



Malcolm Westcott
Barratt David Wilson Homes Southern Counties,
BDW House,
Walnut Tree Close,
Surrey,
GU14 SW

10th April 2017

Our ref. JB/17/LP1364

Dear Malcolm,

Re: BRE 365 Trial Pit Soakage Testing – Courtwick Cottages

1. Introduction

Leap Environmental Ltd (hereafter referred to as LEAP) has been appointed by Barratt Homes Southern Counties Ltd to undertake full scale trial pit soakage testing at a site referred to as Courtwick Park Cottages, Littlehampton, West Sussex. The instruction to carry out the works was given by Malcolm Westcott of Barratt David Wilson Homes Southern Counties in an e-mail dated 24th March, 2017.

The purpose of the current investigation is to provide information on the soakage potential of the underlying soils and assess the suitability of conventional soakaways for the proposed development.

2. Site Description

LEAP attended the above site on 4th April 2017 to undertake a full scale BRE365 soakage test. The proposed soakaway was set out by the client and is located in the rear garden of a 2-storey house immediately to the south of Courtwick Lane, BN17 7PD, some 1.2km north west of Littlehampton town centre, and borders an active construction site to the west. The house and surrounding areas are understood to be part of the proposed Courtwick Park redevelopment project.

It was noted that the area for the proposed soakage test was located under a live overhead cable. Given that ground conditions were understood to be generally uniform across the site, it was then decided, in conjunction with the client, to move the trial pit approximately 10m to the north east of the original location, as per Figure 1, Appendix A.

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Approved for Release on 10/04/2017

The geology of the site has been ascertained with reference to the British Geological Survey website and the BGS Sheet No. 317/332 solid and drift edition. The site is mapped as underlain by the Raised Beach Deposits, comprising silty sands and gravels over the Lewes Nodular Chalk Formation, which typically comprises very hard nodular chalks and hardgrounds with interbedded soft to medium hard chalks and marls.

The Hydrogeology of the site has been assessed with reference to the Environment Agency web site. The site is not located within a source protection zone regarding potable water and the underlying superficial soils are classified as a Secondary A aquifer. The underlying chalk is classified as principal aquifer.

3. Fieldwork

One Trial Pit (TPSI) was excavated 10m north east of the proposed soakaway location as per Figure 1 attached. The trial hole full log is attached.

Ground conditions encountered are detailed on the attached logs and summarised below:

Table 1: Summary of encountered soils

Depth (mbgl)	Soil Description
GL – 0.35m	Grass over dark brown very silty gravelly clay topsoil MADE GROUND with frequent roots and rootlets. Gravel is fine to coarse flint with occasional brick and rare plastic fragments
0.35-2.4m	Soft to firm buff brown very silty CLAY with frequent rootlets. Becoming very gravelly and slightly sandy at 2.0m. Gravel is fine to coarse sub rounded to sub angular flint
2.4-3.0m	Medium dense pale brown yellow and mottled orange gravelly very silty medium SAND. Gravel is fine to medium angular to sub rounded flint

The intrusive works comprised the excavation of one trial pit (designated TPSI) by mechanical excavator to a depth of 3.0mbgl, which remained stable and dry during the excavation.

4. Soakage

A single soakage test was undertaken within the trial pit according to BRE365¹. Due to time constraints the trial hole was only filled once. The results of the soakage tests are attached.

Table 2: Summary of soakage tests

Test Location	Soakage Rate		Comments
	(m/s)	(l/m ² /min)	
TPSI	1.406×10^{-6}	0.08	Result not fully compliant with BRE365, as the drop in water level did not fall below 75%.

The results indicate low infiltration rates were achieved. This may be indicative of the very silty nature of the sands identified in depth, however given that due to time constraints the trial pit was only tested once, additional testing within the installation is recommended in order to confirm these results.

It is noted that topsoil made ground was encountered to 0.35m and soakaways are not recommended in made ground. However, given the encountered ground conditions it is not expected that made ground extends to below 1.0m at this stage.

Given the poor soakage achieved and the encountered geological conditions, re-siting the proposed soakaway chamber may be an option or, alternatively, consideration should be given to adding other shallow sustainable urban drainage systems (SUDS), such as swales, to the current site drainage plan.

Please do not hesitate to contact us if you need any clarification on the above.

Yours sincerely,



Joao Brissos

¹ Building Research Establishment Digest 365: 2007. Soakaway Design

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.

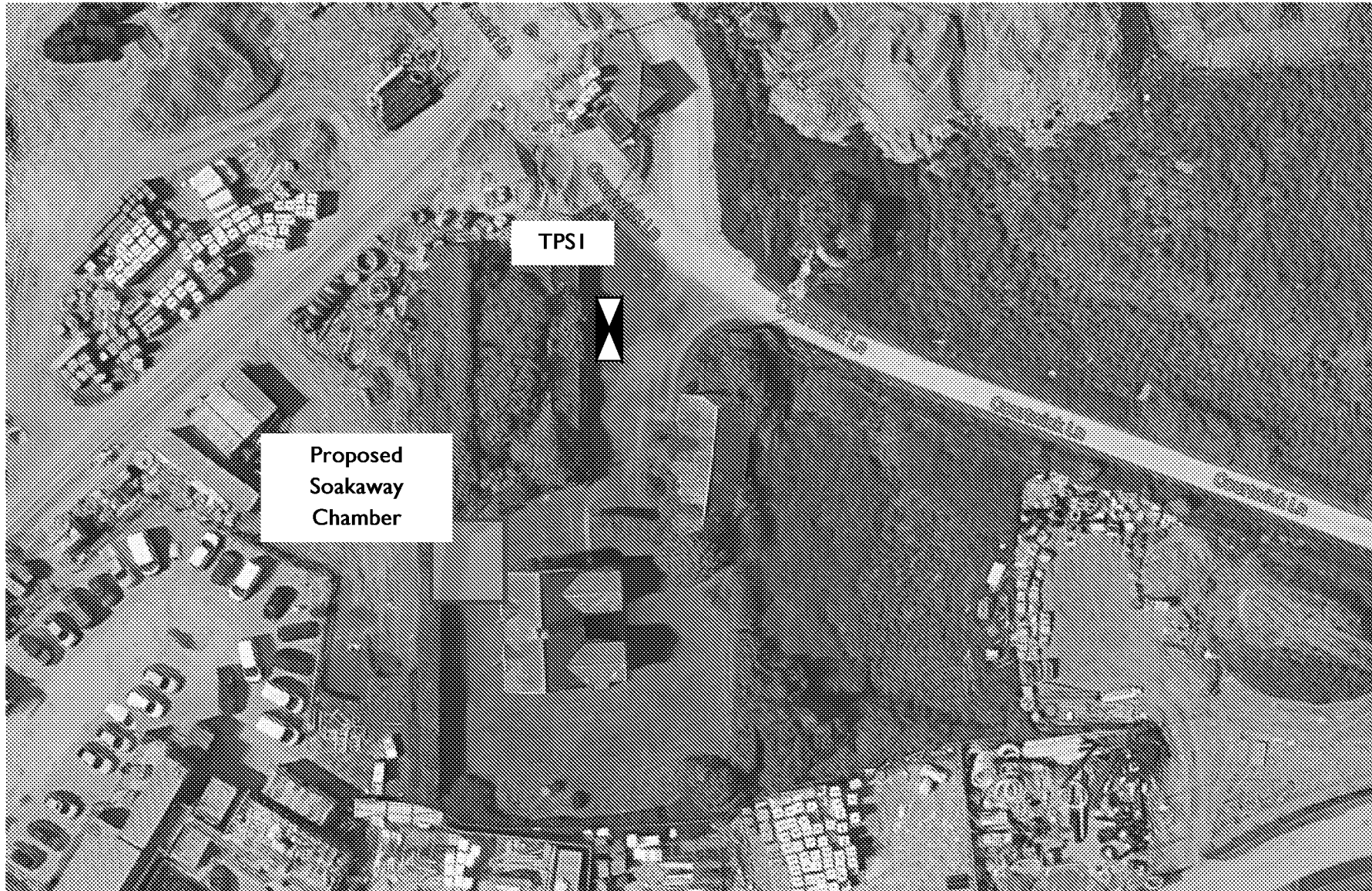
This report is generally consistent with the Eurocode requirements for a Ground Investigation Report, noting the limitations on brief to provision of pile design information only. However, the laboratory testing has been carried out on samples which do not comply with the Eurocode classifications as 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.

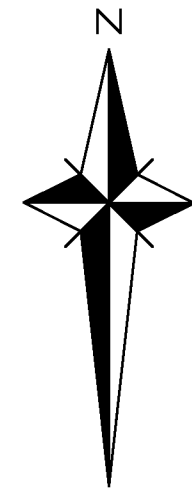
This report is confidential to the Client, and Leap Environmental Ltd accepts no responsibility whatsoever to third parties to whom this report, or any part thereof, is made known, unless formally agreed by Leap Environmental Ltd beforehand. Any such party relies upon the report at their own risk.

APPENDIX A – FIGURES

Figures



	Client :	Barratt Homes	Date:	04/04/2017	Project ID:	LP01364
	Project :	Courtwick Cottages, Littlehampton	Title:	Trial Pit location plan	Fig. No.	I



	Adoptable Highway Drainage 538
	Adoptable Foul Drainage S104
	Adoptable Foul Rising Main S104
	Private Storm Drainage
	Private Foul Drainage
	Adoptable Foul Sewer Manhole
	Adoptable Highway Drainage Manhole
	Manholes fitted with Backdrop Connection
	Adoptable Road Gully
	Private Storm Manhole
	Storm Polypropylene CatchPit IC
	Foul Plastic Reduced Cover IC
	Storm Plastic Reduced Cover IC
	Foul Plastic Inspection Chamber - D202.6
	Storm Plastic Inspection Chamber - D202.6
	300mm ø Foul Water Access Chamber
	300mm ø Storm Water Access Chamber
	Storm Water Rodding Point
	Soil and Vent Pipe
	Stub Stack or Direct Drain Connection
	Bin Store Wash-Down Gully
	Rain Water Pipe
	Private Road Gully
	Private Yard Gully
	Channel Drain
	Precast Concrete Soakaway in Granular Surround Pit
	Modular 'Crate' Soakaway
	Lighting Columns
	Direction of Fall

1. ALL ADAPTABLE SEWERS SHALL BE CONSTRUCTED TO THE STANDARDS LAID DOWN IN 'SEWERS FOR ADOPTION' 7th EDITION, AND SOUTHERN WATER SPECIFICATIONS, WITH A VIEW TO ADOPTION UPON COMPLETION.
2. BEFORE CONNECTIONS ARE MADE TO EXISTING DRAINAGE, ITS LEVEL IS TO BE CHECKED AND CONFIRMED AGAINST LEVELS SHOWN ON THIS DRAWINGS AND THIS OFFICE INFORMED OF ANY SIGNIFICANT DIFFERENCE.
3. ALL SEWERS WITH LESS THAN 1.2m OF COVER WHEN LAID BENEATH THE ROADS, OR 0.9m OF COVER IN OTHER AREAS, SHALL BE PROTECTED WITH CONCRETE IN ACCORDANCE WITH EITHER OF THE DETAILS SHOWN ON THE STANDARD DRAWING PROVIDED (FOR BEDDING TYPE LOCATIONS, REFER TO SEWER SECTIONS).
4. THE MINIMUM SIZE OF PIPE CONNECTING DRAINS TO THE SOKAWAYS SHALL BE 150mm DIA. LAID AT A MINIMUM GRADIENT OF 1 IN 80.
5. ALL SOKAWAYS WILL BE CONSTRUCTED TO THE MINIMUM DEPTHS SHOWN ON THIS DRAWING AND THOSE SHOWN ON THE "STANDARD DRAWINGS".
6. IN ORDER TO MAINTAIN THE SATISFACTORY FUNCTIONING OF SOKAWAYS, ALL ROAD AND YARD GULLIES ARE TO BE "TRAPPED".
7. ALL NON ADAPTABLE LATERALS BENEATH THE HIGHWAY SHALL BE BACKFILLED WITH LEAN MIX CONCRETE UNLESS OTHERWISE AGRED WITH THE HIGHWAYS ENGINEER.
8. ALL PRIVATE SEWERS ARE TO BE 100mm DIA. UNLESS OTHERWISE STATED. THE PRIVATE DRAINAGE DESIGN ON THE PLAN HAS BEEN BASED ON THE PRINCIPLES OF A U/PVC SYSTEM. IT CAN BE ADAPTED TO SUIT A STONWARE SYSTEM BUT REFERENCE SHOULD BE MADE TO THIS OFFICE BEFORE AMENDMENTS ARE MADE.
9. ALL PRIVATE DRAINS ARE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT "H" BRITISH STANDARD 8891, AND TO THE SATISFACTION OF THE BUILDING CONTROL SECTION.
10. MANHOLES SITUATED WITHIN AREAS ACCESSIBLE TO MOTOR VEHICLES ARE TO BE FITTED WITH SUITABLE STRENGTH COVERS AND FRAMES.
11. WHERE DRAINS PASS THROUGH FOUNDATIONS, A FLEXIBLE JOINT SHOULD BE PROVIDED WITHIN 150mm OF THE FACE OF THE STRUCTURE, WHERE TYPE 2 MANHOLES ARE EMPLOYED OR CONCRETE SURROUND IS ADDED TO OTHER MANHOLES A ROOBER PIPE OF MAX 600mm IN LENGTH SHALL BE PROVIDED EITHER SIDE OF THE MANHOLE, LAID AT A SLIGHTLY STEEPER GRADIENT TO ALLOW FOR SETTLEMENT.
12. STUB STACKS FITTED WITH AIR ADMITTANCE VALVES MAY BE USED INSTEAD OF SOIL AND VENT PIPES, SUBJECT TO THE ARCHITECTS APPROVAL (EXCEPT WHERE THE DRAINAGE CONNECTION EXCEEDS 10m BEFORE CONNECTING WITH ANOTHER VENTILATED DRAIN OR INSPECTION CHAMBER OR MANHOLE). HEAD OF DRAIN VENT PIPES MUST NOT BE FITTED WITH AIR ADMITTANCE VALVES.
13. SHALLOW PRIVATE DRAINS MAY REQUIRE PROTECTION USING CONCRETE SURROUND OR PAVING SLABS BRIDGING THE TRENCH SUBJECT TO THE BUILDING INSPECTORS REQUIREMENTS.
14. APPROPRIATE MEASURES (TO BE AGREED WITH THE BUILDING CONTROL SECTION), ARE TO BE TAKEN TO DISCOURAGE RODENT ENTRY INTO THE PROPERTIES.
15. WHERE DRAIN RUNS PASS CLOSE TO BUILDINGS OR THEIR INVERT LEVELS ARE BELOW FOUNDATION LEVEL, THEN THE TRENCHES ARE TO BE BACKFILLED IN ACCORDANCE WITH THE STANDARD DETAIL PROVIDED.
16. REFERENCE SHOULD BE MADE TO THE STRUCTURAL ENGINEERS DETAILS FOR ALL ASPECTS OF FOUNDATION DESIGN AND CONSTRUCTION.
17. BEFORE DETERMINING THE AMOUNT OF FACE BRICKWORK TO EACH JUNT, CONSIDERATION MUST BE GIVEN TO THE PROPOSED FINISHED GROUND LEVELS IN THE VICINITY OF THE PROPERTY. THE LEVELS SHOWN ON THE EXTERNAL WORKS DRAWINGS HAVE BEEN DESIGNED USING PARAMETERS SET DOWN IN THE APPROVED CODE OF THE BUILDING REGULATIONS 2000 (2004 EDITION) - REFER TO DRAWINGS 4485/230-234.
18. THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
19. THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE.
20. IT IS THE SUBCONTRACTORS RESPONSIBILITY TO ENSURE COMPLIANCE WITH CURRENT BUILDING REGULATIONS AND CODES OF PRACTICE.

[illegible]

APPENDIX B – TRIAL PIT LOG

Trial Pit Log

Leap Environmental Ltd The Atrium, Curtis Road Dorking, Surrey RH4 1XA 				Trial Pit Log				Trialpit No TPS1 Sheet 1 of 1	
Project Name: Courtwick Cottages				Project No. LP1364		Co-ords: - Level: 8.30		Date 04/04/2017	
Location: Courtwick Park, Courtwick Lane, Littlehampton, BN17 7PD						Dimensions (m): Depth 3.00 2.4 0.8		Scale 1:25 Logged JB	
Client: Barratt Homes									

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.10	ES		0.35	7.95		Grass over dark brown very silty gravelly clay topsoil MADE GROUND with frequent roots and rootlets. Gravel is fine to coarse flint with occasional brick and rare plastic fragments	
							Soft to firm buff brown very silty CLAY with frequent rootlets. <i>Black staining noted between 0.35-0.45m</i>	
	1.50	D					Becoming gravelly and slightly sandy at 2.0m. Gravel is fine to coarse sub rounded to sub angular flint	
				2.40	5.90		Medium dense pale brown yellow and mottled orange gravelly very silty medium SAND. Gravel is fine to medium angular to sub rounded flint	
	3.00	D		3.00	5.30	----- End of pit at 3.00 m -----		

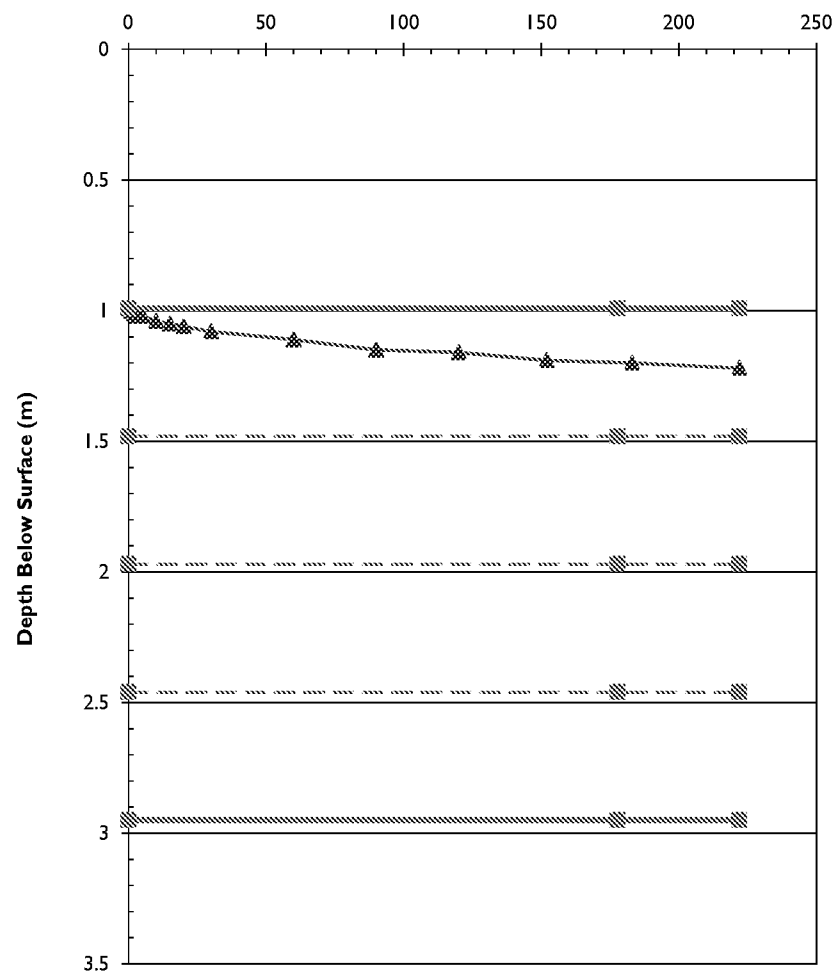
Remarks: Location of full scale BRE365 Soakage Test	
Stability: Stable	

APPENDIX C – SOAKAGE TEST RESULTS

Soakage Test Results

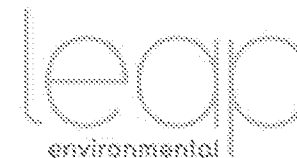
BRE Digest 365 - Soakage Test

Filling to Max Water Depth (min)



initial)

Test Hole No: TPS1
 Test No: Test No 1



Pit Length (m)	2.4
Pit Width (m)	0.8
Depth to Pit Base (m)	2.95
Depth to Top of Permeable Soils (m)	
Depth to Groundwater Surface (m)	
Depth to Top of Granular Fill (m)	
Voids Assumed for Granular Fill (%)	
Depth of Water at Start of Test (m)	0.99
Max Water Dropdown during Test (m)	0.23
Total Soakage Test Time (min)	222
Mean Internal Discharge Area (m ²)	13.176
Discharge Rate (litre/min)	1.1114094
Soakage Rate (litre/m ² /min)	0.084351
BRE Soil Infiltration Rate (m/sec)	1.406E-06

Comments:

Water level did not fall to 75% max water depth, calculations were based on actual fall of water level achieved.
 Result not compliant with BRE365 requirement since water did not fall to 25% max water depth.

Client: Barratt Homes
 Site: Courtwick Cottages
 Tested By: JB
 Test Date: 07/04/17