

Rushby Brewster

RUSHBY BREWSTER
CONSULTING CIVIL & STRUCTURAL ENGINEERS

DRAINAGE AND SUDS ASSESSMENT

FOR

**Dwellings
43/45 Barnham Road
Barnham
West Sussex**

Client:
G P Norgate
c/o Architects

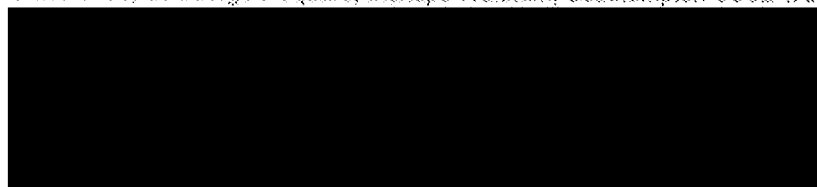
Architect:
Harrington Design + Bloomfield Architects
6 The Old Flour Mill
Queen Street
Emsworth
Hampshire
PO10 7BT

Issue		A	B
Issued By	Steve Brewster		
Date	February 2012		
Purpose	Planning		
Approved By	AWR		

Project No. RBB 146

The Town House, St George's Square, Bishops Waltham, Southampton SO32 1AF

10/02/2012



Drainage Statement

43/45 Barnham Road, Barnham

DRAINAGE STATEMENT

1. Introduction

It is understood that this particular site requires a drainage strategy in order to fulfill Planning Conditions. To this end, enclosed are layouts and calculations to substantiate both foul and storm-water proposals.

2. Strategy

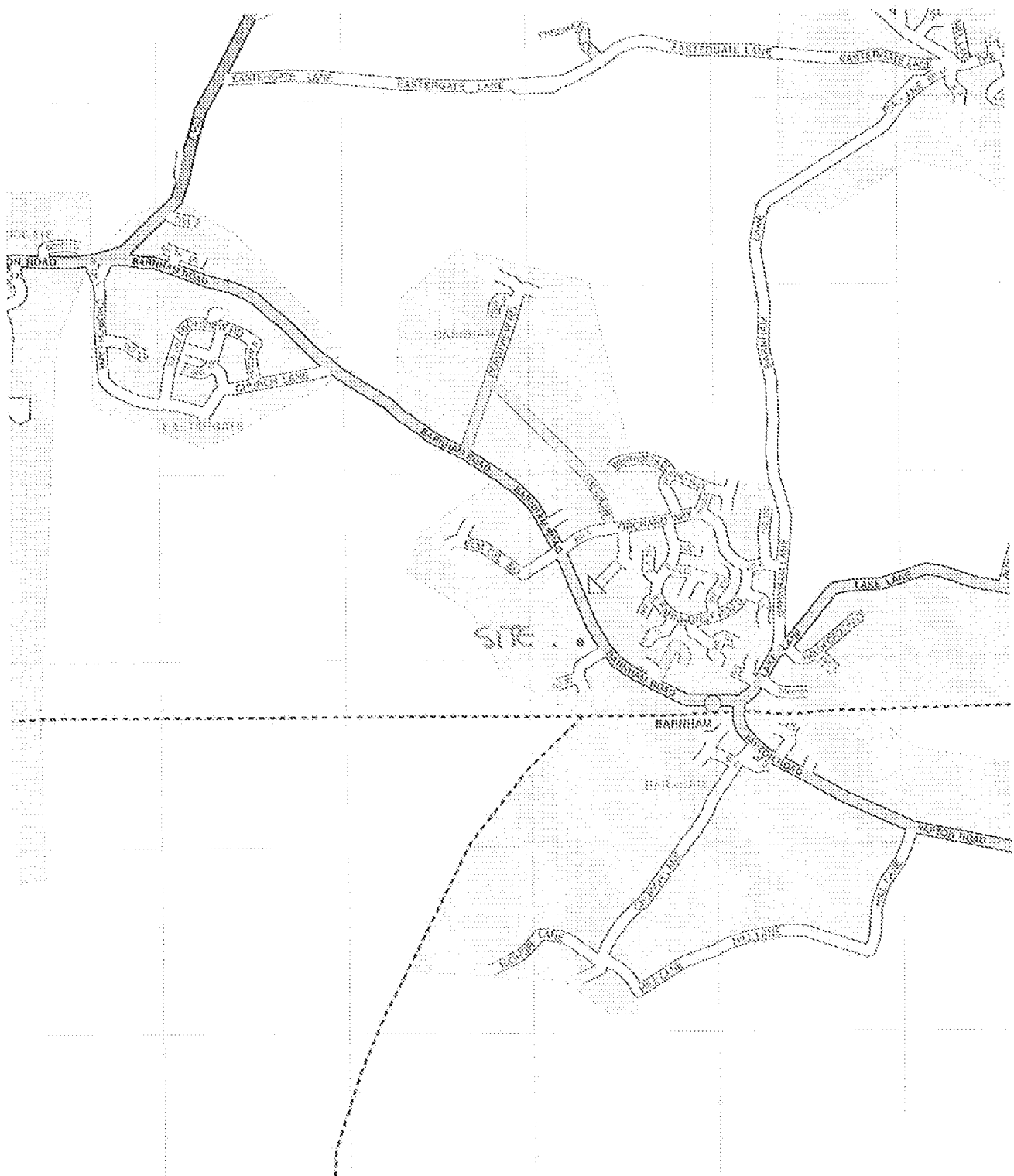
It is the intention to reduce the impermeable area of the existing site by selection of appropriate surfacing materials (e.g. porous pavements) and to disperse the roof drainage to ground via soakaways. The foul flow regime has been demonstrated to be extremely low and, in addition, it is likely that existing storm-water connects either by design or default to the foul system. These connections will all be capped.

3. Information

Data provided herein is as follows:-

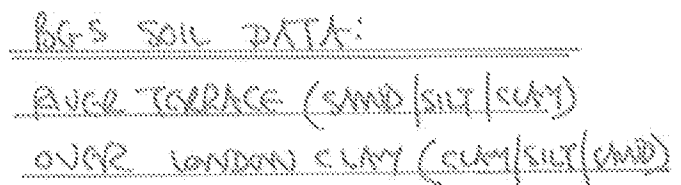
- Surface area considerations
- Porosity review and soakaway designs
- Soil data (initial)
- Site layout/strategy with appropriate notations

Soil Data

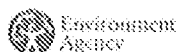


To see all the details that are visible on the screen, use the Print link next to the map.

03/02/2012



Environment Agency Data



Enter a postcode or place name:

Barnham, West Sussex

Other topics for this area...

Risk of Flooding from Rivers and Sea

Risk of Flooding from Rivers and Sea

Map legend

Click on the map to see what is the Risk of Flooding at a particular location.

☒ Flood Maps

☐ Flooding from rivers or sea without defences

☐ Extent of extreme flood

☐ Flood defences

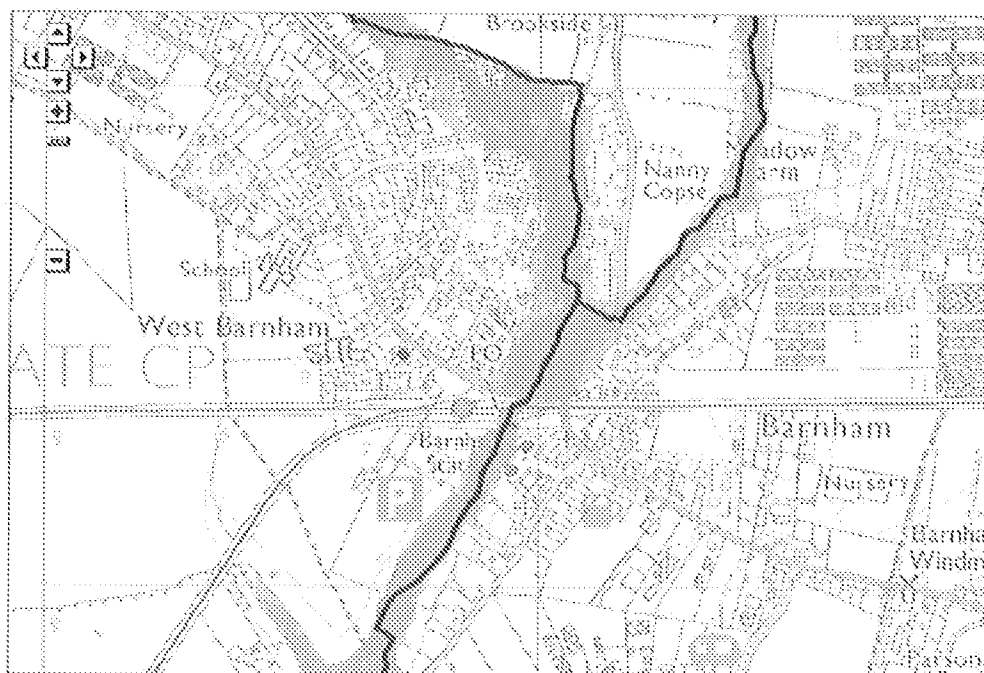
☐ Areas benefiting from flood defences

☐ Main rivers

Barnham, West Sussex at scale 1:10,000

Data search

Text only version



© Environment Agency copyright and database rights 2012. © Ordnance Survey data copyright. All rights reserved. Environment Agency, 10/02/2012.
Contains Royal Mail data © Royal Mail copyright and database right 2012.
This service is designed to inform members of the public, in line with our terms and conditions. For business or commercial use, please contact us.

Flood Map – Information Warnings

Manchester Ship Canal

Flood Mapping of the Manchester Ship Canal in Trafford, Salford and Warrington may be subject to revision as a result of representations. For further information please contact the Environment Agency on 03703 506 505.

Users of the Flood Zone Map should be aware that we have received a Judicial review challenge to the mapping of the Manchester Ship Canal at Trafford, Salford and Warrington on the ground that the preparation of the map is flawed in respect of our consideration of the role of the sluice gates in preventing flooding.

We are defending the challenge and believe and are advised that it is ill founded. Nevertheless, pending determination of the challenge, users of the map need to consider whether the existence of the Challenge, and the basis of it, affects the weight they judge may be given to the zoning of the Manchester Ship Canal within the Flood Map.

More about flooding:

Understanding the flood map

A more detailed explanation to help you understand the flood map shown above.

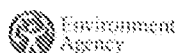
Current flood warnings

We provide flood warnings online 24 hours a day. Find out the current flood warning status in your local area.

Flood map – your questions answered

Answers to commonly asked questions about the flood map.

creating a better place



Interactive Maps

Flood Risk for X:495693, Y:104507

Be prepared

We do not have an assessment of flood risk for the area which you have selected. This may be because the area selected is outside the floodplain, it could also be because we have been unable to assess the likelihood of flooding for this area because we did not have sufficient information (this applies to fewer than 1% of the properties in England and Wales in the flood outline).



For a fuller explanation of flood likelihood, [click here](#).

Be aware

Our maps only cover flooding from rivers and the sea. Flooding can occur at any time and in any place from sources such as rising ground water levels, burst water mains, road drains, run-off from hillsides, sewer overflows etc.

[Click here](#) to find out more.

To find out how to be prepared for all types of flooding go to our [Floodline](#) pages or call Floodline on tel: 0545 986 1188.

The information on the likelihood of flooding is not intended to be used by people applying for planning permission for new developments. To find out how the Flood Map can help when planning a new development, [click here](#).

creating a better place

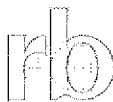
Follow us: [Facebook](#) [Twitter](#) [Email](#) [LinkedIn](#) [RSS feeds](#)

Author: The Environment Agency | WATER.SUPPORT@environment-agency.gov.uk

Last updated: 28th March 2012

[Privacy policy](#) | [Terms and conditions](#) | [Accessibility](#) | [About us](#) | [Advertise](#) | [Contact us](#) | [Feedback](#) | [Help](#)
© Environment Agency 2012

Calculations



The Town House
St George's Square
Bishops Waltham
Southampton SO32 1AF

CALCULATIONS

RUSHBY BREWSTER

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Job Title	43/45 BARNHAM RD BARNHAM	Job No.	PBB 146	Sht. No.	ST-1
Element	STORM DRAINAGE	Prepared	EB	Date	FEB 12
		Checked		Date	

EXISTING IMP AREA - $1381 m^2$

PROPOSED - " - " - ROOFS - $161 + 159 + 85 + 25 = 430$

H/STANDING - $374 + 11 + 13 = 398$

$828 m^2$

($< EXG$)

REFER TO SHTS ST-2/3 FOR PRE & POST
DEVELOPMENT RUN OFF FIGURES.

$$\begin{aligned} 1/1\text{yr} &= 2\frac{2}{3}\% \\ 1/100\text{yr} &= 60\frac{1}{2}\% \\ 5\text{hr vol} &= 99\frac{1}{2}\% \end{aligned}$$

		1 in 1 year					1 in 100 year				
Storm	M5 Rainfall mm	ZZ	Rainfall mm	Intensity mm/hr	SW Runoff l/s	Runoff vol. m ³	ZZ	Rainfall mm	Intensity mm/hr	SW Runoff l/s	Runoff vol. m ³
Duration											
5 min	7.1	1.02	7.2	86.9	33.34	10.00	1.84	13.1	156.8	60.14	18.04
10 min	10.1	1.03	10.4	62.4	23.94	14.37	1.91	19.3	115.7	44.40	26.64
15 min	12.3	1.03	12.7	50.7	19.44	17.50	1.95	24.0	95.9	36.80	33.12
30 min	15.7	1.03	16.2	32.3	12.41	22.33	2.00	31.4	62.8	24.09	43.36
1 hr	20.0	1.03	20.6	20.6	7.90	28.45	2.03	40.6	40.6	15.57	56.07
2 hrs	24.5	1.03	25.2	12.6	4.84	34.85	2.01	49.2	24.6	9.45	58.01
4 hrs	29.9	1.03	30.8	7.7	2.95	42.53	1.97	58.9	14.7	5.65	81.35
6 hrs	33.8	1.03	34.8	5.8	2.23	48.08	1.94	65.6	10.9	4.19	90.55
10 hrs	38.9	1.02	39.7	4.0	1.52	54.80	1.90	73.9	7.4	2.84	102.07
24 hrs	49.6	1.02	50.6	2.1	0.81	69.87	1.81	89.8	3.7	1.43	123.98

035

C:\Programms and Settings\Steve Gray\size\Desktop\Run Off Spreadsheets\Pre-Development design rainfall 0.35.xls

1/1yr +30%=	26.0	4	33.3
1/100yr+30%=	46.8	4	60.14
6hr Val +30%=	70.6	4	90.53

Impermeable Area = 823 m²

Storm	M5 Rainfall mm	1 in 1 year					1 in 100 year				
		Z2	Rainfall mm	Intensity mm/hr	SW Runoff l/s	Runoff vol. m ³	Z2	Rainfall mm	Intensity mm/hr	SW Runoff l/s	Runoff vol. m ³
Duration											
5 min	7.1	1.02	7.2	86.9	19.99	6.00	1.84	13.1	156.8	36.06	10.82
10 min	10.1	1.03	10.4	62.4	14.36	8.61	1.91	19.3	115.7	26.62	15.97
15 min	12.3	1.03	12.7	50.7	11.66	10.49	1.95	24.0	95.9	22.07	19.86
30 min	15.7	1.03	16.2	32.3	7.44	13.39	2.00	31.4	62.8	14.44	26.00
1 hr	20.0	1.03	20.6	20.6	4.74	17.06	2.03	40.6	40.6	9.34	33.62
2 hrs	24.5	1.03	25.2	12.6	2.90	20.89	2.01	49.2	24.6	5.66	40.77
4 hrs	29.9	1.03	30.8	7.7	1.77	25.50	1.97	58.9	14.7	3.39	48.77
6 hrs	33.8	1.03	34.8	5.8	1.33	28.83	1.94	65.6	10.9	2.51	54.29
10 hrs	38.9	1.02	39.7	4.0	0.91	32.85	1.90	73.9	7.4	1.70	61.20
24 hrs	49.6	1.02	50.6	2.1	0.48	41.89	1.81	89.8	3.7	0.86	74.33

Ratio of 60 minute to 2 day rainfalls for 5 year return period $r =$

M5 rainfalls are calculated from Table 1 BRE Digest 365 using Factor Z1

the best development & existing
p to 800000

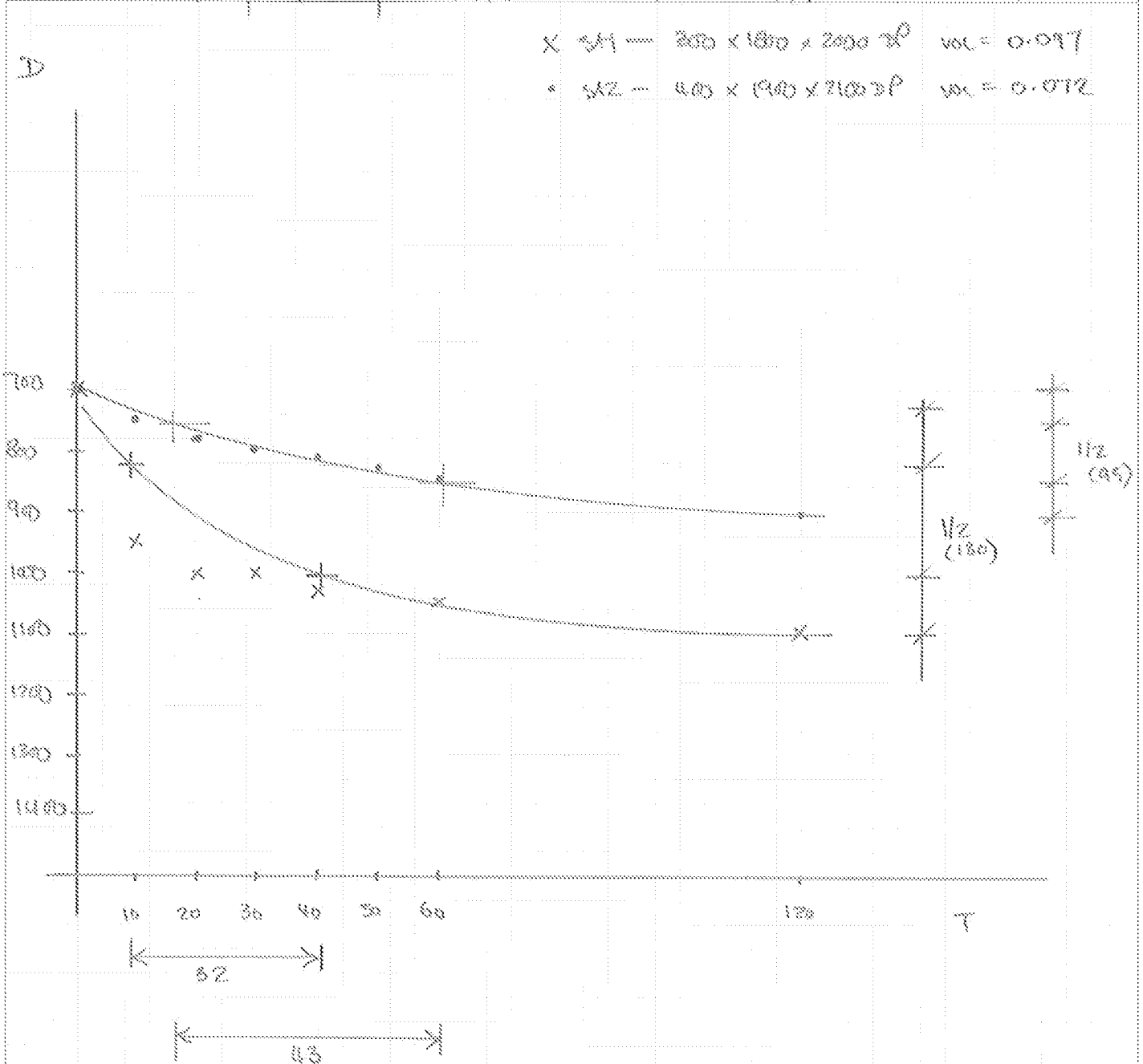


CALCULATIONS

RUSHBY BREWSTER

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

Job Title	U3/45 BURNHAM ROAD	Job No.	REB1116	Shl. No.	S/K 1
Element	SKIN/IN/OUT TESTS / RESULTS.	Prepared	SB	Date	APR 12
		Checked		Date	



$$1) - \text{AREA} = (1.8 \times 0.3) + (1.1 \times 4.2) = 5.16$$

$$f = \frac{0.097}{5.16 \times 32 \times 60} = 9.8 \times 10^{-6}$$

$$2) - \text{AREA} = (1.9 \times 0.4) + (1.3 \times 4.6) = 6.7$$

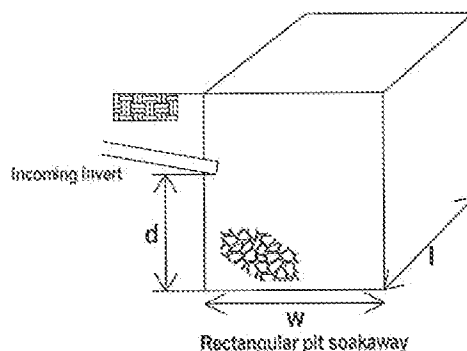
$$f = \frac{0.072}{6.7 \times 48 \times 60} = 4.3 \times 10^{-6} \quad (*)$$

USE FOR DESIGN

Project		43/45 Barnham Road Barnham		Job no.	
Calcs for		Soakaway (1/100 yr - Block A)		Start page no./Revision	
Calcs by		SB		S/A - 2	
Calcs date		April 2012		Approved by	
Checked by				Approved date	
Checked date					

SOAKAWAY DESIGN -- BRE DIGEST 365

TEDDS calculation version 1.0.01



Rectangular Pit Design

Pit length	$l = 4000 \text{ mm}$	Pit width	$w = 3000 \text{ mm}$
Pit depth below invert	$d = 1200 \text{ mm}$	Free volume	$V_{\text{free}} = 95.0 \%$
Location of soakaway	England and Wales	Return period	<u>100 years</u>
Ratio of 60 minute to 2 day rainfalls of 5 year return period (BRE digest 365 - fig 1)		$r = 0.35$	
Impermeable area	$A = 140.0 \text{ m}^2$	Soil infiltration rate	$f = 0.0000043 \text{ m/s}$
Surface area of soakaway to 50% storage depth			

$$A_{50} = 2 \times (l + w) \times d / 2 = 8.400 \text{ m}^2$$

$$\text{Outflow factor} \quad AF = A_{50} \times f = 36.1 \times 10^{-6} \text{ m}^3/\text{s}$$

M5 rainfalls are calculated from table 1 BRE digest 365 using Factor Z1

Duration	M5 rainfalls	Growth factor Z2	100 year rainfall	Inflow	Outflow	Storage required
5 mins	7.1 mm	1.84	13.1 mm	1.8 m ³	0.0 m ³	1.8 m ³
10 mins	10.1 mm	1.91	19.4 mm	2.7 m ³	0.0 m ³	2.7 m ³
15 mins	12.3 mm	1.95	24.0 mm	3.4 m ³	0.0 m ³	3.3 m ³
30 mins	15.7 mm	2.00	31.4 mm	4.4 m ³	0.1 m ³	4.3 m ³
1 hour	20.0 mm	2.03	40.6 mm	5.7 m ³	0.1 m ³	5.6 m ³
2 hours	24.5 mm	2.01	49.2 mm	6.9 m ³	0.3 m ³	6.6 m ³
4 hours	29.9 mm	1.97	59.0 mm	8.3 m ³	0.5 m ³	7.7 m ³
6 hours	33.8 mm	1.94	65.6 mm	9.2 m ³	0.8 m ³	8.4 m ³
10 hours	38.9 mm	1.90	73.9 mm	10.3 m ³	1.3 m ³	9.0 m ³
24 hours	49.6 mm	1.81	89.9 mm	12.6 m ³	3.1 m ³	9.5 m ³

$$\text{Required storage volume} \quad S_{\text{reqd}} = 9.5 \text{ m}^3 + 30\% = 12.4$$

$$\text{Soakaway storage volume} \quad S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 13.7 \text{ m}^3 > 12.4 \text{ m}^3$$

Soakaway storage volume- OK

Time for emptying soakaway to half volume

$$T_{50} = S_{\text{reqd}} \times 0.5 / (A_{50} \times f) = 36 \text{ hr } 24 \text{ min } 52 \text{ s}$$

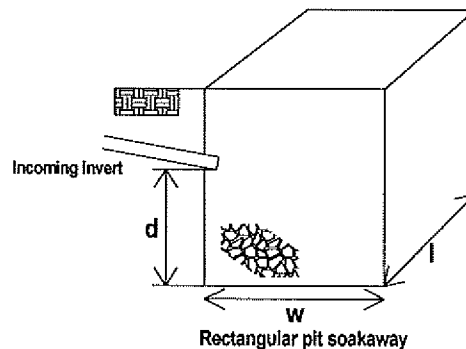
Soakaway discharge time inadequate

fig 2. 1/100 yr.

Project 43/45 Barnham Road Barnham				Job no. RBB 146	
Calcs for Soakaway (1/100 yr - Block B)				Start page no./Revision S/A - 3	
Calcs by SB	Calcs date April 2012	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN – BRE DIGEST 365

TEDDS calculation version 1.0.01



Rectangular Pit Design

Pit length	$l = 5000 \text{ mm}$	Pit width	$w = 3500 \text{ mm}$
Pit depth below invert	$d = 1200 \text{ mm}$	Free volume	$V_{\text{free}} = 95.0 \%$
Location of soakaway	England and Wales	Return period	100 years
Ratio of 60 minute to 2 day rainfalls of 5 year return period (BRE digest 365 - fig 1)		$r = 0.35$	
Impermeable area	$A = 210.0 \text{ m}^2$	Soil infiltration rate	$f = 0.0000043 \text{ m/s}$
Surface area of soakaway to 50% storage depth			

$$A_{s50} = 2 \times (l + w) \times d / 2 = 10.200 \text{ m}^2$$

Outflow factor $AF = A_{s50} \times f = 43.9 \times 10^{-6} \text{ m}^3/\text{s}$

M5 rainfalls are calculated from table 1 BRE digest 365 using Factor Z1

Duration	M5 rainfalls	Growth factor Z2	100 year rainfall	Inflow	Outflow	Storage required
5 mins	7.1 mm	1.84	13.1 mm	2.8 m ³	0.0 m ³	2.7 m ³
10 mins	10.1 mm	1.91	19.4 mm	4.1 m ³	0.0 m ³	4.0 m ³
15 mins	12.3 mm	1.95	24.0 mm	5.0 m ³	0.0 m ³	5.0 m ³
30 mins	15.7 mm	2.00	31.4 mm	6.6 m ³	0.1 m ³	6.5 m ³
1 hour	20.0 mm	2.03	40.6 mm	8.5 m ³	0.2 m ³	8.4 m ³
2 hours	24.5 mm	2.01	49.2 mm	10.3 m ³	0.3 m ³	10.0 m ³
4 hours	29.9 mm	1.97	59.0 mm	12.4 m ³	0.6 m ³	11.8 m ³
6 hours	33.8 mm	1.94	65.6 mm	13.8 m ³	0.9 m ³	12.8 m ³
10 hours	38.9 mm	1.90	73.9 mm	15.5 m ³	1.6 m ³	13.9 m ³
24 hours	49.6 mm	1.81	89.9 mm	18.9 m ³	3.8 m ³	15.1 m ³

Required storage volume $S_{\text{reqd}} = 15.1 \text{ m}^3$

Soakaway storage volume $S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 20.0 \text{ m}^3$

Soakaway storage volume- OK

Time for emptying soakaway to half volume

$$T_{s50} = S_{\text{reqd}} \times 0.5 / (A_{s50} \times f) = 47 \text{ hr } 48 \text{ min } 22 \text{ s}$$

Soakaway discharge time inadequate