

PROPOSED DEVELOPMENT AT CROESNEWYDD RD. Wrexham

Drainage Design
June 2016

PROPOSED DEVELOPMENT AT CROESNEWYDD RD. Wrexham

Drainage Design
June 2016

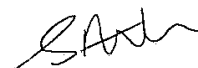
Client: First Choice Housing
Association
19 Stanwell Road
Penarth
Vale of Glamorgan
CF64 2EZ

Report Status: **PLANNING**

Written By: **Giovanni Lunardi**



Reviewed By: **Jonathan Allen**



Approved By: -

Date: June 2016

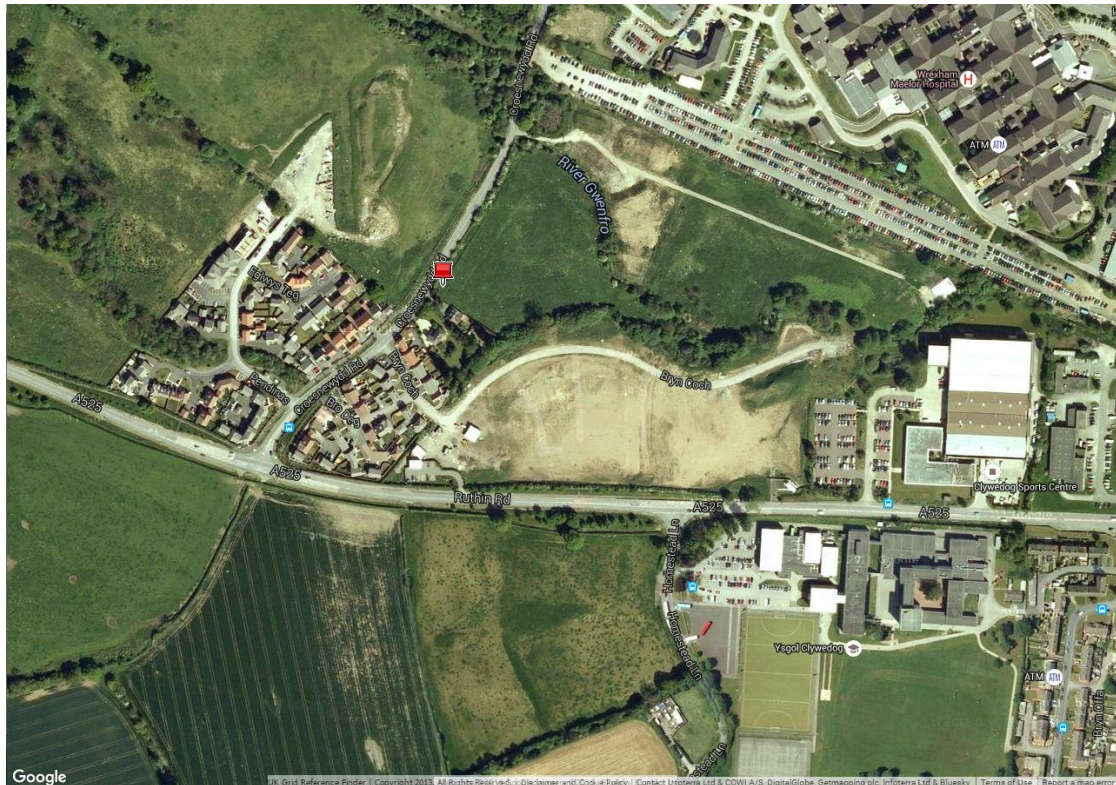
Contents	Page
1 INTRODUCTION	1
2 PERCOLATION TESTS	2
3 DESIGN CRITERIA	3
4 DESIGN	4

Appendices

- A** Site Location Plan
- B** Surface Water / Foul General Arrangement
- C** Greenfield Run-off Calculations
- D** Surface Water Attenuation Calculations
- E** Percolation Test Results
- F** Flood Routing

1. INTRODUCTION

The proposal is contained within a site area of approximately 12,230 m² upon a flat site located adjacent to river Gwenfro and east to Croesnewydd Road, at National Grid Reference SJ 31914 50246 (**Appendix A**).



The development proposal involves the construction of a domestic housing estate comprising 16 No. dwellings and associated estate road in a limited area within the site of approximately 3,100m².

The purpose of these calculations and accompanying details are to produce a drainage layout that complies with the relevant legislation of TAN 15, the Code for Sustainable Homes 2008 and the Sewers for adoption 7th Edition.

2. PERCOLATION TESTS

Porosity tests carried out by the Agent (**Appendix E**) indicate that the site is suitable for the use of an infiltration system such as soakaways. For design purpose, an average infiltration value found on site, among the provided soakaway positions, has been used.

3. DESIGN CRITERIA

The system is to be designed to the following criteria:

- The 1 in 30 year event including 10% climate change to be accommodated below ground
- The 1 in 100 year event + 30% for climate change to be accommodated below and above ground.
- No surface water from the development will leave the site up to the threshold event

The following design criteria will apply for the surface water run off and foul discharge design of the site:

- Approved Document H, Building Regulations
- Sewers for Adoption 7th Edition
- TAN 15
- BRE Digest 365

4. DESIGN

TAN 15 requires the design of surface water to be attenuated and stored below ground to a 1 in 30 year event. In addition, a 1 in 100 year event plus an allowance for climate change (30%) must be contained on site without posing an inherent threat to nearby inhabitants.

The surface water run-off, will be attenuated and permeate underground through trench soakaways, as shown on drawing 15223/501 in **APPENDIX B**.

As the proposed access road will be offered for adoption, the domestic runoff for the 1 in 30 year event will require separate attenuation from the highway runoff. It has been designed so that a 1 in 30 year event will be attenuated within the area marked as open verge and grass/planting respectively. The above ground storage (swales) will have capacity for storing the additional run off to a 1 in 100 year event + 30% (climate change).

Surface water drainage

Enclosed (**APPENDIX C**) are the design calculations for the soakaway systems. In accordance with Natural Resources Wales guidelines, the calculations have been completed assuming a threshold event of 1 in 100 year + 30% for climate change.

It is proposed to attenuate the surface water run-off in underground trench soakaways.

Summary of **Appendix C** calculations:

Highway Attenuation

Area 1: Effective Area = 301.8 m²

Percolation Factor = 1.70E-04 m/s

Storage Requirement 1 in 30yr event = 2.94 m³

Storage Requirement 1 in 100yr event + 30% (c.c) = 7.66 m³

Proposed attenuation method – trench soakaway + swale

Storage provided within soakaway = 3.60 m^3

Paths and Parking area Attenuation

Area 2: Effective Area = 1354.7 m^2

Percolation Factor = $1.70\text{E-}04 \text{ m/s}$

Storage Requirement 1 in 30yr event = 8.68 m^3

Storage Requirement 1 in 100yr event + 30% (c.c) = 20.77 m^3

Proposed attenuation method – trench soakaway + swale

Storage provided within soakaway = 9 m^3

Domestic Attenuation

Area 3: Effective Area = 552.7 m^2

Percolation Factor = $1.70\text{E-}04 \text{ m/s}$

Storage Requirement 1 in 30yr event = 4.70 m^3

Storage Requirement 1 in 100yr event + 30% (c.c) = 11.21 m^3

Proposed attenuation method – trench soakaway + swale

Storage provided within soakaway = 4.95 m^3

Dry Swale: - 450mm deep over granular storage zone.
(30% void ratio within granular material)

Total storage provided = 72.0 m^3

Total storage required: 1 in 100yr event + 30% allowance for climate change
= 39.64 m^3

Total storage provided: = 89.55 m^3

These proposed drainage layout is illustrated upon drawing 15223/501 (**APPENDIX B**).

The design calculations for the attenuated storage of the development run-off are located within **APPENDIX D**

Extreme Event

Surface water run-off for the extreme event shall flow away from the buildings within the site, with finished floor levels of the dwellings being min 150mm above the surrounding ground profiles. This ensures above ground flow routes direct the run-off towards the existing ditches/rivers surrounding the site mimicking original flow paths. Please refer to drawing no. 15223/500 for existing flow routes and proposed flow routes (**APPENDIX F**).

Run-off Assessment

Pre and post development peak flow run-off rates have been calculated using the 'Flood estimation for small catchments' (1994) and the 'Flood Studies Report' (1978).

Storm Event	Pre Dev Run off	Post Dev Run off
1 in 1 year	0.27 L/s	0.59 L/s
1 in 100 year	0.69 L/s	1.51 L/s

Please refer to the attached Run-off calculations. (**APPENDIX C**)

APPENDICES

APPENDIX A – SITE LOCATION PLAN

APPENDIX B – SURFACE WATER GENERAL ARRANGEMENT



MANHOLE SCHEDULE							
MANHOLE REF.	COVER LEVEL	INVERT LEVEL	CHAMBER TYPE	COVER TYPE	CHAMBER SIZE	CHAMBER DEPTH	DOWNSIDE PIPE SIZE
SURFACE WATER							
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20
21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25
26	26	26	26	26	26	26	26
27	27	27	27	27	27	27	27
28	28	28	28	28	28	28	28
29	29	29	29	29	29	29	29
30	30	30	30	30	30	30	30
31	31	31	31	31	31	31	31
32	32	32	32	32	32	32	32
33	33	33	33	33	33	33	33
34	34	34	34	34	34	34	34
35	35	35	35	35	35	35	35
36	36	36	36	36	36	36	36
37	37	37	37	37	37	37	37
38	38	38	38	38	38	38	38
39	39	39	39	39	39	39	39
40	40	40	40	40	40	40	40
41	41	41	41	41	41	41	41
42	42	42	42	42	42	42	42
43	43	43	43	43	43	43	43
44	44	44	44	44	44	44	44
45	45	45	45	45	45	45	45
46	46	46	46	46	46	46	46
47	47	47	47	47	47	47	47
48	48	48	48	48	48	48	48
49	49	49	49	49	49	49	49
50	50	50	50	50	50	50	50
51	51	51	51	51	51	51	51
52	52	52	52	52	52	52	52
53	53	53	53	53	53	53	53
54	54	54	54	54	54	54	54
55	55	55	55	55	55	55	55
56	56	56	56	56	56	56	56
57	57	57	57	57	57	57	57
58	58	58	58	58	58	58	58
59	59	59	59	59	59	59	59
60	60	60	60	60	60	60	60
61	61	61	61	61	61	61	61
62	62	62	62	62	62	62	62
63	63	63	63	63	63	63	63
64	64	64	64	64	64	64	64
65	65	65	65	65	65	65	65
66	66	66	66	66	66	66	66
67	67	67	67	67	67	67	67
68	68	68	68	68	68	68	68
69	69	69	69	69	69	69	69
70	70	70	70	70	70	70	70
71	71	71	71	71	71	71	71
72	72	72	72	72	72	72	72
73	73	73	73	73	73	73	73
74	74	74	74	74	74	74	74
75	75	75	75	75	75	75	75
76	76	76	76	76	76	76	76
77	77	77	77	77	77	77	77
78	78	78	78	78	78	78	78
79	79	79	79	79	79	79	79
80	80	80	80	80	80	80	80
81	81	81	81	81	81	81	81
82	82	82	82	82	82	82	82
83	83	83	83	83	83	83	83
84	84	84	84	84	84	84	84
85	85	85	85	85	85	85	85
86	86	86	86	86	86	86	86
87	87	87	87	87	87	87	87
88	88	88	88	88	88	88	88
89	89	89	89	89	89	89	89
90	90	90	90	90	90	90	90
91	91	91	91	91	91	91	91
92	92	92	92	92	92	92	92
93	93	93	93	93	93	93	93
94	94	94	94	94	94	94	94
95	95	95	95	95	95	95	95
96	96	96	96	96	96	96	96
97	97	97	97	97	97	97	97
98	98	98	98	98	98	98	98
99	99	99	99	99	99	99	99
100	100	100	100	100	100	100	100

- GENERAL NOTES
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEER'S AND OTHER SPECIALISTS' DRAWINGS.
 2. PLEASE REFER TO ARCHITECTS DRAWINGS FOR FINAL BUILDING LOCATION
 3. REFER TO DATRYS DRAWING 15223/*** FOR DRAINAGE DETAILS.
 4. ALL DRAINAGE COMPONENTS ARE TO COMPLY WITH CURRENT BRITISH STANDARDS & BUILDING REGULATIONS REQUIREMENTS
 5. AT ALL OUTFALL POINTS TO AN EXISTING NETWORK, THE POSITION AND INVERT LEVEL OF EXISTING DRAINS MUST BE CONFIRMED WELL IN ADVANCE OF THE PROGRAMMED DATE FOR INSTALLING ANY OF THE UPSTREAM DRAINAGE, OR ORDERING ANY MATERIALS IN ORDER TO ALLOW TIME FOR ANY NECESSARY REVISIONS TO THE HYDRAULIC DESIGN.
 6. ALL GRAVITY PVC-U PIPEWORK TO BE TO BS 4560:2000 OR BS EN 1401-1:2009 WHERE RELEVANT UNLESS NOTED OTHERWISE
 7. FINAL LOCATIONS AND DETAILS OF SOIL VENT PIPE, STUB STACKS, RAINWATER DOWN PIPES, GULLYS etc. TO BE CONFIRMED BY REFERENCE TO ARCHITECTS' DRAWINGS
 8. ALL PIPES INTO MH's TO BE SOFFIT TO SOFFIT LVL U.N.O.
 9. ALL NON ADOPTABLE DOMESTIC FOUL AND SURFACE WATER PIPERUNS SHALL CONSIST OF 100mm Ø PIPES LAID AT FALLS BETWEEN 1 IN 40 AND 1 IN 80 U.N.O
 10. ALL CONNECTIONS FROM HIGHWAY GULLIES TO BE 150mm Ø LAID AT FALLS OF BETWEEN 1:20 & 1:100 WITH TYPE S BED & SURROUND TO ALL CONNECTIONS WHERE MIN 1.2m COVER IS ACHIEVED. TYPE Z BED & SURROUND TO ALL OTHER CONNECTIONS.

KEY:

- PROPOSED SURFACE WATER DRAIN & MANHOLE
- RE — PROPOSED RODDING EYE
- RWP — PROPOSED RODDABLE RAIN WATER PIPE

REV	DATE	DESCRIPTION	BY	CHK	APP
REVISIONS					
CLIENT First Choice Housing Association					
PROJECT Croesnewydd Road Wrexham					
TITLE Drainage Layout					
Yr Arhwyd 3-5 Church Street Caernarfon 01286 671027 info@datrys.coop www.datrys.net Telephone 01286 674434 E-mail Internet					
DRAWN	GL	CHECKED	—	PASSED	—
DATE	02.06.16	CLIENT'S REF.			
SCALE	AT A1 1:200	AUTOCAD REF. 15223/501			
DRAWING No. 15223/501					REVISION

FOR INFORMATION

APPENDIX C – GREENFIELD RUN-OFF CALCULATIONS

 Yr Aelwyd 3-5 Church Street Caernarfon Ffon 01286 671027 Ffacs 01286 674434	CALCULATIONS	Job No. 15223	Sheet No. 1	Rev
	Project: Croesnewydd, Wrexham			
	Subject: Greenfield Runoff Calculations	Prepared By	Date	
		GL	01/06/16	
	Checked By	Date		

Peak Greenfield runoff rates for the storm events as shown below are to be calculated using IHR-124 Flood estimation for small catchments

Storm Intensities

1 in 1 year
1 in 100 years

The following equation is to be used:

$$Q_{\text{bar(Rural)}} = 0.00108 (\text{Area})^{0.89} \times (\text{SAAR})^{1.17} \times (\text{Soil})^{2.17}$$

Site Characteristics

SAAR:	800.00
SPR:	0.30
SOIL:	2.00
$Q_{\text{bar}} = 1.08 \times (50/100)^{0.89} \times \text{SAAR}^{1.17} \times \text{SPR}^{2.17}$	
=	106.53 L/S/50 Ha
=	2.13 L/S/Ha

With inclusion for climate change : 30%

$$Q_{\text{bar}} = 2.77 \text{ L/S/Ha}$$

Peak Runoff Pre Development

Greenfield:	3278.3	Area x 0.35	0.11	Ha
Hardcore:	0	Area x 0.7	0.00	Ha
Roofs/ Hardstanding	0	Area x 1.0	0.00	Ha

Total effective area			0.11 Ha
----------------------	--	--	---------

For 1 in 1 :	$0.85 \times (Q_{\text{bar}} \text{ w.c.c x area})$	$0.85 \times (10.93 \times 0.03)$	0.27 L/s
For 1 in 100:	$2.18 \times (Q_{\text{bar}} \text{ w.c.c x area})$	$2.18 \times (10.93 \times 0.03)$	0.69 L/s

 DATRY'S Yr Aelwyd 3-5 Church Street Caernarfon Ffon 01286 671027 Ffacs 01286 674434	CALCULATIONS	Job No. 15223	Sheet No. 2	Rev
	Project: Croesnewydd, Wrexham			
	Subject: Greenfield Runoff Calculations	Prepared By	Date	
		GL	01/06/16	
	Checked By	Date		
<u>Peak Runoff Post Development</u> Area of Greenfield remaining: 248.7 x 0.35= 87.05 m² 0.01 Ha Area of Hardstanding/Roofs: 552.7 x 1.0= 552.70 m² 0.06 Ha Area of Roads/Paths 2476.9 x 0.75= 1857.68 m² 0.19 Ha Total effective area 0.25 Ha				
For 1 in 1 : 0.85 x (Qbar w.c.c x area) 0.85*(10.93*0.15) 0.59 L/s For 1 in 100: 2.18 x (Qbar w.c.c x area) 2.18*(10.93*0.15) 1.51 L/s The above demonstrates that post development runoff is greater than pre development. Therefore mitigation measures such as soakaways are to be introduced <u>Runoff Volume</u> The increase in runoff volume is demonstrated through calculations. The pre and post development volumes of runoff are calculated using the modified rational method. Reference should be made to the attached calculations of which are summarised below: Pre development Volume: 86.34 m³ Post development Volume 187.94 m³ Note: The above volumetric runoffs are calculated for the 6 hour, 1 in 100 year event + 30% climate change Increase of Run-off to be managed through use of SuDS i.e. soakaways and swales				



CALCULATION SHEET

Project Croesnewydd Road
Project No 15223
Sheet No 1
Description UNDEVELOPED SITE RAINFALL VOLUME

EXISTING RUN OFF 100 Year Return Period

30% Climate Change Allowance

Return Period 100 years
M5-60min 17 mm
M5-60min 22.1 mm
r 0.3

EXISTING GREENFIELD SITE:

	soft	roads	roofs
Volumetric run-off coefficient	0.35	0.75	1
Permeable area	3278 sqm		
Road & fpath	0.0 sqm		
Roofing	0 sqm		

TOTAL EFFECTIVE AREA 1147.3 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m
5	0.34	7.51	1.85	13.90	15.95
10	0.495	10.94	1.93	21.06	24.16
15	0.59	13.04	1.96	25.54	29.30
30	0.78	17.24	2.01	34.61	39.71
60	1	22.10	2.02	44.68	51.26
120	1.24	27.40	1.99	54.56	62.59
240	1.55	34.26	1.94	66.32	76.08
360	1.8	39.78	1.89	75.25	86.34
600	2.13	47.07	1.83	86.30	99.02
1440	2.79	61.66	1.73	106.71	122.43
2880	3.5	77.35	1.63	126.13	144.71



CALCULATION SHEET

Project Development at Croesnewydd, Wrexham
Project No 15223
Sheet No 2
Description DEVELOPED SITE RAINFALL VOLUME

DEVELOPED RUN OFF 100 Year Return Period

30% Climate Change Allowance

Return Period 100 years
 M5-60min 17 mm
 M5-60min 22.1 mm
 r 0.3

PROPOSED NEW DEVELOPMENT

	soft	roads	roofs
Volumetric run-off coefficient	0.35	0.75	1
Permeable area	248.7 sqm		
Paths & Car parking	2476.9 sqm		
Roofing	552.7 sqm		

TOTAL EFFECTIVE AREA 2497.42 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m
5	0.34	7.51	1.85	13.90	34.72
10	0.495	10.94	1.93	21.06	52.59
15	0.59	13.04	1.96	25.54	63.78
30	0.78	17.24	2.01	34.61	86.44
60	1	22.10	2.02	44.68	111.58
120	1.24	27.40	1.99	54.56	136.25
240	1.55	34.26	1.94	66.32	165.62
360	1.8	39.78	1.89	75.25	187.94
600	2.13	47.07	1.83	86.30	215.54
1440	2.79	61.66	1.73	106.71	266.51
2880	3.5	77.35	1.63	126.13	314.99

APPENDIX D – SURFACE WATER ATTENUATION/SOAKAWAY CALCULATIONS



Soakaway calculations to BRE Digest 365

Calculation Sheet 1 HIGHWAY

1 in 30 year return period design

Project Development at Croesnewydd, Wrexham
Ref 15223

10% allowance for climate change	M5-60min	17	PROPOSED NEW DEVELOPMENT	Roads	Roofs
	M5-60min	18.7	Volumetric Runoff Coefficient	0.75	1
	r	0.3			
			Roads / Parking	503	
			Hardstanding / roofs	0	
			Total Effective Area	377.25	

Duration (min)	Z1	M5-D (mm)	Z2	M30-D (mm)	I (mm/hr)	Area (sq m)	Inflow (cu m)	Outflow (cu m)	Storage (cu m)
5.0	0.34	6.36	1.44	9.2	110.2	377.3	3.5	1.1	2.37
10.0	0.495	9.26	1.47	13.6	81.4	377.3	5.1	2.2	2.93
15.0	0.59	11.03	1.50	16.5	66.1	377.3	6.2	3.3	2.94
30.0	0.78	14.59	1.52	22.2	44.4	377.3	8.4	6.6	1.80
60.0	1	18.70	1.54	28.8	28.8	377.3	10.9	13.2	-2.30
120.0	1.24	23.19	1.54	35.6	17.8	377.3	13.4	26.3	-12.87
240.0	1.55	28.99	1.52	44.0	11.0	377.3	16.6	52.6	-36.04
360.0	1.8	33.66	1.49	50.3	8.4	377.3	19.0	78.9	-59.97
600.0	2.13	39.83	1.47	58.5	5.8	377.3	22.1	131.6	-109.53
1440.0	2.79	52.17	1.41	73.7	3.1	377.3	27.8	315.8	-287.97
2880.0	3.5	65.45	1.37	89.8	1.9	377.3	33.9	631.6	-597.69

Percolation factor (m/s) 1.70E-04 Average between SA01 & SA02

Trench: Outflow and storage based on:

No of trenches	(nr)	1.0
Length of soakaway	(m)	8.0
Width of soakaway	(m)	1.5
Effective depth	(m)	1
Eff Area of soakaways at 50%	(sq m)	21.5
Storage per soakaway	(cu m)	3.6
Total Storage provided	(cu m)	3.60



Soakaway calculations to BRE Digest 365

Calculation Sheet 2 FOOTPATH/PARK

1 in 30 year return period design

Project Development at Croesnewydd, Wrexham
Ref 15223

10% allowance for climate change	M5-60min	17	PROPOSED NEW DEVELOPMENT	Roads	Roofs
	M5-60min	18.7	Volumetric Runoff Coefficient	0.75	1
	r	0.3			
			Roads / Parking	1354.68	
			Hardstanding / roofs	0	
			Total Effective Area	1016.01	

Duration (min)	Z1	M5-D (mm)	Z2	M30-D (mm)	I (mm/hr)	Area (sq m)	Inflow (cu m)	Outflow (cu m)	Storage (cu m)
5.0	0.34	6.36	1.44	9.2	110.2	1016.0	9.3	2.7	6.62
10.0	0.495	9.26	1.47	13.6	81.4	1016.0	13.8	5.4	8.38
15.0	0.59	11.03	1.50	16.5	66.1	1016.0	16.8	8.1	8.68
30.0	0.78	14.59	1.52	22.2	44.4	1016.0	22.6	16.2	6.36
60.0	1	18.70	1.54	28.8	28.8	1016.0	29.2	32.4	-3.20
120.0	1.24	23.19	1.54	35.6	17.8	1016.0	36.2	64.9	-28.66
240.0	1.55	28.99	1.52	44.0	11.0	1016.0	44.7	129.7	-85.06
360.0	1.8	33.66	1.49	50.3	8.4	1016.0	51.1	194.6	-143.49
600.0	2.13	39.83	1.47	58.5	5.8	1016.0	59.4	324.4	-264.97
1440.0	2.79	52.17	1.41	73.7	3.1	1016.0	74.9	778.5	-703.55
2880.0	3.5	65.45	1.37	89.8	1.9	1016.0	91.3	1556.9	-1465.65

Percolation factor (m/s) 1.70E-04 Average between SA01 & SA02

Trench: Outflow and storage based on:

No of trenches	(nr)	2.0
Length of soakaway	(m)	10.0
Width of soakaway	(m)	1.5
Effective depth	(m)	1
Eff Area of soakaways at 50%	(sq m)	53.0
Storage per soakaway	(cu m)	4.5
Total Storage provided	(cu m)	9.00



Soakaway calculations to BRE Digest 365

Calculation Sheet 3 ROOF

1 in 30 year return period design

Project Development at Croesnewydd, Wrexham

Ref 15223

10% allowance for climate change	M5-60min	17	PROPOSED NEW DEVELOPMENT	Roads	Roofs
	M5-60min	18.7	Volumetric Runoff Coefficient	0.6	1
	r	0.3			
			Roads / Parking	0	
			Hardstanding / roofs	552.7	
			Total Effective Area	552.7	

Duration (min)	Z1	M5-D (mm)	Z2	M30-D (mm)	I (mm/hr)	Area (sq m)	Inflow (cu m)	Outflow (cu m)	Storage (cu m)
5.0	0.34	6.36	1.44	9.2	110.2	552.7	5.1	1.5	3.59
10.0	0.495	9.26	1.47	13.6	81.4	552.7	7.5	3.0	4.54
15.0	0.59	11.03	1.50	16.5	66.1	552.7	9.1	4.4	4.70
30.0	0.78	14.59	1.52	22.2	44.4	552.7	12.3	8.9	3.41
60.0	1	18.70	1.54	28.8	28.8	552.7	15.9	17.7	-1.84
120.0	1.24	23.19	1.54	35.6	17.8	552.7	19.7	35.5	-15.80
240.0	1.55	28.99	1.52	44.0	11.0	552.7	24.3	71.0	-46.68
360.0	1.8	33.66	1.49	50.3	8.4	552.7	27.8	106.5	-78.68
600.0	2.13	39.83	1.47	58.5	5.8	552.7	32.3	177.5	-145.17
1440.0	2.79	52.17	1.41	73.7	3.1	552.7	40.8	426.0	-385.20
2880.0	3.5	65.45	1.37	89.8	1.9	552.7	49.7	851.9	-802.25

Percolation factor (m/s) 1.70E-04 Average between SA01 & SA02

Trench: Outflow and storage based on:

No of trenches	(nr)	1.0
Length of soakaway	(m)	11.0
Width of soakaway	(m)	1.5
Effective depth	(m)	1
Eff Area of soakaways at 50%	(sq m)	29.0
Storage per soakaway	(cu m)	4.95
Total Storage provided	(cu m)	4.95



CALCULATION SHEET

Project Development at Croesnewydd, Wrexham
 Project No 15223
 Sheet No 1
 Description ATTENUATION HIGHWAY

STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance
 Return Period 100 years
 M5-60min 17 mm
 M5-60min 22.1 mm
 r 0.3

Permissible outflow 3 l/s (~soakaway area*infiltration rate)

PROPOSED NEW DEVELOPMENT
 Volumetric run-off coefficient soft 0.35 roads 0.75 roofs 1
 Permeable area 0 sqm
 Road & fpath 503 sqm
 Roofs and Hardstanding sqm

TOTAL EFFECTIVE AREA 377.25 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Total out cu m	Storage cu m	Qmax l/s
5	0.34	7.51	1.85	13.90	5.25	0.90	4.35	17.48
10	0.495	10.94	1.93	21.06	7.94	1.80	6.14	13.24
15	0.59	13.04	1.96	25.54	9.63	2.70	6.93	10.70
30	0.78	17.24	2.01	34.61	13.06	5.40	7.66	7.25
60	1	22.10	2.02	44.68	16.85	10.80	6.05	4.68
120	1.24	27.40	1.99	54.56	20.58	21.60	-1.02	2.86
240	1.55	34.26	1.94	66.32	25.02	43.20	-18.18	1.74
360	1.8	39.78	1.89	75.25	28.39	64.80	-36.41	1.31
600	2.13	47.07	1.83	86.30	32.56	108.00	-75.44	0.90
1440	2.79	61.66	1.73	106.71	40.26	259.20	-218.94	0.47
2880	3.5	77.35	1.63	126.13	47.58	518.40	-470.82	0.28



CALCULATION SHEET

Project Development at Croesnewydd, Wrexham
 Project No 15223
 Sheet No 2
 Description ATTENUATION FOOTPATHS/PARK

STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance
 Return Period 100 years
 M5-60min 17 mm
 M5-60min 22.1 mm
 r 0.3

Permissible outflow 8 l/s (~soakaway area*infiltration rate)

PROPOSED NEW DEVELOPMENT
 Volumetric run-off coefficient soft roads roofs
 0.35 0.75 1
 Permeable area 0 sqm
 Road & fpath 1354.68 sqm
 Roofs and Hardstanding sqm

TOTAL EFFECTIVE AREA 1016.01 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Total out cu m	Storage cu m	Qmax l/s
5	0.34	7.51	1.85	13.90	14.13	2.40	11.73	47.09
10	0.495	10.94	1.93	21.06	21.40	4.80	16.60	35.66
15	0.59	13.04	1.96	25.54	25.95	7.20	18.75	28.83
30	0.78	17.24	2.01	34.61	35.17	14.40	20.77	19.54
60	1	22.10	2.02	44.68	45.39	28.80	16.59	12.61
120	1.24	27.40	1.99	54.56	55.43	57.60	-2.17	7.70
240	1.55	34.26	1.94	66.32	67.38	115.20	-47.82	4.68
360	1.8	39.78	1.89	75.25	76.46	172.80	-96.34	3.54
600	2.13	47.07	1.83	86.30	87.69	288.00	-200.31	2.44
1440	2.79	61.66	1.73	106.71	108.42	691.20	-582.78	1.25
2880	3.5	77.35	1.63	126.13	128.15	1382.40	-1254.25	0.74



CALCULATION SHEET

Project Development at Croesnewydd, Wrexham
 Project No 15223
 Sheet No 3
 Description ATTENUATION ROOF

STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance
 Return Period 100 years
 M5-60min 17 mm
 M5-60min 22.1 mm
 r 0.3

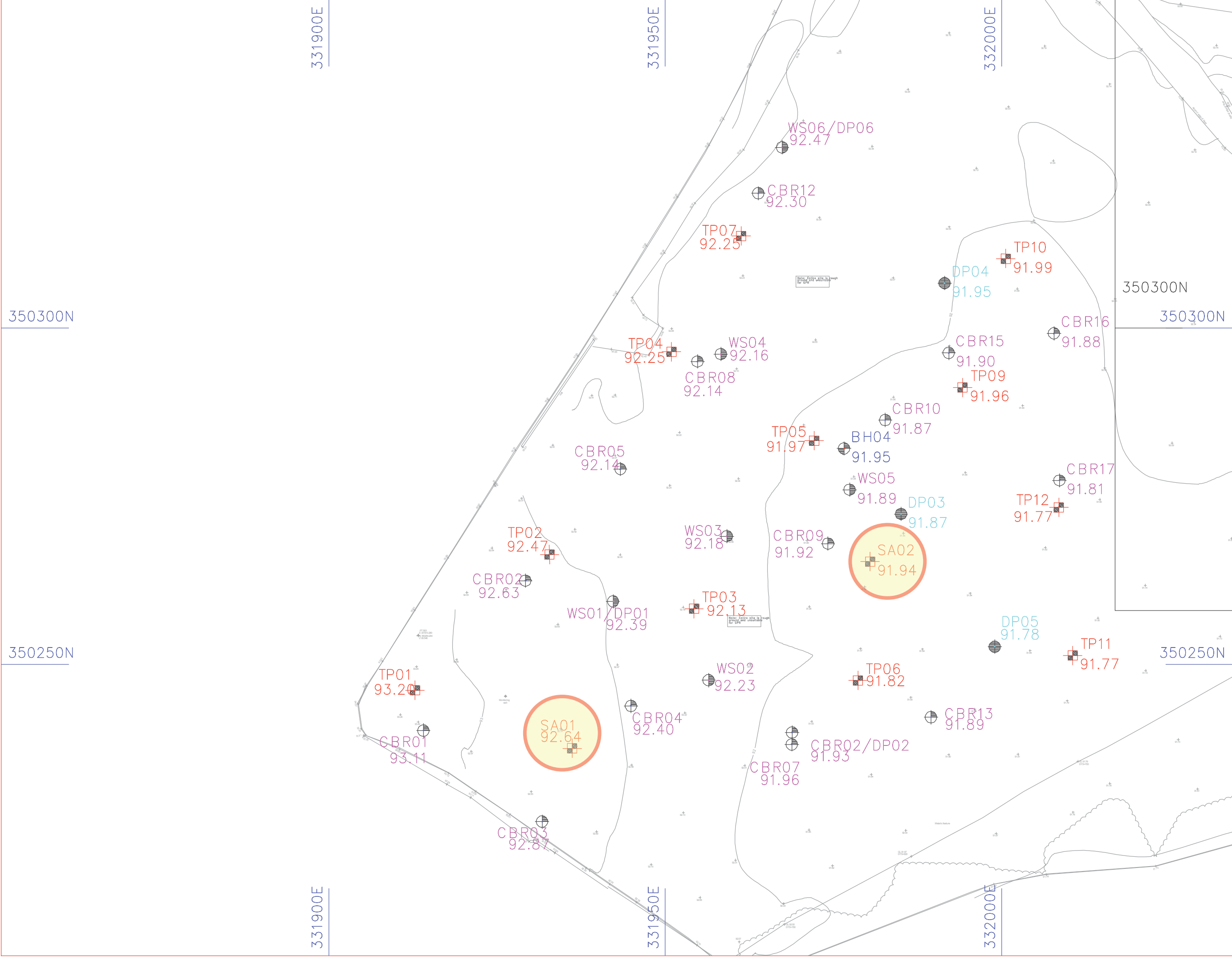
Permissible outflow 4.4 l/s (~soakaway area*infiltration rate)

PROPOSED NEW DEVELOPMENT
 Volumetric run-off coefficient soft roads roofs
 0.35 0.75 1
 Permeable area 0 sqm
 Road & fpath sqm
 Roofs and Hardstanding 552.7 sqm

TOTAL EFFECTIVE AREA 552.7 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Total out cu m	Storage cu m	Qmax l/s
5	0.34	7.51	1.85	13.90	7.68	1.32	6.36	25.61
10	0.495	10.94	1.93	21.06	11.64	2.64	9.00	19.40
15	0.59	13.04	1.96	25.54	14.12	3.96	10.16	15.68
30	0.78	17.24	2.01	34.61	19.13	7.92	11.21	10.63
60	1	22.10	2.02	44.68	24.69	15.84	8.85	6.86
120	1.24	27.40	1.99	54.56	30.15	31.68	-1.53	4.19
240	1.55	34.26	1.94	66.32	36.65	63.36	-26.71	2.55
360	1.8	39.78	1.89	75.25	41.59	95.04	-53.45	1.93
600	2.13	47.07	1.83	86.30	47.70	158.40	-110.70	1.33
1440	2.79	61.66	1.73	106.71	58.98	380.16	-321.18	0.68
2880	3.5	77.35	1.63	126.13	69.71	760.32	-690.61	0.40

APPENDIX E – PERCOLATION TEST RESULTS



Key: height colours
as code colour

- TP (Trial Pit)
- SA (Soakaway Pit)

- CBR (TRL-DCP)
- WS(Window sample)
- BH (Borehole)
- PH (Pokehole)
- DP (Dynamic Probe)

OgI=52
Original Ground Level

PROJECT: WAS TWestern Gateway Site
FIGURE No.A1.2
TITLE: Exploratory Hole Location Plan
Scale 1:500 A3



Site Surveying Services - A.M.I.C.E.S.
3rd Downham Road
Chesham Lancs
BB94AU
Tel 0120441144
Fax 01204376338
www.ianfarmerassociates.co.uk
Land Engineering Surveyors
TSA member

Setting Out & Control Surveys
Topographic/Volumetric Surveys
GPS Specialists using also
GPS Post Process to tie any site
to OS without trip point or BM
Construction Line Registered
TSA member

Client / Location: Ian Farmer Associates
WAGT - Western Gateway Site
Drawing Title S.I. Survey

Additional Comments:
To use B202 signed see spec
all work to site spec, some by gps
contact us for details

Drawing Number: ssa-3772@Awarrenham
Drawn By: AP
Date: 12/03/11

Checked By: MM
Scale: 1:500, A3

Revision: A

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991

BRE Digest 365, Figure 2, Page 5



Client: BAM Construction Limited

Site: WAST - Western Gateway Site

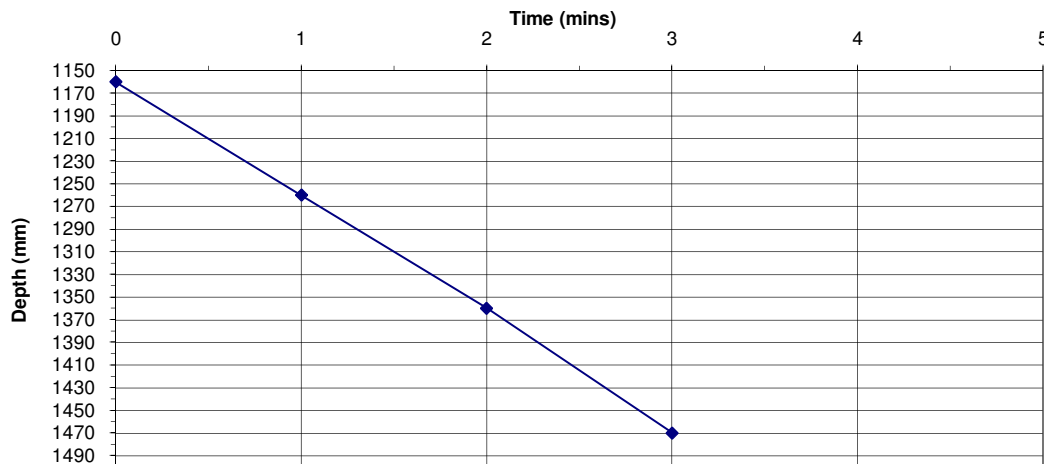
Job No: W11/40822

Test No:

SA01 Test 1

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (mm)		Size of Soakaway	Length (m) =	1.80
0	1160			Width (m) =	0.75
1	1260			Depth (m) =	1.50
2	1360				
3	1470				
				Depth to water at start of test =	1160mm
				Depth to water at end of test =	1470mm
				Depth to water at 75% level =	1238mm
				Depth to water at 50% level =	1315mm
				Depth to water at 25% level =	1393mm
				Base area of pit (m ²) =	1.350
				Eff area of loss 75 - 25% (m ²) =	2.294
				Volume outflow 75 - 25% (m ³) =	0.209
				From the graph:	
				tp 75 (min) =	0.75
				tp 25 (min) =	2.25
				Soil infiltration rate, f, (m/s) =	1.01E-03
				Soil infiltration rate, f, (m/s) =	n/a
				Carried out by:	TB
				Date:	28/02/2011
				Input by:	KMH
				Date:	09/03/2011
				Checked by:	MHW
				Date:	09/03/2011



Notes

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991

BRE Digest 365, Figure 2, Page 5



Client: BAM Construction Limited

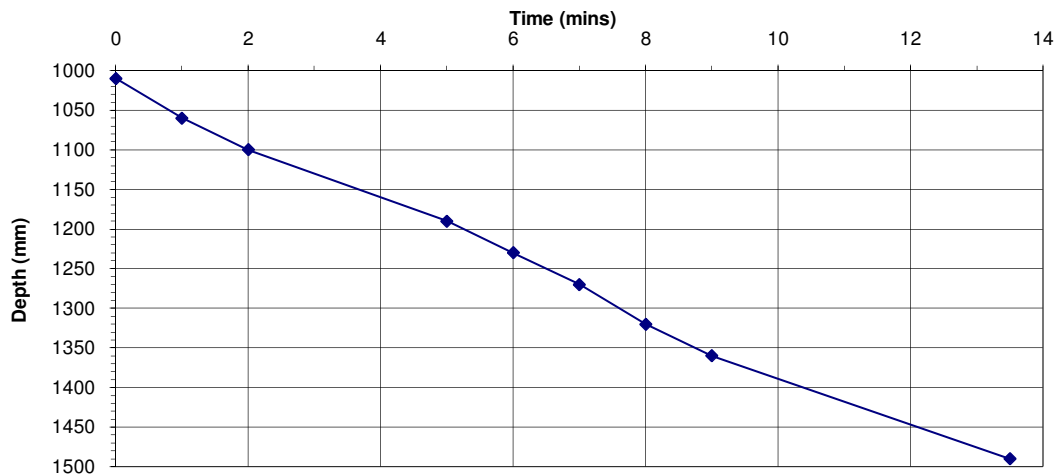
Site: WAST - Western Gateway Site

Job No: W11/40822

Test No: SA01 Test 2

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (mm)		Size of Soakaway	Length (m) =	1.80
0	1010			Width (m) =	0.75
1	1060			Depth (m) =	1.50
2	1100				
5	1190			Depth to water at start of test =	1010mm
6	1230			Depth to water at end of test =	1490mm
7	1270			Depth to water at 75% level =	1130mm
8	1320			Depth to water at 50% level =	1250mm
9	1360			Depth to water at 25% level =	1370mm
13.5	1490				
				Base area of pit (m ²) =	1.350
				Eff area of loss 75 - 25% (m ²) =	2.625
				Volume outflow 75 - 25% (m ³) =	0.324
				From the graph:	
				tp 75 (min) =	3
				tp 25 (min) =	9
				Soil infiltration rate, f, (m/s) =	3.43E-04
				Soil infiltration rate, f, (m/s) =	n/a
				Carried out by:	TB
				Date:	28/02/2011
				Input by:	KMH
				Date:	09/03/2011
				Checked by:	MHW
				Date:	09/03/2011



Notes

BRE Digest 365, Figure 2, Page 5

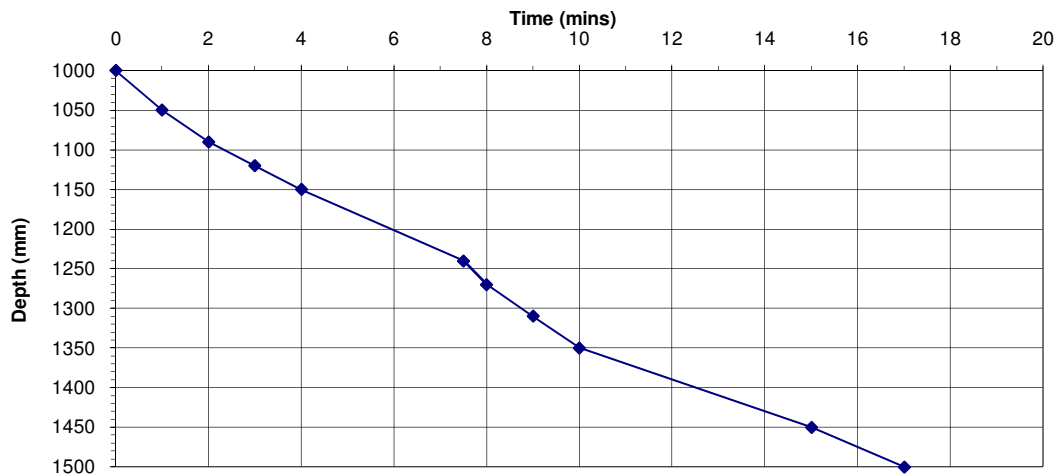


Job No:	W11/40822
---------	-----------

Test No:

SA01 Test 3

Time (min)	Depth (mm)	Size of Soakaway	Length (m) =	1.80
0	1000		Width (m) =	0.75
1	1050		Depth (m) =	1.50
2	1090			
3	1120	Depth to water at start of test =		1000mm
4	1150	Depth to water at end of test =		1500mm
7.5	1240	Depth to water at 75% level =		1125mm
8	1270	Depth to water at 50% level =		1250mm
9	1310	Depth to water at 25% level =		1375mm
10	1350			
15	1450	Base area of pit (m ²) =		1.350
17	1500	Eff area of loss 75 - 25% (m ²) =		2.625
		Volume outflow 75 - 25% (m ³) =		0.338
		From the graph: tp 75 (min) = 3 tp 25 (min) = 11		
		Soil infiltration rate, f, (m/s) =		2.68E-04
		Soil infiltration rate, f, (m/s) =		n/a
		Carried out by:	TB	Date: 28/02/2011
		Input by:	KMH	Date: 09/03/2011
		Checked by:	MHW	Date: 09/03/2011



Notes

BRE Digest 365, Figure 2, Page 5

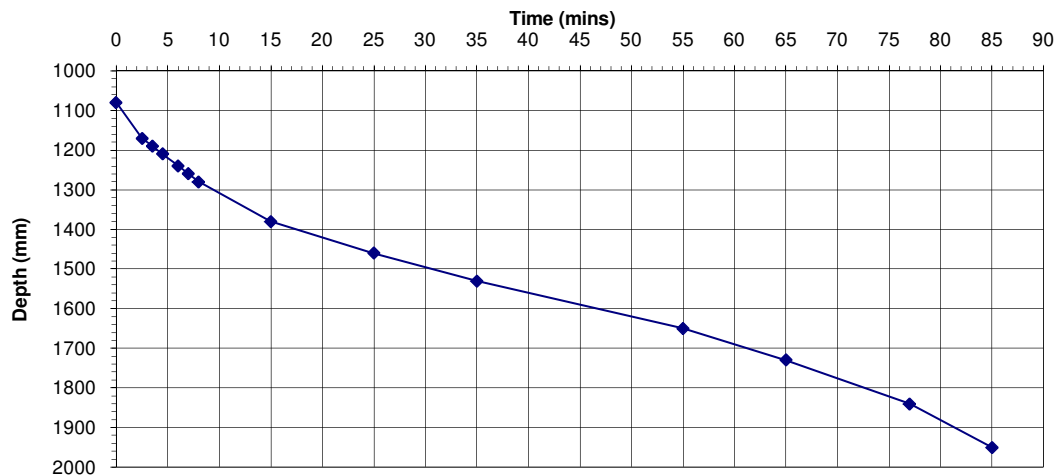


Site: WAST - Western Gateway Site

Job No:	W11/40822
---------	-----------

Test No:

SA02 Test 1

[illegible]

Notes

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991

BRE Digest 365, Figure 2, Page 5



Client: BAM Construction Limited

Site: WAST - Western Gateway Site

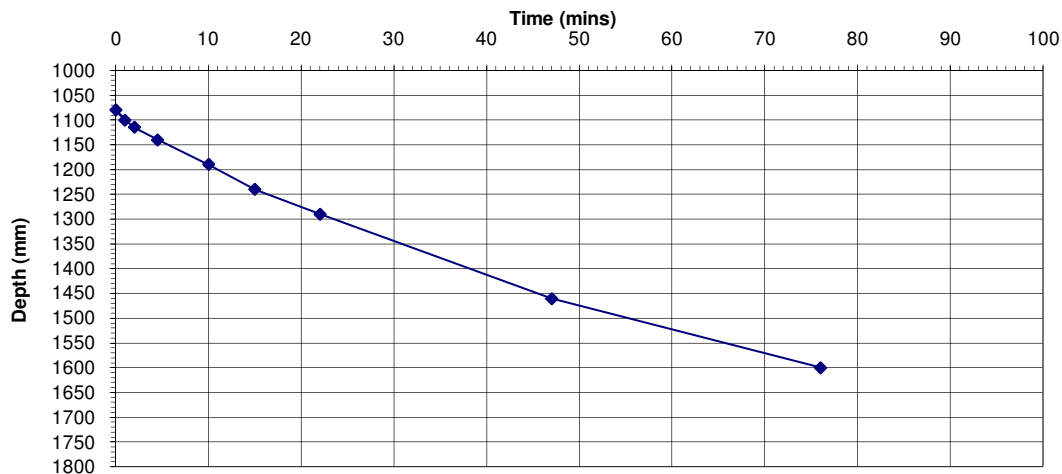
Job No: W11/40822

Test No:

SA02 Test 2

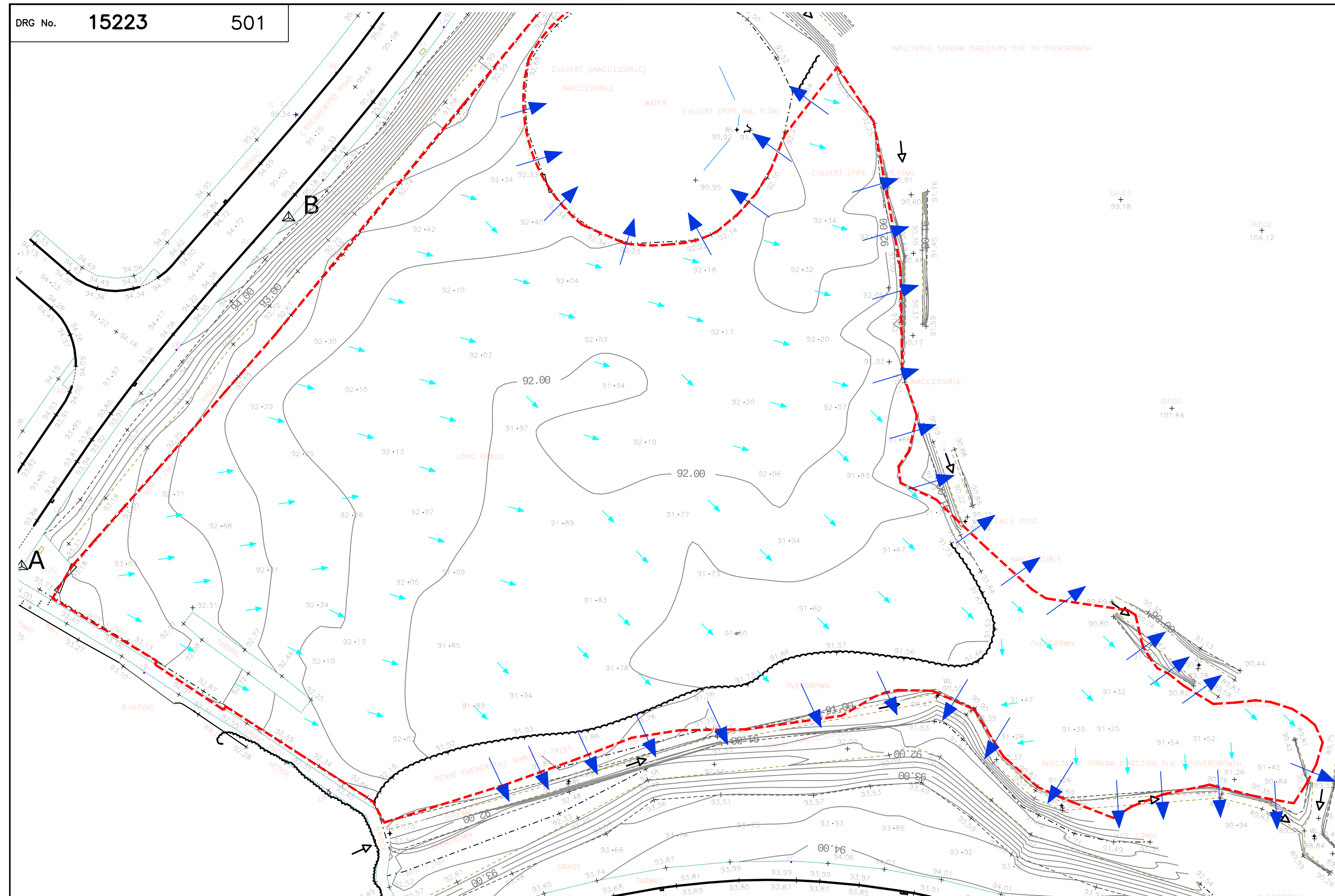
CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (mm)		Size of Soakaway	Length (m) =	1.80
0	1080			Width (m) =	0.65
1	1100			Depth (m) =	2.00
2	1115				
4.5	1140			Depth to water at start of test =	1080mm
10	1190			Depth to water at end of test =	1600mm
15	1240			Depth to water at 75% level =	1210mm
22	1290			Depth to water at 50% level =	1340mm
47	1460			Depth to water at 25% level =	1470mm
76	1600				
				Base area of pit (m ²) =	1.170
				Eff area of loss 75 - 25% (m ²) =	4.404
				Volume outflow 75 - 25% (m ³) =	0.304
				From the graph:	
				tp 75 (min) =	12
				tp 25 (min) =	48
				Soil infiltration rate, f, (m/s) =	3.20E-05
				Soil infiltration rate, f, (m/s) =	n/a
				Carried out by:	TB
				Input by:	KMH
				Checked by:	MHW
				Date:	28/02/2011
				Date:	09/03/2011
				Date:	09/03/2011



Notes

APPENDIX F – FLOOD ROUTING



FOR INFORMATION

GENERAL NOTES

KEY

 SURFACE WATER DIRECTION FLOW ACROSS SITE

 ABOVE GROUND STORAGE PROVISION

 FLOOD ROUTING

REV	DATE	DESCRIPTION	BY	CHK	APP
-----	------	-------------	----	-----	-----

CLIENT	First Choice Housing Association
--------	-------------------------------------

PROJECT

Croesnewydd Road
Wrexham

TITLE	Existing and Proposed Above Ground Flood Routing
-------	--

 **DATRYS**

Yr Aelwyd
3-5 Church Street
Caernarfon
01286 671027
01286 674434
info@datrys.coop
www.datrys.coop

Telephone
Fax
E-mail
Internet

DRAWN	GL	CHECKED	—	PASSED	—
-------	----	---------	---	--------	---

DATE	02.06.16	CLIENT'S REF.
------	----------	---------------

SCALE AT A1 1:500	AUTOCAD REF. 15223/501
-------------------	------------------------

DRAWING No.	REVISION
-------------	----------

15223/500

