

**Surface Water Run-off Appraisal
for
Proposed Residential Properties
at
2 Lodge Road, Rhosddu, Wrexham, LL11 2DD**

10 April 2014

Client:

Document Verification

Project Title	Surface Water Run-off Appraisal for Proposed Residential Property at 2 Lodge Road, Rhosddu, Wrexham, LL11 2DD
Project Number	1232
Document Number	1232 SWA

Prepared by

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Revision Record

Revision Number	Date	Description	Prepared

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3. Environment Agency Flood Map
5. Code for Sustainable Homes: Category 4 Information.
6. Code for Sustainable Homes: Summary Report Template

Nearest Postcode: LL11 2DD
Planning Reference:

1.0 Introduction**Appendix 1: Location Plans**

- 1.1 Kane Design has been instructed to prepare a Surface Water Run-off Appraisal for a proposed development comprising a single dwelling at 2 Lodge Road, Rhosduu, Wrexham, LL11 2DD
- 1.2 The Report will assess the surface water drainage regime for the site and thereby enable the developer to comply with 'The Code for Sustainable Homes' [CSH], version 2. May 2009: Category 4: Surface Water Drainage
The purpose of this report is to justify and supply such information to enable the developer to achieve the SUR 1 credit for Sustainability relating to this item.
- 1.3 The Planning Application states that an overall standard equivalent to Code for Sustainable Homes, Code level 3 is to be achieved.
- 1.4 The copyright of this report is owned by Kane Design. Consequently this report may not be mended or adapted without the approval of Kane Design. Complete copies of this report may, however, be made and distributed by our client in dealing with matters directly related to its commission.

2.0 Existing Site Description**Appendix 2: Proposed Plan**

- 2.1 The site occupies an area of approximately 476m² and is generally part brownfield / part greenfield site. The brownfield area is a slab form a demolished building. The exact extents and area has been estimated.
Site levels are approximately in the region of 88m AOD.
The site accesses on to an existing public road, at the Stansty Road / Lodge Road junction.

The proposed development consists of a single three-storey property, a double Garage / games room, and associated driveway and patios.

3.0 Code for Sustainable Homes

The aim of the Code for Sustainable Homes, with respect to drainage, is that a new development must avoid, reduce, or delay the discharge of rainwater to public sewers and / or watercourses.

In addition, the Code or Practice for Sustainable Drainage, by CIRCA, 2004 [SUDS] must be adhered to. This requires that any surface water run-off into a water course must be no greater than it was for the pre-development situation.

Under “Category 4: Surface Water Run-off”, credits are available for the Management of Surface Water Run-off. These are mandatory, and are required to achieve the final sustainability Environmental Assessment rating

4.0 Proposed Surface Water Drainage Analysis

Appendix 3: Surface Water Run-off Calculations

4.1 Calculation parameters:

An allowance for climate change of 30% has been used, taken from Planning Policy Document 25, Table B2, catering for peak rainfall increases up to year 2115. Design calculations are based on Institute of Hydrology Report 125 (1994), Flood Studies Supplementary Report 16 (1985), and the Wallingford Procedure (1993).

4.2 Proposed Site Drainage and area / flow breakdown

Pre-development:

Site area:	476 m2	scaled from drawings
Hard-standing	121 m2	estimated from site inspection.
Greenfield	355 m2	25%

Peak run-off	4.19 litres / s	calculated
Peak Volume	76.97 m3	for 100 year plus 30% storm, 6 hours duration

Post-development:

Site area:	476 m2	scaled from drawings
Hard-standing	275 m2	scaled from drawings.
Greenfield	201m2	

Peak run-off	8.95 litres / s	calculated
Peak Volume	82.45 m3	for 100 year plus 30% storm, 6 hours duration

Difference in Surface Water Parameters.

Peak run-off: new development increases it by 4.76 litres / s

Peak volume: new development increases it by 5.48 m³

4.3 In-site Surface Water Design

The site surface water discharge has been designed to drain to in-site soakaways.

These are to be designed to accommodate a longest duration storm, for a worst- in-10 year event in accordance with BRE 365, with 50% of the soakaway emptying within 24 hours

In addition, the 100 storm year event has been considered, up to 6 hour storm durations.

4.4 Surface Water Drainage Design Summary:

The proposed site drains to an in-site soakaway

5.0 Other Potential Drainage Issues / Flood Hazards:

Appendix 4: Environment Agency Map

The enclosed Environment Agency flood map indicates that site is outside the 100 year flood area (dark blue) and also outside the extreme flood situation 1000 year (light blue:).

Other potential sources of flooding in addition to surface water:

Land Drainage: The site will become a residential properties and no residual land drainage is anticipated. The site is relatively flat

Rising groundwater: Not identified as an significant issue

Proposed foul drainage: This is discharging via a new connection to the existing public sewer, which has no record of surcharge.

6.0 Further Information and Considerations

The site has a code 3 rating, and rainwater harvesting is not required.

7.0 Code for Sustainable Homes Credit

Appendix 5 Information
Appendix 6 SUR1-Summary Report Template

7.1 SUR 1: Management of Surface Water Run-off from Developments. (Mandatory)

The establishment of agreements for the ownership, long-term operation and maintenance for sustainable drainage elements [in this instance, soakaways] qualifies for 2 credits.

A SUR 1 summary report template is issued with this report, and included in Appendix 6 This information will allow the award of the credits.

In order to meet the mandatory SUR 1 requirements and also gain the 2 credits, the following evidence needs to be provided at post construction stage:

- As-built drawings
- Approved calculations
- Evidence of agreements for soakaway maintenance

7.2 SUR 2: Flood Risk

2 Credits are available for developments in areas of low annual probability of flooding.(Equivalent to PPS25 zone 1)

This applies to this development.

7.3 Total Credits available / awarded:

SU1 1: 2

SUR 2: 2

Surface Water Appraisal for 2 Lodge Road, Rhosddu, Wrexham, LL11 2DD

Appendix 1

LOCATION PLANS:





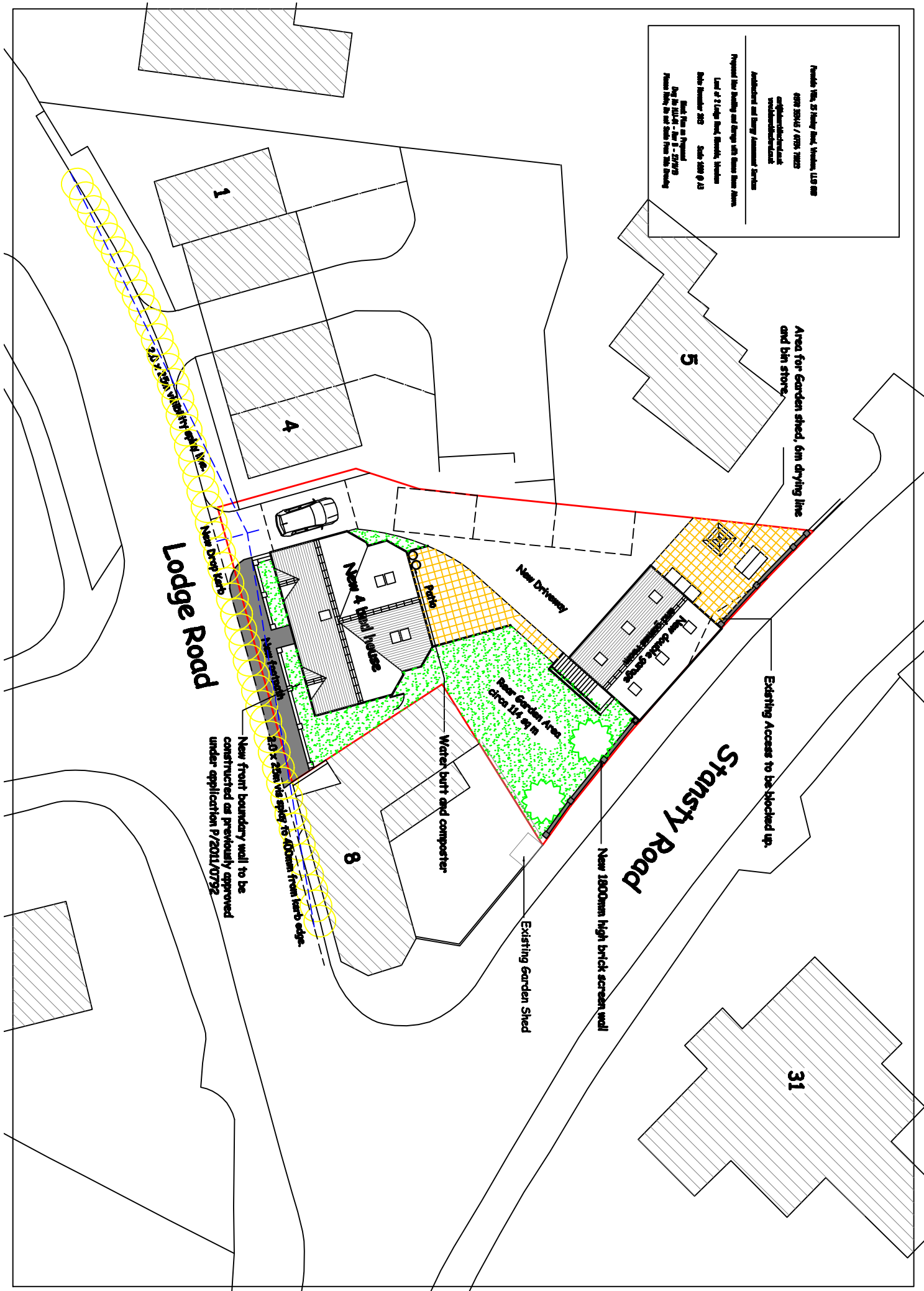
Surface Water Appraisal for 2 Lodge Road, Rhosddu, Wrexham, LL11 2DD

Appendix 2

SITE PLAN



Black Plan on Payment
Due by 11/11 - Nov 8 - 21/10/13
Please Note: Do not Send From This Drawing



Surface Water Appraisal for 2 Lodge Road, Rhosddu, Wrexham, LL11 2DD

Appendix 3

SURFACE WATER RUN-OFF CALCULATIONS



		SURFACE WATER RUN-OFF: PRE AND POST DEVELOPEMENT																																													
KANE DESIGN 15 Winchester Way, Gresford Wrexham LL12 8HH Tel: 01 9788 855888	Project	Scheme number 1232																																													
		2 LODGE ROAD WREXHAM LL11 2DD																																													
		DATE 10-Apr-14 Engineer A Kane Sheet 1 of 7																																													
DESIGN BRIEF The Code of Practise for Sustainable Urban Development requires the following information: - Site pre-development surface water run-off rate - Site pre-development surface water run-off volume - Site post-development surface water run-off rate - Site post-development surface water run-off volume The above are to be computed for storms up to 100 year return, 6 hour duration, and are to include a factor for climate change. The difference between pre-development and post development is to be calculated,																																															
DOCUMENTS USED: Code for Sustainable Homes: Technical Guide: May 2009 Version A Institute of Hydrology Report 124 (IH 124): Flood Assessment for Small Catchments: (1994) Institute of Hydrology Report: Flood Studies Supplementary Report FSSR 16 (1985) Wallingford Procedure (1993) CIRIA Report 697: THE SUDS Manual (2007) HMSO: Planning Policy Statement 25 (PPS25)																																															
FORMULA USED: <table> <tr> <td>Existing (Pre):</td> <td>Greenfield run-off rate</td> <td>source</td> <td></td> </tr> <tr> <td></td> <td></td> <td>IH124</td> <td>Annual peak flow=Qbar-rural</td> </tr> <tr> <td></td> <td></td> <td>FSSR16</td> <td>Ratio Q/Qbar-rural</td> </tr> <tr> <td></td> <td>Greenfield run-off volume:</td> <td>FSSR 16 Run-off model:</td> <td></td> </tr> <tr> <td></td> <td></td> <td>Fixed percentage run-off= PR rural</td> <td></td> </tr> <tr> <td></td> <td>Brown</td> <td>W.P.</td> <td>Modified Rational Method</td> </tr> <tr> <td>Post:</td> <td>Development run-off rate:</td> <td>W.P.</td> <td>Modified Rational Method</td> </tr> <tr> <td></td> <td>(Green portion)</td> <td>W.P.</td> <td>Fixed Wallingford Procedure</td> </tr> <tr> <td></td> <td></td> <td></td> <td>UK run-off = PR urban</td> </tr> <tr> <td></td> <td>Development run-off volume:</td> <td></td> <td>Q = area v rate</td> </tr> <tr> <td>Climate change:</td> <td></td> <td>PPS25</td> <td>Table B2</td> </tr> </table>				Existing (Pre):	Greenfield run-off rate	source				IH124	Annual peak flow=Qbar-rural			FSSR16	Ratio Q/Qbar-rural		Greenfield run-off volume:	FSSR 16 Run-off model:				Fixed percentage run-off= PR rural			Brown	W.P.	Modified Rational Method	Post:	Development run-off rate:	W.P.	Modified Rational Method		(Green portion)	W.P.	Fixed Wallingford Procedure				UK run-off = PR urban		Development run-off volume:		Q = area v rate	Climate change:		PPS25	Table B2
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NOTES PIMP Percentage Impermeable Area SOIL Soil type taken from Wallingford maps and FSR Report SAAR Standard Average Annual Rainfall from F.E.H CD for the catchment UCWI Urban Catchment Wetness Index (evaluated form Fig 9.7, Wallington Procedure) CWI Catchment Wetness Index																																															

		SURFACE WATER RUN-OFF: PRE AND POST DEVELOPEMENT	
KANE DESIGN 15 Winchester Way, Gresford Wrexham LL12 8HH Tel: 01 9788 855888		Project 2 LODGE ROAD WREXHAM LL11 2DD	Scheme number 1232 DATE 10-Apr-14 Engineer A Kane Sheet 2 of 7
SITE SPECIFIC DETAILS			
Location Postcode LL12 2DD Site EXISTING			
Site area (m2)		476 Calculated from drawings	
PIMP (%)		25.42	
Site Impermeable Area (m2)		121 Estimate: Old building demolished, no records	
Site permeable area		355 m2	
PROPOSED Impermeable:		275 m2	57.77% Impermeable (developed) area
Permeable		201	
Input data			
1.	Catchment Data	[proportion of each soil type estimated from Site Investigation Report]	
	<u>1a) Soil Data</u>	WRAP : = Soil Winter Rainfall potential (FSSR 16)	
	Prop S1	0	
	Prop S2	0.5	
	Prop S3	0.5	
	Prop S4	0	
	Prop S5	0	
Soil type = [sum of soil = 0.15 S1 x 0.3 S2 x 0.4 S3 x 0.45 S4 x 0.5 S5		=	0.35
Soil Percentage Runoff (SPR) = 10 S1 x 30 S2 x 37 S3 x 47 S4 x 53 S5		=	34
<u>1 b) Remainder catchment of data</u>			
	Region number	9	From CIRIA 696
	SAAR	900	From FSSR rainfall maps
	CWI	125	From FSSR Figure A7.5
	UCWI	108	From CIRIA 697 Figure 4.6
<u>1 c) rainfall data</u>			
	M5-60 min rainfall	20	From FSSR rainfall maps
	Ratio "r"	0.35	From FSSR rainfall maps
	Climate Change % (C	30	From PPS 25 Table B2
	Storm duration for peak run -off (min)	15	Selected [for post development]
	Z1	1.69	From BRE 365 Table 1 [r = .35 duration =360 mins]
	M5 - 60	33.8	,=Z1 x M5-60 Calculated = P1 year
	Z2	1.55	30 year Wallingford Vol 4 Table A1
	Therefore M30 year 360 min	52.39	mm/hr ,=Z1 x M5-60 Calculated = P30 year
	Z2	1.97	100 year Wallingford Vol 4 Table A1
	Therefore M100 year 360 min	66.59	mm/hr ,=Z1 x M5-60 Calculated = P100 year

		SURFACE WATER RUN-OFF: PRE AND POST DEVELOPEMENT	
KANE DESIGN 15 Winchester Way, Gresford Wrexham LL12 8HH Tel: 01 9788 855888	Project	2 LODGE ROAD WREXHAM LL11 2DD	Scheme number 1232 DATE 10-Apr-14 Engineer A Kane Sheet 3 of 7
NOTES			
A: Calculation	Existing (pre-development) Surface Water run-off rate: GREENFIELD		
Use :	Annual peak flow = $Q_{bar-rural} = 0.00108 \text{Area [Km2] } ^{0.89} \times \text{SAAR} ^{1.17} \times \text{SOIL} ^{2.17}$ m3 / sec		
	Area (m2)=	355	
	Growth Factors: Table 4.3 CIRIA 696	Return Period	Growth
	Region number 9	1	0.82
		30	1.77
		100	2.18
	Calculated	100 +C/C	2.834
	Q bar-rural: =	0.1708 m3/s [Based on equation default 50 Ha: Max area for equation]	
	Q bar-rural: (Actual) =	0.00012 m3/s	Ratio, Q/Qbar as FSSR 16
ESTIMATED GREENFIELD RUN-OFF:			
Storm Return period (yr)	1	30	100 100+CC
Growth (from above)	0.82	1.77	2.18 2.83
Peak run-off rate(m3	0.00010	0.00021	0.00026 0.00034
(Litres/s)	0.10	0.21	0.26 0.34
(Q bar actual x growth)			

		SURFACE WATER RUN-OFF: PRE AND POST DEVELOPEMENT			
KANE DESIGN 15 Winchester Way, Gresford Wrexham LL12 8HH Tel: 01 9788 855888	Project	2 LODGE ROAD		Scheme number	1232
		WREXHAM LL11 2DD		DATE	10-Apr-14
				Engineer	A Kane
				Sheet 4 of 7	
NOTES					
B: Calculation	Existing (pre-development) Surface Water run-off rate: BROWN PORTION OF SITE				
Use:	Modified Ration Method: $Q = 2.78C \times \text{Rainfall} \times \text{Area}$ Where $C = C_v (\text{PR urban}/100) \times C_r$				
PR (%) Impermeable area (PIMP)	25.42% from previous				
	121.00				
Therefore $C_v =$	0.750 Recommended Wallingford value for impermeable				
$C_r =$	1.30 fixed equation value				
Rainfall intensity:	Wallingford Procedure: 15 min Storm: Wallingford Vol 4 Table A1				
Storm Return period (yr)	15 min	1	30	100	100+CC
Z1	0.59				
M5-D	11.8				
Z2		0.61	1.52	1.91	2.48
Rainfall intensity:		28.79	71.74	90.15	117.20
ESTIMATED BROWN POST-DEVELOPMENT RUN-OFF:					
Storm Return period (yr)	1	30	100	100+CC	
Rainfall intensity (15 mins)	28.79	71.74	90.15	117.20	
Run-off rate l/s	0.94	2.35	2.96	3.84	
(Peak Flow)	$Q = 2.78 C_v \times C_r \times \text{Rainfall intensity} \times \text{Area}$				
C: Calculation	Existing (pre-development) Surface Water run-off Volume: BROWN PORTION OF SITE				
Use:	Modified Ration Method: $Q = 2.78 C \times \text{Rainfall} \times \text{Area}$ Where $C = C_v (\text{PR}/100) \times C_r$ volume = $V = Q \times A$				
Storm Return period (years)	100	100+CC			
Z1					360 mins
M5-D					
Z2	1.97				
Rainfall intensity: (mm/hr)	66.59 86.56				
Run-off rate, Q (litres / s)	2.18 2.84				
VOLUME V (m3)= Q/A: 360 mins		47.17	61.32		

		SURFACE WATER RUN-OFF: PRE AND POST DEVELOPEMENT					
KANE DESIGN 15 Winchester Way, Gresford Wrexham LL12 8HH Tel: 01 9788 855888	Project	2 LODGE ROAD WREXHAM LL11 2DD	Scheme number 1232 DATE 10-Apr-14 Engineer A Kane Sheet 5 of 7				
D: Calculation Existing (pre-development) Surface Water run-off Volume: SITE GREENFIELD : Use: FSSR16: Fixed Percentage Run-off Model 360 minute storm 100 year Run-off Volume = PR X AREA [Km2] X Rainfall depth wh PR = Percentage run-off = SPR + DPRcwi +DPR rain Where D= Dynamic contribution and DPRcwi = 0.25 x (CWI-125) DPR rain = 0.45 x (P-40)^0.7 Where P is greater than 40 SPR = 34 DPRcwi = 0 DPR rain = 4.472 Therefore PR = 37.972 <table border="1"> <tr> <td>Peak Run-off Volume (m3)</td> <td>12.04</td> </tr> <tr> <td>With climate change</td> <td>15.65</td> </tr> </table>				Peak Run-off Volume (m3)	12.04	With climate change	15.65
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E: Calculation Post development Surface Water run-off RATE: Use: Modified Ration Method: $Q = 2.78C \times \text{Rainfall} \times \text{Area}$ Where $C = C_v (\text{PR}/100) \times C_r$ Where PR urban = (%) percentage run-off area = $=0.829 \text{ PIMP} + 25\text{SOIL} + 0.078 \text{ UCWI} - 20.7$ [Fixed Wallingford Procedure] USES WHOLE CATCHMENT DATE (GREEN/BROWN) PR (%) Impermeable area (PIMP) 57.77% from previous (or use 'min PIMP 40%') PR urban = 44.37 Therefore $C_v =$ 0.444 $C_r =$ 1.30 fixed equation value Rainfall intensity: Wallingford Procedure: 15 min Storm: Wallingford Vol 4 Table A1 <table> <tr> <th>Storm Return period (y)</th> <th>15 min</th> <th>1</th> <th>30</th> <th>100</th> <th>100+CC</th> </tr> <tr> <td>Z1</td> <td>0.59</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>M5-D</td> <td>11.8</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Z2</td> <td></td> <td>0.61</td> <td>1.52</td> <td>1.91</td> <td>2.48</td> </tr> <tr> <td>Rainfall intensity:</td> <td></td> <td>28.79</td> <td>71.74</td> <td>90.15</td> <td>117.20</td> </tr> </table> ESTIMATED POST-DEVELOPMENT RUN-OFF: <table> <tr> <th>Storm Return period (years)</th> <th>1</th> <th>30</th> <th>100</th> <th>100+CC</th> </tr> <tr> <td>Rainfall intensity (15 mins)</td> <td>28.79</td> <td>71.74</td> <td>90.15</td> <td>117.20</td> </tr> <tr> <td>Run-off rate l/s</td> <td>2.20</td> <td>5.48</td> <td>6.88</td> <td>8.95</td> </tr> </table> (Peak Flow) $Q = 2.78 C_v \times C_r \times \text{Rainfall intensity} \times \text{Area}$		Storm Return period (y)	15 min	1	30	100	100+CC	Z1	0.59					M5-D	11.8					Z2		0.61	1.52	1.91	2.48	Rainfall intensity:		28.79	71.74	90.15	117.20	Storm Return period (years)	1	30	100	100+CC	Rainfall intensity (15 mins)	28.79	71.74	90.15	117.20	Run-off rate l/s	2.20	5.48	6.88	8.95
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F: Calculation Post development Surface Water run-off VOLUME: 360min storm Use: Modified Ration Method: $Q = 2.78 C \times \text{Rainfall} \times \text{Area}$ Where $C = C_v (\text{PR}/100) \times C_r$ volume = $V = Q \times A$ Storm Return period (years) <table> <tr> <th>1</th> <th>30</th> <th>100</th> <th>100+CC</th> </tr> <tr> <td>Z1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>M5-D</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Z2</td> <td></td> <td>1.97</td> <td></td> </tr> <tr> <td>Rainfall intensity: (mm/hr)</td> <td></td> <td>66.59</td> <td>86.56</td> </tr> <tr> <td>Run-off rate, Q (litres / s)</td> <td></td> <td>2.94</td> <td>3.82</td> </tr> </table> VOLUME V (m3)= Q/A: 360 mins 63.42 82.45 Post development run-off volume		1	30	100	100+CC	Z1				M5-D				Z2		1.97		Rainfall intensity: (mm/hr)		66.59	86.56	Run-off rate, Q (litres / s)		2.94	3.82																					
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15 Winchester Way, Gresford		Project 2 LODGE ROAD WREXHAM LL11 2DD	DATE		10-Apr-14	
Wrexham LL12 8HH			Engineer A Kane			
Tel: 01 9788 855888			Sheet 7 of 7			
SUMMARY: SURFACE WATER						
RUN-OFF		PRE-DEVELOPMENT				
	Storm Return	1	30	100	100+CC	
A	GREENFIELD	0.099	0.21	0.26	0.34	
B	BROWN	0.94	2.35	2.96	3.84	
	TOTAL	1.04	2.57	3.22	4.19	LITRES /S
VOLUME						
				100	100+CC	360 min
C	GREENFIELD			12.04	15.65	
D	BROWN			47.17	61.32	
	TOTAL			59.21	76.97	m3
RUN-OFF		POST DEVELOPMENT				
	Storm Return	1	30	100	100+CC	
E		2.20	5.48	6.88	8.95	LITRES /S
VOLUME						
				100	100+CC	360 min
G				63.42	82.45	m3
		PRE-DEVELOPMENT	POST-DEVELOPMENT		ADDITIONAL	
SITE AREA	m3	476	476			
IMPERMEABLE	m3	121	275		154	
PERMEABLE	m3	355	201		-154	
100 year +climate change (litres/s)						
RUN-OFF		4.19	8.95		4.76	
100 year +climate change (m3)						
VOLUME		76.97	82.45		5.48	
ADDITIONAL FLOW DUE TO NEW DEVELOPMENT			4.76 Litres / s			
ADDITIONAL VOLUME DUE TO NEW DEVELOPMENT			5.48 m3			
EXISTING PEAK DISCHARGE RATES=			4.19		100 year +cc	
			2.57		30 year	
			1.04		1 year	

Surface Water Appraisal for 2 Lodge Road, Rhosddu, Wrexham, LL11 2DD

Appendix 4

ENVIRONMENT AGENCY FLOOD MAP



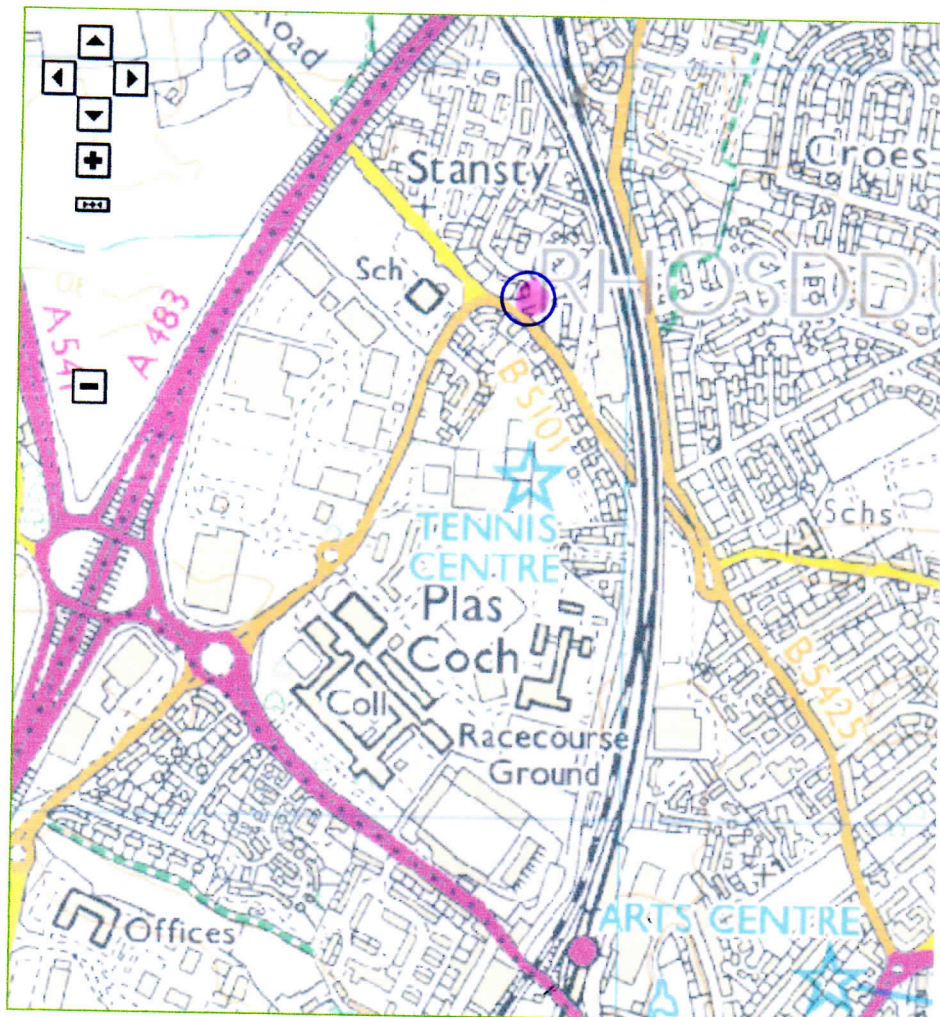
Map legend

Click on the map to see what Flood Zone (National Planning Policy Guidance definitions) the proposed development is in.

☐ ☒ Flood Map for Planning (Rivers and Sea) 

-  Flood Zone 3
-  Flood Zone 2
-  Flood defences (Not all may be shown*)
-  Areas benefiting from flood defences (Not all may be shown*)
-  Main rivers

LL11 2DD at scale 1:10,000



Customers in Wales - From 1 April 2013 Natural Resources Wales (NRW) has taken over the
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Appendix 5

**CODE FOR SUSTAINABLE HOMES
CATEGORY 4 DRAINAGE: INFORMATION**



Category 4: Surface Water Run-off contains 2 Code issues:

- Sur1 - Management of Surface Water Run-off from developments
- Sur2 – Flood Risk

Sur1 - Management of Surface Water Run-off from developments

The aim of Sur1 is to ensure new housing developments are designed to avoid, reduce and delay the discharge of rainfall to public sewers and watercourses, thus protecting watercourses and reducing the risk of localised flooding, pollution and other environmental damage.

Sur1 contains Mandatory Elements which must be met in order for an overall code rating to be achieved. Up to two credits are available for further improvement in the management of rainfall run-off.

The Mandatory Elements to be addressed are:

- 1) Peak Rate of Run-off
- 2) Volume of Run-off

Within the calculations, CSH also requires that an allowance for climate change must also be included. In line with Planning Policy Statement 25 (PPS25), a climate change allowance (CCA) of +30% is used for a 1 in 100 year event.

Sur1 Mandatory Element - Peak Rate of Run-off

The development is required to “*Ensure that the peak rate of run-off into watercourses... is no greater for the developed site than it was for the pre-development site. This should comply with the Interim Code of Practice for Sustainable Drainage Systems [ICP](SUDS) (CIRIA, 2004) or for at least the 1 year and 100 year return period events.*”

The CSH and ICP-SUDS give guidance on the methods to be used for estimating run-off rates for both greenfield and brownfield sites. The method is dependent on the percentage of the total area which is considered impermeable.

The recommended method for calculating peak ‘greenfield’ run-off rates is the Institute of Hydrology Report No 124 – Flood Estimation for Small Catchments (IoH124) (Marshall and Bayliss, 1994).

To calculate the peak run-off rate generated post-development the Rational Method is used. This follows the current best practice set out in ICP-SUDS and CIRIA C697 - The SUDS Manual (Feb 2007).

Sur1 Mandatory Element - Volume of Run-off

The development is required to “Ensure that the additional predicted volume of rainwater discharge caused by the new development, for a 1 in 100 year event of 6 hour duration including an allowance for climate change, is entirely reduced using: Infiltration and/or is made available for use in the dwelling as a replacement for potable water use in non-potable applications such as WC or washing machine operation.”

Following the guidance provided in both ICP-SUDS and CIRIA C697 the predicted run-off volumes are calculated for both pre- and post- development layouts. Return periods of 1 in 100 years and 1 in 100 years + CCA are investigated for a 6 hour duration event.

CIRIA C697 recommends the use of the FSSR 16 run-off method for calculating the run-off volume for greenfield sites.

It should be noted that the Code clearly states that reasons for discounting infiltration or rainwater harvesting must be provided with supporting evidence. BRE Global has also given guidance on this subject and state that neither cost nor maintenance burdens are appropriate reasons for not meeting the criteria.

Any residual run-off volume which can not be disposed of via infiltration or re-use within the dwellings must be dealt with in the following hierarchical approach; “*any residual additional rainwater volume that cannot be prevented from being discharged (reasons must be provided*

with supporting evidence), for all events up to the 100-year return period, the peak discharge rate from the site should be reduced to (in order of priority):

A: the pre-development site's estimated mean annual flood flow rate (Q_{bar}); or

B: 2l/s/ha; or

C: a minimum flow rate (litres per second), based on good practice guidelines to prevent easy blockage, by ensuring the outlet throttle is not too small; unless rainwater is being discharged to a public sewer or adopted surface water sewer, and there is a specific minimum requirement defined by the Sewerage Undertaker."

Sur1 Credits

Within Code issue Sur1 *"2 credits are available for using SUDS to improve water quality of the rainwater discharged or for protecting the quality of the receiving waters by:*

- Ensuring no discharge to the watercourse for rainfall depths up to 5mm... or*
- Establish agreements for the ownership, long term operation and maintenance of all sustainable drainage elements used".*

Sur1 – Mandatory Evidence

In order to demonstrate compliance with Sur1 a Flood Risk Assessment (FRA) must also be provided as mandatory evidence. This is required for houses in any flood risk zone and should be written in accordance with PPS25 and its companion practice guide. The FRA is usually presented as a separate report. In Wales, this may be called a Flood Consequence Assessment (FCA) in accordance with TAN15. The FRA or FCA may also satisfy the requirements for up to 2 credits for Sur2.

Sur2 – Flood Risk

The aim of Sur 2 is to encourage housing development in low flood risk areas, or take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding.

Up to 2 credits are available for flood risk. The Flood Risk Assessment (FRA) is usually presented as a separate report. For sites in the Environment Agency's flood zones 1 and over 1ha and in zones 2 or 3, the FRA is required to accompany the planning application.

Surface Water Appraisal for 2 Lodge Road, Rhosddu, Wrexham, LL11 2DD

Appendix 6

**CODE FOR SUSTAINABLE HOMES
SUMMARY REPORT TEMPLATE**



Sur 1 - Summary Report Template

Introduction:

This template can be used to demonstrate compliance with the criteria specified in the mandatory section of Sur 1 in the Code for Sustainable Homes. The form can be used by the Code Assessor to aid in assessing the Sur 1 issue and can be provided as supporting evidence in addition to the items listed in the schedule of evidence for Sur 1. Completing this template is optional.

National policy documents have been used to set the standards for the mandatory element of Sur 1. PPS25 Development and Flood Risk (ODPM, 2006) and the Interim Code of Practice for Sustainable Drainage (National SUDS Working Group, 2004) are two of the key documents used. Further reading is listed in the References section of the Technical Guide.

Instructions:

Where submitting this template as supporting evidence for a Code assessment please ensure that the assessor completes section A and B and the consultant / engineer completes sections C to F, ensuring that it is signed and dated.

If the form is incomplete and / or unsigned it will not be accepted as evidence supporting a Code assessment.

The Technical Guide does not specify the calculation methodology to be used in Sur 1 (with the exception of greenfield runoff rates). Although flexibility in choice of methodology is available, best practice methodologies should always be used. If required, information regarding applicable calculation methodologies can be found in the SUDS Manual (CIRIA, 2007). Reputable software, such as Microdrainage, can be used for calculation purposes.

Code for Sustainable Homes - Technical Guidance Issue

This template is for use with the following technical guidance issues:

- April 2008
- October 2008
- May 2009

Section A & B to be completed by the assessor	
Section A: Contact Details	
Consultant / Engineer details	
Company Name:	KANE DESIGN
Company Address:	15 WINCHESTER WAY, GRESFORD, WREXHAM LL12 8HH
Contact Name:	ALAN KANE
Contact Telephone Number:	01 978 855888 / 07751 183528
Developer / Client details	
Company Name:	
Company Address:	
Contact Name:	
Contact Telephone Number:	
Development details	
Development Name:	2 Lodge Road, Rhosddu, Wrexham, LL11 2DD
Development Address:	As Above
Site Registration Number:	
Contact Telephone Number:	

Section B: Assessment Information

1.	If applying the criteria from updated versions of the Code to your development please identify which version of the Code is being used to assess Sur 1. ¹ For example, 'This site is registered under the October 2007 scheme but the May 2009 Sur 1 criteria will be met.'	
2.	For sites containing a mixture of non-Code and Code assessed dwellings there are several assessment options for Sur 1. The first would be to assess the whole site (including the non-Code dwellings) under the Code criteria. The second would be to demonstrate with several separate reports that each of the groups of Code dwellings on the site have met the criteria. Please tick one of the following boxes;	
	A. The site contains a mixture of Code and non-Code dwellings and the whole site has been assessed under the Sur 1 criteria.	
Or:		
	B. The site contains a mixture of Code and non-Code dwellings and there is more than one assessed area for Sur 1 within the site boundary. Please write the number of assessed areas within the site in the space provided below (you will need to complete this template for each assessed area).	☐
	Number of assessed areas:	
Or:		
	C. The site only contains Code assessed dwellings.	Y

¹ If you require information on retrospectively applying criteria to older versions of the Code for Sustainable Homes please contact your Code Service Provider.

Section C to G to be completed by the engineer / consultant

Section C: Site Information

3.	A. Please provide the site area ² (delete units of measurement as applicable)	476	m ²
	B. Please provide the impermeable area of the site pre-development (delete units of measurement as applicable)	121	m ²
	C. Please provide the impermeable area of the site post development (delete units of measurement as applicable)	275	m ²
4.	Please provide the number of dwellings on the site		ONE

Section D: Peak Rate of Runoff

5.	A. Pre-development peak rate of runoff for the 1 year event ³	1.04	l/s
	B. Post-development peak rate of runoff for the 1 year event (this figure must be less than or equal to A) ³	0	l/s
	C. Optional ⁴ : Pre-development peak rate of runoff for the 30 year event ³	2.57	l/s
	D. Optional ⁴ : Post-development peak rate of runoff for the 30 year event ³	0	l/s
	E. Pre-development peak rate of runoff for the 100 year event ³	4.19	l/s
	F. Post-development peak rate of runoff for the 100 year event (this figure must be less than or equal to E)	2.26	l/s
6.	If, post-development, it was necessary to reduce the peak rate of runoff to meet the Code criteria, please provide a brief explanation below describing how the peak rate was reduced.		
	Soakaways reduce the peak rate of runoff to pre-development levels		
7.	Please tick this box to confirm that the peak rate of runoff calculations include an allowance for climate change in accordance with current best practice (PPS25, 2006).		Y
8.	Please tick one of the following boxes as applicable to this site:		
	This is a greenfield site ⁵ and is less than 200 ha therefore runoff rate calculations have been carried out in accordance with the IoH Report 124 'Flood estimation for small catchments' (Marshall and Bayliss, 1994).		Y
	This is a greenfield site ⁵ of 200 ha or more therefore runoff rate calculations have been carried out in accordance with the 'Flood estimation handbook' (Centre for Ecology and Hydrology, 1999).		☐

² The site area will include all areas within the boundaries of the site, including both permeable and impermeable areas. If box 2B has been ticked, the 'site area' will be only that for which this template demonstrates compliance.

³ Peak rate of runoff calculations should be carried out for the range of storm durations up to and including the 6 hour storm. The peak rate of runoff for the storm event will then be the 'worst case' runoff rate for the range of storm durations. The climate change allowance should be added to both the pre-development and post development calculations.

⁴ Providing the peak rate of runoff calculations for the 30 year event is optional and is not necessary to demonstrate Code compliance. Space for the provision of the 30 year event calculations has been provided to assist engineers / consultants in presenting their calculations. Calculations for the 30 year event are normally available for most sites.

⁵ Or a site that has been derelict for over 5 years

	This is a brownfield site and runoff rates have been calculated in accordance with current best practice. [75% BROWN, 25% GREEN]	Y
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Section E: Volume of Runoff

9.	Please tick this box to confirm that the volume of runoff calculations include an allowance for climate change ⁶ in accordance with current best practice (PPS25, 2006).		Y
	Please tick this box to confirm that the volume of runoff calculations are for the 100 year event of 6 hour duration.		Y
10.	A. Pre-development volume of runoff	76.97	m ³
	B. Volume of runoff caused by the new development prior to mitigation	82.45	m ³
	C. Additional predicted volume of rainwater caused by the new development prior to mitigation (= 10B – 10A)	5.48	m ³
	D. If the answer to 10C is greater than zero, please provide a brief explanation below describing how you have reduced the additional volume discharged from the developed site		
	Soakaways will infiltrate additional volume		
	Please provide the additional volume of runoff discharged from the site when the mitigation measures described in 10D are in place. ⁷	0	m ³
11.	A. Where it has not been possible to reduce some or all of the additional volume by infiltration and / or making the water available for use in the dwellings (i.e. there is some residual additional volume) please provide an explanation below (evidence to support the reasoning should be provided in the hydrological report);		
	State the reasons infiltration is not possible: SOAKAWAYS ARE USED		NA ☐
	State the reasons re-use in the dwelling is not feasible:		NA ☐
12.	A. Where it has not been possible to reduce all of the additional volume by infiltration or making the water available for use in the dwelling(s) a hierarchical approach should be taken in managing the residual additional volume. The following three criteria are listed in the Technical Guide in order of priority. Please tick one of the boxes below to confirm the level of flow control that has been achieved;		
	The peak discharge rate has been reduced to the site's estimated mean annual flood flow rate (Qbar).		☐
	Please state Qbar:		l/s
	Or:		
	The peak discharge rate has been reduced to 2l/s/ha.		☐

⁶ The climate change allowance should be added to both the pre-development and post development calculations.

⁷ This figure should be zero. For situations where the additional volume can not be reduced to zero explanations must be provided in Q11.

Number of assessed areas:			l/s
Or:			
A minimum flow rate (litres per second), based on good practice guidelines to prevent easy blockage, by ensuring the outlet throttle is not too small.			
Minimum throttle diameter used:			mm
Flow rate achieved:			l/s
B. Where options higher up the list of criteria have been discounted please provide an explanation below (evidence to support the reasoning should be provided in the hydrological report);			
State the reason Qbar not feasible:			NA ☐
State the reason 2l/s/ha not feasible:			NA ☐

Section F: Discharging to the sewers			
13.	Where the mandatory requirements of Sur 1 for the peak rate and volume of runoff have been met as far as possible but the discharge of some surface water runoff to the public sewers (or adopted surface water sewers) cannot be avoided, the flow rate requirements of the sewerage undertaker ⁸ must be met. Please tick one of the following boxes;		
	A. The site discharges surface water to the sewers at a rate that meets the flow rate requirements of the sewerage undertaker, as well as the mandatory criteria in the Code.	☐	
Or:			
	B. The site does not discharge surface water runoff to the sewers.	Y	

⁸ Sewerage undertakers may set maximum and/or minimum flow rate requirements. Where flow rate requirements are set these should always be met in addition to the Sur 1 criteria. Simply discharging surface water runoff to the sewers according to the sewerage undertaker's **maximum** flow rate requirements would not meet the mandatory criteria. It must always be demonstrated that the mandatory requirements as specified in the criteria table have been met since they are applicable to surface water runoff draining to all watercourses, including sewers (see definition of 'watercourses' in the Technical Guide).

Section G: Signature

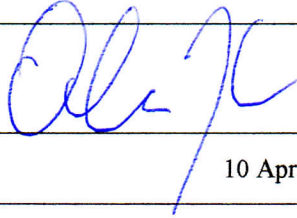
14. The following declaration should be signed by the engineer / consultant responsible for ensuring that the development meets the Sur 1 mandatory criteria

I confirm that the information provided in this document is truthful and accurate at the time of completion.

Name of consultant / engineer:

ALAN KANE

Signature of consultant / engineer:



Date:

10 April 2014