

Mr Noel Ferguson
Unit H2
Burton Road Business Centre
Bromcliffe Park
Barnsley S71 5RN

PR/DES/40196/001

30 August 2016

Dear Mr Ferguson,

Stud Farm, Carlton, Barnsley

We write in relation to the above site, to provide the results of the infiltration testing recently undertaken by Eastwood & Partners. It is proposed to construct 12 new dwellings on the areas of the site which are currently a small field in the north, and two vegetated areas to the west and east of the current farm buildings. It is also proposed to renovate the three existing farm buildings. Disposal of surface water from the development will be via soakaways, if the ground conditions are suitable and adequate infiltration rates are recorded.

The Site

The site is located to the north of Spring Lane and to the west of Church Street in Carlton, Barnsley. It is centred around grid reference SE 366 100 (36632 10092). The geological map of the area (262 SE) indicates the site to be underlain by the Oaks Rock sandstone of the Middle Coal Measures, which comprises a brown to yellow fine grained, flaggy sandstone. However, the online British Geological Survey viewer shows the south western half of the site to be underlain by undivided Pennine Middle Coal Measures of mudstone, siltstone and sandstone, with the north eastern half of the site underlain by sandstone of the Oaks Rock.

Eastwood & Partners previously completed a Phase 1 report for this site for Chris Carr Architects, referenced MJY/DES/33957-001 and dated August 2011.

Site Works

Eastwood & Partners visited site on 5 August 2016. Five test pits were excavated using a mechanical excavator to depths of between 2.1 and 3.7 m bgl. Two of these pits were used as soakaway pits, with an additional three trial pits to determine general ground conditions.

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The ground conditions varied across the site. In the south eastern area, in TP1, at least 3.7 m of made ground was found, comprising reworked brown clayey gravelly sand with sandstone blocks. Previous excavations had taken place in this area in order to remove tree roots, and recorded brick walls at depth.

Elsewhere, around 450 to 700 mm of topsoil was encountered over orange slightly silty clayey gravelly sand to between 0.75 and 2.60 m bgl. In the north western part of the site, firm grey clay was found between 1.35 and 2.95 m bgl onto extremely weak weathered grey mudstone.

The excavator could not progress further than 2.1 m in SA1 due to strong ground conditions.

Two of the pits were used for soakaway testing. The water level of the soakaway was monitored for up to 2 hours per test. Two tests were carried out in both of the soakaway pits.

Soakaway Test Results

The tests were successful in both of the trial pits, with the first tests draining between 1 and 2 hours. The following table summarises the test results:

Location	Pit Depth (m bgl)	Material at base	BR365 Infiltration Rate $\times 10^{-6}$ m/sec		Average Infiltration Rate $\times 10^{-6}$ m/sec	
			Test 1	Test 2	Test 1	Test 2
SA1	2.1	Orange slightly clayey gravelly SAND.	UTC	UTC	53	20
SA2	2.2	Orange brown gravelly SAND.	28	UTC	30	14

UTC - Rate not calculated as water level failed to reach 75 and 25% effective depth.

The rates are generally moderate to acceptable.

SA1 was located in the northern field adjacent to the church. The first test in SA1 drained in just over an hour, and the second test drained in just over two hours.

SA2 was located in the south western area, which seemed to have previously been a garden area. Several mature trees were present. The first test in SA2 drained in around 1 hour 40 minutes, whilst the second test drained around 200 mm within 1 hour and 50 minutes.

Both of the bases of the soakaway pits had severely silted up after the tests; SA1 had silted up by 160 mm after the first test and 270 mm after the second, while SA2 silted up by around 140 mm after the first test.

Discussion of Results

The results of the testing indicate that infiltration drainage via soakaways may be viable in the natural sand. However, clay was encountered between 1.35 and 2.95 m bgl in the north western corner of the site, and deep made ground in the south eastern corner of the site; therefore suitable sand conditions were not found to extend across the site. Soakaways will not be suitable in clay or made ground and therefore are not recommended in the north western corner or the south eastern corner of the site.

It may be that soakaways are only viable across a proportion of the site where the natural sand is found at shallow depth, and of significant thickness.

In the areas of clay or made ground, it may be necessary to install oversized chambers and connect an overflow pipe in to adjacent plots where higher infiltration rates were recorded. This will however present issues of ownership and maintenance, with the surface water drainage systems effectively becoming shared between multiple plots.

We trust that the above information is of use, and satisfies your current needs. However, please do not hesitate to contact us if you have any comments or queries regarding our findings.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'P. Richardson'.

P Richardson

Enc. Infiltration Rate Calculation Sheets
 Drawing 401965/001/A

PROJECT:	Stud Farm, Barnsley	Job No. 40196	Date 11.08.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared KDL	Checked KE

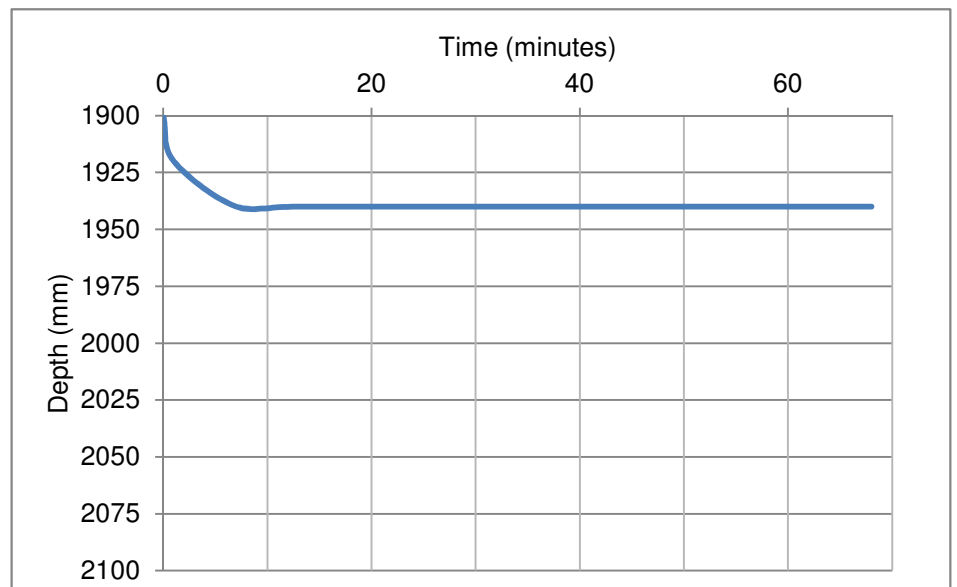
Test No. SA1 - Test 1

Test Pit Dimensions

Length = **1250 mm** Plan area = **0.875 m²**
 Width = **700 mm**
 Depth = **2100 mm** (Total depth)

Approximate time to discharge water into the hole: **480 Seconds**
 Depth to water after completion of pumping: **1900 mm**

Time (min)	Depth (mm)
0	1900
1	1920
7	1940
13	1940
32	1940
57	1940
68	1940



Depth (m)	Description
0.0-0.7	TOPSOIL: Brown SAND
0.7-2.1	Orange slightly clayey gravelly SAND Scraping at base.

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Test No. SA1 - Test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1900** mm Average water depth: **180** mm
 Start time = **0** min Change in water depth: **40** mm

Final parameters

Depth to water = **1940** mm Time interval: **7** min
 End time = **7** min

Effective Storage Volume of Water in the Trial Pit = **0.175** m³
 75% Effective Depth = **1950** mm from ground level
 25% Effective Depth = **2050** mm from ground level
 Time at 75% Effective Depth = **n/a** minutes
 Time at 25% Effective Depth = **n/a** minutes

V_{p75-25} = **0.09** m³

a_{p50} = **1.27** m²

t_{p75-25} = **0** sec

f = **#DIV/0! m/sec**

Average Soakaway Rate = **8.3E-05** m³/sec
 Average soakaway area = **1.58** m² (sides + base)

BR365 Soil Infiltration Rate = N/A m/sec
Average Infiltration Rate = 5.3E-05 m/sec

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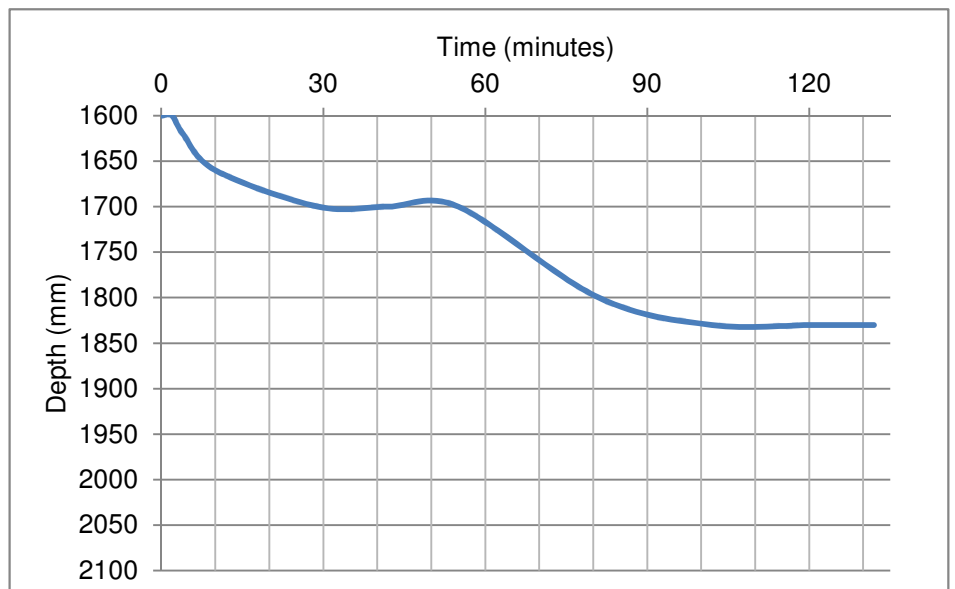
Test No. SA1 - Test 2

Test Pit Dimensions

Length = **2000** mm Plan area = **1.4** m²
 Width = **700** mm
 Depth = **2100** mm (Total depth)

Approximate time to discharge water into the hole: **240** Seconds
 Depth to water after completion of pumping: **1600** mm

Time (min)	Depth (mm)
0	1600
2	1600
4	1620
10	1660
29	1700
42	1700
55	1700
81	1800
102	1830
121	1830
132	1830



Pit collapse revealing tree roots

Depth (m)	Description
0.0-0.7	TOPSOIL: Brown SAND
0.7-2.1	Orange slightly clayey gravelly SAND Scraping at base.

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Test No. SA1 - Test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1700** mm Average water depth: **335** mm
 Start time = **55** min Change in water depth: **130** mm

Final parameters

Depth to water = **1830** mm Time interval: **47** min
 End time = **102** min

Effective Storage Volume of Water in the Trial Pit = **0.7** m³
 75% Effective Depth = **1725** mm from ground level
 25% Effective Depth = **1975** mm from ground level
 Time at 75% Effective Depth = **62** minutes
 Time at 25% Effective Depth = **n/a** minutes

V_{p75-25} = **0.35** m³

a_{p50} = **2.75** m²

t_{p75-25} = **-3720** sec

f = **-3.4E-05** m/sec

Average Soakaway Rate = **6.5E-05** m³/sec
 Average soakaway area = **3.21** m² (sides + base)

BR365 Soil Infiltration Rate = N/A m/sec
Average Infiltration Rate = 2.0E-05 m/sec

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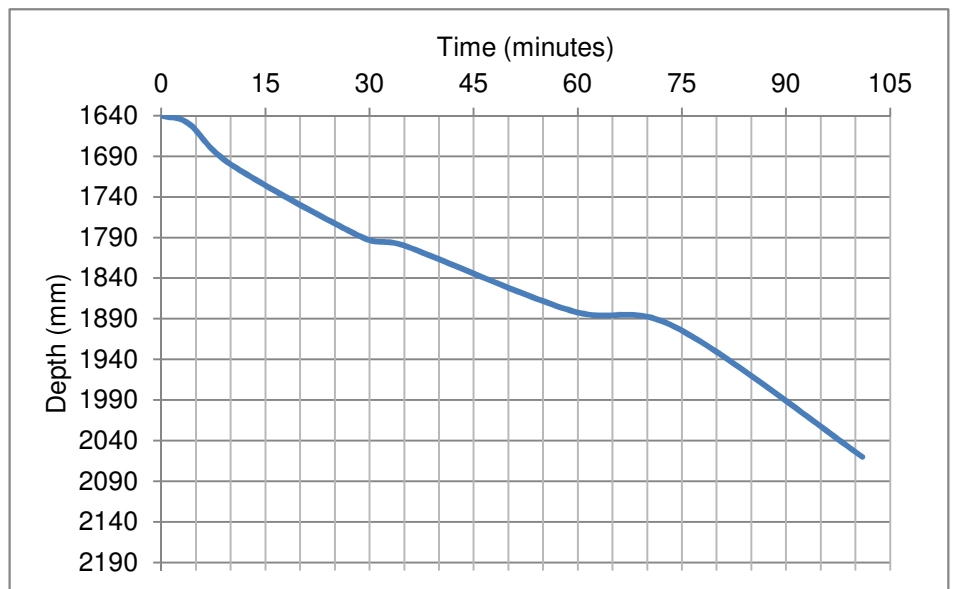
Test No. SA2 - Test 1

Test Pit Dimensions

Length = **1900 mm** Plan area = **1.33 m²**
 Width = **700 mm**
 Depth = **2200 mm** (Total depth)

Approximate time to discharge water into the hole: **420 Seconds**
 Depth to water after completion of pumping: **1640 mm**

Time (min)	Depth (mm)
0	1640
4	1650
10	1700
29	1790
35	1800
59	1880
74	1900
101	2060



Only puddle remained at end.

Depth (m)	Description
0.0-0.45	TOPSOIL: Brown very clayey SAND.
0.45-0.75	Orange slightly clayey gravelly SAND
0.75-2.20	Orange brown gravelly SAND. Gravel is fine to coarse subrounded and subangular of pebbles and flint.

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Test No. SA2 - Test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1650** mm Average water depth: **345** mm
 Start time = **4** min Change in water depth: **410** mm

Final parameters

Depth to water = **2060** mm Time interval: **97** min
 End time = **101** min

Effective Storage Volume of Water in the Trial Pit = **0.7448** m³
 75% Effective Depth = **1780** mm from ground level
 25% Effective Depth = **2060** mm from ground level
 Time at 75% Effective Depth = **21** minutes
 Time at 25% Effective Depth = **101** minutes

V_{p75-25} = **0.37** m³

a_{p50} = **2.79** m²

t_{p75-25} = **4800** sec

f = **2.8E-05** m/sec

Average Soakaway Rate = **9.4E-05** m³/sec
 Average soakaway area = **3.12** m² (sides + base)

BR365 Soil Infiltration Rate = 2.8E-05 m/sec
Average Infiltration Rate = 3.0E-05 m/sec

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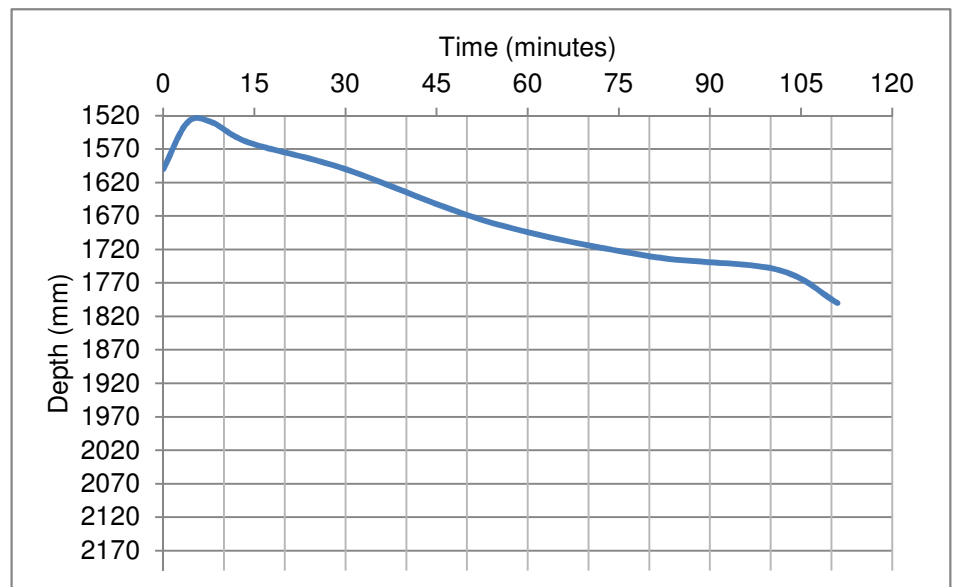
Test No. SA2 - Test 2

Test Pit Dimensions

Length = **2050** mm Plan area = **1.435** m²
Width = **700** mm
Depth = **2200** mm (Total depth)

Approximate time to discharge water into the hole: **480** Seconds
Depth to water after completion of pumping: **1600** mm

Time (min)	Depth (mm)
0	1600
4	1530
8	1530
14	1560
30	1600
54	1680
80	1730
101	1750
111	1800



Depth (m)	Description
0.0-0.45	TOPSOIL: Brown very clayey SAND.
0.45-0.75	Orange slightly clayey gravelly SAND
0.75-2.20	Orange brown gravelly SAND. Gravel is fine to coarse subrounded and subangular of pebbles and flint.

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Test No. SA2 - Test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1530** mm Average water depth: **535** mm
 Start time = **8** min Change in water depth: **270** mm

Final parameters

Depth to water = **1800** mm Time interval: **103** min
 End time = **111** min

Effective Storage Volume of Water in the Trial Pit = **0.861** m³
 75% Effective Depth = **1750** mm from ground level
 25% Effective Depth = **2050** mm from ground level
 Time at 75% Effective Depth = **101** minutes
 Time at 25% Effective Depth = **n/a** minutes

V_{p75-25} = **0.43** m³

a_{p50} = **3.09** m²

t_{p75-25} = **-6060** sec

f = **-2.3E-05** m/sec

Average Soakaway Rate = **6.3E-05** m³/sec
 Average soakaway area = **4.38** m² (sides + base)

BR365 Soil Infiltration Rate = N/A m/sec
Average Infiltration Rate = 1.4E-05 m/sec



INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

KEY:

- Approximate site boundary.
- Approximate location of trial pits excavated by Eastwood & Partners on 05.08.16.
- Approximate location of soakaway tests undertaken by Eastwood & Partners on 05.08.16.
- Approximate extent of no dig area.
- Footprint of existing buildings on site.

A	First Issue.			
REV	DESCRIPTION	SIG	CHK	DATE

MR. NOEL FERGUSON

STUD FARM, CARLTON, BARNSLEY

EXPLORATORY HOLE LOCATION PLAN

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SCALE WHEN PLOTTED AT A3 1:500			DRAWING STATUS INFORMATION	
DRAWN RH	CHECKED DES	DATE 09.08.16	DRAWING NUMBER 40196/001	REV A