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2nd October 2013

Ref: C5584A/5192/MG/MG

320141115P

Dear Chris,

Re. Parsonage Avenue, Ribchester – Soakaway Testing

1. INTRODUCTION

Sirius Geotechnical and Environmental Ltd (Sirius) were commissioned by Partner Construction Ltd (Partner) to undertake soakaway testing on land off Parsonage Avenue, Ribchester, Lancashire.

The objective of this investigation was to establish the nature of the ground and to provide soil infiltration rates for soakaway design.

The site has been subject to a previous preliminary geoenvironmental appraisal (desk top study) by Sirius, Ref. Preliminary Geoenvironmental Appraisal Report for Land at Parsonage Avenue, Ribchester, Lancashire, dated August 2013.

The aforementioned report identified drift geology to comprise river terrace deposits consisting of sands and gravels. It was considered by Partner Construction, that such deposits could be conducive to the use of soakaways and requested infiltration testing to be undertaken.

2. BACKGROUND INFORMATION

2.1 General

This section provides a summary of information relating to the site. A more detailed description is provided in the preliminary geoenvironmental appraisal report dated August 2013.

2.2 Site Location and Description

Ordnance Survey National Grid Ref	SD 6480 3514
Location	The site is situated in the south-western extent of the village of Ribchester, Lancashire, approximately 8km north-west of Blackburn city centre. A site location plan is enclosed as Drawing No. C5584A/01.
Approximate Site Area	0.77 hectares
Site Description	The site comprises an undeveloped and generally level grassed field bordered by mature trees and hedgerows.
Adjacent Land Uses	Residential to the north-east. Agricultural land to the north-west and south-west. Unnamed road and recreational area to the south-east.

2.3 Historical Development

In summary, the site has remained as undeveloped open land and no structures have been recorded on the site.

2.4 Geology

BGS maps indicate the site to be underlain by Quaternary River Terrace Deposits (sand and gravel), overlying mudstone and siltstone of the Sabden Shale Formation. The depth to rockhead is unknown.

3. FIELDWORK

Fieldwork was undertaken on 30th September 2013 and comprised the drilling of five window sample boreholes and the undertaking of soakaway tests within the boreholes.

An exploratory hole location plan, showing the borehole/ soakaway locations in relation to the proposed development layout is enclosed as Drawing No. C5584A/02.

Window sample boreholes were advanced to a maximum depth of 4m below ground level (m bgl). However, on completion of drilling it was observed that the walls of the boreholes had partially collapsed owing to the granular nature of the underlying drift deposits and the base of the boreholes were recorded at depths of between 2m and 2.7m bgl.

All soakaway tests were undertaken within superficial soils, which generally comprised sandy clay, underlain by clayey sand and/or clayey sand and gravel deposits.

On completion of the soakaway tests, the boreholes were backfilled using the drilling arisings.

Exploratory holes records detailing depths and descriptions of strata encountered within each borehole are enclosed within this letter.

4. INFILTRATION TESTS

Soakaway tests were undertaken in general accordance with the test method specified in BRE Digest 365 – Soakaway Design.

Water was added to the borehole using a continuous supply from a water bowser. The water level and time in minutes from filling the borehole was recorded. The depth to the base of the borehole during each test was also recorded subsequent to filling owing to instability within granular soils and/or heaving at the base.

Results of the soakaway tests are appended to this letter. Where the recorded water level did not reach 25% effective depth the results were extrapolated to determine an infiltration rate.

The infiltration rates calculated from the fieldwork data are as follows:

Window Sample Borehole Reference	Average Infiltration Rate (meters/second)
WS1	8.76×10^{-6}
WS2	5.07×10^{-6}
WS3	1.83×10^{-4}
WS4	8.76×10^{-5}
WS5	2.41×10^{-4}

5. CONCLUSION

The slightly lower results from WS1 and WS2 are considered to arise from an increased thickness of cohesive deposits, which typically mantle granular river terrace deposits towards the west and north-west of the site. On this basis, it is envisaged that soakaway drainage exclusively within granular river terrace deposits may prove suitable for the proposed development. Notwithstanding the above, the design of the soakaway, based on the above indicative infiltration results, is to be undertaken by other consultants.

In addition to the above, it is strongly recommended as a matter of course that liaison with the Local Authority and the Environment Agency be entered into at the earliest possible opportunity as the underlying drift deposits are classified by the Environment Agency as a Secondary 'A' Aquifer.

We trust that this is satisfactory for your present needs. However, should you have any queries or require further information, please do not hesitate to contact the undersigned at our Durham office.

Yours sincerely



Michelle Gibson
Engineer

For and on behalf of
Sirius Geotechnical and Environmental Ltd

Encs. Drawing C5584A/01 Site Location Plan
Drawing C5584A/02 Soakaway Exploratory Hole Location Plan
Exploratory Hole Records
Soakaway Test Results

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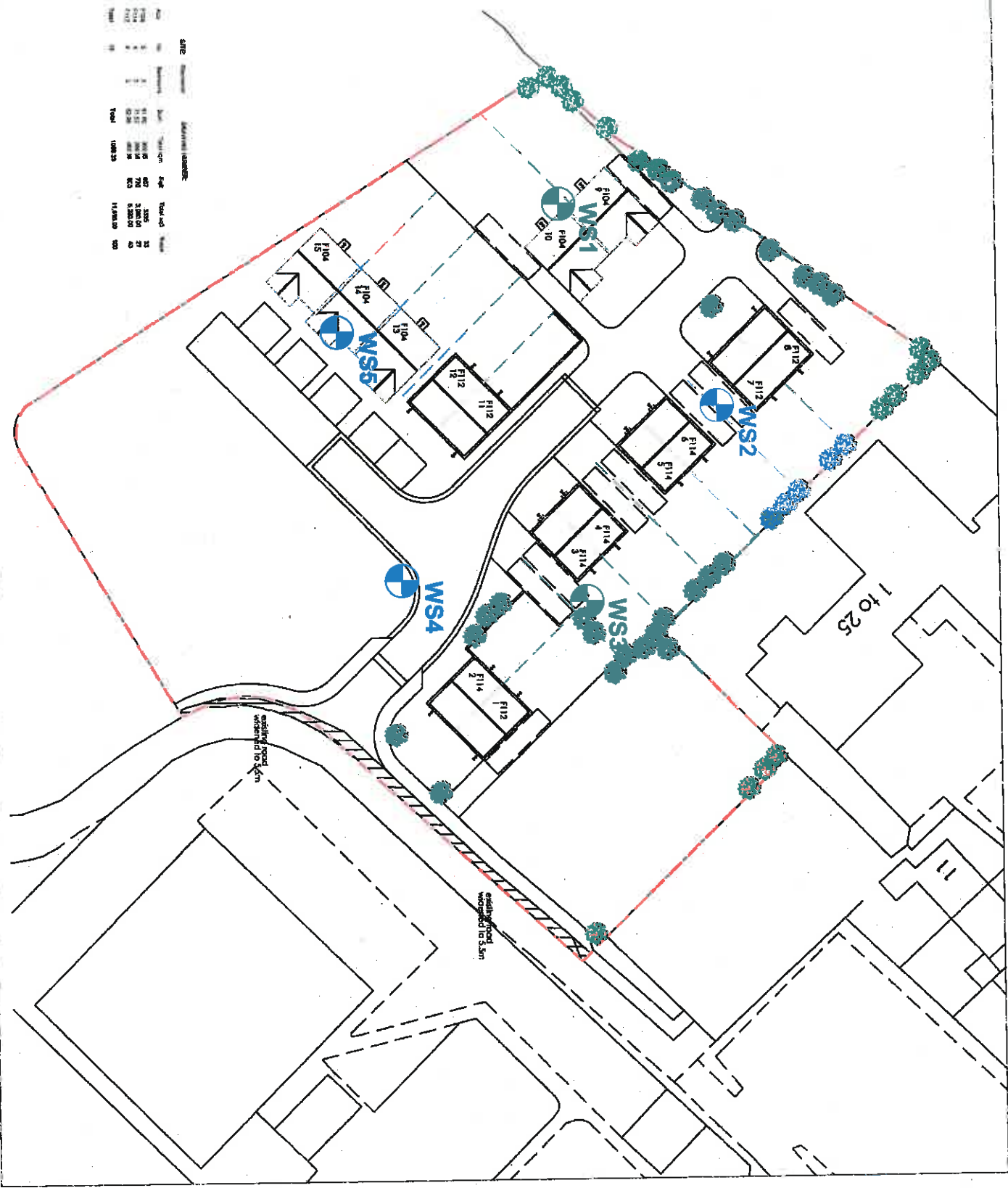
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NOTES  Site Location	REVISION		CLIENT		DRAWING NO.		REVISION NO.			
	D	For Information	Partner Construction Ltd		CBS84A/01		0			
	A	»			SITE Parsonage Avenue, Ribchester		DRAWN BY		APPROVED BY	
	B	»					MG		NJ	
	C	»					DRAWING TITLE		DATE	
D	»	Site Location Plan		30/09/2013		1:25,000				
SIRIUS GEOTECHNICAL & ENVIRONMENTAL Russel House, Mill Lane, Langley Moor Durham DH7 8HJ www.siriusgeo.com TEL: 0191 378 0872 FAX: 0191 378 1837					DATE		SCALE		A4	
		30/09/2013			1:25,000		A4			

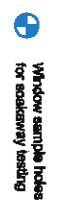


APPROXIMATE QUANTITIES

Item	Quantity	Unit	Value
1	100	m ²	100.00
2	200	m ²	200.00
3	300	m ²	300.00
4	400	m ²	400.00
5	500	m ²	500.00
6	600	m ²	600.00
7	700	m ²	700.00
8	800	m ²	800.00
9	900	m ²	900.00
10	1000	m ²	1000.00
Total	10000	m²	10000.00



NOTES



Background based on Kingston & Kingston Concept Layout dated 12/04/07 prepared for Partner Construction Ltd

REVISION

NO	DESCRIPTION
0	For Information
A	
B	
C	
D	

SIRIUS GEOTECHNICAL & ENVIRONMENTAL
 Registered Geotechnical & Environmental Engineers
 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 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2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100



WINDOW SAMPLING RECORD

BH No. **WS1**
Sheet 1 of 1

Site: Parsonage Avenue, Ribchester

Contract No: **C5584A**

Client: Partner Construction Ltd

Dates:
30/09/2013

Method: Tracked window sample rig

Scale **1:25**

Logged By: MG Checked By: NJ

Driller: RP Drilling Ltd

Depth (m) Level (mAOD) Legend Well

SAMPLE DETAILS

STRATA RECORD

Description

Type Depth From - To(m) (N) Shear vane

Groundwater

MADE GROUND: Dark brown silty sandy slightly gravelly CLAY. (TOPSOIL)

Firm orange brown mottled grey sandy slightly gravelly CLAY.

Below 1.1m bgl - Soft locally very soft (water softened)

Grey clayey fine to coarse SAND.

Grey slightly clayey sandy angular to rounded fine to coarse GRAVEL of sandstone. Sand is medium to coarse. Occasional cobbles.

End of Window Sample at 4.00 m

0.20

1.40

2.60

4.00

Remarks and Water Observations

1. Damp below 1.1m bgl.
2. Resting groundwater level at 1.4m bgl.
3. Borehole walls collapsed to 2.5m bgl on completion of drilling.
4. Borehole backfilled with arisings following soakaway testing.

GL (mAOD)

- Easting:

- Northing:

Fig. No.

WS1

320141115 P 5 P



WINDOW SAMPLING RECORD

BH No. **WS2**
Sheet 1 of 1

Site: Parsonage Avenue, Ribchester

Contract No: **C5584A**

Client: Partner Construction Ltd

Dates:
30/09/2013

Method: Tracked window sample rig

Scale **1:25**

Logged By: MG Checked By: NJ

Driller: RP Drilling Ltd

SAMPLE DETAILS

STRATA RECORD

Type	Depth		(N) Shear vane	Groundwater	Description	Depth (m)	Level (mAOD)	Legend	Well
	From	To(m)							
					MADE GROUND: Dark brown silty sandy slightly gravelly CLAY. (TOPSOIL)	0.20			
					Firm orange brown mottled grey sandy slightly gravelly CLAY.				
					Below 1.2m bgl - Soft locally very soft (water softened)				
					Brown clayey fine to coarse SAND.	1.40			
					At 2.3m bgl - Decaying plant material.	2.35			
					Grey slightly clayey medium to coarse SAND and angular to subrounded fine to coarse GRAVEL of sandstone.				
					End of Window Sample at 3.00 m	3.00			

Remarks and Water Observations

1. Damp below 1.4m bgl.
2. Borehole walls collapsed to 2m bgl on completion of drilling.
3. Borehole backfilled with arisings following soakaway testing.

GL (mAOD)

Eastings:

Northings:

Fig. No.

WS2



WINDOW SAMPLING RECORD

BH No. **WS3**

Sheet 1 of 1

Site: Parsonage Avenue, Ribchester

Contract No: **C5584A**

Client: Partner Construction Ltd

Dates:
30/09/2013

Method: Tracked window sample rig

Scale **1:25**

SAMPLE DETAILS

STRATA RECORD

Logged By: MG Checked By: NJ

Drifter: RP Drilling Ltd

Type	Depth From - To(m)	(N) Shear vane	Groundwater	Description	Depth (m)	Level (mAOD)	Legend	Well
				MADE GROUND: Dark brown silty sandy slightly gravelly CLAY. (TOPSOIL)				
				Stiff locally firm orange brown mottled grey sandy slightly gravelly CLAY.	0.25			
				Brown clayey fine to medium SAND with occasional bands of clay.	0.65			
				Brown slightly gravelly medium to coarse SAND. Gravel is rounded coarse of sandstone.	1.20 1.30			
				Brown slightly clayey medium to coarse SAND and subangular to rounded fine to coarse GRAVEL of sandstone.				
				Below 2m bgl - Grey.				
				End of Window Sample at 3.00 m	3.00			

Remarks and Water Observations

1. Damp below 1m bgl.
2. Borehole walls collapsed to 2.4m bgl on completion of drilling.
3. Borehole backfilled with arisings following soakaway testing.

GL (mAOD)

- Easting:
- Northing:
-

Fig. No.

WS3

320141115P



WINDOW SAMPLING RECORD

BH No. **WS5**
Sheet 1 of 1

Site: Parsonage Avenue, Ribchester

Contract No: **C5584A**

Client: Partner Construction Ltd

Dates:
30/09/2013

Method: Tracked window sample rig

Scale **1:25**

SAMPLE DETAILS

STRATA RECORD

Logged By: MG Checked By: NJ

Driller: RP Drilling Ltd

Type	Depth From - To(m)	(N) Shear vane

Groundwater

Description

Depth (m)	Level (mAOD)	Legend	Well
0.30			
1.65			
3.00			

MADE GROUND: Dark brown silty sandy slightly gravelly CLAY. (TOPSOIL)

Very stiff brown sandy slightly gravelly CLAY. Gravel is angular to subangular fine to coarse of sandstone.

Below 0.75m bgl - Soft locally very soft (water softened)

Brown clayey sandy angular to rounded fine to coarse GRAVEL of sandstone. Sand is medium to coarse.

End of Window Sample at 3.00 m

Remarks and Water Observations

1. Damp below 0.75m bgl.
2. Resting groundwater level at 2.56m bgl.
3. Borehole walls collapsed to 2.6m bgl on completion of drilling.
4. Borehole backfilled with arisings following soakaway testing.

GL (mAOD)

- Easting:
- Northing:

Fig. No.

WS5

320141115P



**SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365:
2007**

Client: Partner Construction Ltd

Site: Parsonage Avenue, Ribchester

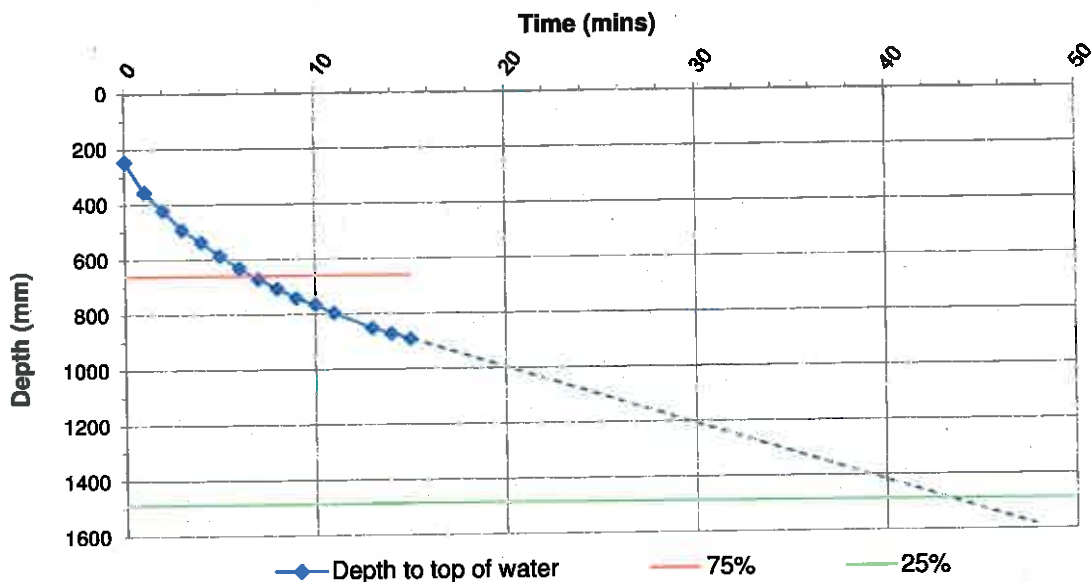
Job No: C5584A

Test No:

WS1 Test 3

CALCULATION OF SOIL INFILTRATION RATE IN BOREHOLE

Time (min)	Depth (mm)		Size of Soakaway	Diameter (m) =	0.097
0	245			Depth (m) =	1.90
1	355				
2	420				
3	490			Depth at start of test (mm) =	245mm
4	535			Depth of BH (mm) =	1900mm
5	585			75% effective depth (mm) =	659mm
6	630			50% effective depth =	1073mm
7	670			25% effective depth =	1486mm
8	705				
9	740			Base area of BH (m ²) =	0.007
10	765			Effective area of loss 50% (m ²) =	0.258181778
11	795			Volume outflow 75 - 25% (m ³) =	0.006
13	850				
14	870			From the graph:	
15	890			tp 75 (min) =	6.5
				tp 25 (min) =	43
				Soil infiltration rate, f, (m/s) =	1.07E-05 Normal test
				Input by:	MG
				Date:	30/09/2013
				Checked by:	NJ
				Date:	02/10/2013





**SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365:
2007**

Client: Partner Construction Ltd

Site: Parsonage Avenue, Ribchester

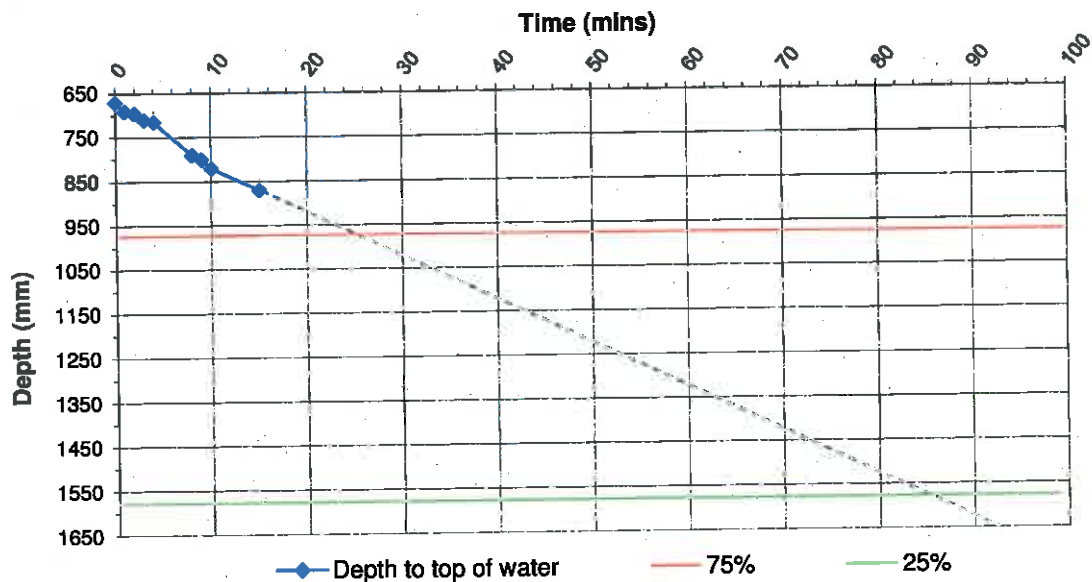
Job No: C5584A

Test No:

WS2 Test 2

CALCULATION OF SOIL INFILTRATION RATE IN BOREHOLE

Time (min)	Depth (mm)		Size of Soakaway	Diameter (m) =	0.097
0	670			Depth (m) =	1.88
1	690				
2	695				
3	710			Depth at start of test (mm) =	670mm
4	715			Depth of BH (mm) =	1880mm
8	790			75% effective depth (mm) =	973mm
9	800			50% effective depth =	1275mm
10	820			25% effective depth =	1578mm
15	870				
				Base area of BH (m ²) =	0.007
				Effective area of loss 50% (m ²) =	0.190727857
				Volume outflow 75 - 25% (m ³) =	0.004
				From the graph:	
				tp 75 (min) =	25
				tp 25 (min) =	85
				Soil infiltration rate, f, (m/s) =	6.44E-06 Normal test
				Input by:	MG
				Date:	30/09/2013
				Checked by:	NJ
				Date:	02/10/2013



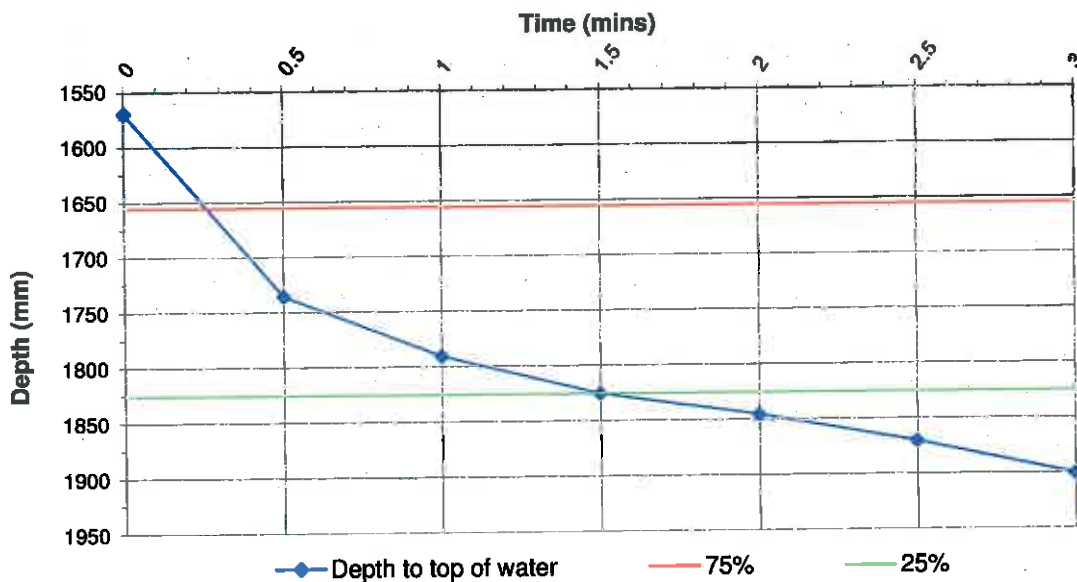


**SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365:
2007**

Client: Partner Construction Ltd		
Site: Parsonage Avenue, Ribchester		
Job No: C5584A	Test No:	WS3 Test 2

CALCULATION OF SOIL INFILTRATION RATE IN BOREHOLE

Time (min)	Depth (mm)		Size of Soakaway	Diameter (m) =	0.097
0	1570			Depth (m) =	1.91
0.5	1735				
1	1790				
1.5	1825				
2	1845				
2.5	1870				
3	1900				
				Depth at start of test (mm) =	1570mm
				Depth of BH (mm) =	1910mm
				75% effective depth (mm) =	1655mm
				50% effective depth =	1740mm
				25% effective depth =	1825mm
				Base area of BH (m²) =	0.007
				Effective area of loss 50% (m²) =	0.058851652
				Volume outflow 75 - 25% (m³) =	0.001
				From the graph:	
				tp 75 (min) =	0.25
				tp 25 (min) =	1.5
			Soil infiltration rate, f, (m/s) =	2.82E-04	Normal test
			Input by:	MG	Date: 30/09/2013
			Checked by:	NJ	Date: 02/10/2013





**SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365:
2007**

Client: Partner Construction Ltd

Site: Parsonage Avenue, Ribchester

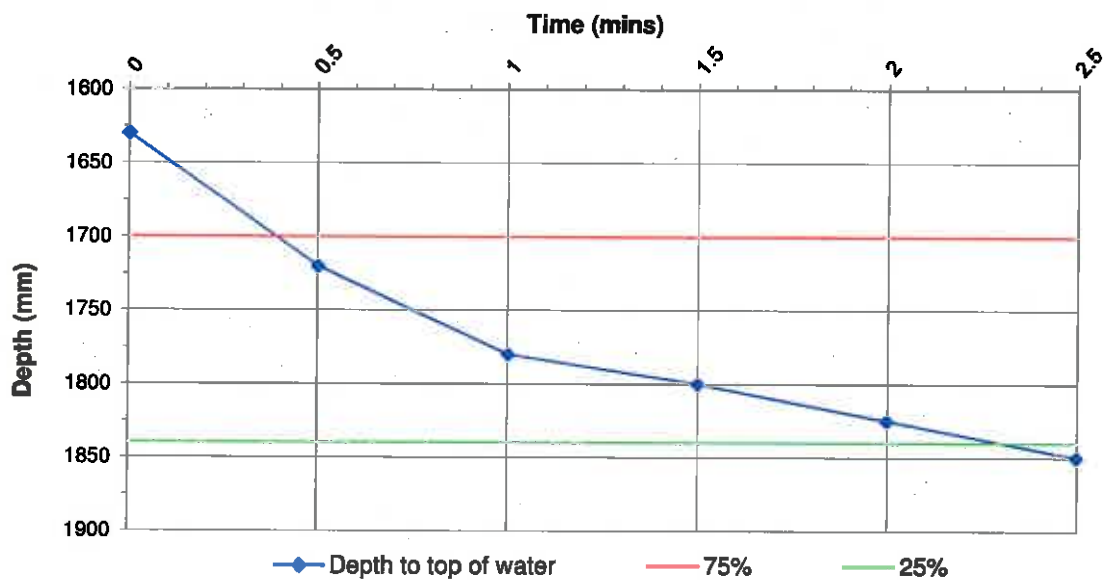
Job No: C5584A

Test No:

WS3 Test 3

CALCULATION OF SOIL INFILTRATION RATE IN BOREHOLE

Time (min)	Depth (mm)		Size of Soakaway	Diameter (m) =	0.097
0	1630			Depth (m) =	1.91
0.5	1720				
1	1780				
1.5	1800				
2	1825				
2.5	1850				
				Depth at start of test (mm) =	1630mm
				Depth of BH (mm) =	1910mm
				75% effective depth (mm) =	1700mm
				50% effective depth =	1770mm
				25% effective depth =	1840mm
				Base area of BH (m²) =	0.007
				Effective area of loss 50% (m²) =	0.049756741
				Volume outflow 75 - 25% (m³) =	0.001
				From the graph:	
				tp 75 (min) =	0.4
				tp 25 (min) =	2.3
				Soil infiltration rate, f, (m/s) =	1.81E-04 Normal test
			Input by:	MG	Date: 30/09/2013
			Checked by:	NJ	Date: 02/10/2013





SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 2007

Client: Partner Construction Ltd
 Site: Parsonage Avenue, Ribchester
 Job No: C5584A Test No: WS4 Test 1

CALCULATION OF SOIL INFILTRATION RATE IN BOREHOLE

Time (min)	Depth (mm)	Size of Soakaway	Diameter (m) =	0.097
0	1590		Depth (m) =	2.14
0.5	1710			
1	1750			
			Depth at start of test (mm) =	1590mm
			Depth of BH (mm) =	2140mm
			75% effective depth (mm) =	1728mm
			50% effective depth =	1865mm
			25% effective depth =	2003mm
			Base area of BH (m ²) =	0.007
			Effective area of loss 50% (m ²) =	0.090683839
			Volume outflow 75 - 25% (m ³) =	0.002
			From the graph:	
			tp 75 (min) =	0.7
			tp 25 (min) =	4
		Soil Infiltration rate, <i>f</i> , (m/s) =	1.12E-04	Normal test
		Input by: MG	Date: 30/09/2013	
		Checked by: NJ	Date: 02/10/2013	

