

346 Chichester Road, Bognor Regis

Surface Water Drainage

Planning Condition Number: 4

Condition 4 states:

“Development shall not commence until full details of the proposed surface water drainage scheme have been submitted to and approved in writing by the Local Planning Authority.

The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, the recommendations of the SUDS Manual produced by CIRIA.

Winter groundwater monitoring to establish highest annual ground water levels and Percolation testing to BRE 365, or similar approved, will be required to support the design of any Infiltration drainage.

No building shall be occupied until the complete surface water drainage system serving the property has been implemented in accordance with the agreed details, retained and maintained in working order thereafter. ”

Percolation tests have been undertaken by Archibald Shaw. Their report is attached to this document.

They conclude that soil infiltration rate is very poor. As a result they consider relatively large, high storage soakaways are required.

The schedule of the required soakaways is set out below:

Ref	Total Depth (m)	Depth of Crates (m)	Plan Size (m)	Soakaway Type
SA 1A	1.4	0.8	2.5 x 1.5	High Storage
SA 1B	1.4	0.8	2.5 x 1.5	High Storage
SA 2	1.4	0.8	4.0 x 2.0	High Storage



Our ref: PEF/DP/27182

12 February 2015

Mr A Boath
346 Chichester Road
BOGNOR REGIS
West Sussex
PO21 5BX

Dear Mr Booth

**Soakage Test Report and Proposals
346 Chichester Road, Bognor Regis**

Further to my site visit on 11 February 2015, please find enclosed herewith the following documents:

- a) Trial Hole Logs
- b) 2 sets of Micro-Drainage Sheets
- c) Drawing PEF01
- d) Marked up Standard Detail SA1A and 1B
- e) Marked up Standard Detail SA2

The soil infiltration rate found at your site is very poor (1.64×10^{-6} m/sec) and groundwater was encountered at a depth of 1.70m, hence relatively large, high storage soakaways are required. Please find below a schedule of the required soakaways:-

Ref	Total Depth (m)	Depth of Crates (m)	Plan Size (m)	Soakaway Type
SA1A	1.4	0.8	2.5 x 1.5	High Storage
SA1B	1.4	0.8	2.5 x 1.5	High Storage
SA2	1.4	0.8	4.0 x 2.0	High Storage

Soakaways shall be sited at least 5.0m from any buildings or structures. Any groundwater strikes should be reported to the Engineer.

Should you have any queries or questions please do not hesitate to contact me.

Yours sincerely

Philip Faulkner EngTech TMICE
for ARCHIBALD SHAW

cc: V Carpenter, Archibald Shaw – by email only: vince@archibaldshaw.co.uk

Partners: Lawrence Jupp BSc(Hons) CEng MStructE
Jonathan Rains BSc CEng MICE
Eur Ing Vincent Carpenter BSc(Hons) CEng MICE CWEM FCIWEM MIHT MIOd
Neil Grinham CEng MStructE
Jon Lord BEng(Hons)

Associate: Neil Stanaway BEng(Hons) CEng MStructE

Consultant: Peter Willmott CEng FStructE

Archibald Shaw LLP uses the word 'Partner' to refer to a Member of the LLP

Also at Newbury

Archibald Shaw Limited		Page 1
One Little London Chichester Sussex PO19 1PP	346 CHICHESTER ROAD BOGNOR REGIS 70 sq m Contributing	
Date feb. 2015 File 70 sq m.SRC	Designed By PEF Checked By	
Micro Drainage	Source Control W.11.2	

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 3033 minutes

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
15 Summer	0.0	0.0	100.2103	0.2102	1.6	O K
30 Summer	0.0	0.0	100.2817	0.2817	2.1	O K
60 Summer	0.0	0.0	100.3592	0.3592	2.7	O K
120 Summer	0.0	0.0	100.4392	0.4392	3.3	O K
180 Summer	0.0	0.0	100.4842	0.4842	3.7	O K
240 Summer	0.0	0.0	100.5147	0.5147	3.9	O K
360 Summer	0.0	0.0	100.5587	0.5588	4.2	O K
480 Summer	0.0	0.0	100.5888	0.5888	4.5	O K
600 Summer	0.0	0.0	100.6108	0.6108	4.6	O K
720 Summer	0.0	0.0	100.6278	0.6278	4.8	O K
960 Summer	0.0	0.0	100.6503	0.6503	4.9	O K
1440 Summer	0.0	0.0	100.6713	0.6713	5.1	O K
2160 Summer	0.0	0.0	100.6738	0.6738	5.1	O K
2880 Summer	0.0	0.0	100.6668	0.6668	5.1	O K
4320 Summer	0.0	0.0	100.6473	0.6473	4.9	O K
5760 Summer	0.0	0.0	100.6243	0.6243	4.7	O K
7200 Summer	0.0	0.0	100.6013	0.6013	4.6	O K
8640 Summer	0.0	0.0	100.5798	0.5798	4.4	O K
10080 Summer	0.0	0.0	100.5588	0.5588	4.2	O K
15 Winter	0.0	0.0	100.2357	0.2357	1.8	O K
30 Winter	0.0	0.0	100.3158	0.3157	2.4	O K
60 Winter	0.0	0.0	100.4027	0.4027	3.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	122.43	23
30 Summer	82.24	38
60 Summer	52.66	68
120 Summer	32.50	128
180 Summer	24.12	188
240 Summer	19.39	248
360 Summer	14.27	368
480 Summer	11.46	486
600 Summer	9.66	606
720 Summer	8.40	726
960 Summer	6.72	966
1440 Summer	4.91	1444
2160 Summer	3.57	2100
2880 Summer	2.85	2400
4320 Summer	2.07	3160
5760 Summer	1.64	3976
7200 Summer	1.38	4824
8640 Summer	1.19	5624
10080 Summer	1.06	6456
15 Winter	122.43	23
30 Winter	82.24	38
60 Winter	52.66	68

Archibald Shaw Limited		Page 2
One Little London Chichester Sussex PO19 1PP	346 CHICHESTER ROAD BOGNOR REGIS 70 sq m Contributing	
Date feb. 2015 File 70 sq m.SRC	Designed By PEF Checked By	
Micro Drainage	Source Control W.11.2	

Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
120 Winter	0.0	0.0	100.4927	0.4927	3.7	O K
180 Winter	0.0	0.0	100.5437	0.5437	4.1	O K
240 Winter	0.0	0.0	100.5782	0.5783	4.4	O K
360 Winter	0.0	0.0	100.6288	0.6288	4.8	O K
480 Winter	0.0	0.0	100.6638	0.6638	5.0	O K
600 Winter	0.0	0.0	100.6893	0.6893	5.2	O K
720 Winter	0.0	0.0	100.7088	0.7088	5.4	O K
960 Winter	0.0	0.0	100.7368	0.7368	5.6	O K
1440 Winter	0.0	0.0	100.7653	0.7653	5.8	O K
2160 Winter	0.0	0.0	100.7753	0.7753	5.9	O K
2880 Winter	0.0	0.0	100.7673	0.7673	5.8	O K
4320 Winter	0.0	0.0	100.7423	0.7423	5.6	O K
5760 Winter	0.0	0.0	100.7123	0.7123	5.4	O K
7200 Winter	0.0	0.0	100.6808	0.6808	5.2	O K
8640 Winter	0.0	0.0	100.6493	0.6493	4.9	O K
10080 Winter	0.0	0.0	100.6188	0.6188	4.7	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
120 Winter	32.50	126
180 Winter	24.12	186
240 Winter	19.39	244
360 Winter	14.27	362
480 Winter	11.46	480
600 Winter	9.66	598
720 Winter	8.40	714
960 Winter	6.72	946
1440 Winter	4.91	1404
2160 Winter	3.57	2060
2880 Winter	2.85	2684
4320 Winter	2.07	3332
5760 Winter	1.64	4264
7200 Winter	1.38	5184
8640 Winter	1.19	6056
10080 Winter	1.06	6960

One Little London
Chichester
Sussex PO19 1PP

346 CHICHESTER ROAD
BOGNOR REGIS
70 sq m Contributing

Date feb. 2015
File 70 sq m.SRC

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Checked By



Micro Drainage

Source Control W.11.2

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	100	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.350	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+30
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 0.007

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.000	4	8	0.007

One Little London
Chichester
Sussex PO19 1PP

346 CHICHESTER ROAD
BOGNOR REGIS
70 sq m Contributing

Date feb. 2015
File 70 sq m.SRC

Designed By PEF
Checked By



Micro Drainage

Source Control W.11.2

Trench Soakaway Details

Infil Coef - Base (m/hr)	0.005900	Length (m)	4.0
Infil Coef - Sides (m/hr)	0.005900	Invert Level (m)	100.000
Safety Factor	1.5	Cover Level (m)	101.400
Porosity	0.95	Slope (1:x)	0.0
Width (m)	2.0		

Archibald Shaw Limited		Page 1
One Little London Chichester Sussex PO19 1PP	346 CHICHESTER ROAD BOGNOR REGIS 30 sq m Contributing	
Date feb. 2015	Designed By PEF	
File 30 sq m.SRC	Checked By	
Micro Drainage		Source Control W.11.2

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 2369 minutes

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m ³)	Status
15 Summer	0.0	0.0	100.1923	0.1922	0.7	O K
30 Summer	0.0	0.0	100.2572	0.2572	0.9	O K
60 Summer	0.0	0.0	100.3277	0.3277	1.2	O K
120 Summer	0.0	0.0	100.3997	0.3997	1.4	O K
180 Summer	0.0	0.0	100.4402	0.4402	1.6	O K
240 Summer	0.0	0.0	100.4667	0.4667	1.7	O K
360 Summer	0.0	0.0	100.5052	0.5052	1.8	O K
480 Summer	0.0	0.0	100.5307	0.5307	1.9	O K
600 Summer	0.0	0.0	100.5488	0.5488	2.0	O K
720 Summer	0.0	0.0	100.5618	0.5618	2.0	O K
960 Summer	0.0	0.0	100.5778	0.5778	2.1	O K
1440 Summer	0.0	0.0	100.5888	0.5888	2.1	O K
2160 Summer	0.0	0.0	100.5848	0.5848	2.1	O K
2880 Summer	0.0	0.0	100.5773	0.5773	2.1	O K
4320 Summer	0.0	0.0	100.5563	0.5563	2.0	O K
5760 Summer	0.0	0.0	100.5317	0.5317	1.9	O K
7200 Summer	0.0	0.0	100.5082	0.5082	1.8	O K
8640 Summer	0.0	0.0	100.4862	0.4862	1.7	O K
10080 Summer	0.0	0.0	100.4652	0.4652	1.7	O K
15 Winter	0.0	0.0	100.2152	0.2152	0.8	O K
30 Winter	0.0	0.0	100.2882	0.2882	1.0	O K
60 Winter	0.0	0.0	100.3672	0.3672	1.3	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	122.43	23
30 Summer	82.24	38
60 Summer	52.66	68
120 Summer	32.50	128
180 Summer	24.12	188
240 Summer	19.39	248
360 Summer	14.27	366
480 Summer	11.46	486
600 Summer	9.66	606
720 Summer	8.40	726
960 Summer	6.72	966
1440 Summer	4.91	1444
2160 Summer	3.57	1824
2880 Summer	2.85	2196
4320 Summer	2.07	2988
5760 Summer	1.64	3808
7200 Summer	1.38	4616
8640 Summer	1.19	5456
10080 Summer	1.06	6264
15 Winter	122.43	23
30 Winter	82.24	38
60 Winter	52.66	68

Archibald Shaw Limited		Page 2
One Little London Chichester Sussex PO19 1PP	346 CHICHESTER ROAD BOGNOR REGIS 30 sq m Contributing	
Date feb. 2015 File 30 sq m.SRC	Designed By PEF Checked By	
Micro Drainage	Source Control W.11.2	

Summary of Results for 100 year Return Period (+30%)

Storm Duration (mins)	Maximum Filtration (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
120 Winter	0.0	0.0	100.4487	0.4487	1.6	O K
180 Winter	0.0	0.0	100.4942	0.4942	1.8	O K
240 Winter	0.0	0.0	100.5247	0.5247	1.9	O K
360 Winter	0.0	0.0	100.5687	0.5688	2.0	O K
480 Winter	0.0	0.0	100.5983	0.5983	2.1	O K
600 Winter	0.0	0.0	100.6193	0.6193	2.2	O K
720 Winter	0.0	0.0	100.6353	0.6353	2.3	O K
960 Winter	0.0	0.0	100.6558	0.6558	2.3	O K
1440 Winter	0.0	0.0	100.6733	0.6733	2.4	O K
2160 Winter	0.0	0.0	100.6713	0.6713	2.4	O K
2880 Winter	0.0	0.0	100.6598	0.6598	2.4	O K
4320 Winter	0.0	0.0	100.6328	0.6328	2.3	O K
5760 Winter	0.0	0.0	100.5988	0.5988	2.1	O K
7200 Winter	0.0	0.0	100.5653	0.5653	2.0	O K
8640 Winter	0.0	0.0	100.5327	0.5327	1.9	O K
10080 Winter	0.0	0.0	100.5022	0.5022	1.8	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
120 Winter	32.50	126
180 Winter	24.12	186
240 Winter	19.39	244
360 Winter	14.27	362
480 Winter	11.46	480
600 Winter	9.66	596
720 Winter	8.40	712
960 Winter	6.72	940
1440 Winter	4.91	1388
2160 Winter	3.57	2016
2880 Winter	2.85	2284
4320 Winter	2.07	3204
5760 Winter	1.64	4144
7200 Winter	1.38	5040
8640 Winter	1.19	5880
10080 Winter	1.06	6760

Archibald Shaw Limited		Page 3
One Little London	346 CHICHESTER ROAD	
Chichester	BOGNOR REGIS	
Sussex PO19 1PP	30 sq m Contributing	
Date feb. 2015	Designed By PEF	
File 30 sq m.SRC	Checked By	
Micro Drainage	Source Control W.11.2	

Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	100	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.350	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+30
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 0.003

Time from:	(mins) to:	Area (ha)	Time from:	(mins) to:	Area (ha)
0	4	0.000	4	8	0.003

One Little London
Chichester
Sussex PO19 1PP

346 CHICHESTER ROAD
BOGNOR REGIS
30 sq m Contributing

Date feb. 2015
File 30 sq m.SRC

Designed By PEF
Checked By

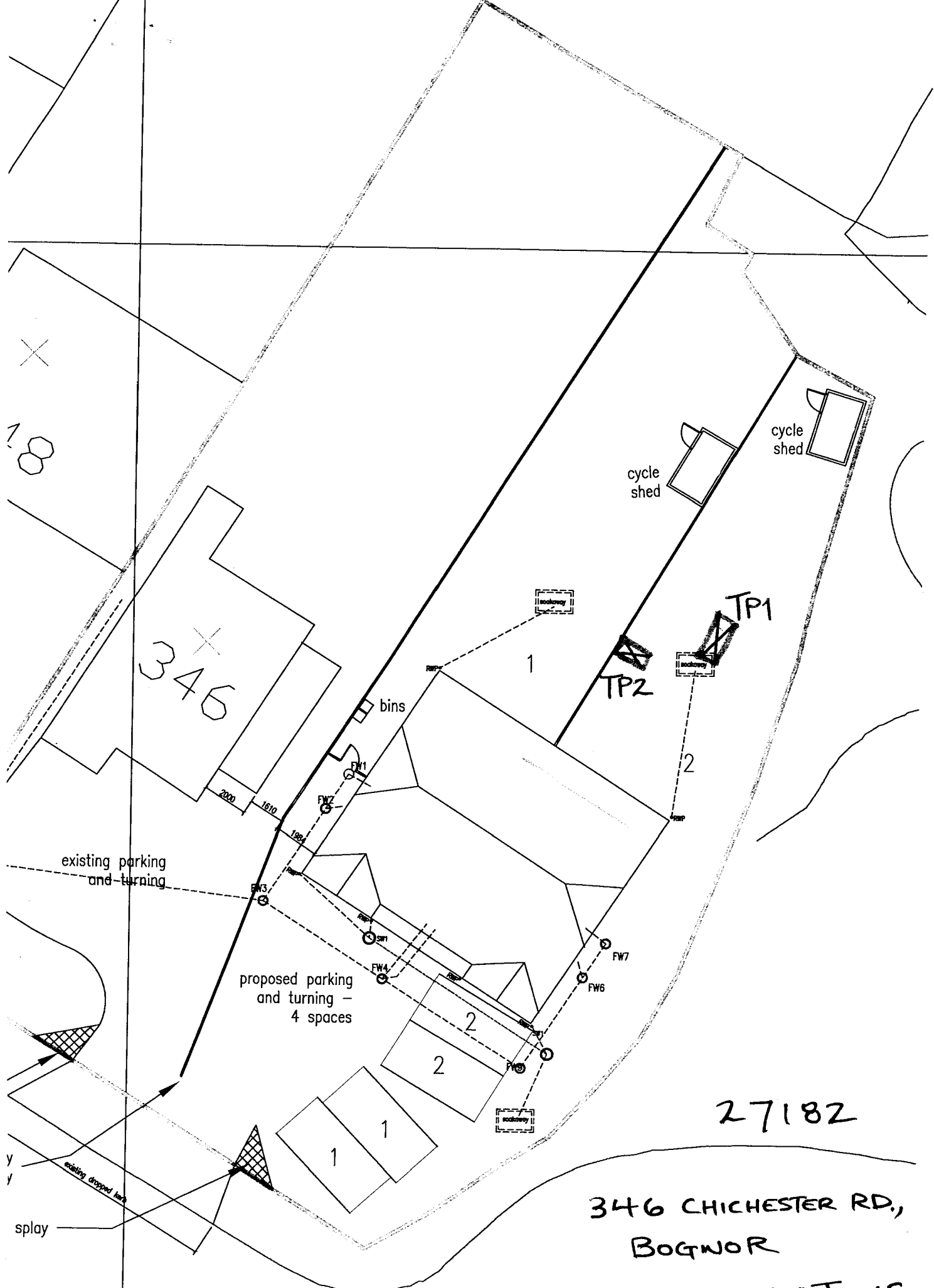


Micro Drainage

Source Control W.11.2

Trench Soakaway Details

Infil Coef - Base (m/hr)	0.005900	Length (m)	2.5
Infil Coef - Sides (m/hr)	0.005900	Invert Level (m)	100.000
Safety Factor	1.5	Cover Level (m)	101.400
Porosity	0.95	Slope (1:x)	0.0
Width (m)	1.5		





Excavation Method
The pit was machine dug using a Yanmar

Dimensions
1.74m deep x 1.75m long x 0.51m wide

Ground Level (mOD)

Client
Mr Boath

Job Number
27182

Location
See Location Plan

Dates
11/02/2015

Engineer
Archibald Shaw

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						Grass over TOPSOIL		
					(0.25)			
					0.25	Medium dense, brown silty sandy CLAY with a little flint gravel.		
					(0.81)			
					1.06	Firm, brown CLAY with lenses of grey clay. Some flint gravel.		
					(0.68)			
					1.74	Complete at 1.74m		

Plan

Remarks

Pit sides stable.
Groundwater ingress at 1.70m.
Soil infiltration rate = 2.13×10^{-6} m/sec.

Scale (approx)

1:20

Logged By

PEF/SD

Figure No.

27182.TP1



Excavation Method

The pit was machine dug
using a Yanmar

Dimensions

1.10m deep x 1.27m long x 0.51m
wide

Ground Level (mOD)

Client

Mr Boath

**Job
Number**
27182

Location

See Location Plan

Dates

11/02/2015

Engineer

Archibald Shaw

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.25)	Grass over TOPSOIL		
					0.25	Medium dense, brown silty sandy CLAY with a little flint gravel.		
					(0.85)			
					1.10	Complete at 1.10m		

Plan

Remarks

Pit sides stable.
No Groundwater ingress .
Soil infiltration rate = 1.64 x 10⁻⁶ m/sec.

Scale (approx)

1:20

Logged By

PEF/SD

Figure No.

27182.TP2

See drawing 20-2

Notes

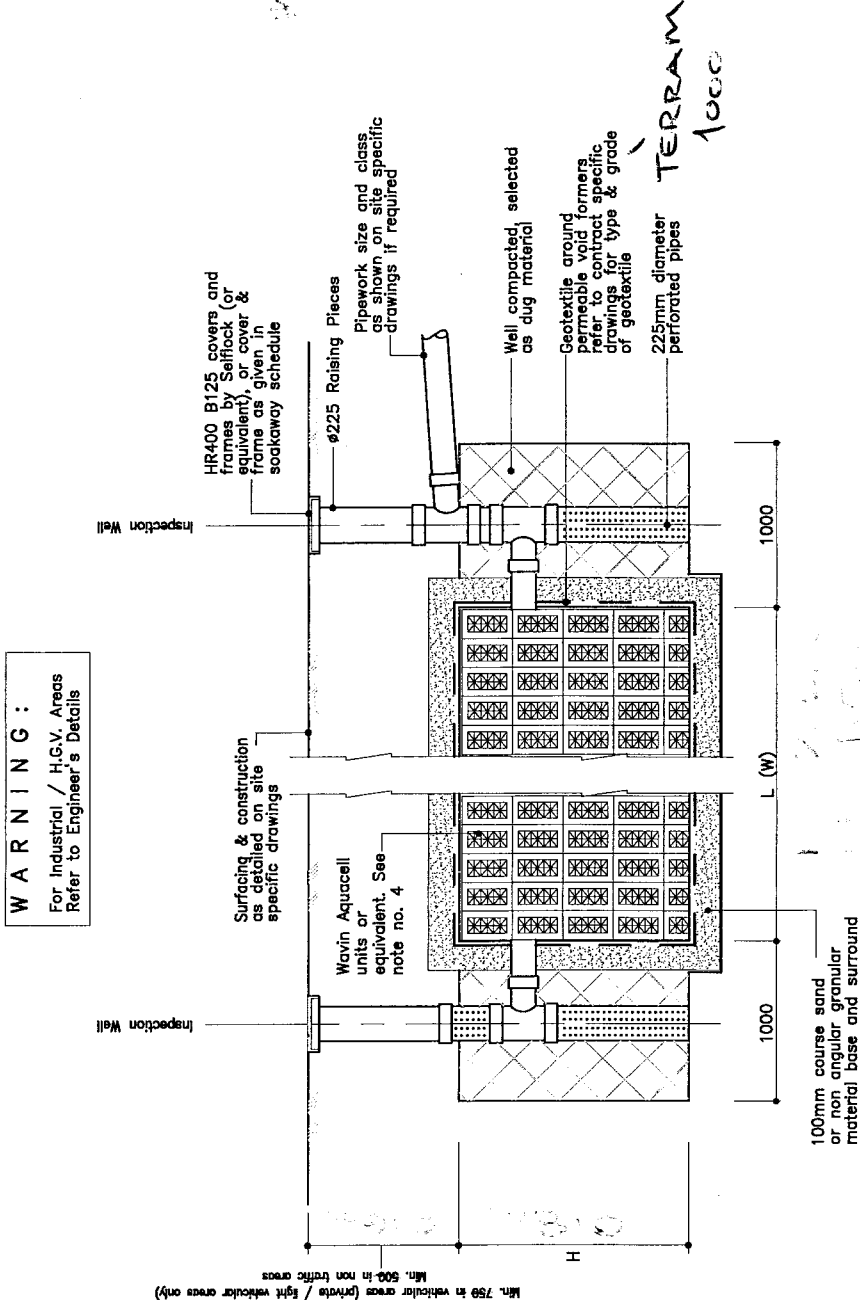
- 1 All dimensions are in millimetres.
- 2 For dimensions of soakaways refer to schedules on contract specific drawings.
- 3 HR400 B125 covers are suitable for the following locations :
 - A) Verges
 - B) Footways / Pedestrian Areas
 - C) Car Parks
- 4 Units shall be Aquacell by Wavin, or equivalent contact wavin tel : 01249 766600
 - Trafficked areas to a - Aquacell Core (Blue Units) total depth of 4.1m
 - Trafficked areas - Aquacell Plus (Light Blue Units) 4.1 to 4.8m total depth
 - Non - trafficked areas/ - Aquacell Eco (Black Units) landscaped areas up to a total depth of 1.5m
 - Non - trafficked areas/ - Aquacell Core (Blue Units) landscaped areas 1.5 to 4.3m total depth
- 5 Units shall be laid fully in accordance with manufacturers instructions
- 6 All details shall otherwise be in accordance with The Department of Transport Specification For Highway Works, 7th Edition.
- 7 Prior to acceptance, the contractor shall submit to the engineer supporting calculations as to the load carrying capacity of the storage units, and the predicted long term fill settlement under dead and live load.

C	NOTE No. 4 UPDATED.	22-08-11
B	NOTE No. 7 ADDED.	03-12-09
A	NOTE No. 4 UPDATED.	16-05-05

REV	DESCRIPTION	DATE
-----	-------------	------

Archibald Shaw
Consulting Civil & Structural Engineers
One Little London Chichester West Sussex PO19 1PR
Telephone: 01243 798471 Facsimile: 01243 779346
mailto:info@archibaldshaw.co.uk www.archibaldshaw.co.uk

PROJECT	Standard Detail High Storage Soakaway	SA/1A/12
DRAWN BY	CHECKED BY	DESIGNED BY
R.J.L	PEF	R.J.L
SCALE	DATE	
N.T.S.	MAY 03	
STD NO.	REVISION	
STD.01.63		C

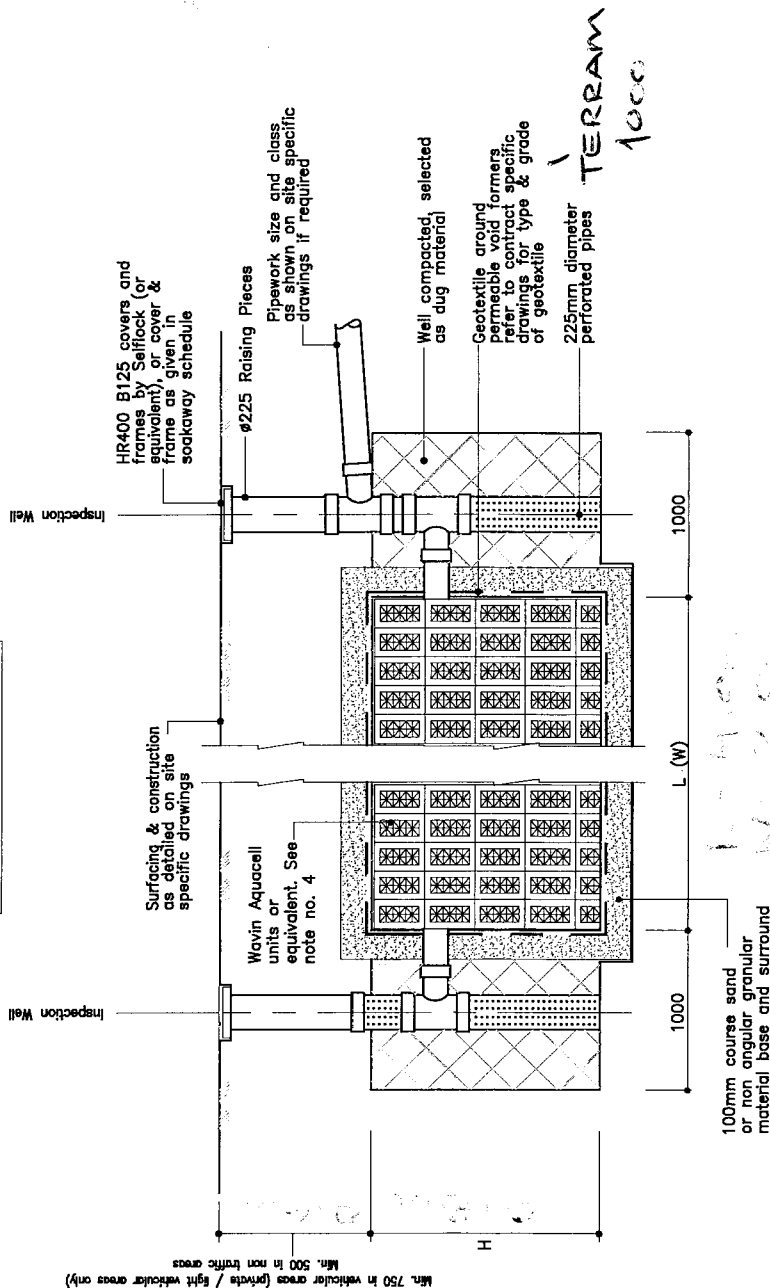


Typical Section

Notes

- 1 All dimensions are in millimetres.
- 2 For dimensions of soakaways refer to schedules on contract specific drawings.
- 3 HR400 B125 covers are suitable for the following locations :
 - A) Verges
 - B) Footways / Pedestrian Areas
 - C) Car Parks
- 4 Units shall be Aquacell by Wavin, or equivalent contact wavin tel : 01249 766600
 - A) Trafficked areas to a total depth of 4.1m
 - Aquacell Core (Blue Units)
 - B) Trafficked areas 4.1 to 4.8m total depth
 - Aquacell Plus (Light Blue Units)
 - C) Non - trafficked areas/ landscaped areas up to a total depth of 1.5m
 - Aquacell Eco (Black Units)
 - D) Non - trafficked areas/ landscaped areas 1.5 to 4.3m total depth
 - Aquacell Core (Blue Units)
- 5 Units shall be laid fully in accordance with manufacturers instructions
- 6 All details shall otherwise be in accordance with The Department of Transport's Specification For Highway Works, 7th Edition.
- 7 Prior to acceptance, the contractor shall submit to the engineer supporting calculations as to the load carrying capacity of the storage units, and the predicted long term fill settlement under dead and live load.

WARNING :
For Industrial / H.G.V. Areas
Refer to Engineer's Details



Typical Section

REV	DESCRIPTION	DATE
C	NOTE No. 4 UPDATED.	22-08-11
B	NOTE No. 7 ADDED.	03-12-09
A	NOTE No. 4 UPDATED.	16-05-05

Archibald Shaw
Consulting Civil & Structural Engineers
One Little London Chichester West Sussex PO19 1PP
Telephone 01243 788471 Facsimile 01243 770346
m.s@archibaldshaw.co.uk www.archibaldshaw.co.uk

PROJECT	Standard Detail High Storage Soakaway
DRAWN BY	RLL
CHECKED BY	PEF
DESIGNED BY	RLL
SCALE	N.T.S.
DATE	MAY 03
STD NO.	STD.01.63
REVISION	C

