

Christian O'Brien
Dandara Homes Ltd
Eridge House,
1 Linden Close,
Tunbridge Wells,
TN4 8HH.

4th October 2019
Our ref. ADC/19/LP1981

Dear Christian,

Re: LP1981 Fontwell Avenue, Further BRE DG365 and Constant Head Testing

Introduction

Leap Environmental Ltd (hereafter referred to as **LEAP**) has been appointed by Dandara Homes Ltd to undertake additional soakage testing at the location of TP406 and TP407 which were tested during an earlier phase of works.

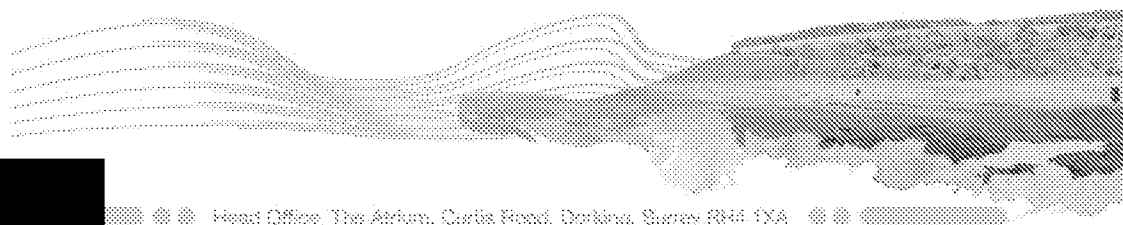
The site is located to the south of Arundel Road, Fontwell, West Sussex, BN18 0SW and consists of several fields, some of which are used as horse paddocks, on which a shallow intrusive archaeological investigation has recently taken place. The site is bounded by trees on all sides. The proposed development is currently at the planning stage. The proposed development comprises 400 houses and areas of public open space.

The site has been the subject of previous investigations by **LEAP**. The following site investigation reports have been carried out in the subject area and the reader is referred to these earlier reports which should be read in conjunction with this report.

- Phase III Investigation Report at Fontwell Avenue, Fontwell, West Sussex for Dandara Ltd, Ref. LP1878, dated 24th May 2019 by **LEAP**.
- Additional Soakage Testing Letter Report at Fontwell Avenue, Fontwell, West Sussex for Dandara Ltd, Ref. ADC/19/LP1981, dated 18th July 2019 by **LEAP**.

During the most recent works which were completed in July 2019 shallow soakage testing was completed across the site with variable soakage rates achieved. Soakage testing within TP406 and TP407 was undertaken within the more cohesive/lower permeability soils than generally encountered elsewhere with the result of notably slower soakage rates. Due to the low soakage rates recorded and the limited available space to widen the proposed soakaways the client's engineer Rogers Cory Partnership Limited (RCP) requested additional soakage testing in the vicinity of these trial pits to assess whether varying the test depth and targeting more permeable strata would result in improved soakage.

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Premier House, Victoria Road,
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BN15 9LH



Head Office, The Atrium, Curtis Road, Dorking, Surrey RH4 1YA

A review of the previous trial hole logs indicated that more granular soils, with potentially higher permeability, were present in nearby trial holes at greater depths than previously tested within TP406.

TP407 encountered clayey gravel between 0.6 and 1.68m and an underlying bed of clayey silt encountered to the base of the pit at 1.97m, with a corresponding reduced soakage rate with depth. Additional targeted shallow soakage testing was therefore suggested.

Deep borehole soakage testing was also scheduled should the shallow testing be found to be insufficient.

2 Fieldwork

2.1 Methodology

LEAP have carried out trial pitting, cable percussion drilling and field testing to fulfil the objectives of this investigation. The site works were carried out in two stages: the trial pits were completed during the first phase between the 3rd and 4th of September with the second phase comprising the cable percussion boreholes being completed between the 9th and 12th of September 2019 and included the following tasks:

- 2 No. 15m deep shell and auger boreholes;
- 2 No. 1.5 – 2.5m deep machine excavated trial pits;
- 2 No. BRE365 soakage tests with each pit filled and allowed to drain three times;
- 4 No. Constant head permeability tests in boreholes and;
- In-situ geotechnical testing including Perth Penetrometer Tests in the trial pits and Standard Penetration Tests in the boreholes;

The location and depth of the tests undertaken were as specified by the client's engineer, RCP. The positions were in the vicinity of TP406 and TP407 of LEAP's previous phase of soakage testing and were positioned in order to target more permeable layers, as well as to assess whether deep or shallow soakaways would produce more favourable soakage rates.

The trial pits were excavated using a JCB 3CX and were approximately 0.50m wide and 2.0m long and were backfilled to ground level with 20mm gravel with a 140mm OD slotted monitoring pipe installed.

The weather during the visit was predominantly dry and overcast.

A site plan for the location of each excavation is presented in Figure 1.



3 Geology

The geology of the development site has been ascertained by reference to the BGS website (www.bgs.ac.uk). The vast majority of the site is mapped as being underlain by Head Deposits underlain by the Lambeth Group over Chalk (undifferentiated) at depth. However, in the north west corner of the site Head Deposits are mapped as underlain by Chalk. River Terrace deposits are also indicated to encroach onto the south eastern corner of the site. From the north west corner of the site the boundary between the Lambeth Group and the Chalk extends in an east-west direction, generally parallel to the A27. Furthermore, the boundary between the Lambeth Group and the London Clay of the Hampshire Basin is mapped immediately beyond Wandleys Lane and the southern boundary of the site.

The area under consideration is underlain by Head over Lambeth Group at depth.

3.1.1 Head Deposits

Head deposits accumulated largely by solifluction (the slow downslope movement of soil in response to the seasonal freezing and thawing of ground) and hillwash, mainly under periglacial conditions during the Quaternary glaciations. In general, it occurs beneath concave slopes on the flanks and floors of valleys. It is locally derived, and its content reflects the base geology, in this case impure clays, silts, sands and gravels. Superficial deposits composed of fine-grained weathered chalky silt and clay matrix with clasts of chalk and flint and some erratic pebbles can also occur on chalk dry valleys typically overlain by more-recent superficial deposits. The site of interest consists mostly of the aforementioned deposits.

There is a small area on the south east part of the site that is underlain by Quaternary River Terrace Deposits (i.e. sand, silt and clay).

3.1.2 Lambeth Group

The Lambeth Group underlies the Head Deposits in the study site. It tends to consist of grey and grey-brown interbedded fine sands silts and clays. There are occasional shelly beds at the top and bottom of the formation. Some very strong bands of weakly cemented shells and limestone can be encountered, although these tend to be encountered further east in the area between Lewisham and Bermondsey.

3.1.3 Chalk (Undifferentiated)

Chalk is a very fine-grained white limestone consisting predominantly of the disaggregated skeletal remains of tiny planktonic algae, and is composed of almost pure calcium carbonate. Layers of flint are common within the Chalk. Flint is composed of silica derived from the dissolved skeletons of siliceous sponges and microfossils. Locally the Chalk comprises the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated).

The Chalk is a Major Aquifer in SE England.



3.2 Hydrogeology

The hydrogeology of the site has been ascertained from DEFRA's Magic map website. The source of the data is reported to be the Environment Agency groundwater vulnerability mapping.

The superficial Head and River Terrace deposits soils which are mapped beneath the site are classified as Secondary A aquifers. The underlying Lambeth Group is also mapped as a Secondary A aquifer, whilst the Chalk is classed as a Principal aquifer.

The north east part of the site is classified as being within a groundwater Source Protection Zone (SPZ) II (outer zone – sub surface activity only). The north west corner of the site is classified as being within a groundwater SPZI (Inner zone). The remainder of the site is classified as being within a groundwater SPZI (Inner zone – subsurface activity only).

4 Ground Conditions Encountered

In summary the ground conditions in trial pits TP407 (from previous phase of works), TP506 and TP507 and boreholes BH506 and BH507 are as follows:

Table 1: Summary of the ground conditions encountered.

Depth from (m)	Depth to (m)	Geology	Description
Ground Level	0.1/0.2	TOPSOIL	Light greyish brown silty sandy TOPSOIL with abundant rootlets. Gravel of coarse sub-angular to angular flint and sub-rounded chalk present in TP506.
0.1/0.17	0.45/0.9	SUBSOIL	Grey brown slightly gravelly sandy SUBSOIL. With occasional Chalk gravel (TP506 and TP507 only)
0.37/1.4	0.9/2.9	Gravelly SAND/SILT	Medium dense silty gravelly fine grained SAND/ gravelly SILT. Gravel is medium to coarse flint and chalk. (BH507only)
0.45/0.9	1.5*/2.3	Gravelly CLAY	Stiff brown grey sandy gravelly CLAY.
1.6/2.9	4.4/5.2	SAND	Medium dense orange brown slightly gravelly SAND. Gravel is fine to coarse flint
4.4/5.2	5.5/6.3	Clayey silty SAND	Medium dense grey slightly gravelly silty clayey SAND (BH506 and BH507 only)
5.5/6.3	15.0*	CLAY	Stiff to very stiff reddish brown mottled grey silty CLAY. Occasional large flints noted in BH506 at 8.60mbgl

*full depth of excavation.

Underlying the superficial topsoil and subsoil trial holes TP506 and BH506 found gravelly sandy clay to 1.6 and 1.9mbgl. Borehole BH507 found the gravelly clay to a depth of 1.4m whilst trial pit TP507 found the clay to extend to its full depth of 1.5m and to 1.68m within TP407. Underlying the gravelly clay soils TP407 and borehole BH507 both encountered gravelly clayey silt, to 1.97m in TP407 (base of excavation) and 2.9m in BH507. Brown silty fine grained sand was found within TP506 and both boreholes BH506 and BH507 to maximum depths of 4.4 and 5.2m. Both boreholes then proceeded through very similar conditions with medium dense clayey sands to 5.6 and 6.3m respectively underlain by the firm to stiff and stiff reddish-brown clays of the Lambeth Group to the full depth of the investigation.

These ground conditions are in keeping with those encountered previously in this area and across the site as a whole.

5 Groundwater

No groundwater seepages were noted within either the boreholes or trial pits during the works. However, the sand soils identified within TP506 below 1.9m were noted to be damp to the touch whilst logging.

From the previous works windowless sampler WSI02 found groundwater at a depth of between 0.67 and 1.36mbgl whilst BH304 recorded a groundwater strike at a depth of 7.2m which rose to 6.5mbgl after 20 minutes.

6 Soakage Testing Results

6.1 BRE DG365¹ Trial Pit Soakage Testing

Soakage testing was undertaken in both trial pits. Each was filled three times in accordance with BRE DG365. The full soakage test results are attached. A summary of the soakage test results is outlined below.

Table 1: Summary of the trial pit soakage testing results

Test Locations	Average infiltration Rate		Test depth	Comments
	m/s	L/m ² /min	m	
TP506	6.14E-06	0.37	0.68-2.5	Trial pit was nearly empty at the end of test one and three. Water level fell between 50% - 75% of maximum water depth during test two.
TP507	4.98E-05	4.06	0.4-1.5	Trial pit was empty at the end of tests one and two and nearly empty at the end of test three.

¹ Building Research Establishment Design Guide 365- Soakaway Design, revised 2016

The soakage rates recorded within the targeted more granular soils in both trial pits were significantly improved compared to those of TP406 and TP407 which recorded soakage rates of 0.06 and 0.16 l/m²/min, respectively. The results indicate that by slightly deepening soakaways in the vicinity of TP406/TP506 and reducing the depth in the area of TP407/TP507 then soakage rates could be improved.

6.2 Constant Head Testing

Constant head tests were attempted in both boreholes at a depth of 15.0m to provide infiltration rates for potential deep bore soakaways. The tests were undertaken within the more cohesive soils of the underlying Lambeth Group as specified by RCP.

Within borehole BH506 two tests were attempted with the casing at a depth of 1.5m. The first test raised water levels from the base of the borehole at 15m up to 4.1m where the high permeability sand deposits were found. Due to the high permeability of the sands it was not possible to raise water levels any further and the test was attempted at this depth. During the test water levels remained static at 4.1m with no water needing to be added. The second test was attempted after an hour by adding further water to the borehole however the sand soils collapsed during the filling and backfilled the borehole from 15m to a depth of 3.7mbgl and the test was abandoned.

The constant head test undertaken within borehole BH507 was completed with the casing at a depth of 7.0m, screening off the sand deposits which were encountered between 2.9 and 5.2mbgl, and testing the deeper cohesive soils. Water level was raised to ground level where it then remained for the full test period of 1 hour without adding water.

On the basis of the above, the constant test tests undertaken on the clays at 15m indicate that borehole soakaways into the clays of the Lambeth Group at depth would not work.

6.3 Borehole Falling Head Test

Following the poor constant head test results a single falling head test was undertaken in line with DG365 the shallow sand deposits within BH507, and the results are outlined in the table below:

Table 3: Summary of the borehole soakage testing results

Test Locations	Test Depth (m)	Casing depth (m)	Infiltration rate (m/sec)	Comments
BH507	5.0	4.0	1.02E-06	Test was undertaken over a one-hour period and water levels fell approximately 200mm.

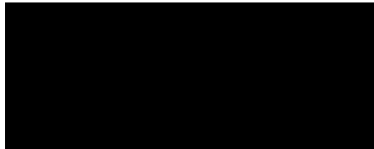


The test undertaken at 5.0m within BH507 exhibited reasonable soakage rates but was less than that calculated in the shallower sand deposits.

The sand deposits identified within this borehole are found at a similar depth to those identified in BH506 from between 1.9 and 4.4mbgl.

Please do not hesitate to contact the undersigned if you require any further information.

Yours faithfully,



Adam Carr BSc MSc FGS

Enc.

This letter report has been prepared by Leap Environmental Ltd on the basis of information received from a variety of sources which Leap Environmental Ltd believes to be accurate. Nevertheless, Leap Environmental Ltd cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

Leap Environmental Ltd has used all reasonable skill, care and diligence in the design and execution of this report, taking into account the manpower and resources devoted to it in agreement with the Client. Although every reasonable effort has been made to obtain all relevant information, all potential contamination, environmental constraints or liabilities associated with the site may not necessarily have been revealed.

This report is generally consistent with the Eurocode requirements for a Ground Investigation Report, noting the limitations on brief to provision of pile design information only. However, the laboratory testing has been carried out on samples which do not comply with the Eurocode classifications as identified in tables 2 and 3 of EN ISO 22475-1. This report should not be deemed as a Geotechnical Design Report, and where any calculations have been made, these are not Eurocode compliant and are for indicative purposes only.

The conclusions reached in this report are necessarily restricted to those which can be determined from the information consulted, and may be subject to amendment in the light of additional information becoming available. These conclusions may not be appropriate for alternative schemes.

This report is confidential to the Client, and Leap Environmental Ltd accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Leap Environmental Ltd beforehand. Any such party relies upon the report at their own risk.



LIMITATIONS

This report is confidential to the Client, and Leap Environmental Ltd accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Leap Environmental Ltd beforehand. Any such party relies upon the report at their own risk. Unless explicitly agreed otherwise in writing, this report has been prepared under LEAP's standard terms and conditions, as included in the quotation for this works.

This report has been prepared by Leap Environmental Ltd on the basis of information received from a variety of sources which Leap Environmental Ltd believes to be accurate. Nevertheless, Leap Environmental Ltd cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

Leap Environmental Ltd has used all reasonable skill, care and diligence in the design and execution of this report, taking into account the manpower and resources devoted to it in agreement with the Client. Although every reasonable effort has been made to obtain all relevant information, all potential contamination, environmental constraints or liabilities associated with the site may not necessarily have been revealed. LEAP cannot be held responsible for any disclosures or changes in regulation that are provided post production of this report, and will not automatically update the report.

The conclusions reached in this report are necessarily restricted to those which can be determined from the information consulted, and may be subject to amendment in the light of additional information becoming available. These conclusions may not be appropriate for alternative schemes.

The extent of the exploratory holes, laboratory testing and monitoring undertaken may have been restricted due to a number of factors including accessibility, the presence of buried or overhead services, current development and site usage, timescales or clients specification. The exploratory holes only assess a small proportion of the site area with respect to the site as a whole, and as such may only provide an overall assessment of ground conditions on site. The presence of hotspots of undisclosed contamination or exceptional and unforeseen ground conditions cannot be discounted.

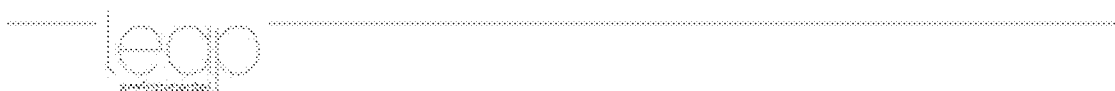
Eurocode 7 gives guidance on the type of sampling, sample quality, number and spacing of intrusive investigations, and number of laboratory tests required. It is intended that the Geotechnical Information section of this report will fulfil the general requirements of the Ground Investigation Report as set out in section 6 of Eurocode², although this is subject to the restrictions imposed on the investigation as listed above. For geotechnical design,

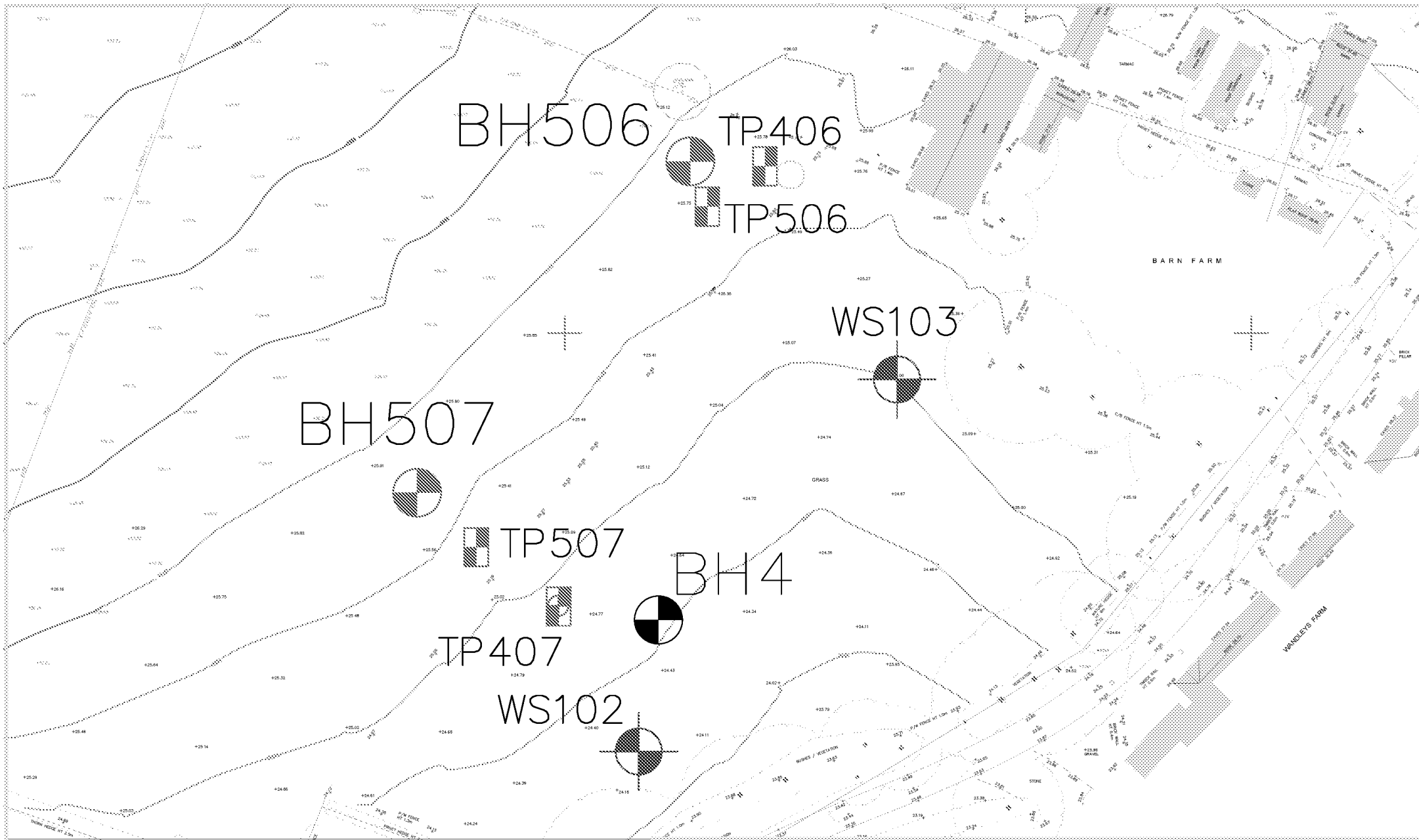
² BS EN 1997 Eurocode 7- Geotechnical Design - Part 1: General Rules (2004) and Part 2: Ground Investigation and Testing (2007)



Eurocode 7 requires the Geotechnical Design Report to address both the geotechnical and structural aspects of the geotechnical design for both the limit and serviceability states. The Geotechnical Appraisal section of this report will not meet the requirements of a Geotechnical Design Report (GDR), and should therefore be used for preliminary guidance only.

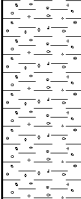
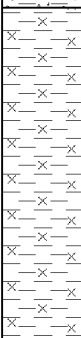
The presence of asbestos may be noted during the site walkover survey, intrusive investigations and/or from the results of contamination testing. However, this report does not constitute an asbestos survey. On this basis, the presence of asbestos on site cannot be discounted and a full asbestos survey should be undertaken.





Client	Dandara Properties Ltd	Date	4/10/19	Project Ref.	LPI 981
Project	Fontwell Avenue, Fontwell	Scale at A4	NTS	Fig No.	I
Title	Investigation Locations Pt3 Soakage testing				

 Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA 				Trial Pit Log				Trialpit No TP406 Sheet 1 of 1	
Project Name: Fontwell Shallow Soaks				Project No. LP1981		Co-ords: - Level:		Date 02/07/2019	
Location: Fontwell Avenue, Fontwell						Dimensions (m):		Scale 1:25	
Client: Dandara Homes						Depth 2.00		Logged ADC	

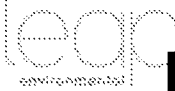
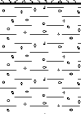
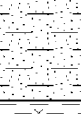
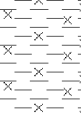
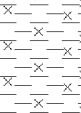
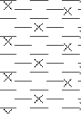
Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.20			Light grey clayey silty TOPSOIL	
							Medium dense orangish brown gravelly CLAY. Gravel is fine to medium, angular to sub-angular flint.	
				0.90			Firm to stiff yellowish grey mottled pale brown slightly gravelly slightly silty CLAY. Gravel is fine sub-rounded flint	1
							Hand Pen at 1.5 m = 160 kPa	
							Hand Pen at 1.8 m = 160 kPa	
				2.00			End of pit at 2.00 m	2
								3
								4
								5

Remarks: End of trial pit. Trial pit remained dry and stable		
Stability:		

Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA				Trial Pit Log				Trialpit No TP407 Sheet 1 of 1	
Project Name: Fontwell Shallow Soaks				Project No. LP1981		Co-ords: - Level:		Date 02/07/2019	
Location: Fontwell Avenue, Fontwell				Dimensions (m): Depth 1.97 0.53 1.8		Scale 1:25 Logged ADC			
Client: Dandara Homes									

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.25			Light brown clayey silty TOPSOIL	
				0.60			Light brownish grey gravelly silty clay SUBSOIL. Gravel is fine to coarse, angular to sub-angular flint.	
				1.68			Medium dense orangish brown slightly silty clayey GRAVEL. Gravel is fine to coarse with occasional cobbles of sub-angular to sub-rounded flint.	1
				1.97			Firm off white mottled pale orange slightly gravelly clayey SILT with pockets of silty clay. Gravel of rare fine to medium flint. (Chalk Head) <i>Hand Pen at 1.7 m = 220 kPa</i>	2
							End of pit at 1.97 m	3
								4
								5

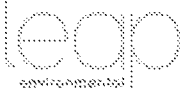
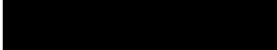
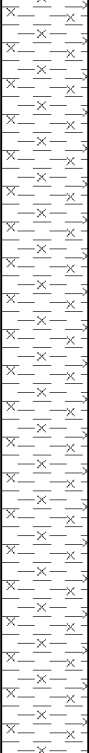
Remarks: End of trial pit. Trial pit remained dry and stable	
Stability:	

 Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA					Borehole Log			Borehole No. BH506 Sheet 1 of 2		
Project Name: Fontwell Shallow Soaks					Project No. LP1981		Co-ords: -		Hole Type CP	
Location: Fontwell Avenue, Fontwell					Level:		Scale 1:50		Logged By KT	
Client: Dandara Homes					Dates: 09/09/2019 - 10/09/2019					
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.15	D					Brown silty clayey gravelly TOPSOIL. Gravel is fine to coarse angular to sub-rounded flint. Abundant rootlets. <u>Soil is less clayey at 0.5m</u>		
	0.50	D								
			1.00	D		0.80		Soft to firm brown gravelly CLAY. Gravel is fine to coarse angular to sub-rounded flint. <u>Pockets of black fine sandy material. No smell</u> <u>Rare gravel present at 1.2m</u>	1	
			1.20	D						
			1.20	SPTL S	8	1.60				
			2.50	B				Loose to medium dense orange brown fine SAND	2	
			2.50	SPTL S	11					
			2.50	S						
			3.50	B				<u>Soil becomes slightly clayey. Thin laminations noted at 3.5m</u> <u>Too soft for hand pen</u>	3	
			4.00	SPTL S	17					
			4.00	S						
			5.00	B		4.40		Medium dense grey clayey SAND	4	
			5.50	D						
			5.50 - 5.90	U						
			5.90	D				Stiff grey mottled red slightly silty CLAY <u>Clay is stiff at 5.9m</u>	5	
			6.50	D						
			7.00	SPTL S	18					
			7.00	S				<u>Clay is soft at 6.5m</u> <u>Clay is stiff at 7m</u>	6	
			7.50	D						
			7.50	D						
		8.50	U				<u>Hand Pen at 7.5m =310kPa</u> <u>Clay is very stiff at 8.6m</u>	7		
		8.60	D							
		9.00	D							
		9.00	SPTL S	22			<u>Hand Pen at 9m =280kPa</u>	8		
		9.00	S							
		9.00	S							
		10.00	D					9		
								10		

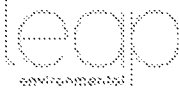
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Remarks
 Borehole remained dry and stable.

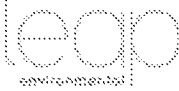
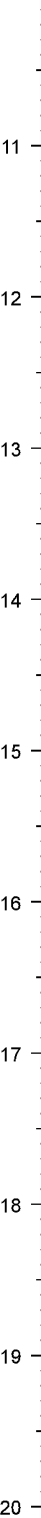


 Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA 				Borehole Log				Borehole No. BH506 Sheet 2 of 2	
Project Name: Fontwell Shallow Soaks				Project No. LP1981		Co-ords: -		Hole Type CP	
Location: Fontwell Avenue, Fontwell				Level:		Scale 1:50			
Client: Dandara Homes				Dates: 09/09/2019 - 10/09/2019		Logged By KT			
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		10.50 - 10.95	U				 Hand Pen at 10m =270kPa Hand Pen at 10.95m =290kPa Hand Pen at 11.5m =540kPa Clay is hard at 13m - weak rock End of borehole at 15.00 m		
		10.95	D					11	
		11.50	D						
		12.00	SPTL					12	
		12.00	S	50					
		13.00	D					13	
		13.50	SPTL						
		13.50	S	41				14	
		14.50	D						
		15.00	SPTL		15.00			15	
		15.00	S	50					
Remarks Borehole remained dry and stable.									



 Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA		Borehole Log			Borehole No. BH507 Sheet 1 of 2					
Project Name: Fontwell Shallow Soaks		Project No. LP1981		Co-ords: -		Hole Type CP				
Location: Fontwell Avenue, Fontwell		Level:		Scale 1:50						
Client: Dandara Homes		Dates: 11/09/2019 - 12/09/2019		Logged By KT						
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.15	D					Brown silty gravelly slightly sandy TOPSOIL. Gravel is fine to coarse sub-angular to rounded flint. Abundant rootlets. <i>Becomes slightly more clayey at 0.5m</i>	1	
	0.50	D			0.75					
	1.00	B					Brown gravelly CLAY. Gravel is mostly fine with occasional medium angular to sub-angular flint. <i>Too gravelly for hand pen</i> <i>Gravel coarsens at 1.2m. Now fine to coarse</i>			
	1.20	B			1.40					
	1.20		21				Medium dense pale brownish grey gravelly SILT of chalk. Gravel is fine to coarse angular flint and chalk	2		
	2.00	D								
	2.50	SPTL			2.90					
			2.50	S	4				Medium dense orange brown slightly gravelly fine to medium SAND. Rare fine flint gravel.	3
	3.50	B								
	4.00	SPTL			4					
			4.00	S	12				Medium dense dark grey gravelly very clayey SAND. Gravel is medium sub angular flint. <i>Hand Pen at 5.2m = 100kPa</i>	4
	5.20	B			5.20					
	5.50	SPTL			6					
			5.50	S	19				Firm to stiff pale grey mottled red CLAY <i>Hand Pen at 6.3m = 120kPa</i> <i>Clay becomes more red, and is now stiff</i> <i>Hand Pen at 7.5m = 240kPa</i>	7
	6.30	D			6.30					
	7.00	D								
			7.00	U					Hand Pen at 7.5m = 240kPa	8
	7.50	D								
7.50	SPTL			21						
		7.50	S					Hand Pen at 8.5m = 140kPa	9	
8.50	D									
9.00	U									
		9.50	D					Clay is now more grey, with yellow mottling	10	
9.50	SPTL									
9.50	U									
Continued on next sheet										
Remarks Borehole remained dry and stable.										



 Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA 				Borehole Log				Borehole No. BH507 Sheet 2 of 2		
Project Name: Fontwell Shallow Soaks				Project No. LP1981		Co-ords: -		Hole Type CP		
Location: Fontwell Avenue, Fontwell				Level:		Scale 1:50				
Client: Dandara Homes				Dates: 11/09/2019 - 12/09/2019		Logged By KT				
Well	Water Strikes	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		9.50	D	24	15.00			Hand Pen at 10m =360kPa		
		10.00								
		11.00	B							Hand Pen at 11m =225kPa
		11.00	D							
		11.00	U							
		11.50	SPTL							Hand Pen at 11.5m =370kPa
		11.50	S	34						
		12.50	D							Hand Pen at 12.5m =420kPa
		13.00	SPTL							Hand Pen at 13m =490kPa
		13.00	S	40						
		14.00	D							Hand Pen at 14m =510kPa
		14.50	SPTL							Hand Pen at 14.5m =560kPa
14.50	S	50								
End of borehole at 15.00 m										
Remarks Borehole remained dry and stable.										



Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA				Trial Pit Log				Trialpit No TP506 Sheet 1 of 1	
Project Name: Fontwell Shallow Soaks				Project No. LP1981		Co-ords: - Level:		Date 03/09/2019	
Location: Fontwell Avenue, Fontwell						Dimensions (m): 2		Scale 1:25	
Client: Dandara Homes						Depth 2.50		Logged KT	

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.10			Light greyish brown silty sandy very gravelly TOPSOIL with abundant rootlets. Gravel is coarse sub-angular to angular flint and sub-rounded chalk.	
				0.45			Light brown slightly clayey gravelly silty sand SUBSOIL. Gravel is coarse sub-angular to angular flint and rare sub-rounded chalk.	
				1.90			Firm slightly greenish brown gravelly slightly sandy CLAY. Gravel is fine to medium angular to sub-angular flint and fine chalk fragments	
				2.50			Gravel becomes finer with depth. Soil loses sand and gravel and becomes more clayey with depth. Pockets of iron staining at 1.8m Reddish brown silty fine SAND. Sand has high moisture content (no seepage noted) Dilatancy test indicates high levels of silt and low levels of clay	
							End of pit at 2.50 m	

Remarks: Pit was wet and stable	
Stability: Stable	

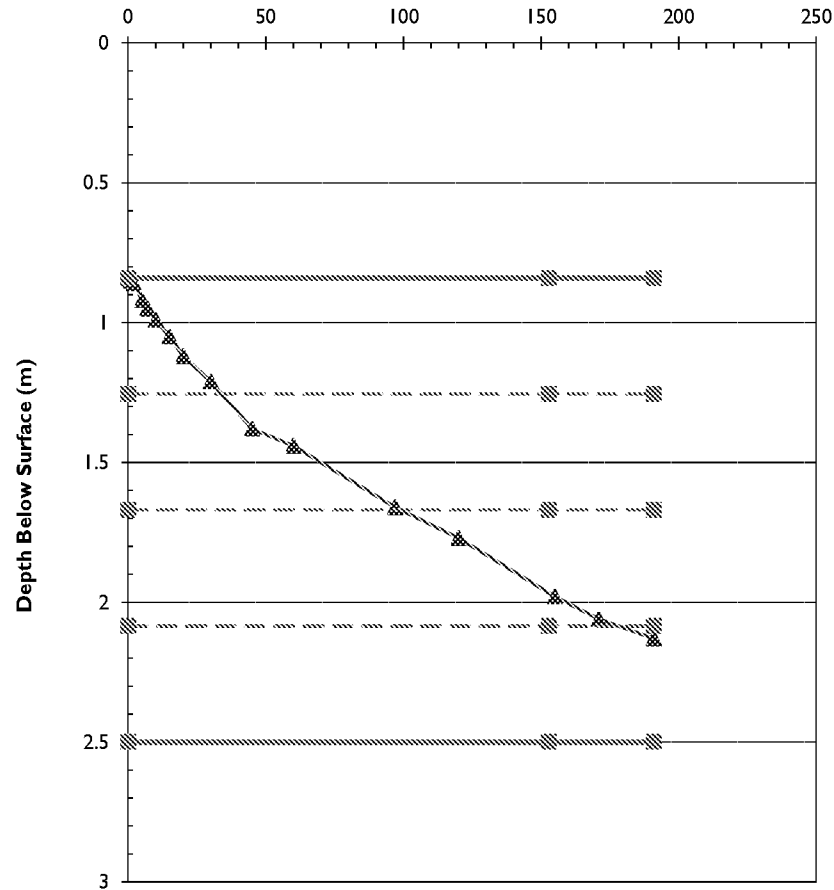
Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA 				Trial Pit Log				Trialpit No TP507 Sheet 1 of 1	
Project Name: Fontwell Shallow Soaks				Project No. LP1981		Co-ords: - Level:		Date 03/09/2019	
Location: Fontwell Avenue, Fontwell						Dimensions (m): Depth 1.50 0.5 1.7		Scale 1:25 Logged KT	
Client: Dandara Homes									

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
				0.17			Pale greyish brown silty sandy TOPSOIL with abundant rootlets.	
							Medium dense brown silty gravelly fine SAND. Gravel is medium to coarse sub-angular to rounded flint and rare fine sub-rounded to rounded chalk.	
				0.90			Firm to stiff dark brown very gravelly slightly sandy CLAY. Gravel is medium to coarse sub-rounded flint and very fine chalk.	1
			N=35	1.50		End of pit at 1.50 m		
								2
								3
								4
								5

Remarks: Pit was dry and stable		
Stability: Stable		

BRE Digest 365 - Soakage Test

Filling to Max Water Depth (min)



initial)

Test Hole No: 506
Test No: Test No 1



Pit Length (m)	2
Pit Width (m)	0.5
Depth to Pit Base (m)	2.5
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	0
voids Assumed for Granular Fill (%)	35%
Depth of Water at Start of Test (m)	0.84
Max Water Dropdown during Test (m)	1.29
Total Soakage Test Time (min)	191
Mean Internal Discharge Area (m2)	5.15
Discharge Rate (litre/min)	2.014951
Soakage Rate (litre/m2/min)	0.391253
BRE Soil Infiltration Rate (m/sec)	6.52E-06

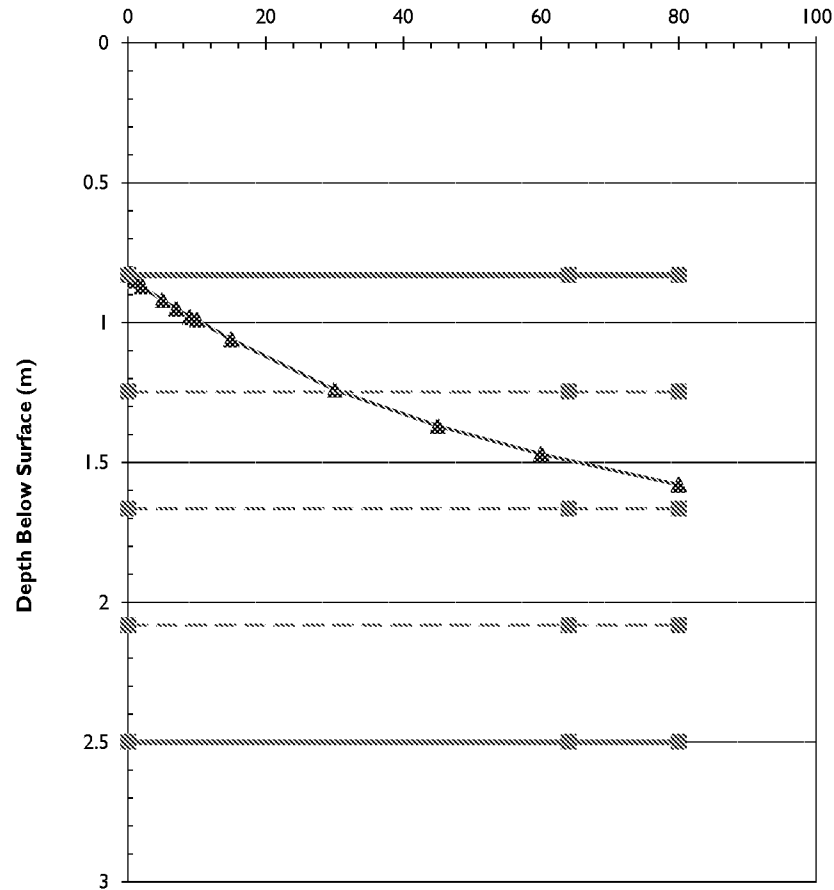
Comments:

Pit was nearly emptied at finish of test.

Client: Dandara Home
Site: Fontwell Avenue
Tested By: KT
Test Date: 03/09/19

BRE Digest 365 - Soakage Test

Filling to Max Water Depth (min)



repeated)

Test Hole No: 506
Test No: Test No 2



Pit Length (m)	2
Pit Width (m)	0.5
Depth to Pit Base (m)	2.5
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	0
Voids Assumed for Granular Fill (%)	35%
Depth of Water at Start of Test (m)	0.83
Max Water Dropdown during Test (m)	0.75
Total Soakage Test Time (min)	80
Mean Internal Discharge Area (m2)	6.43125
Discharge Rate (litre/min)	2.368493
Soakage Rate (litre/m2/min)	0.368279
BRE Soil Infiltration Rate (m/sec)	6.14E-06

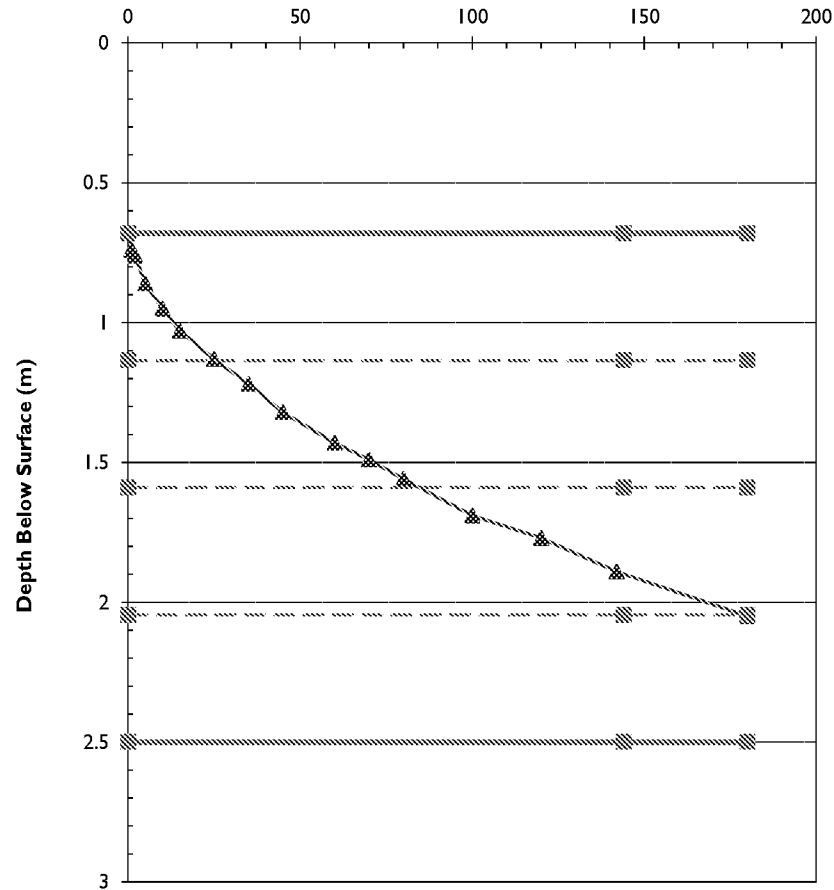
Comments:

Water level fell to 75% -- 50% max water depth,
Result not compliant with BRE365 requirement

Client: Dandara Home
Site: Fontwell Avenue
Tested By: KT
Test Date: 04/09/19

BRE Digest 365 - Soakage Test

Filling to Max Water Depth (min)



Test Hole No: 506
Test No: Test No 3

repeated)



Pit Length (m)	2
Pit Width (m)	0.5
Depth to Pit Base (m)	2.5
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	0
Voids Assumed for Granular Fill (%)	35%
Depth of Water at Start of Test (m)	0.68
Max Water Dropdown during Test (m)	1.37
Total Soakage Test Time (min)	180
Mean Internal Discharge Area (m2)	5.55
Discharge Rate (litre/min)	2.078209
Soakage Rate (litre/m2/min)	0.374452
BRE Soil Infiltration Rate (m/sec)	6.24E-06

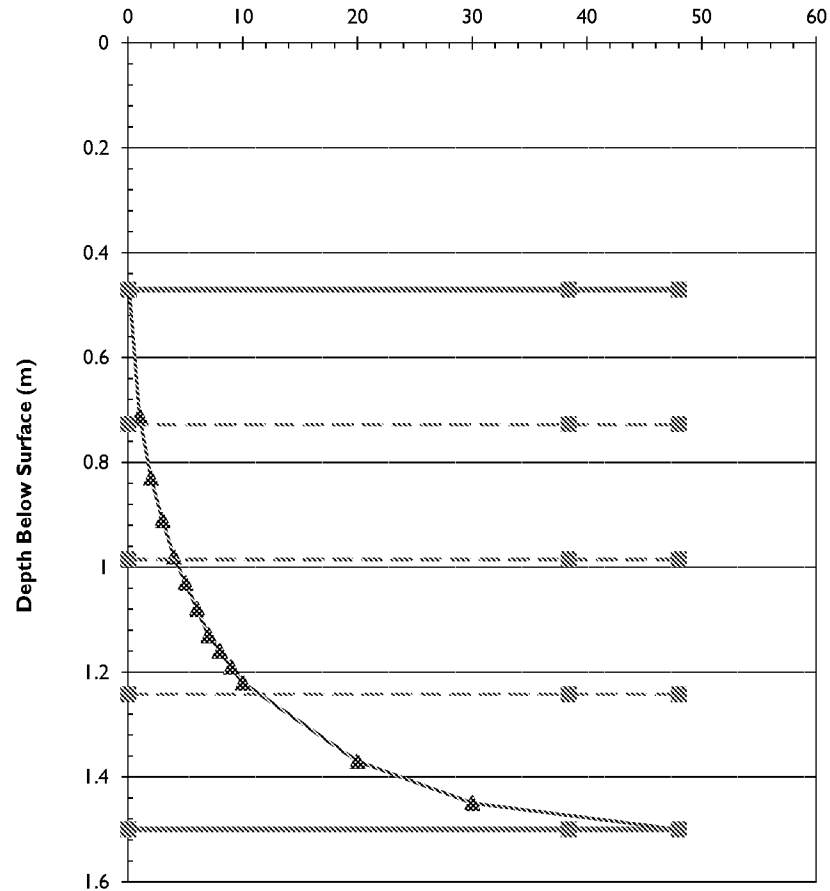
Comments:

Pit was nearly emptied at finish of test.

Client: Dandara Home
Site: Fontwell Avenue
Tested By: KT
Test Date: 04/09/19

BRE Digest 365 - Soakage Test

Filling to Max Water Depth (min)



initial)

Test Hole No: 507
Test No: Test No 1



Pit Length (m)	1.7
Pit Width (m)	0.5
Depth to Pit Base (m)	1.5
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	0
voids Assumed for Granular Fill (%)	35%
Depth of Water at Start of Test (m)	0.47
Max Water Dropdown during Test (m)	1.03
Total Soakage Test Time (min)	48
Mean Internal Discharge Area (m2)	3.116
Discharge Rate (litre/min)	14.79718
Soakage Rate (litre/m2/min)	4.748775
BRE Soil Infiltration Rate (m/sec)	7.91E-05

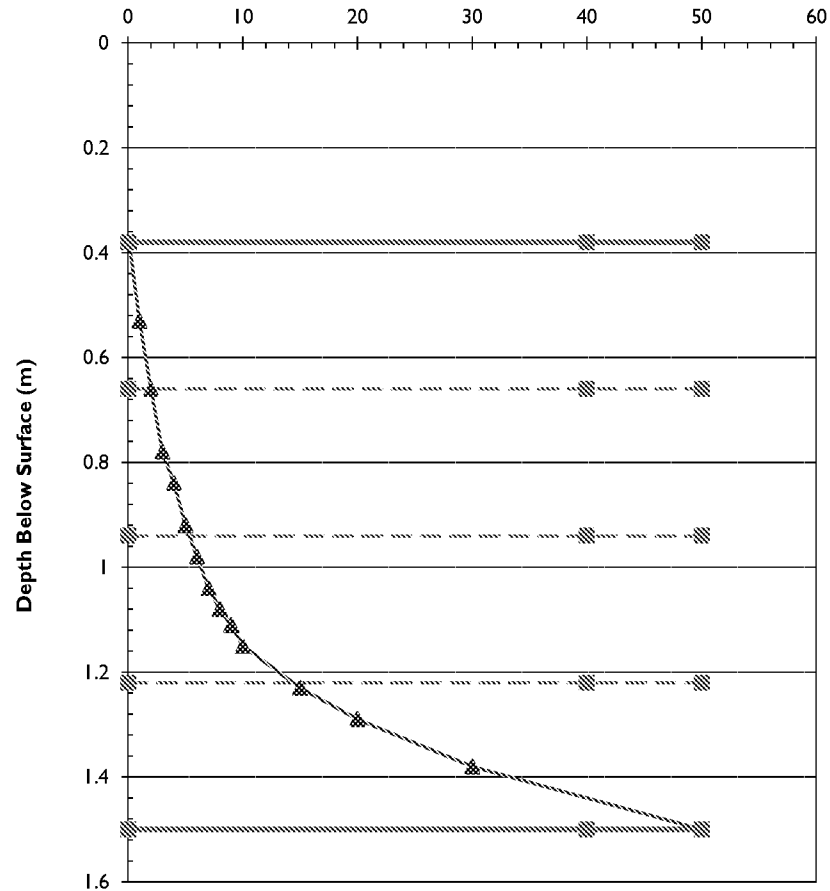
Comments:

Pit was emptied at finish of test.

Client: Dandara Home
Site: Fontwell Avenue
Tested By: KT
Test Date: 03/09/19

BRE Digest 365 - Soakage Test

Filling to Max Water Depth (min)



Test Hole No: 507
Test No: Test No 2

repeated)



Pit Length (m)	1.7
Pit Width (m)	0.5
Depth to Pit Base (m)	1.5
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	0
Voids Assumed for Granular Fill (%)	35%
Depth of Water at Start of Test (m)	0.38
Max Water Dropdown during Test (m)	1.12
Total Soakage Test Time (min)	50
Mean Internal Discharge Area (m2)	3.314
Discharge Rate (litre/min)	13.46263
Soakage Rate (litre/m2/min)	4.06235
BRE Soil Infiltration Rate (m/sec)	6.77E-05

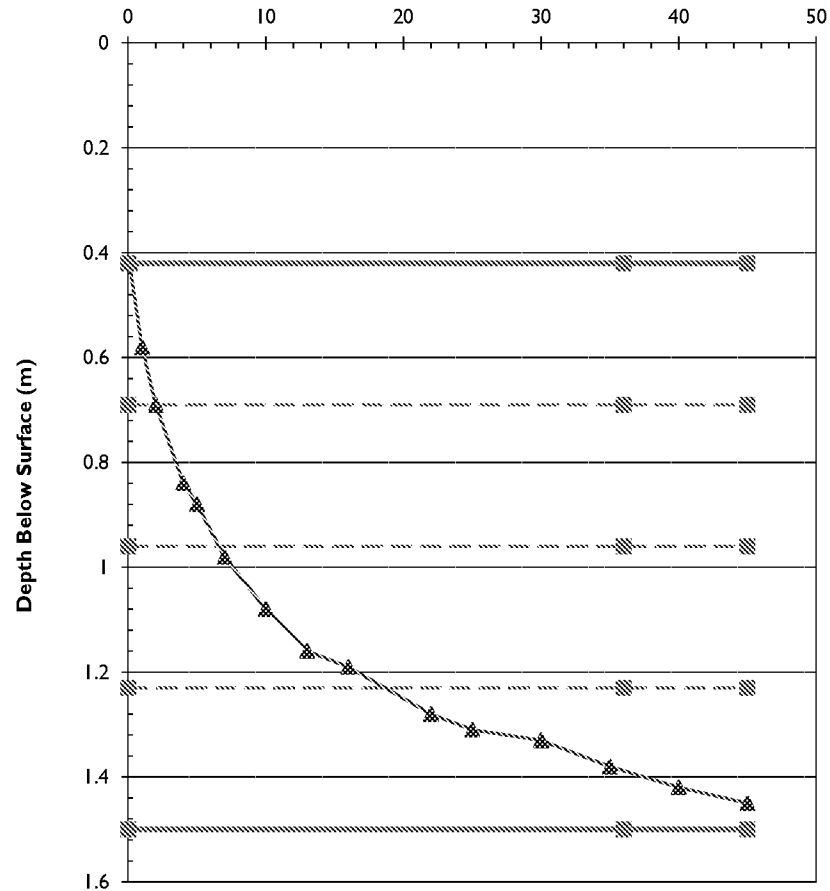
Comments:

Pit was emptied at finish of test.

Client: Dandara Home
Site: Fontwell Avenue
Tested By: KT
Test Date: 03/09/19

BRE Digest 365 - Soakage Test

Filling to Max Water Depth (min)



Test Hole No: 507
Test No: Test No 3

repeated)



Pit Length (m)	1.7
Pit Width (m)	0.5
Depth to Pit Base (m)	1.5
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	0
Voids Assumed for Granular Fill (%)	35%
Depth of Water at Start of Test (m)	0.42
Max Water Dropdown during Test (m)	1.03
Total Soakage Test Time (min)	45
Mean Internal Discharge Area (m2)	3.226
Discharge Rate (litre/min)	9.639
Soakage Rate (litre/m2/min)	2.987911
BRE Soil Infiltration Rate (m/sec)	4.98E-05

Comments:

Pit was nearly emptied at finish of test.

Client: Dandara Home
Site: Fontwell Avenue
Tested By: KT
Test Date: 03/09/19



Results of BRE Digest 365 Soakage Tests

Site : Fontwell Avenue

Tested By : KT

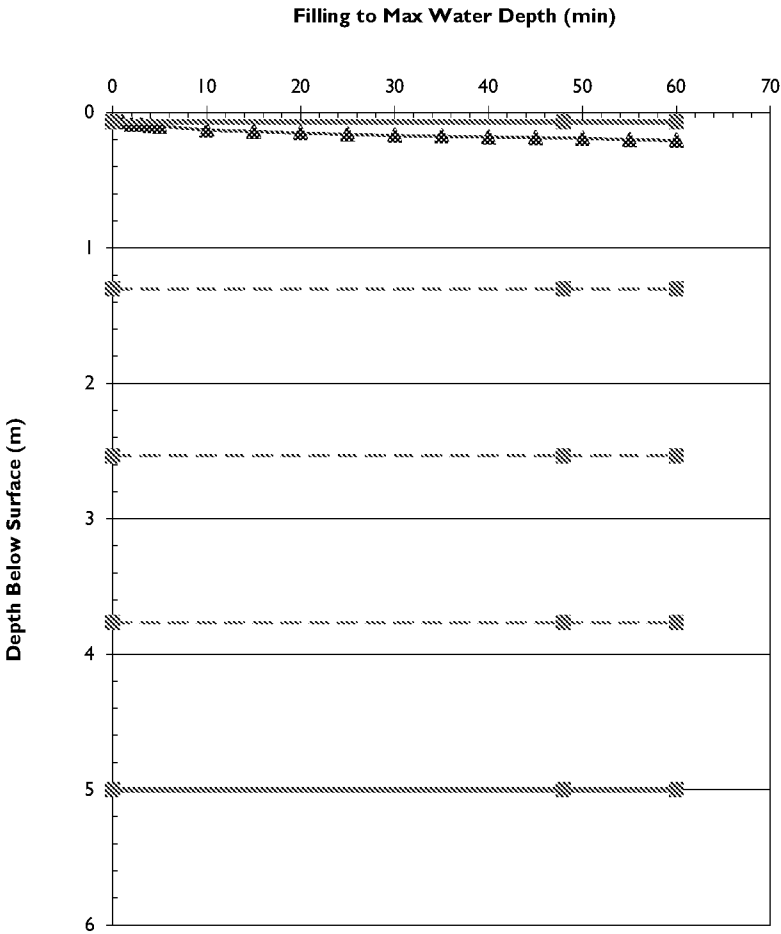
Client : Dandara Home

Test Date : 08/10/2019

O S Reference :

Hole Number	Test Number	Hole Depth m	Test Soakage Rate litre/m2/min	Design Soakage Rate litre/m2/min m/sec	End Water Level	Remarks
507	No 1	1.5	4.75	4.06 4.97985E-05	Empty pit.	
507	No 2	1.5	4.06		Empty pit.	
507	No 3	1.5	2.99		Nearly empty pit.	
506	No 1	2.5	0.39	0.37 6.13798E-06	Nearly empty pit.	
506	No 2	2.5	0.37		Pit was not empty	
506	No 3	2.5	0.37		Nearly empty pit.	
Mean Value of All Calculated Soakage Rates :				2.22 litre/m2/min 2.7968E-05 m/sec		

BRE Digest 365 - Soakage Test



initial)

Test Hole No:	BH507
Test No:	Test No I



Diameter of Borehole (m)	0.22
Depth to End of Borehole Casing (m)	4
Depth to Borehole Base (m)	5
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	
Voids Assumed within Borehole (%)	

Depth of Water at Start of Test (m)	0.07
Max Water Dropdown during Test (m)	0.135
Total Soakage Test Time (min)	60
Mean Internal Discharge Area (m2)	0.729163655
Discharge Rate (litre/min)	0.044624275
Soakage Rate (litre/m2/min)	0.061199258
BRE Soil Infiltration Rate (m/sec)	1.01999E-06

Comments:	Water level did not fall to 75% max water depth, Result not compliant with BRE365 requirement since
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Client:	Dandara Home
Site:	Fontwell Avenue
Tested By:	KT
Test Date:	03/09/19