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Soil Infiltration Rate

PROPOSED DEVELOPMENT AT 16 PRIORY PLACE, HEREFORD, HR4 9ND

Project Ref: 19-1029-17
Date: December 2019

Introduction

The proposed development is for three new dwellings (two new plots and one replacement dwelling) within the domestic curtilage at 16 Priory Place, with associated gardens and hardstanding for vehicle parking and turning.

The total area of the site is approximately 860m^2.

The soakaway trial pits were undertaken for each plot in accordance with the BRE 365 in December 2019. The trial pits were rapidly filled three times within the same day. The depth of water was recorded at regular intervals on each occasion. The test was undertaken to the extent of the digger's capabilities to establish the groundwater level, recording, where necessary any geotechnical implications.

Soil Infiltration Rate

The soil infiltration rates were calculated using: $f = V_{p75-25} \div a_{p50} \times t_{p75-25}$ where:

f: soil infiltration rate (m/s)

V_{p75-25}: volume of water in the trial pit between 75% - 25% effective depth in m^3.
a_{p50}: internal surface area of trial pit up to 50% effective depth, including the base area in m^2. t_{p75-25}: time for water to fall from 75% - 25% effective depth in seconds.

Table 1: Test Results

Test Site	Test Pit 1			Test Pit 2			Test Pit 3		
	0.75m	0.50m	0.25m	0.75m	0.50m	0.25m	0.75m	0.50m	0.25m
Fill 1	00:06:15	00:23:55	01:20:07	00:04:05	00:17:26	01:09:42	00:04:32	00:16:52	00:38:17
time			4432 secs			3937 secs			2025 secs
Fill 2	00:07:09	00:36:44	02:03:46	00:04:29	00:27:32	01:51:26	00:04:56	00:24:32	01:12:25
time			6997 secs			6417 secs			4049 secs
Fill 3	00:11:22	00:41:23	02:43:12	00:07:56	00:32:05	02:28:36	00:06:04	00:31:11	01:52:20
time			9110 secs			8440 secs			6376 secs

Infiltration Rates from data in Table 1

Trial Pit 1
Fill 1
f = 0.39 ÷ 2.63 x 4432 =
f = 0.39 ÷ 11656.16 =
3.345870338 x 10-5 m/s
3.3 x 10-5 m/s

Fill 2
f = 0.39 ÷ 2.63 x 3937 =
f = 0.39 ÷ 10354.31 =
3.766547457 x 10-5 m/s
3.7 x 10-5 m/s

Fill 3
f = 0.39 ÷ 2.63 x 2025 =
f = 0.39 ÷ 5325.75 =
7.322912266 x 10-5 m/s
7.3 x 10-5 m/s

Trial Pit 2
Fill 1
f = 0.42 ÷ 2.74 x 6997 =
f = 0.42 ÷ 19171.78 =
2.190719902 x 10-5 m/s
2.1 x 10-5 m/s

Fill 2
f = 0.42 ÷ 2.74 x 6417 =
f = 0.42 ÷ 17582.58 =
2.388727934 x 10-5 m/s
2.34 x 10-5 m/s

Fill 3
f = 0.42 ÷ 2.74 x 4049 =
f = 0.42 ÷ 11094.26 =
3.785741455 x 10-5 m/s
3.7 x 10-5 m/s

Trial Pit 3
Fill 1
f = 0.4225 ÷ 2.795 x 9110 =
f = 0.4225 ÷ 25462.45 =
1.659306155 x 10-5 m/s
1.6 x 10-5 m/s

Fill 2
f = 0.4225 ÷ 2.795 x 8440 =
f = 0.4225 ÷ 23589.8 =
1.791028326 x 10-5 m/s
1.7 x 10-5 m/s

Fill 3
f = 0.4225 ÷ 2.795 x 6376 =
f = 0.4225 ÷ 17820.92 =
2.370809139 x 10-5 m/s
2.3 x 10-5 m/s

Infiltration Rate Calculations

The soil infiltration testing to the BRE365 standard corroborate that soils at the site are freely draining.

No groundwater was encountered. The test was undertaken to the extent of the digger's capabilities. The groundwater level was more than 2.35m below ground level even during this wet period.

Soil infiltration rates for each fill ranged between 1.6 x 10-5 m/s and 7.3 x 10-5 m/s, with an averaged site infiltration rate of 3.115 x 10-5 m/s, indicating that the soil is sufficiently permeable to manage runoff using infiltration.

Runoff from each of the proposed dwellings to be managed on site.

Runoff from the areas of the roof and hardstanding will infiltrate into the ground.

Even though the southern edge of the site is adjacent to Flood Zone 2, the Flood Risk Assessment showed there is a very low risk from surface water flooding and from all other sources at the site.

No special measures are required to mitigate flood risk other than to raise the finished floor levels of the dwellings 300mm above the highest flood level of 55.7m.

Areas for Soil Infiltration Rate Calculations

Plot 1 and 2 roof areas are identical:

90.1689m^2 Main duo pitch roof at 45 degrees (effective area)

3.766m^2 terrace flat roof

2.015m^2 porch flat roof

A = 95.9499m^2 total

Plot 1 SUDs surfaces:

Rear terrace and yard: 45m^2

Front paved surfaces: 73.5m^2

46m^2 garden (lawn and flower beds)

Plot 2 SUDs surfaces:

Rear terrace and courtyard: 47.5m^2

Front paved surfaces: 75m^2

41m^2 garden (lawn and flower bed)

Replacement dwelling:

148.72m^2 Main roof 30 degrees duo pitch roofs (effective area)

30.38m^2 Flat green annexe roof

13.22m^2 Terrace flat roof

10.88m^2 Front porch 40 degrees (effective area)

SUDS area front: 96.875m^2

SUDs terraces rear 35m^2

120.25m^2 garden (lawn and flower beds)

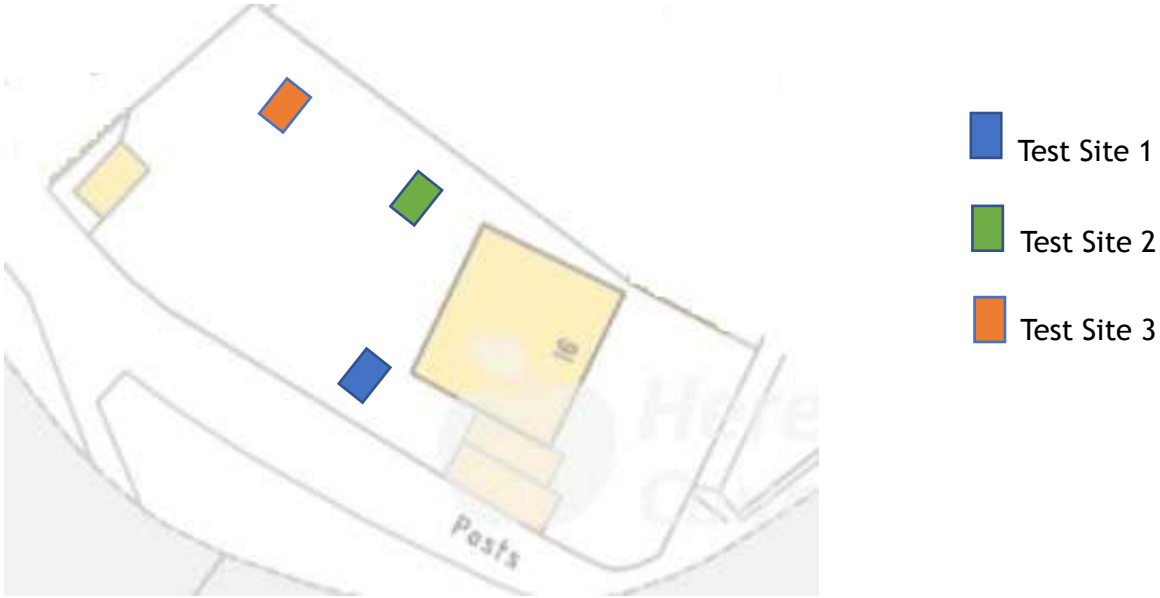
PERCOLATION TESTS TO BRE 365 STANDARD FOR WATER SOAKAWAYS TO BE INSTALLED AT

16 PRIORY PLACE, HEREFORD, HR4 9ND

Background

Planning permission is being applied for at the above site, surface water will need to be removed on site and not into the stormwater drain. In order to confirm that all surface water can be removed on site, a test in accordance with BRE365 guidelines is to be completed. These results will decide the size and type of soakaway required.

Test Sites in general



Test Site Dimensions

Location	Length (m)	Width (m)	Depth(m)	Date Dug and Tested
Test Site 1	1.2	0.65	1.0	4 Dec 19
Test Site 2	1.2	0.7	1.0	4 Dec 19
Test Site 3	1.3	0.65	1.0	4 Dec 19

A hydraulic digger was utilised to excavate the test pits, all pits were dug on the 4 Dec 2019. Each pit was dug and measured with a tape measure prior to the addition of water. A dip stick was created and marked every 100mm, markers were then placed inside the pits at 1.0m, 0.75m, 0.50m and 0.25m to assist in identifying key levels.

Test Site 1

Test Site 2

Test Site 3

The Test Procedure

Each was filled with water until the water level was stable at the 1m mark. The clock was then started and the time recorded when the water level reduced to 0.75m, 0.50m and finally 0.25m.

Once the water level had dropped comfortably below 0.25m the pit was filled again to the 1m mark and the process repeated.

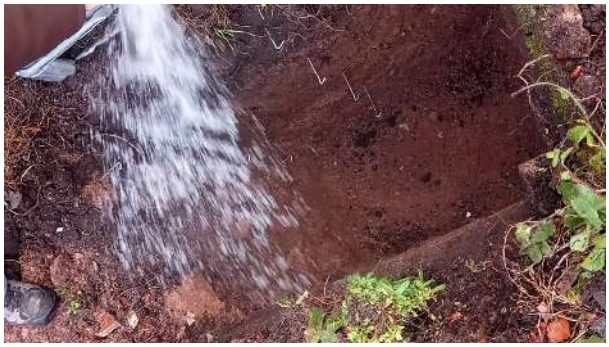


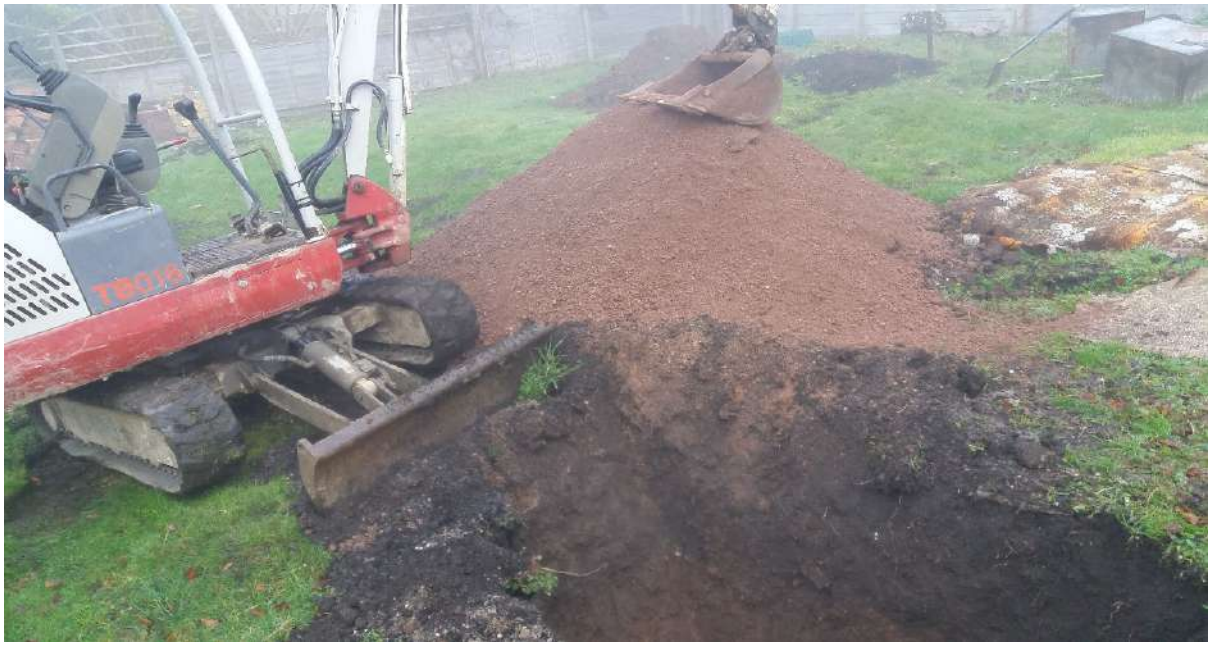
Table of Results

All tests conducted between 0730 and 1730 on the 4th Dec 2019. Tests ran concurrently.

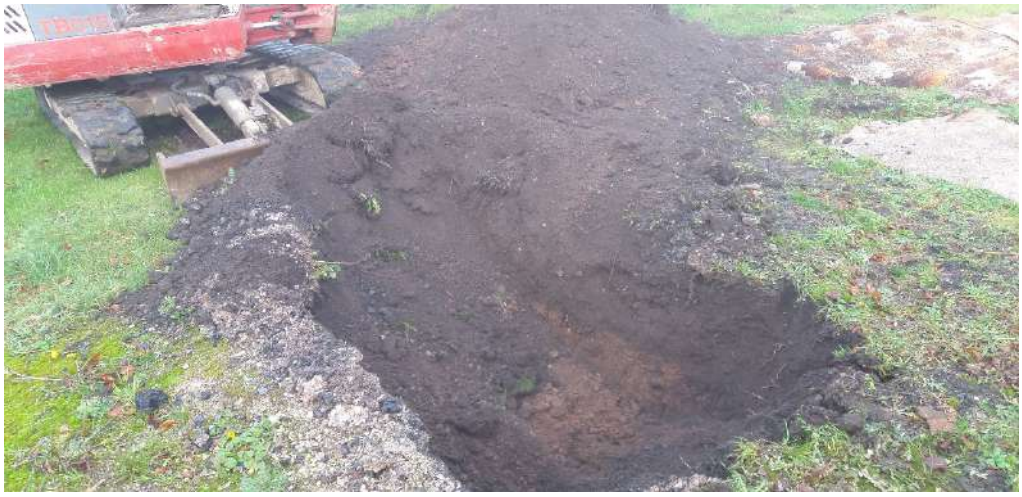
Test Site	Test Pit 1			Test Pit 2			Test Pit 3		
	0.75m	0.50m	0.25m	0.75m	0.50m	0.25m	0.75m	0.50m	0.25m
Fill 1	00:06:15	00:23:55	01:20:07	00:04:05	00:17:26	01:09:42	00:04:32	00:16:52	00:38:17
Fill 2	00:07:09	00:36:44	02:03:46	00:04:29	00:27:32	01:51:26	00:04:56	00:24:32	01:12:25
Fill 3	00:11:22	00:41:23	02:43:12	00:07:56	00:32:05	02:28:36	00:06:04	00:31:11	01:52:20

Observations

It was noted that significantly more water than the pit dimensions would hold, was needed in order to reach the 1m mark, this was due to the immediate drainage of water. The local soil varies from 0.6 – 0.7m of top soil, with the next layer descending down to a depth greater than our hydraulic digger could reach. This soil was very gritty and resembled 10mm pea gravel at times.



A separate dig was conducted in order to try and find the water table and also to identify soil types. The following pictures show a final dig depth of 2.35m (no water found) and the gritty/ gravel soil.



Summary

3 test sites were dug, each site was filled 3 times and allowed to drain until the water level was below 0.25m from the starting level of 1m. A separate dig was conducted (equidistant from each of the 3 test sites) to ascertain depth of the water table – not found and digger maxed out at 2.35m.

The soil levels were consistent between all sites, 0.6 – 0.7m of top soil before giving way to gritty gravel-based soil type (up to 10mm stone) that continued to a depth of 2.35m as a minimum (unable to dig deeper).

No rain on the day and all test sites dug and tested on the 4th Dec 2019.

The test hole site record sheets are attached to this document.

DATA ENTRY FORM – TRIAL PIT 1

Date of Testing: 4th DEC 2019

TEST 1

Length (m)	1.2M
Width (m)	0.65M
Depth (m)	1.0M (FILLED TO).

	Time	Water Level (m)	Notes
Start	0:00s	1M	DRAINING QUICKLY AS PIT WAS BEING FILLED.
1	6:15s	0.75M	
2	23:55s	0.50M	
3	1:20:07s	0.25M	
4			
5			
6			
7			
8			
9			

TEST 2

	Time	Water Level (m)	Notes
Start	0:00s	1M	
1	07:09s	0.75M	
2	36:44s	0.50M	
3	02:03:46s	0.25M	
4			
5			
6			
7			
8			
9			

TEST 3

	Time	Water Level (m)	Notes
Start	0:00s	1M	
1	11:22s	0.75M	
2	41:23s	0.50M	
3	02:43:12s	0.25M	
4			
5			
6			
7			
8			
9			

DATA ENTRY FORM – TRIAL PIT 2

Date of Testing: 4th Dec 2019

TEST 1

Length (m)	1.2M
Width (m)	0.7M
Depth (m)	1.0M

	Time	Water Level (m)	Notes
Start	0:00s	1M	AGAIN, DRAINING RAPIDLY AS FILLED!
1	4:05s	0.75M	
2	17:26s	0.50M	
3	1:09:42s	0.25M.	
4			
5			
6			
7			
8			
9			

TEST 2

	Time	Water Level (m)	Notes
Start	0:00s	1M	
1	4:29s	0.75M	
2	27:32s	0.50M	
3	1:51:26s	0.25M	
4			
5			
6			
7			
8			
9			

TEST 3

	Time	Water Level (m)	Notes
Start	0:00s	1M	
1	07:56s	0.75M	
2	32:05s	0.50M	
3	02:28:36s	0.25M	
4			
5			
6			
7			
8			
9			

DATA ENTRY FORM – TRIAL PIT 3

Date of Testing: 4th DEC 2019

TEST 1

Length (m)	1.3M
Width (m)	0.65M
Depth (m)	1.0M

	Time	Water Level (m)	Notes
Start	0:00S	1.0M	AGAIN, INITIAL DRAINAGE ON FILLING WAS SUBSTANTIAL.
1	4:32S	0.75M	
2	16:52S	0.50M	
3	38:17S	0.25M.	
4			
5			
6			
7			
8			
9			

TEST 2

	Time	Water Level (m)	Notes
Start	0:00S	1M	
1	04:56S	0.75M	
2	24:32S	0.50M	
3	01:12:25S	0.25M	
4			
5			
6			
7			
8			
9			

TEST 3

	Time	Water Level (m)	Notes
Start	0:00S	1.0M	
1	06:04S	0.75M	
2	31:11 S	0.50M	
3	01:52:20S	0.25M	
4			
5			
6			
7			
8			
9			