Received 14·3·11

gta civils ltd - consulting engineers



FLOOD RISK ASSESSMENT

Land Adjacent to Thatch Cottage
Pond Lane, Durrington BN13 2RH

CLIENT
Mr. G. Pullen
c/o Archideus Architects
2 Ashley Road, Lower View
Uffculme
Cullompton
Devon EX15 3AH

Ref: 3800/2.3F
Date: 18 January 2011

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Issue	Date	Compiled	Checked
First Issue	18 January '11	JP	JR
Second Issue	07 March '11	JP	JR
Third Issue	14 March '11	JP	JR

This Report has been prepared for Mr. Pullen & Archideus Architects in relation to the above development and no responsibility is accepted to any third party for all or part of this study in connection with this or any other development.

GTA Civils Ltd. was appointed by its Client to provide a Flood Risk Assessment (FRA) to satisfy Worthing Borough Council's Planning Department's requirement to demonstrate that the proposed development does not impact on this neighbourhood's flood risk.

The FRA report has been developed to satisfy the requirements of Planning Policy Statement 25 (PPS25), this being the current definitive central government flood risk policy.

1.0 EXISTING SITE & CURRENT FLOOD CONDITIONS

1.1 The application site lies within Worthing Borough, approximately 200m east of Ferring Rife, which is culverted in places. As the site is approximately 3.3km north of the coast and the floodplain (of Ferring Rife) is approximately 1.5km away to the southwest, no consideration of tidal/coastal flooding is considered necessary.

1.2 The site centres on OS grid reference E 511799m, N 105028m.

1.3 The existing site is partially occupied by a garage and driveway serving the adjacent Thatch Cottage with the remainder vacant, ie landscaped. The site is accessed from Pond Lane to the north of the site. See the Location Map and Aerial view of the site in Appendix A.

1.4 It is assumed that the garage roof drains directly to ground, ie it is not positively drained.

1.5 The site slopes gently: the lowest level of 9.94m AOD is in the middle of the site and the highest level of 11.25m AOD is at the southeast corner. The site's area is approximately 650m^2.

1.6 There is an existing culverted watercourse that flows under the south half of the site. This stream flows from the east, flowing into Ferring Rife – see the EA's flood map in Appendix C.

1.7 The Sussex rifes' geology comprises typically clays of the Lower Eocene (Lower London Tertiaries and London Clay.) These are known for their low porosity.

1.8 It is understood from conversations with the Local Authority Building Control officers that there is a tendency for springs to form in this vicinity. Whilst this site has not demonstrated this specifically it would be prudent to factor this into the proposed drainage strategy. See the proposed drainage drawing in Appendix B, which shows a network of land drains.

1.9 The EA Flood Map (Appendix C) shows that this site is in Flood Zone 1 - Low Probability (FZ1). The annual chance of flooding from rivers and the coast is less than 1 in 1000 (0.01%.) This does not take into account flood risk from other sources, however, such as groundwater, overland flow, surface water and sewerage failure.

1.10 Overland Flow and Sewerage Failure Sources: The site is sloping generally from south to north and this development will not interrupt this overall overland flow route. There is no record of any overland flooding in this vicinity in the past. There is no indication of any history of sewerage failures in this vicinity and so this is considered to be a negligible risk.

1.11 A visual survey (backed up with taking spot levels) of the nearby storm sewers indicated that the stream that this site's sewer discharges into Ferring Rife. This flows via Pond Lane Recreation Ground, which acts as a balancing pond, or wetland area. In periods of high rainfall this low-lying site floods, leaving all the relatively higher properties dry.

2.0 PROPOSED SITE LAYOUT & FLOOD RISK

2.1 The proposed application is for the erection of 2 no. houses, outbuildings and garages. This is not a major development, as defined by PPS25, as the site is less than a hectare and fewer than 10 dwellings are being created.

2.2 Table D2 of Annex D in PPS25 classifies residential dwellings as "More Vulnerable". Table D3 states that this class of Vulnerability is acceptable in FZ1, ie low risk areas.

2.3 The proposed area of impermeable surfaces is 164m^2. During a peak '1 in 100 year' event at 158mm/hour rainfall intensity the off-site flow rate would be approximately 7.2 l/s. This calculation determines the maximum likely unattenuated flow rate. (This equates to 7.2 x 3600 / 1000 = 25.92m^3/hr.)

2.4 Surface Water Design: due to the impermeable nature of the clay soil and the presence of groundwater at 1m approximate depth it is contended that soakaways are not feasible. This will be confirmed by carrying out a soakage Test (to BRE Digest 365.)

2.5 As outlined in Section 1.8 it is proposed to form a network of land drains: this will stop any springs from causing groundwater flooding. The water table will be limited to these drains' elevation and any build up will flow off site with the roofs' surface water. This is solely a precautionary measure – it is uncertain whether or not it is needed on this site. These will be constructed as per the detail drawing on GTA drawing ref 3800/100 in Appendix B.

2.6 All the roofs will be positively drained and will discharge into the existing manhole in the open fronted bin store – see the proposed drawing - and then into the stream. It is proposed to attenuate the offsite flow rate to 4.3 l/s during the critical 1 in 100 years plus 30% climate change storm. This will be by means of a 40mm diameter orifice plate. (Any smaller than 40mm is risking debris clogging this hole.) This will cause the flood water to back up and so an attenuation pipe will be necessary to store this. The size of this has been calculated using Micro Drainage – see Appendix E: at 450mm dia x 2.0m long. The total volume stored is 1.6m^3. This equates to about 8 minutes and 20 seconds of the difference in 'flow rate in' less 'flow rate out' (7.2 – 4.0 = 3.2); 3.2 x 60 seconds x 8.333 mins = 1600*l*, equalling 1.6m^3. As the duration of the critical storm is 15 minutes this would be the period of highest intensity approximately halfway through this.

2.7 The approximate invert level of the orifice plate and land drains is 8.80m AOD and the storage pipe will be set at approximately 9.20m, the same level as the drain runs' downstream inverts from the roofs. Therefore when the groundwater level rises to the highest point of these holed pipes the storage and other pipes will be higher: also the land drains are encased in gravel, this helping the ground's drainage characteristics. The main point is that the whole network (drains serving the roofed areas plus the land drains) will drain to the sewer via the orifice plate and the attenuated volume will be stored temporarily within *all* the pipes.

2.8 The maximum depth in the Appendix E calculation relates to the difference in level between the pipe's invert level and the maximum level of flooding. Pages 3-4 outline the rainfall/catchment and physical design of the orifice and storage pipe, whilst the earlier pages show the storm events with the critical one highlighted. The volume in the chamber between orifice (8.8m) and pipe (9.2m) is extra, ie conservative.

2.9 It is clear that in the critical event the land drains will saturate before the attenuation pipe is filled: this calculation (in Appendix E) is on the basis that the land drains are fully saturated. The rest of the drainage network will fill with flood water but not overtop.

2.10 The level at Pond Lane Recreation Ground's outfall is 8.89m AOD, meaning that the application site has a 1.05m freeboard above this. It is contended that this proposal will have no detrimental effect on the

vicinity's flood risk, ie the existing sewerage system has excellent capacity for the whole area: the wetland will attenuate the vicinity's SW discharge.

3.0 SUMMARY

3.1 The application site lies within Worthing Borough and is in Flood Zone 1, meaning that the risk of flooding from rivers and the coast is low.

3.2 The nearest watercourse is a culverted stream, ie a SW sewer, which passes under the site. It flows west discharging into Ferring Rife.

3.3 The application is for the creation of 2 houses with outbuildings and garages, whose area adds up to 164m^2. As the existing garage is assumed to drain to ground this is the net increase in impermeable area.

3.4 There is a culverted SW sewer running under the site. It is proposed to discharge the roofs' surface water into the manhole, see the drainage drawing in Appendix B. The surface water strategy is to drain into this run and attenuate the offsite flow to 4.3 l/s, this being the practical lower limit of devices such as hydrobrakes or orifice plates. An attenuation pipe sized to store the critical 1 in 100 years plus 30% climate change storm is positioned off-line adjacent to this flow limiting device, this being 450mm dia. x 2.0m long.

3.5 The nearby Pond Lane Recreation Ground is a SUDS wetland: as the level at its outfall is 8.89m AOD, whilst the lowest level on the application site is 9.94m AOD, there is 1.05m freeboard should the overflow route get blocked for any reason. The wetland acts as an attenuation tank that benefits the wider neighbourhood.

3.6 The risk of groundwater flooding is significant: Local Authority Building Control officers have let it be known that springs have formed in this vicinity. Even though *this* site has is not specifically at risk it would be prudent to factor this into the proposed drainage strategy. The proposed drainage drawing in Appendix B shows a network of land drains that will stop the water table from rising to the ground's surface. The land drain will be at approximately the same level as the orifice plate and 400mm lower than the attenuation pipe and so the groundwater level will never reach the storage pipe.

3.7 There is no indication of any history of sewerage failure in this neighbourhood.

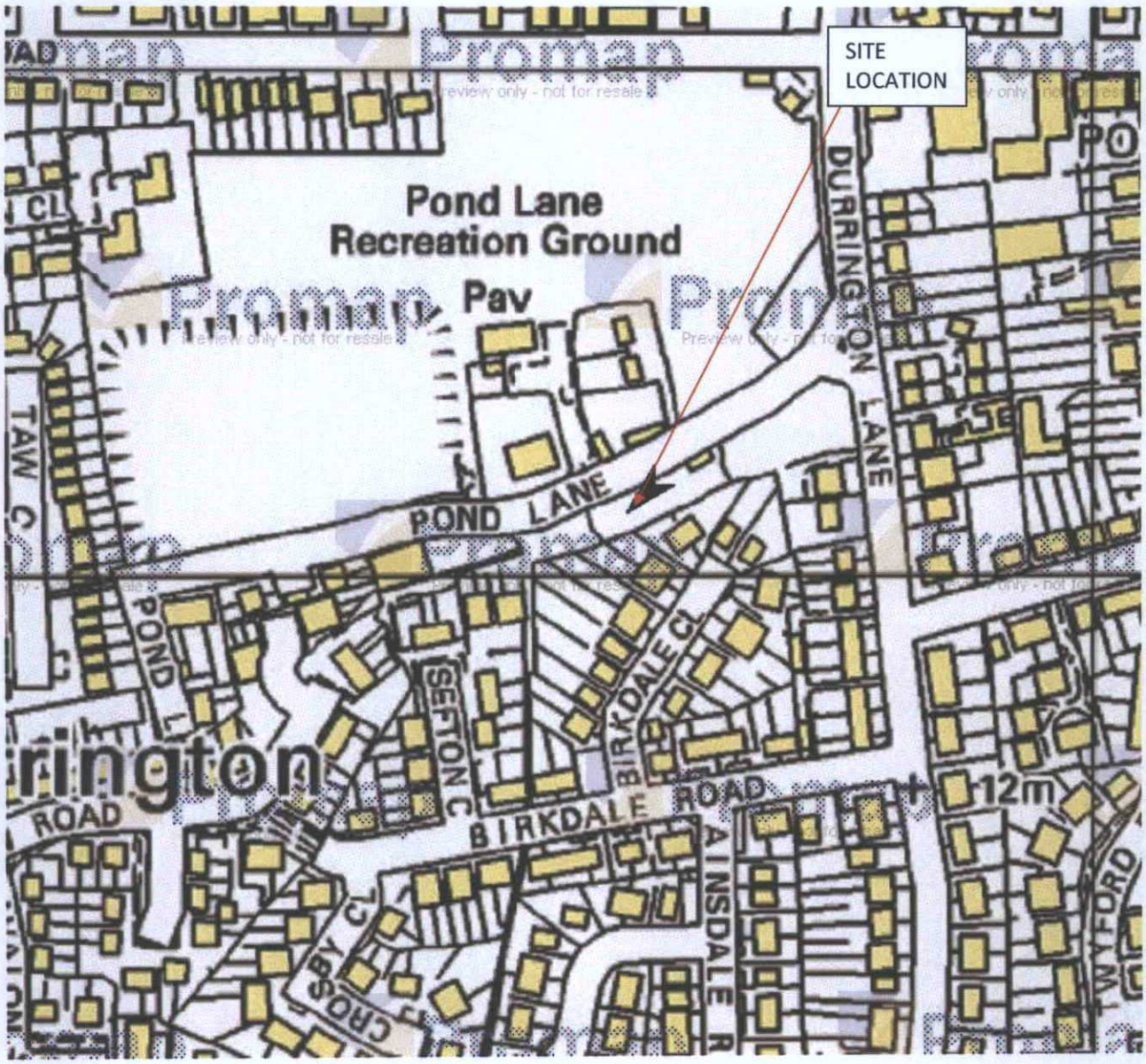
3.8 This development will not affect this overland flow route. As there is no record of overland flooding in this region the risk of flooding from this source is considered to be low.

It is therefore considered that this development is PPS25 compliant – it is at very low risk of flooding.

– End of Report –

APPENDIX A

Site Location Map & Site Aerial Photo




SITE
LOCATION
Pond Ln
Pond Ln

APPENDIX B

Existing Topographical Survey & Proposed Scheme Drawings

GTA Civils Ltd. Pond Lane, Burringham Topographical Survey

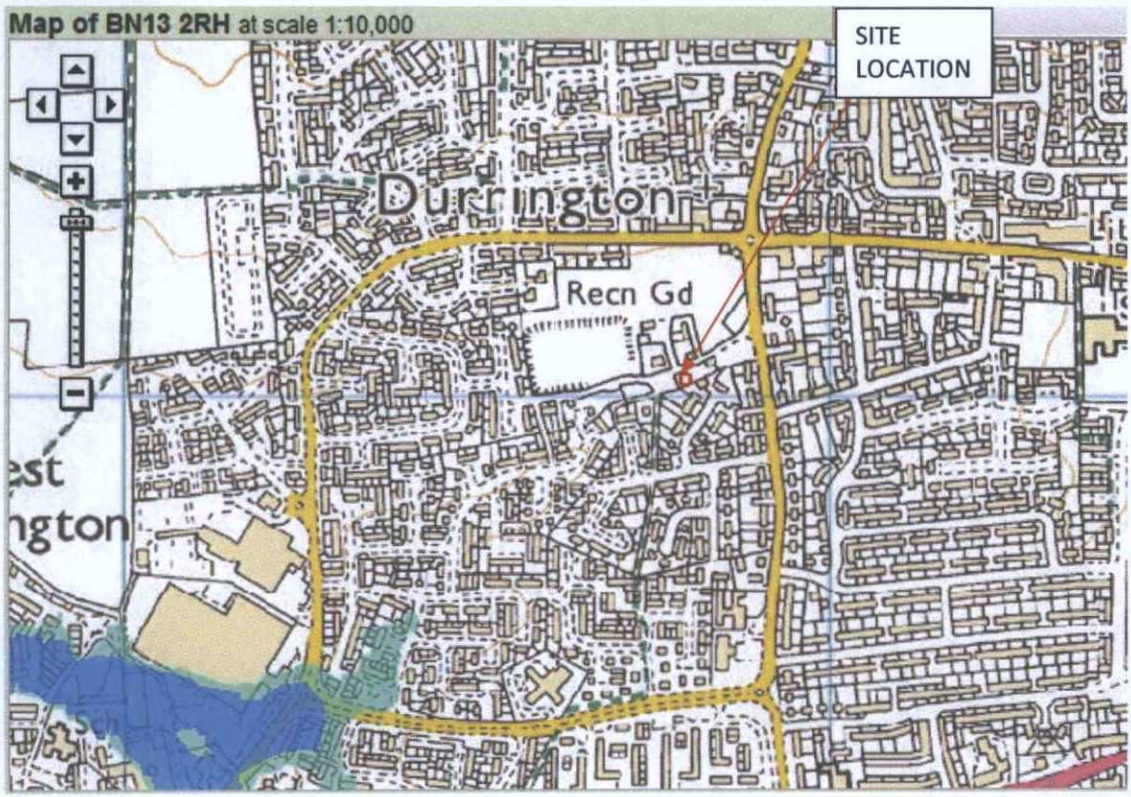
Scale 1:200

PLANNING APPLICATION
Mr & Mrs Pullen
Land Adjacent Thatch Cottage Westbrook Marlborough Wiltshire SN8 4NS
01/23209
Mr & Mrs Pullen
1:1250 @ A4
1:200 @ A1
A4 LW
CED
Thatch Cottage
Footprint 45m²
Dunmington Farmhouse
Footprint 78m²
Parking Area
Plot 1
Plot 2
PROPOSED BLOCK PLAN 1:200
PROPOSED ROOF PLAN 1:200
PROPOSED GROUND FLOOR PLAN 1:100
PROPOSED FIRST FLOOR PLAN 1:100
PROPOSED SECTION FROM NORTH 1:100
PROPOSED NORTH ELEVATION 1:100
PROPOSED WEST ELEVATION 1:100
PROPOSED SOUTH ELEVATION 1:100
PROPOSED EAST ELEVATION 1:100
PROPOSED BARN 1:100
DETAIL OF HIP AND REAR EAVES 1:20
SECTION THROUGH PROPOSED DORMER 1:100
UNIT 1
UNIT 2

DRAINAGE LAYOUT
PROPOSED INDICATIVE
SURFACE WATER
3800\001
INDICATIVE
Unless stated otherwise all SW pipes
to be 100mm Ø at 1:80 min gradients
Drainage Design to be finalised at
detailed design stage: this layout is
indicative only
Detail of Vitrified Clay Land Drain
Plot 1
Plot 2
Existing house
Existing block
Existing garage
Existing Pond
Land Drain
stock fence line
Proposed connection to
Existing main sewer
Proposed Surface Water
Attenuation Pipe
Existing Water Course
Existing Ditch
Existing Hedge
Existing Tree
Existing Pylon
Existing Telephone Pole
Existing Telegraph Pole
Existing Manhole
Existing Gully
Existing Soil Pipe
Existing Rain Water Pipe
Existing Foul Drain
Existing Surface Water Drain
Existing Combined Drain
Existing Land Drain
Existing Culvert
Existing Ditch
Existing Hedge
Existing Tree
Existing Pylon
Existing Telephone Pole
Existing Telegraph Pole
Existing Manhole
Existing Gully
Existing Soil Pipe
Existing Rain Water Pipe
Existing Foul Drain
Existing Surface Water Drain
Existing Combined Drain
Existing Land Drain
Existing Culvert

APPENDIX C

Environment Agency Flood Map



Excerpt From EA's Website

(This shows that this neighbourhood is in Flood Zone 1 – the floodplain in the SW corner is Ferring Rife)

APPENDIX D

Southern Water Sewer Records

SEWER RECORDS PAGE 1 OF 2

Title: 119893_Land adjacent Thatch Co	Date: 08/01/2017	Drawn by: Jthrutlin
	Scale: 1:1250	

0.S. REF: TQ710SSE

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy.
The actual positions should be determined on site.
WARNING - SBC pipes are committed at bonded Asbestos Cement
WARNING - Unknown (GRP) material may include bonded Asbestos Cement

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Southern Water

N

512053

104911

511582

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape
0001X	13.43	10.42	225	VC	CIRC
0002X	13.57	10.54	225	VC	CIRC
0003X	12.71	10.95	225	VC	CIRC
0004X	12.85	11.06	225	VC	CIRC
0010X			225	VC	CIRC
0051X	13.43	10.92	300	CP	CIRC
0053X	13.51	11.04	300	CP	CIRC
0101X	13.53	11.4	225	VC	CIRC
0901X	13.5	10.88	150	VC	CIRC
0904X	13.63	11.13	150	VC	CIRC
0905X	13.88	11.38	150	VC	CIRC
0951X	13.48	11.18	225	VC	CIRC
0954X	13.6	11.34	225	VC	CIRC
6950X			1200	CP	CIRC
6951X	10.25	8.68	150	VC	CIRC
6953X	10.32	8.05	375	CP	CIRC
6954X			1200	CP	CIRC
7001X	11.86	10.2	150	VC	CIRC
7002X	10.78	9.84	150	VC	CIRC
7003X	10.49	9.28	225	VC	CIRC
7004X	10.5	9.45	150	VC	CIRC
7050X	11.95	9.78	600	CP	CIRC
7051X	10.78	8.44	600	CP	CIRC
7052X	10.36	7.48	OTHER	CP	CIRC
7101X	13.08	11.81	150	VC	CIRC
7150X	13.08	11.12	600	CP	CIRC
7152X	12.27	9.14	1350	CP	CIRC
7152Y	12.27	10.49	600	CP	CIRC
7901X	10.75	9.67	150	VC	CIRC
7903X	10.77	8.9	225	VC	CIRC
7950X	10.74	9.38	225	VC	CIRC
7951X	11.19	9.19	300	CP	CIRC
7952X	10.2	7.43	1200	CP	CIRC
8052X	10.92	8.28	OTHER	CP	CIRC
8053X	10.37	7.7	OTHER	CP	CIRC
8054X	10.33	7.61	OTHER	CP	CIRC
8101X	11.19	9.21	225	VC	CIRC
8100X			UNK	UNK	UNK
8150X	14.34	10.22	1350	CP	CIRC
8151X	11.22	9.09	OTHER	CP	CIRC
8152X	13.14	10.9	OTHER	CP	CIRC
8901X	11.19	9.79	150	VC	CIRC
8902X	11.82	9.15	150	VC	CIRC
8905X	12.72	8.88	225	VC	CIRC
8906X	11.53	9.45	150	VC	CIRC
8950X	11.21	9.04	300	VC	CIRC
8953X	12.34	10.93	150	VC	CIRC
9001X	10.62	8.71	375	CP	CIRC
9002X	10.64	8.58	450	CP	CIRC
9051X	10.58	8.59	OTHER	CP	CIRC
9052Y	10.7	9.79	375	CP	CIRC
9052X	10.7	9.67	375	CP	CIRC
9053X	10.52	8.28	OTHER	CP	CIRC
9054X	10.55	9.58	375	CP	CIRC
9055X	10.82	10.04	225	VC	CIRC
9056X	10.74	9.8	150	VC	CIRC
9901X	13.15	10.15	225	VC	CIRC
9902X	11.37	8.42	375	CP	CIRC
9903X	11.97	8.26	375	CP	CIRC
9950X	13.08	10.67	300	CP	CIRC
9951X	11.39	10.14	375	CP	CIRC
9952X	11.92	9.9	450	CP	CIRC

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape

LINE STYLES / COLOURS

MATERIALS

LEGEND - SEWERS

NODE REFERENCING SYSTEM

SHAPES

Drawn by: JhunjhN

Title: 111993_Land adjacent Thatch Co

Date: 06/01/2011

Southern Water

APPENDIX E

Micro Drainage Calculation

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

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m³)	Status
15 Summer	4.1	4.1	10.3053	1.1053	1.4	O K
30 Summer	4.1	4.1	10.3448	1.1448	1.5	O K
60 Summer	3.8	3.8	10.0983	0.8983	1.2	O K
120 Summer	3.0	3.0	9.6292	0.4292	0.7	O K
180 Summer	2.6	2.6	9.4212	0.2212	0.4	O K
240 Summer	2.3	2.3	9.2998	0.0998	0.2	O K
360 Summer	1.9	1.9	9.2000	0.0000	0.0	O K
480 Summer	1.6	1.6	9.2000	0.0000	0.0	O K
600 Summer	1.3	1.3	9.2000	0.0000	0.0	O K
720 Summer	1.1	1.1	9.2000	0.0000	0.0	O K
960 Summer	0.9	0.9	9.2000	0.0000	0.0	O K
1440 Summer	0.7	0.7	9.2000	0.0000	0.0	O K
2160 Summer	0.5	0.5	9.2000	0.0000	0.0	O K
2880 Summer	0.4	0.4	9.2000	0.0000	0.0	O K
4320 Summer	0.3	0.3	9.2000	0.0000	0.0	O K
5760 Summer	0.2	0.2	9.2000	0.0000	0.0	O K
7200 Summer	0.2	0.2	9.2000	0.0000	0.0	O K
8640 Summer	0.2	0.2	9.2000	0.0000	0.0	O K
10080 Summer	0.2	0.2	9.2000	0.0000	0.0	O K
15 Winter	4.3	4.3	10.4938	1.2937	1.6	FLOOD RISK
30 Winter	4.2	4.2	10.4223	1.2223	1.5	O K
60 Winter	3.6	3.6	10.0058	0.8058	1.1	O K
120 Winter	2.7	2.7	9.4707	0.2707	0.5	O K
180 Winter	2.2	2.2	9.2623	0.0623	0.1	O K
240 Winter	1.9	1.9	9.2000	0.0000	0.0	O K
360 Winter	1.4	1.4	9.2000	0.0000	0.0	O K
480 Winter	1.1	1.1	9.2000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	118.65	12
30 Summer	80.93	20
60 Summer	52.66	36
120 Summer	32.98	68
180 Summer	24.63	98
240 Summer	19.92	126
360 Summer	14.77	0
480 Summer	11.93	0
600 Summer	10.09	0
720 Summer	8.80	0
960 Summer	7.08	0
1440 Summer	5.20	0
2160 Summer	3.81	0
2880 Summer	3.05	0
4320 Summer	2.22	0
5760 Summer	1.78	0
7200 Summer	1.50	0
8640 Summer	1.30	0
10080 Summer	1.16	0
15 Winter	118.65	13
30 Winter	80.93	21
60 Winter	52.66	38
120 Winter	32.98	70
180 Winter	24.63	98
240 Winter	19.92	0
360 Winter	14.77	0
480 Winter	11.93	0

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

Storm Duration (mins)	Maximum Control (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Maximum Volume (m^3)	Status
600 Winter	1.0	1.0	9.2000	0.0000	0.0	O K
720 Winter	0.8	0.8	9.2000	0.0000	0.0	O K
960 Winter	0.7	0.7	9.2000	0.0000	0.0	O K
1440 Winter	0.5	0.5	9.2000	0.0000	0.0	O K
2160 Winter	0.4	0.4	9.2000	0.0000	0.0	O K
2880 Winter	0.3	0.3	9.2000	0.0000	0.0	O K
4320 Winter	0.2	0.2	9.2000	0.0000	0.0	O K
5760 Winter	0.2	0.2	9.2000	0.0000	0.0	O K
7200 Winter	0.1	0.1	9.2000	0.0000	0.0	O K
8640 Winter	0.1	0.1	9.2000	0.0000	0.0	O K
10080 Winter	0.1	0.1	9.2000	0.0000	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
600 Winter	10.09	0
720 Winter	8.80	0
960 Winter	7.08	0
1440 Winter	5.20	0
2160 Winter	3.81	0
2880 Winter	3.05	0
4320 Winter	2.22	0
5760 Winter	1.78	0
7200 Winter	1.50	0
8640 Winter	1.30	0
10080 Winter	1.16	0

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Rainfall Details

Region	ENG+WAL	Shortest Storm (mins)	15
Return Period (years)	100	Longest Storm (mins)	10080
M5-60 (mm)	20.000	Summer Storms	Yes
Ratio-R	0.320	Winter Storms	Yes
Cv (Summer)	0.750	Climate Change %	+30
Cv (Winter)	0.840		

Time / Area Diagram

Total Area (ha) = 0.016

Time from:	(mins) to:	Area (ha)
0	4	0.016

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Offline Pipe Details

Diameter (m)	0.450	Dividing Weir level (m)	9.200
Slope (1:x)	1000.0	Invert Level (m)	9.200
Length (m)	2.000	Cover Level (m)	10.650

Orifice Outflow Control

Diameter (m)	0.040	Discharge Coefficient	0.600	Invert Level (m)	8.800

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