone/Claystone	
Siltstone	
Sandstone	
Limestone	
Chalk	

Project Name: Land off Shawstead Road

Remarks:

Co-ordinates:

577920E - 165730N

Level:

Logger:

JMW

Location: Hale, Kent

Borehole dry. Constant Head test carried out at 10m and 15mbgl.

Client: KD Attwood & Partners

Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description			
		Depth (m bgl)	Type	Results								
		0.15	D									
		0.15	ES							(0.20)	0.20	Dark brown speckled white slightly gravelly sandy CLAY. Gravel is fine angular flint. Sand is fine to coarse flint, red brick and coarse sand sized chalk (Topsoil).
		0.30	D									Stiff light to mid brown speckled white slightly sandy slightly silty CLAY. Sand is coarse extremely weak chalk.
		0.50	D									HEAD
		0.50 - 1.00	B									0.5m to 2.8m... Light brown to orange brown speckled white, gravelly, very sandy. Gravel is fine to coarse flint.
		1.50	SPTLS							(2.60)		
		1.50	SPT(S)	N=19 (5,4/3,5,5,6)								
		2.00	D									
		2.50	SPTLS									
		2.50	SPT(S)	N=30 (4,8/9,7,6,8)								
		3.00	B									Structureless CHALK composed of gravelly silty putty chalk. Chalk gravel is medium sized, extremely weak, white stained brown, veined orange brown.
		3.50	SPTLS							(2.20)		
		3.50	SPT(S)	N=24 (4,6/6,6,5,7)								LEWES NODULAR CHALK
		4.00	D									
		4.50	SPTLS									
	4.50	SPT(S)	N=26 (3,5/6,7,6,7)									
	5.00	D				Possible structured CHALK recovered as white veined orange brown gravelly silt comminuted putty chalk.						
	5.50	SPTLS										
	5.50	SPT(S)	N=17 (3,3/4,3,5,5)			LEWES NODULAR CHALK						
	6.50	D										
	7.00	SPTLS										
	7.00	SPT(S)	N=10 (4,4/3,3,1,3)									
	8.00	D										
	8.50	SPTLS										
	8.50	SPT(S)	N=15 (3,3/3,3,4,5)									
	9.50	D										
	10.00	SPTLS										

Hole Details		Casing Details		Waterstrike (m bgl)					Standing/Chiselling (m bgl)				
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
20.00	150			10-09-2018	15.20	2.30			0				

Project Name: Land off Shawstead Road

Remarks:

Co-ordinates:

577920E - 165730N

Level:

Logger:

JMW

Location: Hale, Kent

Borehole dry. Constant Head test carried out at 10m and 15mbgl.

Client: KD Attwood & Partners

Well	Water Strikes	Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
		Depth (m bgl)	Type	Results					
		10.00	SPT(S)	N=50 (9,7/50 for 295mm)				Possible structured CHALK recovered as white veined orange brown gravelly silt comminuted putty chalk. LEWES NODULAR CHALK	
		11.00	D						
		11.50	SPTLS						
		11.50	SPT(S)	N=50 (4,7/50 for 275mm)					
		12.50	D						
		13.00	SPTLS						
		13.00	SPT(S)	N=50 (5,8/50 for 295mm)					
		14.00	D						
		14.50	SPTLS						
		14.50	SPT(S)	10 (25,40/10 for 5mm)					
		15.50	D		(15.00)				
		16.00	SPTLS						
		16.00	SPT(S)	N=50 (6,6/6,8,14,22)					
		17.00	D						
		17.50	SPTLS						
		17.50	SPT(S)	50 (7,8/50 for 215mm)					
		18.50	D						
		19.00	SPTLS						
		19.00	SPT(S)	50 (7,14/50 for 160mm)					
		20.00	D						

End of Borehole at 20.00m

Hole Details		Casing Details		Waterstrike (m bgl)					Standing/Chiselling (m bgl)				
Depth (m bgl)	Dia. (mm)	Depth (m bgl)	Dia. (mm)	Date	Depth Strike	Depth Casing	Depth Sealed	Rose to:	Time (mins)	From	To	Time	Remarks
20.00	150			10-09-2018	15.20	2.30			0				

Project Name: Land off Shawstead Road

Remarks: Co-ordinates: E 577932 - N 165684

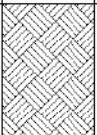
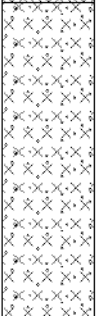
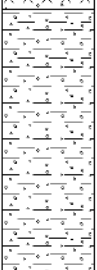
Level (m AOD):

Logger: JMW

Location: Hale, Kent

Pit dry. Soakage test carried out in accordance with BRE 365.

Client: KD Attwood & Partners

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
0.10	ES			(0.35)		0.35	Dark brown gravelly sandy CLAY. Gravel is fine to coarse subrounded flint, fine chalk and slate, with coarse sand sized brick (Ploughed Topsoil).
0.50	D			(0.85)		1.20	Light brown speckled white gravelly SILT. Gravel is fine crushed white chalk. HEAD
1.30	D			(0.70)		1.30	Firm to stiff orange brown gravelly sandy CLAY. Gravel is fine subangular crushed flint. Sand is fine to coarse crushed chalk. HEAD
1.30	HP	UCS(kPa)=270				1.90	Pit terminated at 1.9m.
1.60	D						
1.80	PPT	N=10(450)					

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.65
Length: 1.80
Depth: 1.90

Stable

Project Name: Land off Shawstead Road

Remarks:

Co-ordinates:

E 577772 - N 165696

Level (m AOD):






Logger:

JMW

Location: Hale, Kent

Pit dry. Soakage test carried out in accordance with BRE 365.

Client: KD Attwood & Partners

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
0.15	ES			(0.20)		0.20	Grass over dark brown to orange brown speckled white slightly gravelly sandy CLAY with frequent fine to coarse roots. Gravel is fine to medium subrounded chalk. Sand is fine to coarse chalk. Structureless CHALK composed of cream mottled light brown sandy silty GRAVEL. Gravel is fine to coarse subrounded to subangular weak to medium strength chalk (CIRIA Grade Dc). LEWES NODULAR CHALK
0.80	B						
1.00	PPT	N=10(450)		(1.60)			Pit terminated at 1.8m.
1.40	B						
1.70	PPT	N=17(450)				1.80	

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.65

Length: 2.00

Depth: 1.80

Stable

Project Name: Land off Shawstead Road

Remarks: Co-ordinates: E 577563 - N 165784

Level (m AOD):

Logger: JMW

Location: Hale, Kent

Pit dry. Soakage test carried out in accordance with BRE 365.

Client: KD Attwood & Partners

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description
Depth (m)	Type	Results					
0.15	ES			(0.20)		0.20	Dark brown gravelly slightly sandy silty CLAY. Gravel is fine to medium subangular flint (Ploughed Topsoil).
				(0.10)		0.30	Firm orange brown gravelly CLAY. Gravel is fine to coarse subrounded to angular flint.
							Structureless CHALK composed of cream mottled mid brown black speckled gravelly sandy SILT. Gravel is fine to coarse subrounded to subangular weak to medium strength chalk (CIRIA Grade Dm). LEWES NODULAR CHALK
1.00	PPT	N=20(450)		(1.50)			
1.10	B						
1.70	B					1.80	Pit terminated at 1.8m.
1.80	PPT	N=50(400)					

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.65
Length: 2.20
Depth: 1.80

Stable

Project Name: Land off Shawstead Road

Remarks:

Co-ordinates:

E 577553 - N 165591

Level (m AOD):


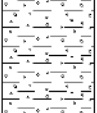

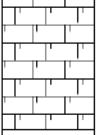
Logger:

JMW

Location: Hale, Kent

Pit dry. Soakage test carried out in accordance with BRE 365.

Client: KD Attwood & Partners

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.20	ES	UCS(kPa)=200		(0.25)		0.25	Dark brown gravelly CLAY. Gravel is fine to medium subangular flint (Topsoil).	1
0.30	HP						Firm orange brown gravelly CLAY with medium cobble content. Gravels are medium to coarse flint. Cobbles are subangular flint.	
0.40	ES						CLAY WITH FLINTS	
1.00	B	N=50(300)		(1.15)		1.40	Structureless CHALK composed of cream veined mid brown speckled black gravelly SILT. Gravel is fine to medium rounded weak chalk (CIRIA Grade Dm). LEWES NODULAR CHALK	2
1.00	PPT							
1.30	PPT	N=12(450)				1.80	Pit terminated at 1.8m.	3
1.70	B			(0.40)				
								4

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.65
Length: 2.20
Depth: 1.80

Stable

Project Name: Land off Shawstead Road

Remarks:

Co-ordinates:

E 577547 - N 165214

Level (m AOD):

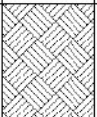
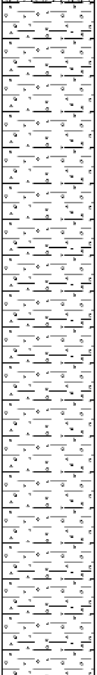
Logger:

JMW

Location: Hale, Kent

Pit dry. Soakage test carried out in accordance with BRE 365.

Client: KD Attwood & Partners

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.20	D			(0.30)		0.30	Dark brown gravelly silty CLAY. Gravel is fine to coarse subangular to subrounded flint (Topsoil).	
0.20	ES						Stiff orange brown very gravelly silty CLAY with medium cobble content. Gravel is medium to coarse subangular flint. Cobbles are subangular flint. CLAY WITH FLINTS 0.5m... becoming clayey GRAVEL.	
0.40	D			(1.80)				
0.40	ES							
0.40	HP	UCS(kPa)=400						
1.00	PPT	N=32(450)						
1.10	HP	UCS(kPa)=580						
1.20	B							
1.50	D							
1.50	HP	UCS(kPa)=330						
1.80	B							
							2.10	Pit terminated at 2.1m.

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.65
Length: 2.10
Depth: 2.10

Stable

Project Name: Land off Shawstead Road

Remarks:

Co-ordinates:

E 577339 - N 164786

Level (m AOD):

Logger:

JMW

Location: Hale, Kent

Pit dry. Soakage test carried out in accordance with BRE 365.

Client: KD Attwood & Partners

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description				
Depth (m)	Type	Results									
0.20	D			(0.25)		0.25	Dark brown gravelly CLAY. Gravel is fine to coarse subangular to angular flint (Ploughed Topsoil).				
0.20	ES						Stiff orange brown black mottled ironstained very gravelly CLAY with low cobble content. Gravel and cobbles are flint. CLAY WITH FLINTS				
0.50	HP	UCS(kPa)=540	(1.15)			1.40	1.0m... with frequent fine to medium chalk gravel.	1			
0.80	B										
0.80	HP	UCS(kPa)=540									
1.00	PPT	N=450(450)									
1.20	D		(0.70)			2.10	Structureless CHALK composed of cream mottled mid brown gravelly sandy SILT (CIRIA Grade Dm). LEWES NODULAR CHALK	2			
1.30	HP	UCS(kPa)=410									
1.60	B										
							Pit terminated at 2.1m.	4			

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.65
Length: 2.00
Depth: 2.10

Stable

Project Name: Land off Shawstead Road

Remarks:

Co-ordinates:

E 577284 - N 164381

Level (m AOD):

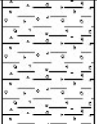
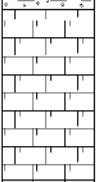
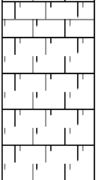
Logger:

JMW

Location: Hale, Kent

Pit dry. Soakage test carried out in accordance with BRE 365.

Client: KD Attwood & Partners

Samples and Insitu Testing			Level (m AOD)	Thickness (m)	Legend	Depth (m bgl)	Stratum Description	
Depth (m)	Type	Results						
0.15	D			(0.35)		0.35	Dark brown speckled white gravelly slightly sandy slightly silty CLAY. Gravel is fine crushed chalk. Sand is crushed chalk.	
0.15	ES			(0.45)		0.80	Structureless CHALK composed of of extremely weak cream stained/ veined mid brown silty GRAVEL (CIRIA Grade Dc). LEWES NODULAR CHALK	
1.00	B			(1.00)		1.80	Extremely weak thickly laminated cream stained mid brown CHALK. LEWES NODULAR CHALK	1
1.00	PPT	N=19(450)						
1.30	HP	UCS(kPa)=270						
1.60	B							
							Pit terminated at 1.8m.	2
								3
								4

Pit Dimension (m)

Pit Stability:

Water Strikes:

Width: 0.65

Length: 2.10

Depth: 1.80

Stable

APPENDIX B

Field Sampling and in-situ Test Methods & Results

Field Sampling and in-situ Test Methods

Disturbed Samples

Disturbed samples were taken from the trial holes at intervals and stored in sealed glass jars and polythene bags, as appropriate.

Undisturbed U100 Samples

Undisturbed U100 samples were taken in the clay soils at appropriate intervals. These samples are taken in a 100 mm diameter, 450 mm long, thin-walled steel tube, and are sealed with paraffin wax and tightly fitting end caps for transporting to the laboratory.

Standard Penetration Test

The Standard Penetration (SPT) Test is specified in BS EN ISO 22476-3:2005+A1:2011. In this test, a 51mm diameter open-ended tube is driven into the ground by a 63.5 kg hammer falling freely through 760 mm. The tube is seated by driving to a penetration of 150mm, or by 25 standard blows, whichever occurs first. It is then driven for a maximum of a further 300mm and the number of blows is termed the penetration resistance (N). If 300mm penetration cannot be achieved in 50 blows (100 blows in soft rock), the test drive is terminated.

When testing in gravels, a conical end piece is attached to the tube. The test is then called an SPT(C).

This test provides an indirect method of assessing the properties of cohesionless soils, and the following table (after Terzaghi and Peck) gives the approximate condition:-

Number Blows (N)	Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
Over 50	Very Dense

Clay

An approximate value for the shear strength of clay may be obtained using Stroud (1974), which paper indicates that the cohesive strength is a function of plasticity and SPT 'N' value. The relation is:

$$C_u = f_i \times N \text{ kPa}$$

$$C_u = \text{undrained shear strength}$$

$$f_i = \text{factor related to plasticity index and ranging from 4 to more than 6}$$

The SPT test is not generally accepted as giving a reliable indication of the strength of cohesive soils but it does give a guide; often the following table:-

Number Blows (N)	Soil Strength
Less than 2	Very Soft (Very Low Strength)
2 - 5	Soft (Low Strength)
5 - 10	Firm (Medium Strength)
10 - 15	Stiff (High Strength)
15 - 30	Very Stiff (Very High Strength)

Perth Penetrometer Test

Perth Penetrometer tests were carried out. The Perth Penetrometer is a device used for measuring the relative density of sands. It consists of a 16 mm diameter hardened steel probe, which is driven into the soil by successive blows of a 9 kg weight, which freely falls over a distance of 600 mm. The number of blows required for each 50 mm of penetration is recorded, and the test is continued for a depth of 450 mm, according to soil type. Useful information can be obtained by carrying the test past the standard depth, and 2,000 mm and 3,000 mm extensions are used to probe the depth of loose fill or other soil, or to make an estimate of the strength of soils or rock in an auger hole or in the base of an unsupported test pit.

The energy input per square metre is roughly the same as the energy input from the Standard Penetration Test (SPT), and the blow counts recorded in sand are roughly the same as SPT blow counts (but this relationship does not hold for coarse soils). The SPT test is a similar type of test except that much heavier driving weights (63.5 kg) are used. The relative density relationship given for the SPT test is:

Number of Blows (N)	Density
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
Over 50	Very Dense

Summary Sheet

Results of BRE Digest 365 Soakage Tests

Site : Land off Shawstead Road, Hale, ME5				Job No : J13752			
Client : KD Attwood & Partners				O S Reference :			
Tested By : OS/GC			Engineer: JMW		Test Date : 10/Sep/2018		
Hole No	Test No	Hole Depth <i>m</i>	Soakage Rate for Each Test <i>litre/m²/min</i>	Soakage Rate for Each Hole <i>litre/m²/min m/sec</i>		Water Level at Finish of Test	Remarks
TP1	No 1	1.90	0.157	0.152	2.54E-6	Nearly empty pit.	
TP1	No 2	1.90	0.152			Nearly empty pit.	
TP1	No 3	1.90	0.190			Pit was not emptied; Non compliant value was calculated.	
TP2	No 1	1.80	30.90	22.47	3.75E-4	Nearly empty pit.	
TP2	No 2	1.80	39.96			Nearly empty pit.	
TP2	No 3	1.80	22.47			Nearly empty pit.	
TP3	No 1	1.80	6.01	4.75	7.92E-5	Nearly empty pit.	
TP3	No 2	1.80	5.41			Nearly empty pit.	
TP3	No 3	1.80	4.75			Nearly empty pit.	
TP4	No 1	1.80	6.35	4.56	7.60E-5	Empty pit.	
TP4	No 2	1.80	5.61			Nearly empty pit.	

Summary Sheet

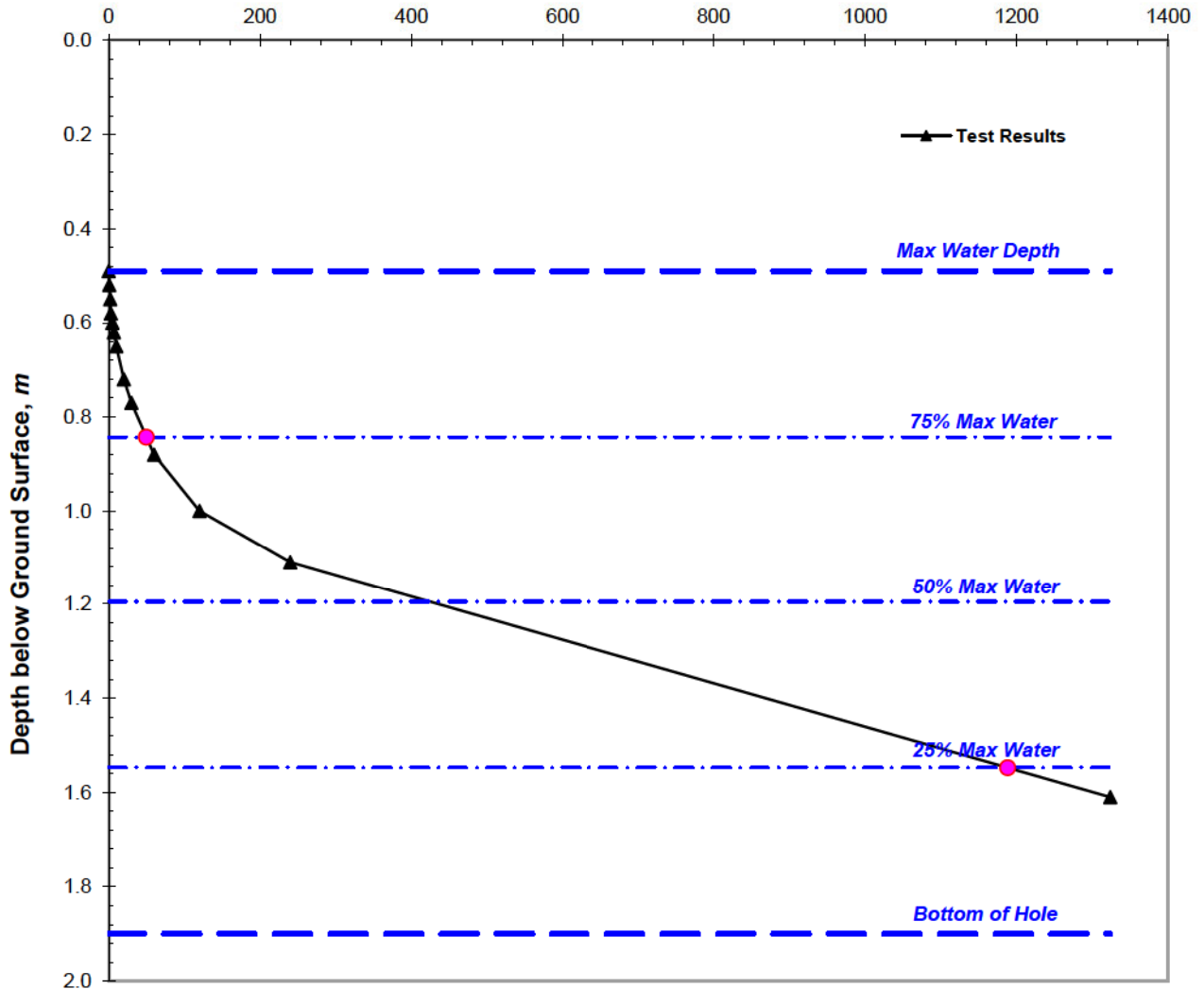
Results of BRE Digest 365 Soakage Tests

Site : Land off Shawstead Road, Hale, ME5				Job No : J13752			
Client : KD Attwood & Partners				O S Reference :			
Tested By : OS/GC		Engineer: JMW		Test Date : 10/Sep/2018			
Hole No	Test No	Hole Depth <i>m</i>	Soakage Rate for Each Test <i>litre/m² /min</i>	Soakage Rate for Each Hole <i>litre/m² /min m/sec</i>		Water Level at Finish of Test	Remarks
TP4	No 3	1.80	4.56			Nearly empty pit.	
TP5	No 1	2.10	0.165	0.165	2.75E-6	Pit was not emptied; Non compliant value was calculated.	
TP6	No 1	2.10	0.065	0.065	1.08E-6	Pit was not emptied; Non compliant value was calculated.	
TP6	No 2	2.10	0.157			Pit was not emptied; Non compliant value was calculated.	
TP7	No 1	1.80	4.16	2.84	4.73E-5	Nearly empty pit.	
TP7	No 2	1.80	3.56			Nearly empty pit.	
TP7	No 3	1.80	2.84			Nearly empty pit.	
Mean Value of All Calculated Soakage Rates :				5.00 <i>litre/m² /min</i>	8.33E-5 <i>m/sec</i>		

BRE Digest 365 Soakage Test

Test Hole No: TP1
 Test No: Test No 1 (Initial)

Time from Filling to Maximum Water Depth, *minute*



Pit Length, m	1.800	Depth to Water at Start of Test, m	0.490
Pit Width, m	0.650	Max Water Dropdown during Test, m	1.120
Depth to Pit Base, m	1.900	Total Soakage Test Time, min	1324.0
Depth to Top of Permeable Soils, m		Mean Internal Discharge Area, m ²	4.625
Depth to Groundwater Surface, m		Discharge Rate, litre/min	0.724
Depth to Top of Granular Fill, m		Soakage Rate, litre/m ² /min	0.157
Void Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, m/sec	2.61E-06

Comments:

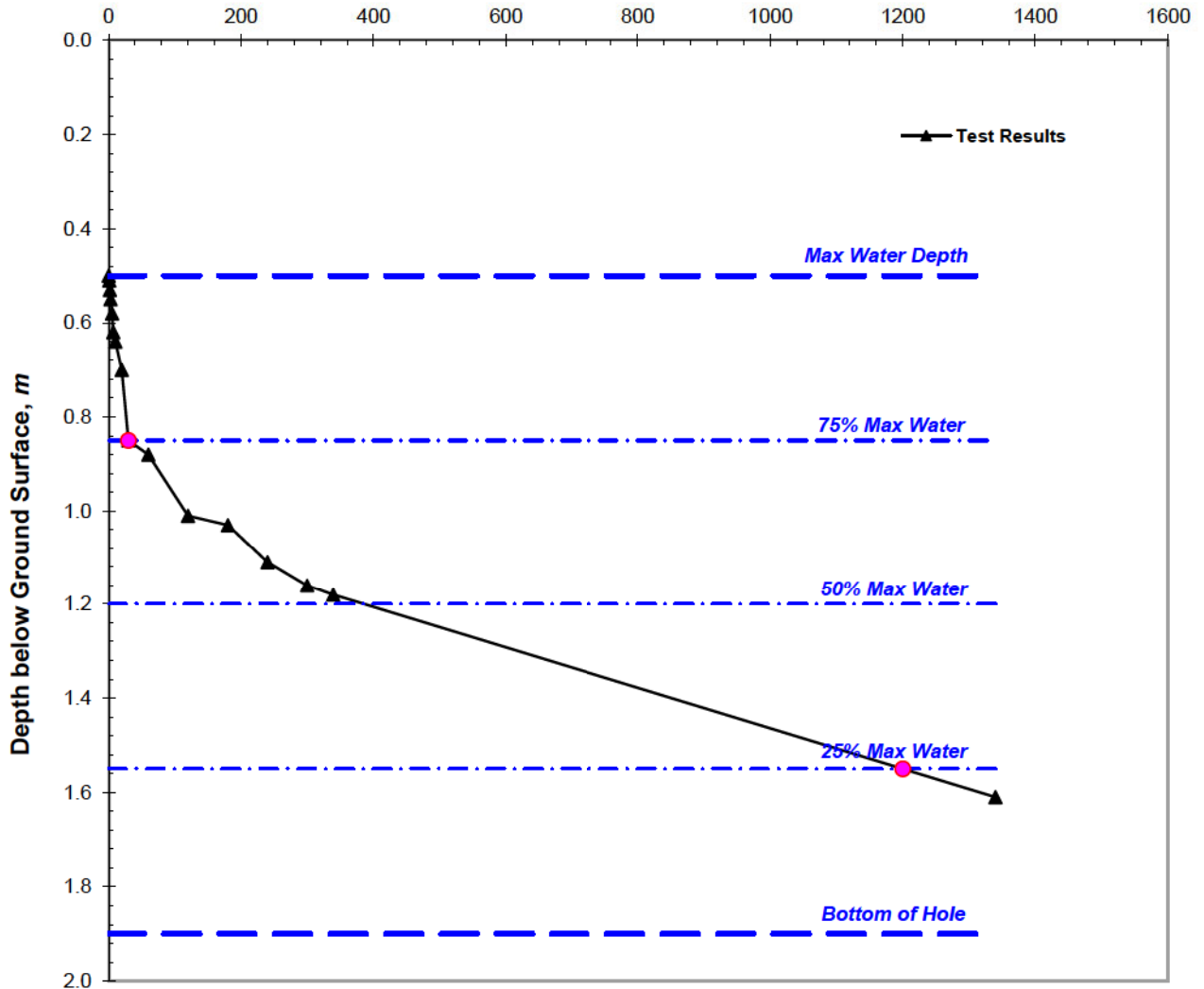
Pit was nearly emptied at finish of test.

Client: KD Attwood & Partners	Job No: J13752	Test Date: 10/Sep/2018
Site: Land off Shawstead Road, Hale, ME5	Tested By: OS/GC	Engineer: JMW Fig. S1

BRE Digest 365 Soakage Test

Test Hole No: TP1
 Test No: Test No 2 (Repeated)

Time from Filling to Maximum Water Depth, *minute*



Pit Length, m	1.800	Depth to Water at Start of Test, m	0.500
Pit Width, m	0.650	Max Water Dropdown during Test, m	1.110
Depth to Pit Base, m	1.900	Total Soakage Test Time, min	1340.0
Depth to Top of Permeable Soils, m		Mean Internal Discharge Area, m ²	4.600
Depth to Groundwater Surface, m		Discharge Rate, litre/min	0.700
Depth to Top of Granular Fill, m		Soakage Rate, litre/m ² /min	0.152
Void Assumed for Granular Fill, %	100%	BRE Soil Infiltration Rate, m/sec	2.54E-06

Comments:

Pit was nearly emptied at finish of test.

Client: KD Attwood & Partners	Job No: J13752	Test Date: 11/Sep/2018
Site: Land off Shawstead Road, Hale, ME5	Tested By: OS/GC	Engineer: JMW Fig. S2