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**CIVIL • STRUCTURAL
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WREXHAM ROAD, RHOSTYLLEN

TECHNICAL NOTE IN RELATION TO SURFACE WATER DRAINAGE

8th DECEMBER 2022

INTRODUCTION

Robert E Fry & Associates Ltd have been appointed by S G Estates Ltd., to undertake drainage design on the above project.

The site was granted Outline Planning Permission (Code No. ESC P/2004/094) on 06.12.04 and this was subsequently varied under Outline Planning Permission (Code No. ESC P/2008/1063) on 01.12.08. The Reserved Matters Approval (Code No. ESC P/2007/0686) was approved on 01.07.10.

A Wrexham County Borough Council letter dated 05.07.13 confirms all pre-commencement planning conditions have been discharged and this includes Condition 11 (Surface Water Drainage) and Condition 22 (Surface Water Regulation) of the Outline Planning Permission (Code No. ESC P/2008/1063) and Condition 16 (Comprehensive Site Drainage) of the Reserved Matters Approval (Code No. ESC P/2007/0686).

The details that were submitted to discharge the drainage conditions above are as follows:-

V-R5675.00/50/CL/120 Rev A,
V-R5675.00/50/CL/100 RevA1,
V-R5675.00/50/CL/101 Rev A4,
V-R5675.00/50/CL/102 Rev A4,
V-R5675.00/50/CL/103 Rev A1,
V-R5675.00/50/CL/104 RevA2,
V-R5675.00/50/CL/105 Rev A3,
V-R5675.00/50/CL/106 RevA3,
V-R5675.00/50/CL/107 Rev A3,
V-R5675.00/50/CL/108 Rev A4,
V-R5675.00/50/CL/109 Rev A4,
V-R5675.00/50/CL/110 Rev A4,
V-R5675.00/50/CL/111 Rev A2,
V-R5675.00/50/CL/113 Rev A1,
V-R5675.00/50/CL/114 Rev A1,
V-R5675.00/50/CL/115 Rev A,
V-R5675.00/50/CL/116 Rev A,
Soakaway test results.

Plot drainage

V-R5675.00/50/CL/112 Rev A,

ROBERT E FRY & ASSOCIATES LTD.

**45, Bridgeman Terrace
Wigan, WN1 1TT**

Telephone: 01942 826020

Fax: 01942 230816

Email: mail@refa.co.uk

Company Registration No. 2436911



A short section of roadway on the site has been constructed and a Wrexham County Borough Council letter dated 08.11.13 confirms *'I have observed works on site and I am satisfied that these constitute works in the course of the laying of a access track or roadway. Wrexham County Borough Council as local planning authority is therefore satisfied that development has commenced in accordance with condition 4 of planning permission P/2008/1063'*.

Part of this appointment is to review the existing surface water drainage information provided (i.e., the details that were submitted to discharge Condition 11 (Surface Water Drainage) and Condition 22 (Surface Water Regulation) of the Outline Planning Permission (Code No. ESC P/2008/1063) and Condition 16 (Comprehensive Site Drainage) of the Reserved Matters Approval (Code No. ESC P/2007/0686)) along with recently completed site investigation works to ascertain if surface water disposal by means of infiltration to the sub grade is a long-term viable option i.e. as proposed by the submitted details to discharge the drainage planning conditions.

We have therefore undertaken a detailed review of the infiltration testing and results undertaken by others and prepared composite plans entitled *Infiltration Assessment 1 of 2 – Drawing Number 22094/101/1 Rev B* and *Infiltration Assessment 2 of 2 – Drawing Number 22094/101/2 Rev B* and these can be found in Appendix A.

These plans tabulate the infiltration testing results with favourable results / areas shown in green and unfavourable results / areas shown in red.

ASSESSMENT

The above plans show that of the 64 percolation tests undertaken only 13 returned favourable results, amounting to only 20%, however, this 20% is spread out in small, isolated areas across the whole site.

Importantly, a number of tests were non BRE compliant, and we have undertaken basic soakaway calculations and for a typical house / drive amounting to a paved area of 150 square metres, with a design return period of 100 years, climate change at 35%, a half drain time of less than 1440 minutes, infiltration through the sides only and no predicted surface flooding and a figure of 125mm / hour is considered to be necessary for a satisfactory soakaway performance. A significant number of the percolation test results had infiltration rates less than 125mm / hour.

We have also referred to the HR Wallingford UK SuDS web site which indicates the soil type at this location to be type 4 (See Appendix B).

The WRAP (winter rainfall acceptance potential) for soil type 4 is LOW with a HIGH run off rate (See Appendix C).

Further reference has also been made to the Cranfield University "Soilscapes" web site (See Appendix D).

This indicated that the site is underlain by ***"Slowly permeable seasonally wet slightly acidic but base-rich loamy and clayey soils"***

It also indicates that the subgrade will have impeded drainage.

This information is also reproduced on the following drawings which can be found in Appendix E:-

- *Surface Water Drainage Strategy 1 of 2 – Drawing No.22094/105/1 Rev A*
- *Surface Water Drainage Strategy 2 of 2 – Drawing No.22094/105/2*

In addition to this, recently completed site investigations by this practice across the whole site also confirm the above and our report will state the following:-

'Assessment of the ground conditions present within the site in terms of sustainable urban drainage, confirms the presence of topsoil generally overlying impermeable cohesive deposits with localised granular bands/ lenses of sands and gravels recorded within the clay. As the granular deposits were not recorded within all of the trial pits, the granular deposits represent localised deposits rather than widespread ground conditions. Therefore, this proposed development is considered not suitable for the use of a soakaway system of surface water disposal. It will be necessary for surface water to be disposed of utilising a traditional gravity drainage system.'

The draft trial hole and borehole logs and associated location plans can be found in Appendix F.

CONCLUSIONS

Based on the above it is our opinion that the use of an infiltration system for the surface water drainage on this site will not provide a long-term surface water drainage solution, catering for current and worsening weather events we are likely encounter during the lifetime of the development.

To this end we have prepared a more traditional drainage solution which is shown on the following drawings which can be found in Appendix E:-

- *Surface Water Drainage Strategy 1 of 2 – Drawing No.22094/105/1 Rev A*
- *Surface Water Drainage Strategy 2 of 2 – Drawing No.22094/105/2 Rev A*

This surface water drainage design incorporates oversized pipes with flows restricted to the Qbar greenfield figure of 34.67 litres/second as shown.

The attenuation system shown on these plans will cater for the 1 in 100-year return period event, with a 35% climate change allowance.

Simulations on the system shown predict no surface flooding for the above events (please refer to the REFA / Causeway Technologies Ltd surface water calculations in Appendix G).

The traditional surface water drainage design shown on the above drawings will be put forward for adoption and future maintenance by Welsh Water under a Section 104 Agreement.

It is thus our opinion that the surface water drainage system we propose will offer a compliant system in line with current guidance.

Geoff Hardman, B.Sc.

On behalf of Robert E Fry & Associates Ltd.

8th December 2022

APPENDIX A

Infiltration Assessment 1 of 2 – Drawing Number 22094/101/1 Rev B

Infiltration Assessment 2 of 2 – Drawing Number 22094/101/2 Rev B

WYRCHAM ROAD, RHOSYSTYLEN - REVIEW OF INFILTRATION TESTING UNDERTAKEN (BY OPUIS)						
TEST	TEST NO 1	TEST NO 2	TEST NO 3		COMMENTS	
SA	TEST NO 1	TEST NO 2	TEST NO 3	mm/hour		
33	8.813 10+6	11.7	6.261	22.54	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
34	8.649 10+6	11.6	NO TEST	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr	
35	7.758 10+5	279.3	8.441 10+5	303.88	9.689 10 ⁻⁵	348.1
36	9.884 10+6	12.4	8.204 10+6	17.49	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
37	NO TEST	GROUND WATER FLOW	NO TEST	GROUND WATER FLOW	NO TEST	NON BE COMPLAINT
38	1.09 10+6	10.6	NO TEST	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr	
40	4.762 10+6	17.3	5.389 10+6	11.41	7.042 10+6	25.4
41	NO TEST	GROUND WATER FLOW	NO TEST	GROUND WATER FLOW	NO TEST	NON BE COMPLAINT
41	8.818 10+6	13.0	1.375 10+5	56.70	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
42	3.135 10+6	1128.6	1.397 10+6	832.32	1.199 10+6	57.6
43	6.564 10+6	23.6	1.962 10+5	70.83	1.493 10+5	56.0
44	4.583 10+5	156.9	6.788 10+5	242.03	4.457 10+5	100.5
45	3.879 10+5	138.6	2.386 10+5	84.10	3.009 10+5	58.3
46	NO TEST	GROUND WATER FLOW	NO TEST	GROUND WATER FLOW	NO TEST	NON BE COMPLAINT
47	NO TEST	GROUND WATER FLOW	NO TEST	GROUND WATER FLOW	NO TEST	NON BE COMPLAINT
48	1.508 10+6	17.3	2.466 10+6	37.44	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
49	1.508 10+6	175.3	8.869 10+5	193.38	1.197 10+6	466.9
50	1.508 10+6	17.3	2.466 10+6	7.72	1.507 10+6	160.0
51	1.636 10+6	5.9	NO TEST	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr	
52	1.636 10+6	5.9	NO TEST	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr	
53	2.466 10+5	88.4	3.496 10+6	112.9	3.288 10+6	11.8
54	2.466 10+5	88.4	3.496 10+6	112.9	3.288 10+6	11.8
55	1.734 10+6	12.4	6.827 63.9	300.00	8.444 10+6	311.1
56	1.053 10+5	36.5	NO TEST	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr	
57	2.988 10+6	7.7	2.019 10+6	7.27	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
58	2.988 10+6	10.6	NO TEST	GROUND WATER FLOW	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
59	2.988 10+6	7.7	2.019 10+6	7.27	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
60	4.583 10+6	14.6	2.311 10+6	7.60	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr
61	6.124 10+7	2.2	NO TEST	NO TEST	NON BE COMPLAINT & INFILTRATION <15mm / hr	
62	2.534 10+5	91.2	8.009 10+6	32.07	9.207 10+6	35.5
63	2.534 10+5	91.8	8.014 10+6	79.33	1.096 10+6	1.7
64	3.013 10+5	108.5	2.676 10+5	96.34	3.341 10+5	120.3

HARD PAVED AREA 0.015ha (TYPICAL HOUSE,
GARAGE & DRIVE)
100YEAR + 35% CC EVENT WITH NO FLOODING
PCC RING TYPE SOAKAWAY 1.5m Ø x 2.5m DEEP
INFILTRATION THROUGH SIDES ONLY
HALF DRAIN TIME < 1440 MINUTES

THIS AREA MAY BE SUBJECT
RESTRICTION BY NETWORK R

THIS AREA MAY BE SUBJECT TO
RESTRICTION BY NETWORK RAIL

INDICATES AREAS THAT APPEAR VIABLE FOR
INFILTRATION DRAINAGE BASED ON EXISTING
TESTING REGIME

NOTE
FLOOR LEVELS ARE
INDICATIVE ONLY
AND SUBJECT TO
REVIEW AT DETAILED
DESIGN STAGE

INDICATES AREAS THAT APPEAR UNVIALE FOR
INFILTRATION DRAINAGE BASED ON EXISTING
TESTING REGIME

B	NOTES UPDATED	GWH	21/02/22
A	UPDATED AFTER DISCUSSION WITH CLIENT	GWH	03/02
rev	Revision details	Healy	Date

as recognised by

www.ssmastd.com

Drawing Stage		Drawing Status	
●	Draft	●	Comments
●	Issued	●	Information
		●	Approval
		●	Construction
		●	As Built

Client

S G ESTATES LIMITED

Job title

WREXHAM ROAD RHOXYLLEN

Drawing title

INFILTRATION ASSESSMENT 1 OF 2

CONSULTING ENGINEERS

CIVIL & STRUCTURAL

GEOTECHNICAL & ENVIRONMENTAL

48 Ridgeman Terrace
 Wigton, Larnia
 WAU - (01942) 826020
 Fax - (01942) 230816

Date	Scale	1/500	Drawn
5.9.22			DB

DRAWING No

22094/101/1

Rev

08

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NOTE
FLOOR LEVELS ARE
INDICATIVE ONLY
AND SUBJECT TO
REVIEW AT DETAILED
DESIGN STAGE

HARD PAVED AREA 0.015ha (TYPICAL HOUSE,
GARAGE & DRIVE)
100YEAR + 35% CC EVENT WITH NO FLOODING
PCC RING TYPE SOAKAWAY 1.5m Ø x 2.5m DEEP
INFILTRATION THROUGH SIDES ONLY
HALF DRAIN TIME < 1440 MINUTES

[illegible][illegible]

APPENDIX B

HR Wallingford UK SuDS Greenfield Runoff Rate Estimation

Calculated by: Geoff Hardman

Site name: WREXHAM RD

Site location: RHOSTYLLEN

Site Details

Latitude: 53.03045° N

Longitude: 3.02001° W

Reference: 3754639765

Date: Jul 14 2022 08:33

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 6.17

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

Default

Edited

SOIL type:

4

4

HOST class:

N/A

N/A

SPR/SPRHOST:

0.47

0.47

Hydrological characteristics

Default

Edited

SAAR (mm):

797

797

Hydrological region:

9

9

Growth curve factor 1 year:

0.88

0.88

Growth curve factor 30 years:

1.78

1.78

Growth curve factor 100 years:

2.18

2.18

Growth curve factor 200 years:

2.46

2.46

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):

34.67

34.67

1 in 1 year (l/s):

30.51

30.51

1 in 30 years (l/s):

61.72

61.72

1 in 100 year (l/s):

75.59

75.59

1 in 200 years (l/s):

85.29

85.29

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

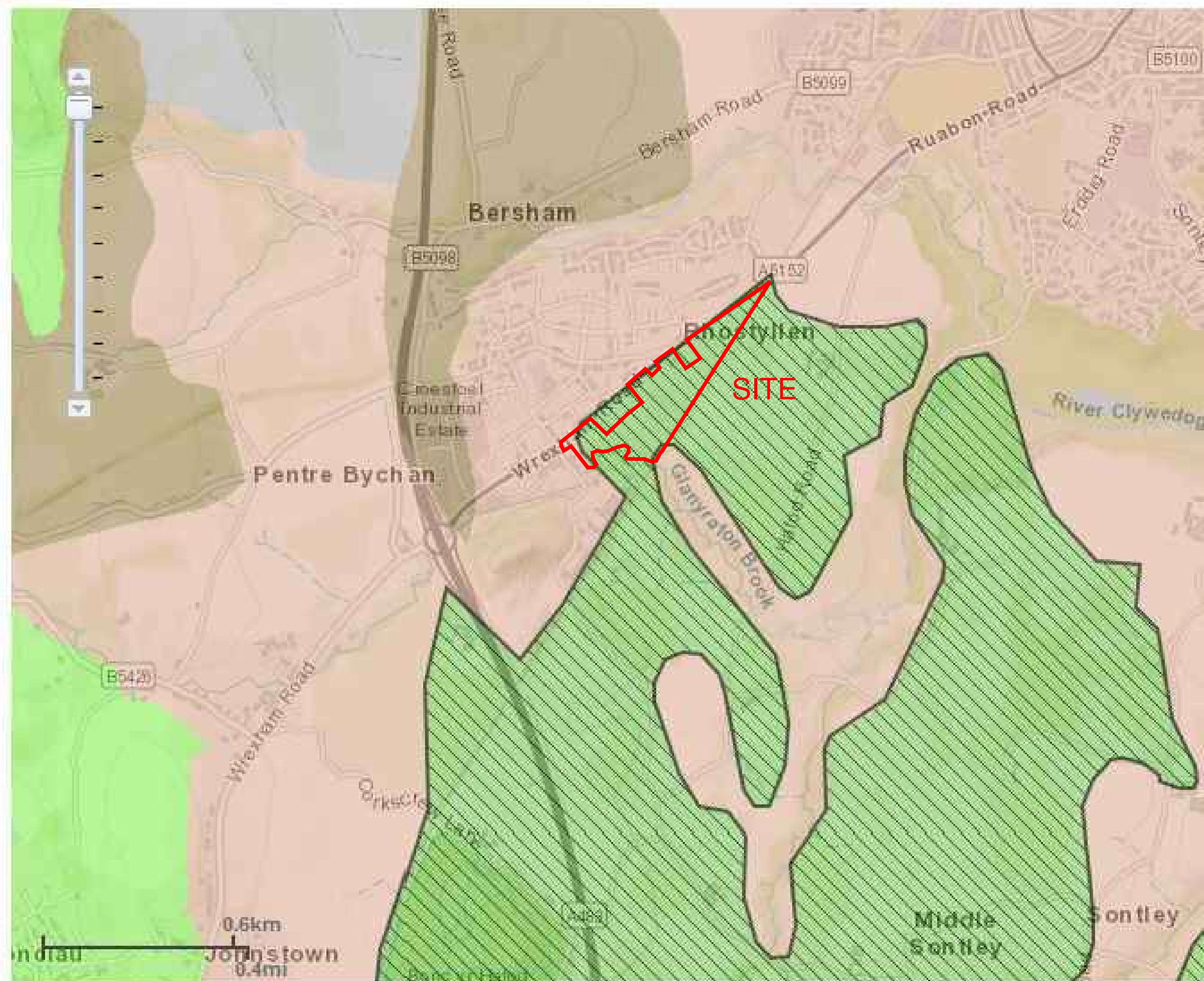
APPENDIX C

Winter Rainfall Acceptance Potential (WRAP)

Soil Class	WRAP	Runoff	SOIL
Soil Class	WRAP	Runoff	SOIL
1	Very high	Very low	0.15
2	High	Low	0.30
3	Moderate	Moderate	0.40
4	Low	High	0.45
5	Very low	Very high	0.50

APPENDIX D

Cranfield University Soilscales Map



Legend

Search

Soil information

Soilscape 18:

Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils

Texture:

Loamy and clayey



Coverage:

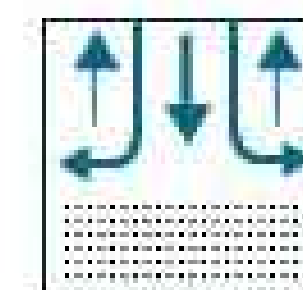
England: 19.9% Wales: 2.4%
England & Wales: 17.5%

Selected area:

39.5km²

Drainage:

Impeded drainage



Fertility:

Moderate



Habitats:

Seasonally wet pastures and woodlands



Landcover:

Grassland and arable some woodland



Carbon:

Low



Adjust transparency

APPENDIX E

Surface Water Drainage Strategy 1 of 2 – Drawing Number 22094/105/1 Rev A

Surface Water Drainage Strategy 2 of 2 – Drawing Number 22094/105/2