Royal College Street,60-86, NW1 0TH
Job no. 2222
Date May 2021
Produced by Sophie Mugnaini
Revision P02

RE: London Borough of Camden Planning Conditions

Appendices:

Appendix A – Bauder's Blue Roof Calculations

Appendix B – Hydraulic Modelling

Appendix C – Pump Specification from Pump

Appendix D - Maintenance Plans

Appendix E – Detail connection to Sewer

Appendix F – Updated Camden proforma

1. Introduction

This report has been compiled to facilitate the discharge of planning condition 8 and clarify further queries regarding the drainage strategy for the development at 60-86 Royal College Street, Camden, NW1 0TH.

Planning condition states as follows:

"*Prior to commencement of development, details of a sustainable urban drainage system shall be submitted to and approved in writing by the local planning authority. Such a system should be designed to accommodate all storms up to and including a 1:100 year storm with a 40% provision for climate change such that flooding does not occur in any part of a building or in any utility plant susceptible to water, and shall demonstrate the reduced run-off rates approved by the LPA. Details shall include a lifetime maintenance plan, and systems shall thereafter be retained and maintained in accordance with the approved details.*

Reason: To reduce the rate of surface water run-off from the buildings and limit the impact on the storm-water drainage system in accordance with Policies CC1, CC2, CC3 of the London Borough of Camden Local Plan 2017."

As a response to this report, Camden has given further queries and requirements that are indicated below:

1. Full justification for the introduction of a pump has not been provided.
2. Full justification for the increase in the proposed discharge rate has not been provided.
3. Calculations have not been provided for the unrestricted area (36 m²) to confirm the proposed maximum runoff rates for the area, and that the buildings will remain safe from flooding.
4. The maintenance guidance document does not provide details of the proposed maintenance owner/provider.
5. An updated sewer capacity confirmation letter from Thames Water (based on the new higher overall discharge rate) has not been provided.
6. A drainage strategy drawing confirming the proposed sewer connection details has not been provided.
7. An updated SuDS proforma has not been submitted. The GLA-Camden SuDS proforma can be downloaded here.

To address the above, please can the applicant submit information which:

1. Fully justifies the introduction of a pump as part of the proposed drainage strategy.
2. Fully justifies why the overall discharge rate has increased.
3. Confirms the following regarding the unrestricted area for the 1 in 100 year + 40% CC scenario:
    a. The proposed maximum discharge rate for the unrestricted area.
    b. That the proposed buildings will be safe from flooding as a result of runoff from the unrestricted areas.
4. Provides details of the proposed maintenance owner/provider.
5. Confirms that there is sufficient capacity in the Thames Water sewer network for the new proposed overall discharge rate.
6. Outlines the proposed sewer connection details for the site as part of a drainage strategy drawing.
7. Provides an updated SuDS proforma."

2. Response to Planning Condition

In the following paragraphs both the planning condition and questions from Camden have been addressed. The number in brackets at the beginning of each paragraph will be found to answer each of the above point.

As proposed for the planning application the site will discharge the run-off from hardstanding areas via blue roofs. The blue roof design was undertaken by blue roof specialists, Bauder, who have provided the calculations for the 1 in 100 storm event +40% climate change. Please find information provided in Appendix A.

Since the SuDS Strategy report the blue roof effective area provided was approximately 755m², while at the current stage it is of approximately 788m², and while it used to serve a catchment area of 1150m² it now serves an area of 1063m². The new blue roof system gives a total discharge rate of 1.63 l/s which is in line with the planning approved submission with a discharge rate of 1.7 l/s. The reduced run-off will be achieved using restricted outlets.

Hydraulic modelling via MicroDrainage has been provided to demonstrate that the blue roofs are designed to accommodate all storms up to and including a 1:100 year storm event with a 40% provision for climate change, please find it attached as Appendix B.

Please find below a breakdown of the depths and run-offs from the current proposal for the blue roofs.

Roof No.	Location	Catchment Area	Blue Roof Area	Blue Roof Depth	Run-off Rate
1 - 2	Roof	157m²	100m²	200mm	0.25 l/s
3-4	Roof	205m²	148m²	200mm	0.35 l/s
5-6	Roof	650m²	489m²	200mm	0.93 l/s
7	Roof	51m²	51m²	200mm	0.1 l/s
				Total	1.63 l/s

Table 1 – Blue roof information

(1) Due to architectural restrictions, and differently to what was agreed at planning, a total area of 91m², located at the north of the site can no longer be drained via blue roof. As per the NPPF it is not allowed to discharge surface water run off to the neighbouring sites. More sustainable options were explored in line with best practice, however, the area mentioned above is located at the opposite side to the outfall connection to the sewer, making it not possible for the RWPs to discharge across the site at high level lower ground floor and be able to meet the sewer by gravity. Therefore, this area will discharge via a pumping chamber at basement level. The total pumped discharge rate for each of the storm events up to 1 in 100+ 40% climate change is 1.0 l/s. The pump will provide 2.6m³ of storage and will have a discharge rate of 1.0 l/s, Refer to Appendix B for MicroDrainage calculations and Appendix C for the pump specification by specialist, pump manufacturer New Haden Pumps.

(2) The remaining area (36m²) is going to be picked up at high level and discharge to the existing outfall at high level basement. It will therefore be discharged unrestricted via gravity, mimicking the existing situation and also in line with the proposals set out in the planning application.

As provided in the previous report, please find below a summary of the total discharge rates from the site at each storm event:

Return Period	Run-off Rate					Betterment
	Existing (unmitigated 1400m²)	Proposed				
		From blue roofs (1063m²)	Pumped areas (91m²)	Unrestricted areas (36m²)	Total (1190m²)	
Q_1	10.7 l/s	1.63 l/s	1.0 l/s	0.32 l/s	2.95 l/s	72%
Q_{30}	26.4 l/s	1.63 l/s	1.0 l/s	0.79 l/s	3.42 l/s	87%
Q_{100}	34.2 l/s	1.63 l/s	1.0 l/s	1.03 l/s	3.66 l/s	89%
$Q_{100+40\%}$	47.9 l/s	1.63 l/s	1.0 l/s	1.44 l/s	4.07 l/s	92%

Table 2 – Summary with split discharge rate per each area

(3a) As mentioned in Table 2 the maximum unrestricted discharge rate is 1.44 l/s.

(3b) As mentioned previously the unrestricted areas are going to be picked up at high level and discharge by gravity to the existing outfall, it is therefore considered that the site is safe from flooding as basement level.

(4) A lifetime inspection and maintenance plan has been attached as Appendix C. Refer to the FRA and SuDS Strategy for any further information.

The owner and maintenance provider: Central North West London NHS Foundation Trust.

Address:
350 Euston Rd,
London
NW1 3AX

(5) As there is an increase which is less than 0.5 l/s, we do not envisage issues with the capacity of the sewer. However, we have contacted TW about this but have not received an answer back yet.

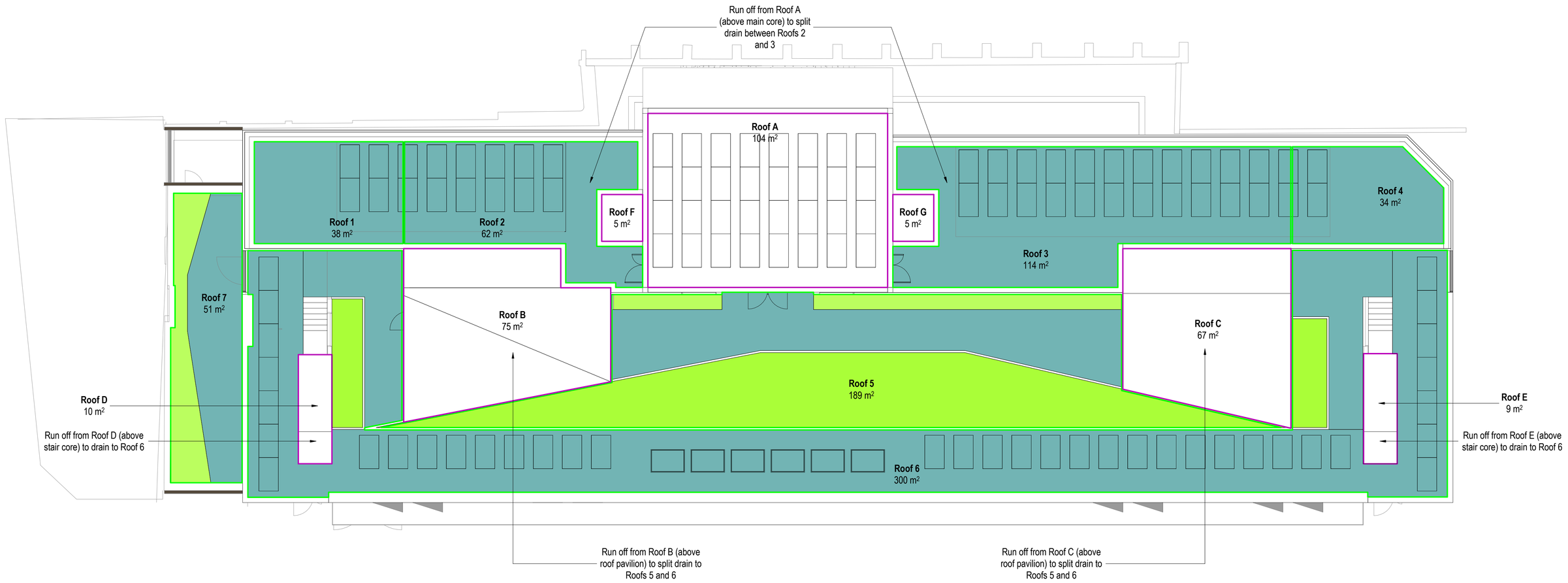
(6) It is proposed to reuse the existing outfall from the site, which connects to the Thames Water sewer, the outfall layout can be found in Appendix E. It is not proposed to construct any new connections to the Thames Water sewer.

(7) The updated Proforma has been incorporated as Appendix F,

Yours sincerely

Sophie Mugnaini
Civil Engineer
smugnaini@hts.uk.com

Appendix A - Bauder's Blue Roof Calculations



Blue green roof

Blue roof

Catchment area draining to an adjacent blue / blue green roof

NOTES

REVISION	DESCRIPTION	DRAWN	CHECKED	DATE
P01	First Issue	AZ	ST	18/08/20

CLIENT

BDP.
3 St Paul's Place
129 Norfolk Street
Sheffield
S1 2JE
United Kingdom

T +44 (0)114 273 1641
www.bdp.com

PROJECT TITLE: 70-86 Royal College Street

BDP JOB NUMBER: P3000358

PURPOSE OF ISSUE: For Information

DRAWING TITLE: Blue Roof Catchment Areas

SCALE: As indicated @ A1

DATE FIRST ISSUED: 18/08/20

DRAWING No: RCS-BDP--XX-ZZ-DR-A-271201

REVISION: P01

BlueRoofDesign Software

Bauder Ltd, 70 Landseer Road, Ipswich, IP3 0DH. T: +44 (0)1473 257671 e: info@bauder.co.uk

Date: 21/08/2020 **Revision:** A

Client:

Project: (1067) 70 -86 Royal College Street

Location: London

Roof Location: Roof 1 -2

Roof Details:

BlueRoof	100 m²	x 100 %
Additional Area	57 m²	x 100 %
Effective Area	157 m²	

Storage Details:

Length	100 m
Width	1 m
Depth	200 mm
Porosity	95 %

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	40 %

Summer Storm Profile

Duration	Intensity mm	mm/h	Required storage(m³)
5 min	25.8	309.2	4.0
10 min	36.7	220.1	5.7
15 min	45.1	180.4	7.0
30 min	58.0	115.9	8.9
45 min	65.4	87.3	9.9
60 min	70.7	70.7	10.6
2 hours	90.7	45.3	13.2
6 hours	123.0	20.5	15.9
24 hours	150.8	6.3	13.6

Outflow Details:

Attenuation Control	BlueRoof Outlet
Control	2 holes
Sump Depth	None
Discharge rate	0.25 l/s
Outlet	1 No

Result:

Outcome	**Pass**
Critical Storm Duration	6 hrs
Hmax	167 mm
Required Volume	15.9 m³
Time to half empty	8.9 hrs
Roof Loading	159 Kg/m²

All results based on input data. Please check that input data has been correctly interpreted.

The Bauder Blue Flat Roof Rainwater Calculation Software will perform calculations in accordance with industry best practice for blue roof design based upon provided data relating to a specific building's dimensions geographical location and the flow rate performance of the selected Bauder rainwater outlet product.

Whilst the information contained herein is to the best of our knowledge true and accurate we specifically exclude any liability for errors omissions or otherwise arising therefrom.

Details practices principles values and calculations should be verified for accuracy and suitability for the required purpose for use.

Bauder Ltd, 70 Landseer Road, Ipswich, IP3 0DH. T: +44 (0)1473 257671 e: info@bauder.co.uk

Date: 21/08/2020 **Revision:** A

Client:

Project: (1067) 70 -86 Royal College Street

Location: London

Roof Location: Roof 3-4

Roof Details:

BlueRoof	148 m²	x 100 %
Additional Area	57 m²	x 100 %
Effective Area	205 m²	

Storage Details:

Length	148 m
Width	1 m
Depth	200 mm
Porosity	95 %

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	40 %

Summer Storm Profile

Duration	Intensity		Required storage(m³)
	mm	mm/h	
5 min	25.8	309.2	5.3
10 min	36.7	220.1	7.4
15 min	45.1	180.4	9.1
30 min	58.0	115.9	11.6
45 min	65.4	87.3	13.0
60 min	70.7	70.7	13.9
2 hours	90.7	45.3	17.2
6 hours	123.0	20.5	20.4
24 hours	150.8	6.3	17.2

Outflow Details:

Attenuation Control	BlueRoof Outlet
Control	3 holes
Sump Depth	None
Discharge rate	0.35 l/s
Outlet	1 No

Result:

Outcome	**Pass**
Critical Storm Duration	6 hrs
Hmax	145 mm
Required Volume	20.4 m³
Time to half empty	8.2 hrs
Roof Loading	137.84 Kg/m²

All results based on input data. Please check that input data has been correctly interpreted.

The Bauder Blue Flat Roof Rainwater Calculation Software will perform calculations in accordance with industry best practice for blue roof design based upon provided data relating to a specific building's dimensions geographical location and the flow rate performance of the selected Bauder rainwater outlet product.

Whilst the information contained herein is to the best of our knowledge true and accurate we specifically exclude any liability for errors omissions or otherwise arising therefrom.

Details practices principles values and calculations should be verified for accuracy and suitability for the required purpose for use.

Bauder Ltd, 70 Landseer Road, Ipswich, IP3 0DH. T: +44 (0)1473 257671 e: info@bauder.co.uk

Date: 21/08/2020 **Revision:** A

Client:

Project: (1067) 70 -86 Royal College Street

Location: London

Roof Location: Roof 5 - 6

Roof Details:

BlueRoof	489 m²	x 100 %
Additional Area	161 m²	x 100 %
Effective Area	650 m²	

Storage Details:

Length	489 m
Width	1 m
Depth	200 mm
Porosity	95 %

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	40 %

Summer Storm Profile

Duration	Intensity		Required storage(m³)
	mm	mm/h	
5 min	25.8	309.2	16.7
10 min	36.7	220.1	23.6
15 min	45.1	180.4	29.0
30 min	58.0	115.9	36.9
45 min	65.4	87.3	41.3
60 min	70.7	70.7	44.3
2 hours	90.7	45.3	55.2
6 hours	123.0	20.5	67.2
24 hours	150.8	6.3	58.7

Outflow Details:

Attenuation Control	BlueRoof Outlet
Control	4 holes
Sump Depth	None
Discharge rate	0.93 l/s
Outlet	2 No
Flow Per Outlet	0.46 l/s

Result:

Outcome	**Pass**
Critical Storm Duration	6.42 hrs
Hmax	145 mm
Required Volume	67.2 m³
Time to half empty	10.1 hrs
Roof Loading	137.42 Kg/m²

All results based on input data. Please check that input data has been correctly interpreted.

The Bauder Blue Flat Roof Rainwater Calculation Software will perform calculations in accordance with industry best practice for blue roof design based upon provided data relating to a specific building's dimensions geographical location and the flow rate performance of the selected Bauder rainwater outlet product.

Whilst the information contained herein is to the best of our knowledge true and accurate we specifically exclude any liability for errors omissions or otherwise arising therefrom.

Details practices principles values and calculations should be verified for accuracy and suitability for the required purpose for use.

Bauder Ltd, 70 Landseer Road, Ipswich, IP3 0DH. T: +44 (0)1473 257671 e: info@bauder.co.uk

Date: 21/08/2020 **Revision:** A

Client:

Project: (1067) 70 -86 Royal College Street

Location: London

Roof Location: Roof 7 Green / Blue

Roof Details:

BlueRoof	51 m²	x 100 %
Additional Area	0 m²	x 100 %
Effective Area	51 m²	

Storage Details:

Length	51 m
Width	1 m
Depth	200 mm
Porosity	95 %

Rainfall Details - FEH Method:

Return Period	100 years
Climate Change Factor	40 %

Summer Storm Profile

Duration	Intensity		Required storage(m³)
	mm	mm/h	
5 min	25.8	309.2	1.3
10 min	36.7	220.1	1.9
15 min	45.1	180.4	2.3
30 min	58.0	115.9	2.9
45 min	65.4	87.3	3.2
60 min	70.7	70.7	3.4
2 hours	90.7	45.3	4.2
6 hours	123.0	20.5	4.9
24 hours	150.8	6.3	4.1

Outflow Details:

Attenuation Control	BlueRoof Outlet
Control	1 hole
Sump Depth	None
Discharge rate	0.1 l/s
Outlet	1 No

Result:

Outcome	**Pass**
Critical Storm Duration	6 hrs
Hmax	102 mm
Required Volume	4.9 m³
Time to half empty	7.1 hrs
Roof Loading	96.08 Kg/m²

All results based on input data. Please check that input data has been correctly interpreted.

The Bauder Blue Flat Roof Rainwater Calculation Software will perform calculations in accordance with industry best practice for blue roof design based upon provided data relating to a specific building's dimensions geographical location and the flow rate performance of the selected Bauder rainwater outlet product.

Whilst the information contained herein is to the best of our knowledge true and accurate we specifically exclude any liability for errors omissions or otherwise arising therefrom.

Details practices principles values and calculations should be verified for accuracy and suitability for the required purpose for use.

Appendix B – Hydraulic modelling

Summary of Results for 1 year Return Period

Half Drain Time : 361 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.810	0.010	0.0	0.0	0.0	1.0	Flood Risk
30 min Summer	0.813	0.013	0.0	0.0	0.0	1.3	Flood Risk
60 min Summer	0.816	0.016	0.0	0.0	0.0	1.5	Flood Risk
120 min Summer	0.819	0.019	0.0	0.1	0.1	1.8	Flood Risk
180 min Summer	0.820	0.020	0.0	0.1	0.1	1.9	Flood Risk
240 min Summer	0.820	0.020	0.0	0.1	0.1	1.9	Flood Risk
360 min Summer	0.821	0.021	0.0	0.1	0.1	2.0	Flood Risk
480 min Summer	0.821	0.021	0.0	0.1	0.1	2.0	Flood Risk
600 min Summer	0.822	0.022	0.0	0.1	0.1	2.0	Flood Risk
720 min Summer	0.822	0.022	0.0	0.1	0.1	2.1	Flood Risk
960 min Summer	0.822	0.022	0.0	0.1	0.1	2.0	Flood Risk
1440 min Summer	0.821	0.021	0.0	0.1	0.1	2.0	Flood Risk
2160 min Summer	0.820	0.020	0.0	0.1	0.1	1.9	Flood Risk
2880 min Summer	0.819	0.019	0.0	0.1	0.1	1.8	Flood Risk
4320 min Summer	0.817	0.017	0.0	0.0	0.0	1.6	Flood Risk
5760 min Summer	0.816	0.016	0.0	0.0	0.0	1.5	Flood Risk
7200 min Summer	0.815	0.015	0.0	0.0	0.0	1.4	Flood Risk
8640 min Summer	0.814	0.014	0.0	0.0	0.0	1.3	Flood Risk
10080 min Summer	0.813	0.013	0.0	0.0	0.0	1.2	Flood Risk
15 min Winter	0.812	0.012	0.0	0.0	0.0	1.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.106	0.0	0.6	19
30 min Summer	21.352	0.0	0.9	33
60 min Summer	13.306	0.0	1.4	62
120 min Summer	8.114	0.0	1.7	122
180 min Summer	6.043	0.0	1.9	180
240 min Summer	4.897	0.0	2.1	214
360 min Summer	3.618	0.0	2.3	272
480 min Summer	2.911	0.0	2.5	336
600 min Summer	2.459	0.0	2.7	400
720 min Summer	2.142	0.0	2.8	470
960 min Summer	1.723	0.0	3.0	606
1440 min Summer	1.268	0.0	3.3	866
2160 min Summer	0.934	0.0	3.9	1256
2880 min Summer	0.752	0.0	4.1	1644
4320 min Summer	0.553	0.0	4.5	2380
5760 min Summer	0.444	0.0	5.0	3120
7200 min Summer	0.375	0.0	5.3	3888
8640 min Summer	0.327	0.0	5.5	4592
10080 min Summer	0.291	0.0	5.6	5344
15 min Winter	33.106	0.0	0.8	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.815	0.015	0.0	0.0	0.0	1.4	Flood Risk
60 min Winter	0.818	0.018	0.0	0.1	0.1	1.7	Flood Risk
120 min Winter	0.821	0.021	0.0	0.1	0.1	2.0	Flood Risk
180 min Winter	0.822	0.022	0.0	0.1	0.1	2.1	Flood Risk
240 min Winter	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
360 min Winter	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
480 min Winter	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
600 min Winter	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
720 min Winter	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
960 min Winter	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
1440 min Winter	0.822	0.022	0.0	0.1	0.1	2.1	Flood Risk
2160 min Winter	0.820	0.020	0.0	0.1	0.1	1.9	Flood Risk
2880 min Winter	0.818	0.018	0.0	0.1	0.1	1.8	Flood Risk
4320 min Winter	0.816	0.016	0.0	0.0	0.0	1.5	Flood Risk
5760 min Winter	0.815	0.015	0.0	0.0	0.0	1.4	Flood Risk
7200 min Winter	0.813	0.013	0.0	0.0	0.0	1.3	Flood Risk
8640 min Winter	0.812	0.012	0.0	0.0	0.0	1.2	Flood Risk
10080 min Winter	0.812	0.012	0.0	0.0	0.0	1.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	21.352	0.0	1.0	33
60 min Winter	13.306	0.0	1.6	62
120 min Winter	8.114	0.0	1.9	118
180 min Winter	6.043	0.0	2.2	174
240 min Winter	4.897	0.0	2.4	226
360 min Winter	3.618	0.0	2.7	278
480 min Winter	2.911	0.0	2.9	354
600 min Winter	2.459	0.0	3.0	430
720 min Winter	2.142	0.0	3.2	504
960 min Winter	1.723	0.0	3.4	646
1440 min Winter	1.268	0.0	3.7	922
2160 min Winter	0.934	0.0	4.4	1320
2880 min Winter	0.752	0.0	4.7	1728
4320 min Winter	0.553	0.0	5.1	2464
5760 min Winter	0.444	0.0	5.6	3224
7200 min Winter	0.375	0.0	5.9	3968
8640 min Winter	0.327	0.0	6.2	4752
10080 min Winter	0.291	0.0	6.4	5288

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	100.0	0.0	0.201	0.0	0.0
0.200	100.0	0.0			

Orifice Outflow Control

Diameter (m) 0.018 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 1 year Return Period

Half Drain Time : 487 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.809	0.009	0.0	0.0	0.0	1.3	Flood Risk
30 min Summer	0.812	0.012	0.0	0.0	0.0	1.7	Flood Risk
60 min Summer	0.814	0.014	0.0	0.0	0.0	2.0	Flood Risk
120 min Summer	0.817	0.017	0.0	0.0	0.0	2.4	Flood Risk
180 min Summer	0.818	0.018	0.0	0.1	0.1	2.6	Flood Risk
240 min Summer	0.819	0.019	0.0	0.1	0.1	2.7	Flood Risk
360 min Summer	0.820	0.020	0.0	0.1	0.1	2.8	Flood Risk
480 min Summer	0.820	0.020	0.0	0.1	0.1	2.8	Flood Risk
600 min Summer	0.820	0.020	0.0	0.1	0.1	2.9	Flood Risk
720 min Summer	0.821	0.021	0.0	0.1	0.1	2.9	Flood Risk
960 min Summer	0.821	0.021	0.0	0.1	0.1	2.9	Flood Risk
1440 min Summer	0.821	0.021	0.0	0.1	0.1	2.9	Flood Risk
2160 min Summer	0.820	0.020	0.0	0.1	0.1	2.8	Flood Risk
2880 min Summer	0.819	0.019	0.0	0.1	0.1	2.7	Flood Risk
4320 min Summer	0.818	0.018	0.0	0.1	0.1	2.5	Flood Risk
5760 min Summer	0.817	0.017	0.0	0.0	0.0	2.4	Flood Risk
7200 min Summer	0.816	0.016	0.0	0.0	0.0	2.2	Flood Risk
8640 min Summer	0.815	0.015	0.0	0.0	0.0	2.1	Flood Risk
10080 min Summer	0.814	0.014	0.0	0.0	0.0	2.0	Flood Risk
15 min Winter	0.810	0.010	0.0	0.0	0.0	1.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.106	0.0	0.7	19
30 min Summer	21.352	0.0	1.0	34
60 min Summer	13.306	0.0	1.7	64
120 min Summer	8.114	0.0	2.1	122
180 min Summer	6.043	0.0	2.4	182
240 min Summer	4.897	0.0	2.6	240
360 min Summer	3.618	0.0	2.9	304
480 min Summer	2.911	0.0	3.1	360
600 min Summer	2.459	0.0	3.3	426
720 min Summer	2.142	0.0	3.5	492
960 min Summer	1.723	0.0	3.7	626
1440 min Summer	1.268	0.0	4.1	896
2160 min Summer	0.934	0.0	5.0	1296
2880 min Summer	0.752	0.0	5.3	1676
4320 min Summer	0.553	0.0	5.7	2424
5760 min Summer	0.444	0.0	6.5	3176
7200 min Summer	0.375	0.0	6.9	3960
8640 min Summer	0.327	0.0	7.1	4672
10080 min Summer	0.291	0.0	7.3	5352
15 min Winter	33.106	0.0	0.8	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.813	0.013	0.0	0.0	0.0	1.9	Flood Risk
60 min Winter	0.816	0.016	0.0	0.0	0.0	2.3	Flood Risk
120 min Winter	0.819	0.019	0.0	0.1	0.1	2.7	Flood Risk
180 min Winter	0.820	0.020	0.0	0.1	0.1	2.9	Flood Risk
240 min Winter	0.821	0.021	0.0	0.1	0.1	3.0	Flood Risk
360 min Winter	0.822	0.022	0.0	0.1	0.1	3.1	Flood Risk
480 min Winter	0.822	0.022	0.0	0.1	0.1	3.1	Flood Risk
600 min Winter	0.822	0.022	0.0	0.1	0.1	3.2	Flood Risk
720 min Winter	0.823	0.023	0.0	0.1	0.1	3.2	Flood Risk
960 min Winter	0.822	0.022	0.0	0.1	0.1	3.1	Flood Risk
1440 min Winter	0.822	0.022	0.0	0.1	0.1	3.1	Flood Risk
2160 min Winter	0.820	0.020	0.0	0.1	0.1	2.9	Flood Risk
2880 min Winter	0.819	0.019	0.0	0.1	0.1	2.7	Flood Risk
4320 min Winter	0.817	0.017	0.0	0.1	0.1	2.4	Flood Risk
5760 min Winter	0.816	0.016	0.0	0.0	0.0	2.2	Flood Risk
7200 min Winter	0.815	0.015	0.0	0.0	0.0	2.0	Flood Risk
8640 min Winter	0.814	0.014	0.0	0.0	0.0	1.9	Flood Risk
10080 min Winter	0.813	0.013	0.0	0.0	0.0	1.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	21.352	0.0	1.2	33
60 min Winter	13.306	0.0	1.9	62
120 min Winter	8.114	0.0	2.4	120
180 min Winter	6.043	0.0	2.7	176
240 min Winter	4.897	0.0	3.0	232
360 min Winter	3.618	0.0	3.3	330
480 min Winter	2.911	0.0	3.6	372
600 min Winter	2.459	0.0	3.8	448
720 min Winter	2.142	0.0	3.9	520
960 min Winter	1.723	0.0	4.2	672
1440 min Winter	1.268	0.0	4.6	954
2160 min Winter	0.934	0.0	5.6	1364
2880 min Winter	0.752	0.0	6.0	1760
4320 min Winter	0.553	0.0	6.5	2548
5760 min Winter	0.444	0.0	7.3	3336
7200 min Winter	0.375	0.0	7.7	4032
8640 min Winter	0.327	0.0	8.0	4736
10080 min Winter	0.291	0.0	8.2	5448

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.021

Time (mins) From:	To:	Area (ha)
0	4	0.021

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	148.0	0.0	0.201	0.0	0.0
0.200	148.0	0.0			

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 1 year Return Period

Half Drain Time : 1068 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.809	0.009	0.0	0.0	0.0	4.0	Flood Risk
30 min Summer	0.811	0.011	0.0	0.0	0.0	5.2	Flood Risk
60 min Summer	0.814	0.014	0.0	0.0	0.0	6.4	Flood Risk
120 min Summer	0.817	0.017	0.0	0.1	0.1	7.7	Flood Risk
180 min Summer	0.818	0.018	0.0	0.1	0.1	8.4	Flood Risk
240 min Summer	0.819	0.019	0.0	0.1	0.1	8.9	Flood Risk
360 min Summer	0.821	0.021	0.0	0.1	0.1	9.6	Flood Risk
480 min Summer	0.821	0.021	0.0	0.1	0.1	9.9	Flood Risk
600 min Summer	0.822	0.022	0.0	0.1	0.1	10.0	Flood Risk
720 min Summer	0.822	0.022	0.0	0.1	0.1	10.2	Flood Risk
960 min Summer	0.822	0.022	0.0	0.1	0.1	10.4	Flood Risk
1440 min Summer	0.823	0.023	0.0	0.1	0.1	10.7	Flood Risk
2160 min Summer	0.823	0.023	0.0	0.1	0.1	10.8	Flood Risk
2880 min Summer	0.823	0.023	0.0	0.1	0.1	10.8	Flood Risk
4320 min Summer	0.823	0.023	0.0	0.1	0.1	10.5	Flood Risk
5760 min Summer	0.822	0.022	0.0	0.1	0.1	10.1	Flood Risk
7200 min Summer	0.821	0.021	0.0	0.1	0.1	9.8	Flood Risk
8640 min Summer	0.820	0.020	0.0	0.1	0.1	9.4	Flood Risk
10080 min Summer	0.820	0.020	0.0	0.1	0.1	9.1	Flood Risk
15 min Winter	0.810	0.010	0.0	0.0	0.0	4.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.106	0.0	1.2	19
30 min Summer	21.352	0.0	1.8	34
60 min Summer	13.306	0.0	3.7	64
120 min Summer	8.114	0.0	4.9	124
180 min Summer	6.043	0.0	5.7	182
240 min Summer	4.897	0.0	6.3	242
360 min Summer	3.618	0.0	7.1	362
480 min Summer	2.911	0.0	7.7	480
600 min Summer	2.459	0.0	8.2	572
720 min Summer	2.142	0.0	8.6	620
960 min Summer	1.723	0.0	9.2	740
1440 min Summer	1.268	0.0	10.0	994
2160 min Summer	0.934	0.0	13.8	1388
2880 min Summer	0.752	0.0	14.7	1792
4320 min Summer	0.553	0.0	15.6	2592
5760 min Summer	0.444	0.0	19.2	3352
7200 min Summer	0.375	0.0	20.1	4104
8640 min Summer	0.327	0.0	20.7	4848
10080 min Summer	0.291	0.0	21.0	5552
15 min Winter	33.106	0.0	1.5	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.812	0.012	0.0	0.0	0.0	5.8	Flood Risk
60 min Winter	0.815	0.015	0.0	0.1	0.1	7.2	Flood Risk
120 min Winter	0.819	0.019	0.0	0.1	0.1	8.6	Flood Risk
180 min Winter	0.820	0.020	0.0	0.1	0.1	9.4	Flood Risk
240 min Winter	0.822	0.022	0.0	0.1	0.1	10.0	Flood Risk
360 min Winter	0.823	0.023	0.0	0.1	0.1	10.7	Flood Risk
480 min Winter	0.824	0.024	0.0	0.1	0.1	11.1	Flood Risk
600 min Winter	0.824	0.024	0.0	0.1	0.1	11.3	Flood Risk
720 min Winter	0.825	0.025	0.0	0.1	0.1	11.4	Flood Risk
960 min Winter	0.825	0.025	0.0	0.1	0.1	11.6	Flood Risk
1440 min Winter	0.825	0.025	0.0	0.1	0.1	11.7	Flood Risk
2160 min Winter	0.825	0.025	0.0	0.1	0.1	11.7	Flood Risk
2880 min Winter	0.825	0.025	0.0	0.1	0.1	11.4	Flood Risk
4320 min Winter	0.823	0.023	0.0	0.1	0.1	10.8	Flood Risk
5760 min Winter	0.822	0.022	0.0	0.1	0.1	10.1	Flood Risk
7200 min Winter	0.821	0.021	0.0	0.1	0.1	9.6	Flood Risk
8640 min Winter	0.820	0.020	0.0	0.1	0.1	9.1	Flood Risk
10080 min Winter	0.819	0.019	0.0	0.1	0.1	8.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	21.352	0.0	2.2	34
60 min Winter	13.306	0.0	4.4	64
120 min Winter	8.114	0.0	5.7	122
180 min Winter	6.043	0.0	6.6	180
240 min Winter	4.897	0.0	7.3	238
360 min Winter	3.618	0.0	8.2	352
480 min Winter	2.911	0.0	8.9	464
600 min Winter	2.459	0.0	9.5	570
720 min Winter	2.142	0.0	9.9	664
960 min Winter	1.723	0.0	10.7	750
1440 min Winter	1.268	0.0	11.6	1052
2160 min Winter	0.934	0.0	15.7	1492
2880 min Winter	0.752	0.0	16.7	1908
4320 min Winter	0.553	0.0	17.8	2728
5760 min Winter	0.444	0.0	21.7	3520
7200 min Winter	0.375	0.0	22.7	4256
8640 min Winter	0.327	0.0	23.4	5016
10080 min Winter	0.291	0.0	23.8	5752

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.065

Time (mins) From:	To:	Area (ha)
0	4	0.065

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	489.0	0.0	0.201	0.0	0.0
0.200	489.0	0.0			

Orifice Outflow Control

Diameter (m) 0.031 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 1 year Return Period

Half Drain Time : 439 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.806	0.006	0.0	0.0	0.0	0.3	Flood Risk
30 min Summer	0.808	0.008	0.0	0.0	0.0	0.4	Flood Risk
60 min Summer	0.810	0.010	0.0	0.0	0.0	0.5	Flood Risk
120 min Summer	0.812	0.012	0.0	0.0	0.0	0.6	Flood Risk
180 min Summer	0.812	0.012	0.0	0.0	0.0	0.6	Flood Risk
240 min Summer	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
360 min Summer	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
480 min Summer	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
600 min Summer	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
720 min Summer	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
960 min Summer	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
1440 min Summer	0.813	0.013	0.0	0.0	0.0	0.7	Flood Risk
2160 min Summer	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
2880 min Summer	0.812	0.012	0.0	0.0	0.0	0.6	Flood Risk
4320 min Summer	0.811	0.011	0.0	0.0	0.0	0.5	Flood Risk
5760 min Summer	0.810	0.010	0.0	0.0	0.0	0.5	Flood Risk
7200 min Summer	0.810	0.010	0.0	0.0	0.0	0.5	Flood Risk
8640 min Summer	0.809	0.009	0.0	0.0	0.0	0.4	Flood Risk
10080 min Summer	0.809	0.009	0.0	0.0	0.0	0.4	Flood Risk
15 min Winter	0.807	0.007	0.0	0.0	0.0	0.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.106	0.0	0.2	19
30 min Summer	21.352	0.0	0.3	34
60 min Summer	13.306	0.0	0.4	62
120 min Summer	8.114	0.0	0.5	122
180 min Summer	6.043	0.0	0.6	180
240 min Summer	4.897	0.0	0.6	234
360 min Summer	3.618	0.0	0.7	284
480 min Summer	2.911	0.0	0.8	348
600 min Summer	2.459	0.0	0.8	410
720 min Summer	2.142	0.0	0.9	478
960 min Summer	1.723	0.0	0.9	616
1440 min Summer	1.268	0.0	1.0	882
2160 min Summer	0.934	0.0	1.2	1276
2880 min Summer	0.752	0.0	1.3	1668
4320 min Summer	0.553	0.0	1.4	2420
5760 min Summer	0.444	0.0	1.6	3168
7200 min Summer	0.375	0.0	1.6	3888
8640 min Summer	0.327	0.0	1.7	4584
10080 min Summer	0.291	0.0	1.8	5344
15 min Winter	33.106	0.0	0.2	19

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.809	0.009	0.0	0.0	0.0	0.4	Flood Risk
60 min Winter	0.811	0.011	0.0	0.0	0.0	0.5	Flood Risk
120 min Winter	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
180 min Winter	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
240 min Winter	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
360 min Winter	0.815	0.015	0.0	0.0	0.0	0.7	Flood Risk
480 min Winter	0.815	0.015	0.0	0.0	0.0	0.7	Flood Risk
600 min Winter	0.815	0.015	0.0	0.0	0.0	0.7	Flood Risk
720 min Winter	0.815	0.015	0.0	0.0	0.0	0.7	Flood Risk
960 min Winter	0.815	0.015	0.0	0.0	0.0	0.7	Flood Risk
1440 min Winter	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
2160 min Winter	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
2880 min Winter	0.812	0.012	0.0	0.0	0.0	0.6	Flood Risk
4320 min Winter	0.811	0.011	0.0	0.0	0.0	0.5	Flood Risk
5760 min Winter	0.810	0.010	0.0	0.0	0.0	0.5	Flood Risk
7200 min Winter	0.809	0.009	0.0	0.0	0.0	0.4	Flood Risk
8640 min Winter	0.808	0.008	0.0	0.0	0.0	0.4	Flood Risk
10080 min Winter	0.808	0.008	0.0	0.0	0.0	0.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	21.352	0.0	0.3	33
60 min Winter	13.306	0.0	0.5	62
120 min Winter	8.114	0.0	0.6	120
180 min Winter	6.043	0.0	0.7	176
240 min Winter	4.897	0.0	0.7	230
360 min Winter	3.618	0.0	0.8	288
480 min Winter	2.911	0.0	0.9	364
600 min Winter	2.459	0.0	0.9	440
720 min Winter	2.142	0.0	1.0	514
960 min Winter	1.723	0.0	1.0	662
1440 min Winter	1.268	0.0	1.1	938
2160 min Winter	0.934	0.0	1.4	1340
2880 min Winter	0.752	0.0	1.4	1728
4320 min Winter	0.553	0.0	1.6	2504
5760 min Winter	0.444	0.0	1.8	3232
7200 min Winter	0.375	0.0	1.8	4040
8640 min Winter	0.327	0.0	1.9	4760
10080 min Winter	0.291	0.0	2.0	5544

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.005

Time (mins) From:	To:	Area (ha)
0	4	0.005

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	51.0	0.0	0.201	0.0	0.0
0.200	51.0	0.0			

Orifice Outflow Control

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 30 year Return Period

Half Drain Time : 377 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.825	0.025	0.0	0.1	0.1	2.4	Flood Risk
30 min Summer	0.832	0.032	0.0	0.1	0.1	3.0	Flood Risk
60 min Summer	0.838	0.038	0.0	0.1	0.1	3.6	Flood Risk
120 min Summer	0.843	0.043	0.0	0.1	0.1	4.1	Flood Risk
180 min Summer	0.845	0.045	0.0	0.1	0.1	4.2	Flood Risk
240 min Summer	0.845	0.045	0.0	0.1	0.1	4.3	Flood Risk
360 min Summer	0.846	0.046	0.0	0.1	0.1	4.3	Flood Risk
480 min Summer	0.846	0.046	0.0	0.1	0.1	4.3	Flood Risk
600 min Summer	0.846	0.046	0.0	0.1	0.1	4.3	Flood Risk
720 min Summer	0.845	0.045	0.0	0.1	0.1	4.3	Flood Risk
960 min Summer	0.844	0.044	0.0	0.1	0.1	4.2	Flood Risk
1440 min Summer	0.841	0.041	0.0	0.1	0.1	3.9	Flood Risk
2160 min Summer	0.837	0.037	0.0	0.1	0.1	3.6	Flood Risk
2880 min Summer	0.834	0.034	0.0	0.1	0.1	3.2	Flood Risk
4320 min Summer	0.829	0.029	0.0	0.1	0.1	2.7	Flood Risk
5760 min Summer	0.825	0.025	0.0	0.1	0.1	2.4	Flood Risk
7200 min Summer	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
8640 min Summer	0.821	0.021	0.0	0.1	0.1	2.0	Flood Risk
10080 min Summer	0.820	0.020	0.0	0.1	0.1	1.9	Flood Risk
15 min Winter	0.828	0.028	0.0	0.1	0.1	2.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	81.304	0.0	2.0	19
30 min Summer	52.121	0.0	2.6	33
60 min Summer	31.905	0.0	3.6	62
120 min Summer	18.953	0.0	4.3	122
180 min Summer	13.833	0.0	4.7	180
240 min Summer	11.019	0.0	5.0	228
360 min Summer	7.983	0.0	5.4	282
480 min Summer	6.348	0.0	5.8	344
600 min Summer	5.311	0.0	6.0	412
720 min Summer	4.589	0.0	6.3	480
960 min Summer	3.643	0.0	6.6	616
1440 min Summer	2.628	0.0	7.1	882
2160 min Summer	1.894	0.0	8.0	1276
2880 min Summer	1.501	0.0	8.4	1644
4320 min Summer	1.080	0.0	9.0	2376
5760 min Summer	0.855	0.0	9.7	3104
7200 min Summer	0.713	0.0	10.1	3816
8640 min Summer	0.614	0.0	10.4	4576
10080 min Summer	0.542	0.0	10.7	5256
15 min Winter	81.304	0.0	2.3	18

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.836	0.036	0.0	0.1	0.1	3.4	Flood Risk
60 min Winter	0.843	0.043	0.0	0.1	0.1	4.1	Flood Risk
120 min Winter	0.848	0.048	0.0	0.1	0.1	4.6	Flood Risk
180 min Winter	0.850	0.050	0.0	0.1	0.1	4.8	Flood Risk
240 min Winter	0.851	0.051	0.0	0.1	0.1	4.9	Flood Risk
360 min Winter	0.851	0.051	0.0	0.1	0.1	4.9	Flood Risk
480 min Winter	0.851	0.051	0.0	0.1	0.1	4.8	Flood Risk
600 min Winter	0.850	0.050	0.0	0.1	0.1	4.8	Flood Risk
720 min Winter	0.850	0.050	0.0	0.1	0.1	4.7	Flood Risk
960 min Winter	0.847	0.047	0.0	0.1	0.1	4.5	Flood Risk
1440 min Winter	0.843	0.043	0.0	0.1	0.1	4.1	Flood Risk
2160 min Winter	0.837	0.037	0.0	0.1	0.1	3.5	Flood Risk
2880 min Winter	0.832	0.032	0.0	0.1	0.1	3.1	Flood Risk
4320 min Winter	0.826	0.026	0.0	0.1	0.1	2.5	Flood Risk
5760 min Winter	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
7200 min Winter	0.820	0.020	0.0	0.1	0.1	1.9	Flood Risk
8640 min Winter	0.819	0.019	0.0	0.1	0.1	1.8	Flood Risk
10080 min Winter	0.817	0.017	0.0	0.0	0.0	1.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	52.121	0.0	3.0	33
60 min Winter	31.905	0.0	4.0	62
120 min Winter	18.953	0.0	4.8	120
180 min Winter	13.833	0.0	5.3	176
240 min Winter	11.019	0.0	5.6	230
360 min Winter	7.983	0.0	6.1	294
480 min Winter	6.348	0.0	6.5	368
600 min Winter	5.311	0.0	6.8	444
720 min Winter	4.589	0.0	7.0	520
960 min Winter	3.643	0.0	7.5	666
1440 min Winter	2.628	0.0	8.0	950
2160 min Winter	1.894	0.0	9.0	1344
2880 min Winter	1.501	0.0	9.5	1728
4320 min Winter	1.080	0.0	10.1	2424
5760 min Winter	0.855	0.0	10.9	3168
7200 min Winter	0.713	0.0	11.4	3896
8640 min Winter	0.614	0.0	11.7	4592
10080 min Winter	0.542	0.0	12.0	5440

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	100.0	0.0	0.201	0.0	0.0
0.200	100.0	0.0			

Orifice Outflow Control

Diameter (m) 0.018 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 30 year Return Period

Half Drain Time : 461 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.822	0.022	0.0	0.1	0.1	3.2	Flood Risk
30 min Summer	0.828	0.028	0.0	0.1	0.1	4.0	Flood Risk
60 min Summer	0.834	0.034	0.0	0.1	0.1	4.8	Flood Risk
120 min Summer	0.839	0.039	0.0	0.1	0.1	5.5	Flood Risk
180 min Summer	0.841	0.041	0.0	0.1	0.1	5.7	Flood Risk
240 min Summer	0.841	0.041	0.0	0.1	0.1	5.8	Flood Risk
360 min Summer	0.842	0.042	0.0	0.1	0.1	5.9	Flood Risk
480 min Summer	0.842	0.042	0.0	0.1	0.1	5.9	Flood Risk
600 min Summer	0.842	0.042	0.0	0.1	0.1	5.9	Flood Risk
720 min Summer	0.842	0.042	0.0	0.1	0.1	5.9	Flood Risk
960 min Summer	0.842	0.042	0.0	0.1	0.1	5.8	Flood Risk
1440 min Summer	0.840	0.040	0.0	0.1	0.1	5.6	Flood Risk
2160 min Summer	0.837	0.037	0.0	0.1	0.1	5.2	Flood Risk
2880 min Summer	0.834	0.034	0.0	0.1	0.1	4.8	Flood Risk
4320 min Summer	0.830	0.030	0.0	0.1	0.1	4.2	Flood Risk
5760 min Summer	0.827	0.027	0.0	0.1	0.1	3.8	Flood Risk
7200 min Summer	0.825	0.025	0.0	0.1	0.1	3.5	Flood Risk
8640 min Summer	0.823	0.023	0.0	0.1	0.1	3.2	Flood Risk
10080 min Summer	0.822	0.022	0.0	0.1	0.1	3.0	Flood Risk
15 min Winter	0.825	0.025	0.0	0.1	0.1	3.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	81.304	0.0	2.4	19
30 min Summer	52.121	0.0	3.2	33
60 min Summer	31.905	0.0	4.5	62
120 min Summer	18.953	0.0	5.4	122
180 min Summer	13.833	0.0	6.0	182
240 min Summer	11.019	0.0	6.4	240
360 min Summer	7.983	0.0	6.9	300
480 min Summer	6.348	0.0	7.4	360
600 min Summer	5.311	0.0	7.7	424
720 min Summer	4.589	0.0	8.0	492
960 min Summer	3.643	0.0	8.4	626
1440 min Summer	2.628	0.0	9.1	896
2160 min Summer	1.894	0.0	10.4	1296
2880 min Summer	1.501	0.0	10.9	1672
4320 min Summer	1.080	0.0	11.6	2416
5760 min Summer	0.855	0.0	12.7	3120
7200 min Summer	0.713	0.0	13.2	3888
8640 min Summer	0.614	0.0	13.6	4592
10080 min Summer	0.542	0.0	13.8	5344
15 min Winter	81.304	0.0	2.7	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.832	0.032	0.0	0.1	0.1	4.5	Flood Risk
60 min Winter	0.838	0.038	0.0	0.1	0.1	5.4	Flood Risk
120 min Winter	0.844	0.044	0.0	0.2	0.2	6.1	Flood Risk
180 min Winter	0.846	0.046	0.0	0.2	0.2	6.5	Flood Risk
240 min Winter	0.847	0.047	0.0	0.2	0.2	6.6	Flood Risk
360 min Winter	0.847	0.047	0.0	0.2	0.2	6.6	Flood Risk
480 min Winter	0.847	0.047	0.0	0.2	0.2	6.6	Flood Risk
600 min Winter	0.847	0.047	0.0	0.2	0.2	6.6	Flood Risk
720 min Winter	0.847	0.047	0.0	0.2	0.2	6.5	Flood Risk
960 min Winter	0.845	0.045	0.0	0.2	0.2	6.4	Flood Risk
1440 min Winter	0.842	0.042	0.0	0.1	0.1	5.9	Flood Risk
2160 min Winter	0.837	0.037	0.0	0.1	0.1	5.3	Flood Risk
2880 min Winter	0.833	0.033	0.0	0.1	0.1	4.7	Flood Risk
4320 min Winter	0.828	0.028	0.0	0.1	0.1	3.9	Flood Risk
5760 min Winter	0.825	0.025	0.0	0.1	0.1	3.5	Flood Risk
7200 min Winter	0.822	0.022	0.0	0.1	0.1	3.1	Flood Risk
8640 min Winter	0.821	0.021	0.0	0.1	0.1	2.9	Flood Risk
10080 min Winter	0.819	0.019	0.0	0.1	0.1	2.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	52.121	0.0	3.6	33
60 min Winter	31.905	0.0	5.1	62
120 min Winter	18.953	0.0	6.1	120
180 min Winter	13.833	0.0	6.7	176
240 min Winter	11.019	0.0	7.2	232
360 min Winter	7.983	0.0	7.8	336
480 min Winter	6.348	0.0	8.3	378
600 min Winter	5.311	0.0	8.7	452
720 min Winter	4.589	0.0	9.0	528
960 min Winter	3.643	0.0	9.5	680
1440 min Winter	2.628	0.0	10.2	966
2160 min Winter	1.894	0.0	11.7	1368
2880 min Winter	1.501	0.0	12.3	1760
4320 min Winter	1.080	0.0	13.1	2504
5760 min Winter	0.855	0.0	14.3	3224
7200 min Winter	0.713	0.0	14.8	3968
8640 min Winter	0.614	0.0	15.3	4664
10080 min Winter	0.542	0.0	15.6	5440

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.021

Time (mins) From:	To:	Area (ha)
0	4	0.021

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	148.0	0.0	0.201	0.0	0.0
0.200	148.0	0.0			

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 30 year Return Period

Half Drain Time : 766 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.821	0.021	0.0	0.1	0.1	9.9	Flood Risk
30 min Summer	0.827	0.027	0.0	0.2	0.2	12.6	Flood Risk
60 min Summer	0.833	0.033	0.0	0.2	0.2	15.2	Flood Risk
120 min Summer	0.838	0.038	0.0	0.3	0.3	17.6	Flood Risk
180 min Summer	0.840	0.040	0.0	0.3	0.3	18.8	Flood Risk
240 min Summer	0.842	0.042	0.0	0.3	0.3	19.4	Flood Risk
360 min Summer	0.843	0.043	0.0	0.3	0.3	20.0	Flood Risk
480 min Summer	0.843	0.043	0.0	0.3	0.3	20.1	Flood Risk
600 min Summer	0.844	0.044	0.0	0.3	0.3	20.3	Flood Risk
720 min Summer	0.844	0.044	0.0	0.3	0.3	20.4	Flood Risk
960 min Summer	0.844	0.044	0.0	0.3	0.3	20.5	Flood Risk
1440 min Summer	0.844	0.044	0.0	0.3	0.3	20.4	Flood Risk
2160 min Summer	0.843	0.043	0.0	0.3	0.3	19.9	Flood Risk
2880 min Summer	0.841	0.041	0.0	0.3	0.3	19.2	Flood Risk
4320 min Summer	0.839	0.039	0.0	0.3	0.3	17.9	Flood Risk
5760 min Summer	0.836	0.036	0.0	0.3	0.3	16.8	Flood Risk
7200 min Summer	0.834	0.034	0.0	0.2	0.2	15.8	Flood Risk
8640 min Summer	0.832	0.032	0.0	0.2	0.2	15.0	Flood Risk
10080 min Summer	0.831	0.031	0.0	0.2	0.2	14.3	Flood Risk
15 min Winter	0.824	0.024	0.0	0.1	0.1	11.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	81.304	0.0	5.0	19
30 min Summer	52.121	0.0	7.1	34
60 min Summer	31.905	0.0	11.8	64
120 min Summer	18.953	0.0	14.4	122
180 min Summer	13.833	0.0	16.0	182
240 min Summer	11.019	0.0	17.2	242
360 min Summer	7.983	0.0	18.8	360
480 min Summer	6.348	0.0	20.0	420
600 min Summer	5.311	0.0	21.0	476
720 min Summer	4.589	0.0	21.7	540
960 min Summer	3.643	0.0	22.9	666
1440 min Summer	2.628	0.0	24.4	938
2160 min Summer	1.894	0.0	30.2	1344
2880 min Summer	1.501	0.0	31.7	1756
4320 min Summer	1.080	0.0	33.3	2508
5760 min Summer	0.855	0.0	38.3	3288
7200 min Summer	0.713	0.0	39.6	4032
8640 min Summer	0.614	0.0	40.6	4760
10080 min Summer	0.542	0.0	41.0	5544
15 min Winter	81.304	0.0	5.9	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.830	0.030	0.0	0.2	0.2	14.1	Flood Risk
60 min Winter	0.837	0.037	0.0	0.3	0.3	17.0	Flood Risk
120 min Winter	0.842	0.042	0.0	0.3	0.3	19.7	Flood Risk
180 min Winter	0.845	0.045	0.0	0.3	0.3	21.0	Flood Risk
240 min Winter	0.847	0.047	0.0	0.4	0.4	21.7	Flood Risk
360 min Winter	0.848	0.048	0.0	0.4	0.4	22.5	Flood Risk
480 min Winter	0.849	0.049	0.0	0.4	0.4	22.7	Flood Risk
600 min Winter	0.849	0.049	0.0	0.4	0.4	22.7	Flood Risk
720 min Winter	0.849	0.049	0.0	0.4	0.4	22.8	Flood Risk
960 min Winter	0.849	0.049	0.0	0.4	0.4	22.7	Flood Risk
1440 min Winter	0.848	0.048	0.0	0.4	0.4	22.2	Flood Risk
2160 min Winter	0.845	0.045	0.0	0.3	0.3	21.0	Flood Risk
2880 min Winter	0.843	0.043	0.0	0.3	0.3	19.8	Flood Risk
4320 min Winter	0.839	0.039	0.0	0.3	0.3	17.9	Flood Risk
5760 min Winter	0.835	0.035	0.0	0.2	0.2	16.4	Flood Risk
7200 min Winter	0.833	0.033	0.0	0.2	0.2	15.2	Flood Risk
8640 min Winter	0.831	0.031	0.0	0.2	0.2	14.2	Flood Risk
10080 min Winter	0.829	0.029	0.0	0.2	0.2	13.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	52.121	0.0	8.3	33
60 min Winter	31.905	0.0	13.5	62
120 min Winter	18.953	0.0	16.5	120
180 min Winter	13.833	0.0	18.3	178
240 min Winter	11.019	0.0	19.6	236
360 min Winter	7.983	0.0	21.4	348
480 min Winter	6.348	0.0	22.8	452
600 min Winter	5.311	0.0	23.9	494
720 min Winter	4.589	0.0	24.7	562
960 min Winter	3.643	0.0	26.1	714
1440 min Winter	2.628	0.0	27.7	1010
2160 min Winter	1.894	0.0	34.1	1432
2880 min Winter	1.501	0.0	35.8	1844
4320 min Winter	1.080	0.0	37.7	2636
5760 min Winter	0.855	0.0	43.0	3408
7200 min Winter	0.713	0.0	44.6	4176
8640 min Winter	0.614	0.0	45.7	4928
10080 min Winter	0.542	0.0	46.3	5656

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.065

Time (mins) From:	To:	Area (ha)
0	4	0.065

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	489.0	0.0	0.201	0.0	0.0
0.200	489.0	0.0			

Orifice Outflow Control

Diameter (m) 0.031 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 30 year Return Period

Half Drain Time : 475 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.816	0.016	0.0	0.0	0.0	0.8	Flood Risk
30 min Summer	0.820	0.020	0.0	0.0	0.0	1.0	Flood Risk
60 min Summer	0.824	0.024	0.0	0.0	0.0	1.1	Flood Risk
120 min Summer	0.827	0.027	0.0	0.0	0.0	1.3	Flood Risk
180 min Summer	0.828	0.028	0.0	0.0	0.0	1.4	Flood Risk
240 min Summer	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
360 min Summer	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
480 min Summer	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
600 min Summer	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
720 min Summer	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
960 min Summer	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
1440 min Summer	0.828	0.028	0.0	0.0	0.0	1.3	Flood Risk
2160 min Summer	0.825	0.025	0.0	0.0	0.0	1.2	Flood Risk
2880 min Summer	0.823	0.023	0.0	0.0	0.0	1.1	Flood Risk
4320 min Summer	0.820	0.020	0.0	0.0	0.0	1.0	Flood Risk
5760 min Summer	0.818	0.018	0.0	0.0	0.0	0.8	Flood Risk
7200 min Summer	0.816	0.016	0.0	0.0	0.0	0.8	Flood Risk
8640 min Summer	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
10080 min Summer	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
15 min Winter	0.817	0.017	0.0	0.0	0.0	0.8	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	81.304	0.0	0.6	19
30 min Summer	52.121	0.0	0.8	33
60 min Summer	31.905	0.0	1.1	62
120 min Summer	18.953	0.0	1.3	122
180 min Summer	13.833	0.0	1.5	182
240 min Summer	11.019	0.0	1.5	240
360 min Summer	7.983	0.0	1.7	314
480 min Summer	6.348	0.0	1.8	374
600 min Summer	5.311	0.0	1.9	434
720 min Summer	4.589	0.0	1.9	504
960 min Summer	3.643	0.0	2.0	638
1440 min Summer	2.628	0.0	2.2	910
2160 min Summer	1.894	0.0	2.5	1316
2880 min Summer	1.501	0.0	2.6	1700
4320 min Summer	1.080	0.0	2.8	2460
5760 min Summer	0.855	0.0	3.0	3168
7200 min Summer	0.713	0.0	3.2	3888
8640 min Summer	0.614	0.0	3.3	4584
10080 min Summer	0.542	0.0	3.3	5344
15 min Winter	81.304	0.0	0.7	19

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.822	0.022	0.0	0.0	0.0	1.1	Flood Risk
60 min Winter	0.826	0.026	0.0	0.0	0.0	1.3	Flood Risk
120 min Winter	0.830	0.030	0.0	0.0	0.0	1.5	Flood Risk
180 min Winter	0.832	0.032	0.0	0.0	0.0	1.5	Flood Risk
240 min Winter	0.833	0.033	0.0	0.0	0.0	1.6	Flood Risk
360 min Winter	0.833	0.033	0.0	0.0	0.0	1.6	Flood Risk
480 min Winter	0.833	0.033	0.0	0.0	0.0	1.6	Flood Risk
600 min Winter	0.833	0.033	0.0	0.0	0.0	1.6	Flood Risk
720 min Winter	0.833	0.033	0.0	0.0	0.0	1.6	Flood Risk
960 min Winter	0.832	0.032	0.0	0.0	0.0	1.5	Flood Risk
1440 min Winter	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
2160 min Winter	0.826	0.026	0.0	0.0	0.0	1.3	Flood Risk
2880 min Winter	0.823	0.023	0.0	0.0	0.0	1.1	Flood Risk
4320 min Winter	0.819	0.019	0.0	0.0	0.0	0.9	Flood Risk
5760 min Winter	0.816	0.016	0.0	0.0	0.0	0.8	Flood Risk
7200 min Winter	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk
8640 min Winter	0.813	0.013	0.0	0.0	0.0	0.6	Flood Risk
10080 min Winter	0.812	0.012	0.0	0.0	0.0	0.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	52.121	0.0	0.9	33
60 min Winter	31.905	0.0	1.2	62
120 min Winter	18.953	0.0	1.5	120
180 min Winter	13.833	0.0	1.6	178
240 min Winter	11.019	0.0	1.7	234
360 min Winter	7.983	0.0	1.9	340
480 min Winter	6.348	0.0	2.0	390
600 min Winter	5.311	0.0	2.1	462
720 min Winter	4.589	0.0	2.2	538
960 min Winter	3.643	0.0	2.3	692
1440 min Winter	2.628	0.0	2.5	982
2160 min Winter	1.894	0.0	2.8	1404
2880 min Winter	1.501	0.0	2.9	1788
4320 min Winter	1.080	0.0	3.2	2548
5760 min Winter	0.855	0.0	3.4	3232
7200 min Winter	0.713	0.0	3.5	3960
8640 min Winter	0.614	0.0	3.7	4592
10080 min Winter	0.542	0.0	3.7	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.005

Time (mins) From:	To:	Area (ha)
0	4	0.005

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	51.0	0.0	0.201	0.0	0.0
0.200	51.0	0.0			

Orifice Outflow Control

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period

Half Drain Time : 400 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.833	0.033	0.0	0.1	0.1	3.1	Flood Risk
30 min Summer	0.842	0.042	0.0	0.1	0.1	4.0	Flood Risk
60 min Summer	0.850	0.050	0.0	0.1	0.1	4.8	Flood Risk
120 min Summer	0.857	0.057	0.0	0.1	0.1	5.4	Flood Risk
180 min Summer	0.859	0.059	0.0	0.2	0.2	5.6	Flood Risk
240 min Summer	0.860	0.060	0.0	0.2	0.2	5.7	Flood Risk
360 min Summer	0.860	0.060	0.0	0.2	0.2	5.7	Flood Risk
480 min Summer	0.860	0.060	0.0	0.2	0.2	5.7	Flood Risk
600 min Summer	0.859	0.059	0.0	0.2	0.2	5.6	Flood Risk
720 min Summer	0.859	0.059	0.0	0.2	0.2	5.6	Flood Risk
960 min Summer	0.857	0.057	0.0	0.1	0.1	5.4	Flood Risk
1440 min Summer	0.853	0.053	0.0	0.1	0.1	5.1	Flood Risk
2160 min Summer	0.848	0.048	0.0	0.1	0.1	4.5	Flood Risk
2880 min Summer	0.843	0.043	0.0	0.1	0.1	4.1	Flood Risk
4320 min Summer	0.836	0.036	0.0	0.1	0.1	3.4	Flood Risk
5760 min Summer	0.831	0.031	0.0	0.1	0.1	2.9	Flood Risk
7200 min Summer	0.827	0.027	0.0	0.1	0.1	2.6	Flood Risk
8640 min Summer	0.825	0.025	0.0	0.1	0.1	2.3	Flood Risk
10080 min Summer	0.823	0.023	0.0	0.1	0.1	2.2	Flood Risk
15 min Winter	0.837	0.037	0.0	0.1	0.1	3.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.764	0.0	2.7	19
30 min Summer	68.314	0.0	3.6	33
60 min Summer	41.961	0.0	4.8	62
120 min Summer	24.896	0.0	5.7	122
180 min Summer	18.110	0.0	6.2	180
240 min Summer	14.371	0.0	6.6	240
360 min Summer	10.355	0.0	7.1	294
480 min Summer	8.205	0.0	7.5	356
600 min Summer	6.845	0.0	7.9	422
720 min Summer	5.900	0.0	8.1	490
960 min Summer	4.665	0.0	8.6	626
1440 min Summer	3.346	0.0	9.2	896
2160 min Summer	2.396	0.0	10.2	1296
2880 min Summer	1.889	0.0	10.7	1672
4320 min Summer	1.350	0.0	11.3	2420
5760 min Summer	1.063	0.0	12.1	3120
7200 min Summer	0.882	0.0	12.6	3824
8640 min Summer	0.758	0.0	12.9	4504
10080 min Summer	0.666	0.0	13.1	5248
15 min Winter	105.764	0.0	3.0	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.847	0.047	0.0	0.1	0.1	4.5	Flood Risk
60 min Winter	0.856	0.056	0.0	0.1	0.1	5.4	Flood Risk
120 min Winter	0.864	0.064	0.0	0.2	0.2	6.1	Flood Risk
180 min Winter	0.867	0.067	0.0	0.2	0.2	6.3	Flood Risk
240 min Winter	0.868	0.068	0.0	0.2	0.2	6.4	Flood Risk
360 min Winter	0.868	0.068	0.0	0.2	0.2	6.4	Flood Risk
480 min Winter	0.867	0.067	0.0	0.2	0.2	6.4	Flood Risk
600 min Winter	0.866	0.066	0.0	0.2	0.2	6.3	Flood Risk
720 min Winter	0.865	0.065	0.0	0.2	0.2	6.2	Flood Risk
960 min Winter	0.862	0.062	0.0	0.2	0.2	5.9	Flood Risk
1440 min Winter	0.856	0.056	0.0	0.1	0.1	5.3	Flood Risk
2160 min Winter	0.848	0.048	0.0	0.1	0.1	4.6	Flood Risk
2880 min Winter	0.842	0.042	0.0	0.1	0.1	4.0	Flood Risk
4320 min Winter	0.832	0.032	0.0	0.1	0.1	3.1	Flood Risk
5760 min Winter	0.827	0.027	0.0	0.1	0.1	2.5	Flood Risk
7200 min Winter	0.824	0.024	0.0	0.1	0.1	2.2	Flood Risk
8640 min Winter	0.822	0.022	0.0	0.1	0.1	2.0	Flood Risk
10080 min Winter	0.820	0.020	0.0	0.1	0.1	1.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	68.314	0.0	4.0	33
60 min Winter	41.961	0.0	5.4	62
120 min Winter	24.896	0.0	6.4	120
180 min Winter	18.110	0.0	7.0	176
240 min Winter	14.371	0.0	7.4	232
360 min Winter	10.355	0.0	8.0	332
480 min Winter	8.205	0.0	8.5	374
600 min Winter	6.845	0.0	8.8	452
720 min Winter	5.900	0.0	9.1	528
960 min Winter	4.665	0.0	9.6	676
1440 min Winter	3.346	0.0	10.3	966
2160 min Winter	2.396	0.0	11.4	1364
2880 min Winter	1.889	0.0	12.0	1760
4320 min Winter	1.350	0.0	12.7	2504
5760 min Winter	1.063	0.0	13.6	3176
7200 min Winter	0.882	0.0	14.1	3888
8640 min Winter	0.758	0.0	14.5	4576
10080 min Winter	0.666	0.0	14.8	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	100.0	0.0	0.201	0.0	0.0
0.200	100.0	0.0			

Orifice Outflow Control

Diameter (m) 0.018 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period

Half Drain Time : 476 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.829	0.029	0.0	0.1	0.1	4.1	Flood Risk
30 min Summer	0.837	0.037	0.0	0.1	0.1	5.2	Flood Risk
60 min Summer	0.845	0.045	0.0	0.2	0.2	6.3	Flood Risk
120 min Summer	0.851	0.051	0.0	0.2	0.2	7.2	Flood Risk
180 min Summer	0.854	0.054	0.0	0.2	0.2	7.6	Flood Risk
240 min Summer	0.855	0.055	0.0	0.2	0.2	7.7	Flood Risk
360 min Summer	0.855	0.055	0.0	0.2	0.2	7.7	Flood Risk
480 min Summer	0.855	0.055	0.0	0.2	0.2	7.7	Flood Risk
600 min Summer	0.855	0.055	0.0	0.2	0.2	7.7	Flood Risk
720 min Summer	0.855	0.055	0.0	0.2	0.2	7.7	Flood Risk
960 min Summer	0.854	0.054	0.0	0.2	0.2	7.5	Flood Risk
1440 min Summer	0.851	0.051	0.0	0.2	0.2	7.2	Flood Risk
2160 min Summer	0.847	0.047	0.0	0.2	0.2	6.6	Flood Risk
2880 min Summer	0.843	0.043	0.0	0.2	0.2	6.0	Flood Risk
4320 min Summer	0.837	0.037	0.0	0.1	0.1	5.2	Flood Risk
5760 min Summer	0.832	0.032	0.0	0.1	0.1	4.5	Flood Risk
7200 min Summer	0.829	0.029	0.0	0.1	0.1	4.1	Flood Risk
8640 min Summer	0.827	0.027	0.0	0.1	0.1	3.7	Flood Risk
10080 min Summer	0.825	0.025	0.0	0.1	0.1	3.5	Flood Risk
15 min Winter	0.833	0.033	0.0	0.1	0.1	4.6	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.764	0.0	3.2	19
30 min Summer	68.314	0.0	4.4	33
60 min Summer	41.961	0.0	6.1	62
120 min Summer	24.896	0.0	7.3	122
180 min Summer	18.110	0.0	7.9	182
240 min Summer	14.371	0.0	8.4	240
360 min Summer	10.355	0.0	9.1	314
480 min Summer	8.205	0.0	9.7	372
600 min Summer	6.845	0.0	10.1	434
720 min Summer	5.900	0.0	10.4	500
960 min Summer	4.665	0.0	10.9	636
1440 min Summer	3.346	0.0	11.7	910
2160 min Summer	2.396	0.0	13.2	1300
2880 min Summer	1.889	0.0	13.8	1700
4320 min Summer	1.350	0.0	14.7	2424
5760 min Summer	1.063	0.0	15.9	3168
7200 min Summer	0.882	0.0	16.4	3888
8640 min Summer	0.758	0.0	16.8	4584
10080 min Summer	0.666	0.0	17.1	5344
15 min Winter	105.764	0.0	3.7	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.842	0.042	0.0	0.1	0.1	5.9	Flood Risk
60 min Winter	0.850	0.050	0.0	0.2	0.2	7.1	Flood Risk
120 min Winter	0.858	0.058	0.0	0.2	0.2	8.1	Flood Risk
180 min Winter	0.861	0.061	0.0	0.2	0.2	8.5	Flood Risk
240 min Winter	0.862	0.062	0.0	0.2	0.2	8.7	Flood Risk
360 min Winter	0.862	0.062	0.0	0.2	0.2	8.7	Flood Risk
480 min Winter	0.862	0.062	0.0	0.2	0.2	8.7	Flood Risk
600 min Winter	0.861	0.061	0.0	0.2	0.2	8.6	Flood Risk
720 min Winter	0.861	0.061	0.0	0.2	0.2	8.5	Flood Risk
960 min Winter	0.859	0.059	0.0	0.2	0.2	8.3	Flood Risk
1440 min Winter	0.854	0.054	0.0	0.2	0.2	7.7	Flood Risk
2160 min Winter	0.848	0.048	0.0	0.2	0.2	6.8	Flood Risk
2880 min Winter	0.842	0.042	0.0	0.1	0.1	6.0	Flood Risk
4320 min Winter	0.834	0.034	0.0	0.1	0.1	4.8	Flood Risk
5760 min Winter	0.829	0.029	0.0	0.1	0.1	4.1	Flood Risk
7200 min Winter	0.826	0.026	0.0	0.1	0.1	3.6	Flood Risk
8640 min Winter	0.824	0.024	0.0	0.1	0.1	3.3	Flood Risk
10080 min Winter	0.822	0.022	0.0	0.1	0.1	3.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	68.314	0.0	4.9	33
60 min Winter	41.961	0.0	6.8	62
120 min Winter	24.896	0.0	8.2	120
180 min Winter	18.110	0.0	9.0	178
240 min Winter	14.371	0.0	9.5	234
360 min Winter	10.355	0.0	10.3	340
480 min Winter	8.205	0.0	10.9	388
600 min Winter	6.845	0.0	11.3	462
720 min Winter	5.900	0.0	11.7	538
960 min Winter	4.665	0.0	12.3	692
1440 min Winter	3.346	0.0	13.1	982
2160 min Winter	2.396	0.0	14.8	1388
2880 min Winter	1.889	0.0	15.5	1788
4320 min Winter	1.350	0.0	16.5	2548
5760 min Winter	1.063	0.0	17.8	3232
7200 min Winter	0.882	0.0	18.4	3968
8640 min Winter	0.758	0.0	18.9	4672
10080 min Winter	0.666	0.0	19.2	5440

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.021

Time (mins) From:	To:	Area (ha)
0	4	0.021

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	148.0	0.0	0.201	0.0	0.0
0.200	148.0	0.0			

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period

Half Drain Time : 782 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.828	0.028	0.0	0.2	0.2	12.8	Flood Risk
30 min Summer	0.835	0.035	0.0	0.2	0.2	16.4	Flood Risk
60 min Summer	0.843	0.043	0.0	0.3	0.3	19.9	Flood Risk
120 min Summer	0.849	0.049	0.0	0.4	0.4	23.0	Flood Risk
180 min Summer	0.853	0.053	0.0	0.4	0.4	24.4	Flood Risk
240 min Summer	0.854	0.054	0.0	0.4	0.4	25.2	Flood Risk
360 min Summer	0.856	0.056	0.0	0.4	0.4	25.9	Flood Risk
480 min Summer	0.856	0.056	0.0	0.4	0.4	26.0	Flood Risk
600 min Summer	0.856	0.056	0.0	0.4	0.4	26.1	Flood Risk
720 min Summer	0.856	0.056	0.0	0.4	0.4	26.2	Flood Risk
960 min Summer	0.856	0.056	0.0	0.4	0.4	26.1	Flood Risk
1440 min Summer	0.855	0.055	0.0	0.4	0.4	25.7	Flood Risk
2160 min Summer	0.853	0.053	0.0	0.4	0.4	24.8	Flood Risk
2880 min Summer	0.851	0.051	0.0	0.4	0.4	23.7	Flood Risk
4320 min Summer	0.846	0.046	0.0	0.4	0.4	21.5	Flood Risk
5760 min Summer	0.843	0.043	0.0	0.3	0.3	19.9	Flood Risk
7200 min Summer	0.840	0.040	0.0	0.3	0.3	18.6	Flood Risk
8640 min Summer	0.838	0.038	0.0	0.3	0.3	17.5	Flood Risk
10080 min Summer	0.836	0.036	0.0	0.3	0.3	16.5	Flood Risk
15 min Winter	0.831	0.031	0.0	0.2	0.2	14.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.764	0.0	7.2	19
30 min Summer	68.314	0.0	10.2	34
60 min Summer	41.961	0.0	16.3	64
120 min Summer	24.896	0.0	19.9	122
180 min Summer	18.110	0.0	21.9	182
240 min Summer	14.371	0.0	23.3	242
360 min Summer	10.355	0.0	25.3	360
480 min Summer	8.205	0.0	26.8	440
600 min Summer	6.845	0.0	27.9	494
720 min Summer	5.900	0.0	28.8	554
960 min Summer	4.665	0.0	30.3	676
1440 min Summer	3.346	0.0	32.0	952
2160 min Summer	2.396	0.0	38.9	1360
2880 min Summer	1.889	0.0	40.6	1756
4320 min Summer	1.350	0.0	42.4	2508
5760 min Summer	1.063	0.0	47.9	3280
7200 min Summer	0.882	0.0	49.5	4032
8640 min Summer	0.758	0.0	50.5	4752
10080 min Summer	0.666	0.0	51.0	5456
15 min Winter	105.764	0.0	8.4	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.840	0.040	0.0	0.3	0.3	18.4	Flood Risk
60 min Winter	0.848	0.048	0.0	0.4	0.4	22.3	Flood Risk
120 min Winter	0.856	0.056	0.0	0.4	0.4	25.8	Flood Risk
180 min Winter	0.859	0.059	0.0	0.4	0.4	27.5	Flood Risk
240 min Winter	0.861	0.061	0.0	0.4	0.4	28.4	Flood Risk
360 min Winter	0.863	0.063	0.0	0.4	0.4	29.2	Flood Risk
480 min Winter	0.863	0.063	0.0	0.4	0.4	29.5	Flood Risk
600 min Winter	0.863	0.063	0.0	0.4	0.4	29.4	Flood Risk
720 min Winter	0.863	0.063	0.0	0.4	0.4	29.3	Flood Risk
960 min Winter	0.863	0.063	0.0	0.4	0.4	29.1	Flood Risk
1440 min Winter	0.861	0.061	0.0	0.4	0.4	28.1	Flood Risk
2160 min Winter	0.857	0.057	0.0	0.4	0.4	26.3	Flood Risk
2880 min Winter	0.853	0.053	0.0	0.4	0.4	24.5	Flood Risk
4320 min Winter	0.846	0.046	0.0	0.4	0.4	21.4	Flood Risk
5760 min Winter	0.841	0.041	0.0	0.3	0.3	19.3	Flood Risk
7200 min Winter	0.838	0.038	0.0	0.3	0.3	17.7	Flood Risk
8640 min Winter	0.835	0.035	0.0	0.2	0.2	16.4	Flood Risk
10080 min Winter	0.833	0.033	0.0	0.2	0.2	15.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	68.314	0.0	11.8	33
60 min Winter	41.961	0.0	18.6	62
120 min Winter	24.896	0.0	22.6	120
180 min Winter	18.110	0.0	24.9	178
240 min Winter	14.371	0.0	26.4	236
360 min Winter	10.355	0.0	28.7	348
480 min Winter	8.205	0.0	30.4	458
600 min Winter	6.845	0.0	31.6	554
720 min Winter	5.900	0.0	32.7	574
960 min Winter	4.665	0.0	34.3	722
1440 min Winter	3.346	0.0	36.2	1024
2160 min Winter	2.396	0.0	43.8	1452
2880 min Winter	1.889	0.0	45.8	1872
4320 min Winter	1.350	0.0	47.9	2640
5760 min Winter	1.063	0.0	53.9	3408
7200 min Winter	0.882	0.0	55.6	4176
8640 min Winter	0.758	0.0	56.9	4928
10080 min Winter	0.666	0.0	57.5	5648

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.065

Time (mins) From:	To:	Area (ha)
0	4	0.065

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	489.0	0.0	0.201	0.0	0.0
0.200	489.0	0.0			

Orifice Outflow Control

Diameter (m) 0.031 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period

Half Drain Time : 523 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.820	0.020	0.0	0.0	0.0	1.0	Flood Risk
30 min Summer	0.826	0.026	0.0	0.0	0.0	1.2	Flood Risk
60 min Summer	0.831	0.031	0.0	0.0	0.0	1.5	Flood Risk
120 min Summer	0.836	0.036	0.0	0.0	0.0	1.7	Flood Risk
180 min Summer	0.837	0.037	0.0	0.0	0.0	1.8	Flood Risk
240 min Summer	0.838	0.038	0.0	0.0	0.0	1.9	Flood Risk
360 min Summer	0.838	0.038	0.0	0.0	0.0	1.9	Flood Risk
480 min Summer	0.838	0.038	0.0	0.0	0.0	1.9	Flood Risk
600 min Summer	0.838	0.038	0.0	0.0	0.0	1.9	Flood Risk
720 min Summer	0.838	0.038	0.0	0.0	0.0	1.8	Flood Risk
960 min Summer	0.837	0.037	0.0	0.0	0.0	1.8	Flood Risk
1440 min Summer	0.836	0.036	0.0	0.0	0.0	1.7	Flood Risk
2160 min Summer	0.833	0.033	0.0	0.0	0.0	1.6	Flood Risk
2880 min Summer	0.830	0.030	0.0	0.0	0.0	1.5	Flood Risk
4320 min Summer	0.825	0.025	0.0	0.0	0.0	1.2	Flood Risk
5760 min Summer	0.822	0.022	0.0	0.0	0.0	1.1	Flood Risk
7200 min Summer	0.819	0.019	0.0	0.0	0.0	0.9	Flood Risk
8640 min Summer	0.817	0.017	0.0	0.0	0.0	0.8	Flood Risk
10080 min Summer	0.816	0.016	0.0	0.0	0.0	0.8	Flood Risk
15 min Winter	0.823	0.023	0.0	0.0	0.0	1.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	105.764	0.0	0.8	19
30 min Summer	68.314	0.0	1.1	33
60 min Summer	41.961	0.0	1.5	64
120 min Summer	24.896	0.0	1.8	122
180 min Summer	18.110	0.0	1.9	182
240 min Summer	14.371	0.0	2.0	240
360 min Summer	10.355	0.0	2.2	338
480 min Summer	8.205	0.0	2.3	390
600 min Summer	6.845	0.0	2.4	452
720 min Summer	5.900	0.0	2.5	514
960 min Summer	4.665	0.0	2.6	652
1440 min Summer	3.346	0.0	2.8	924
2160 min Summer	2.396	0.0	3.2	1320
2880 min Summer	1.889	0.0	3.3	1728
4320 min Summer	1.350	0.0	3.5	2468
5760 min Summer	1.063	0.0	3.8	3224
7200 min Summer	0.882	0.0	3.9	3960
8640 min Summer	0.758	0.0	4.0	4664
10080 min Summer	0.666	0.0	4.1	5344
15 min Winter	105.764	0.0	0.9	19

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.829	0.029	0.0	0.0	0.0	1.4	Flood Risk
60 min Winter	0.835	0.035	0.0	0.0	0.0	1.7	Flood Risk
120 min Winter	0.840	0.040	0.0	0.0	0.0	1.9	Flood Risk
180 min Winter	0.842	0.042	0.0	0.0	0.0	2.0	Flood Risk
240 min Winter	0.843	0.043	0.0	0.0	0.0	2.1	Flood Risk
360 min Winter	0.844	0.044	0.0	0.0	0.0	2.1	Flood Risk
480 min Winter	0.843	0.043	0.0	0.0	0.0	2.1	Flood Risk
600 min Winter	0.843	0.043	0.0	0.0	0.0	2.1	Flood Risk
720 min Winter	0.843	0.043	0.0	0.0	0.0	2.1	Flood Risk
960 min Winter	0.841	0.041	0.0	0.0	0.0	2.0	Flood Risk
1440 min Winter	0.838	0.038	0.0	0.0	0.0	1.9	Flood Risk
2160 min Winter	0.834	0.034	0.0	0.0	0.0	1.7	Flood Risk
2880 min Winter	0.830	0.030	0.0	0.0	0.0	1.5	Flood Risk
4320 min Winter	0.824	0.024	0.0	0.0	0.0	1.2	Flood Risk
5760 min Winter	0.820	0.020	0.0	0.0	0.0	1.0	Flood Risk
7200 min Winter	0.817	0.017	0.0	0.0	0.0	0.8	Flood Risk
8640 min Winter	0.815	0.015	0.0	0.0	0.0	0.7	Flood Risk
10080 min Winter	0.814	0.014	0.0	0.0	0.0	0.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	68.314	0.0	1.2	33
60 min Winter	41.961	0.0	1.7	62
120 min Winter	24.896	0.0	2.0	120
180 min Winter	18.110	0.0	2.2	178
240 min Winter	14.371	0.0	2.3	234
360 min Winter	10.355	0.0	2.5	344
480 min Winter	8.205	0.0	2.6	442
600 min Winter	6.845	0.0	2.7	472
720 min Winter	5.900	0.0	2.8	548
960 min Winter	4.665	0.0	3.0	702
1440 min Winter	3.346	0.0	3.2	996
2160 min Winter	2.396	0.0	3.6	1424
2880 min Winter	1.889	0.0	3.7	1820
4320 min Winter	1.350	0.0	4.0	2592
5760 min Winter	1.063	0.0	4.2	3344
7200 min Winter	0.882	0.0	4.4	4040
8640 min Winter	0.758	0.0	4.5	4672
10080 min Winter	0.666	0.0	4.6	5408

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.005

Time (mins) From:	To:	Area (ha)
0	4	0.005

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	51.0	0.0	0.201	0.0	0.0
0.200	51.0	0.0			

Orifice Outflow Control

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 458 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.846	0.046	0.0	0.1	0.1	4.4	Flood Risk
30 min Summer	0.859	0.059	0.0	0.2	0.2	5.6	Flood Risk
60 min Summer	0.871	0.071	0.0	0.2	0.2	6.7	Flood Risk
120 min Summer	0.880	0.080	0.0	0.2	0.2	7.6	Flood Risk
180 min Summer	0.884	0.084	0.0	0.2	0.2	8.0	Flood Risk
240 min Summer	0.885	0.085	0.0	0.2	0.2	8.1	Flood Risk
360 min Summer	0.886	0.086	0.0	0.2	0.2	8.1	Flood Risk
480 min Summer	0.885	0.085	0.0	0.2	0.2	8.1	Flood Risk
600 min Summer	0.885	0.085	0.0	0.2	0.2	8.0	Flood Risk
720 min Summer	0.884	0.084	0.0	0.2	0.2	8.0	Flood Risk
960 min Summer	0.882	0.082	0.0	0.2	0.2	7.8	Flood Risk
1440 min Summer	0.877	0.077	0.0	0.2	0.2	7.3	Flood Risk
2160 min Summer	0.869	0.069	0.0	0.2	0.2	6.6	Flood Risk
2880 min Summer	0.863	0.063	0.0	0.2	0.2	6.0	Flood Risk
4320 min Summer	0.852	0.052	0.0	0.1	0.1	4.9	Flood Risk
5760 min Summer	0.844	0.044	0.0	0.1	0.1	4.2	Flood Risk
7200 min Summer	0.838	0.038	0.0	0.1	0.1	3.6	Flood Risk
8640 min Summer	0.834	0.034	0.0	0.1	0.1	3.2	Flood Risk
10080 min Summer	0.831	0.031	0.0	0.1	0.1	2.9	Flood Risk
15 min Winter	0.852	0.052	0.0	0.1	0.1	4.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	148.070	0.0	3.9	19
30 min Summer	95.640	0.0	5.1	33
60 min Summer	58.745	0.0	6.7	62
120 min Summer	34.854	0.0	8.0	122
180 min Summer	25.354	0.0	8.8	182
240 min Summer	20.120	0.0	9.3	240
360 min Summer	14.497	0.0	10.1	314
480 min Summer	11.487	0.0	10.6	376
600 min Summer	9.583	0.0	11.1	436
720 min Summer	8.261	0.0	11.5	504
960 min Summer	6.531	0.0	12.1	642
1440 min Summer	4.684	0.0	12.9	910
2160 min Summer	3.354	0.0	14.3	1316
2880 min Summer	2.645	0.0	15.0	1700
4320 min Summer	1.890	0.0	16.0	2464
5760 min Summer	1.488	0.0	17.0	3176
7200 min Summer	1.235	0.0	17.7	3896
8640 min Summer	1.061	0.0	18.1	4592
10080 min Summer	0.932	0.0	18.5	5344
15 min Winter	148.070	0.0	4.4	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.866	0.066	0.0	0.2	0.2	6.3	Flood Risk
60 min Winter	0.879	0.079	0.0	0.2	0.2	7.5	Flood Risk
120 min Winter	0.890	0.090	0.0	0.2	0.2	8.6	Flood Risk
180 min Winter	0.895	0.095	0.0	0.2	0.2	9.0	Flood Risk
240 min Winter	0.897	0.097	0.0	0.2	0.2	9.2	Flood Risk
360 min Winter	0.897	0.097	0.0	0.2	0.2	9.2	Flood Risk
480 min Winter	0.896	0.096	0.0	0.2	0.2	9.1	Flood Risk
600 min Winter	0.895	0.095	0.0	0.2	0.2	9.0	Flood Risk
720 min Winter	0.894	0.094	0.0	0.2	0.2	8.9	Flood Risk
960 min Winter	0.890	0.090	0.0	0.2	0.2	8.6	Flood Risk
1440 min Winter	0.883	0.083	0.0	0.2	0.2	7.8	Flood Risk
2160 min Winter	0.872	0.072	0.0	0.2	0.2	6.8	Flood Risk
2880 min Winter	0.862	0.062	0.0	0.2	0.2	5.9	Flood Risk
4320 min Winter	0.848	0.048	0.0	0.1	0.1	4.6	Flood Risk
5760 min Winter	0.839	0.039	0.0	0.1	0.1	3.7	Flood Risk
7200 min Winter	0.832	0.032	0.0	0.1	0.1	3.1	Flood Risk
8640 min Winter	0.828	0.028	0.0	0.1	0.1	2.7	Flood Risk
10080 min Winter	0.825	0.025	0.0	0.1	0.1	2.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	95.640	0.0	5.8	33
60 min Winter	58.745	0.0	7.6	62
120 min Winter	34.854	0.0	9.0	120
180 min Winter	25.354	0.0	9.9	178
240 min Winter	20.120	0.0	10.5	234
360 min Winter	14.497	0.0	11.3	342
480 min Winter	11.487	0.0	11.9	390
600 min Winter	9.583	0.0	12.5	464
720 min Winter	8.261	0.0	12.9	540
960 min Winter	6.531	0.0	13.5	692
1440 min Winter	4.684	0.0	14.5	982
2160 min Winter	3.354	0.0	16.0	1404
2880 min Winter	2.645	0.0	16.8	1812
4320 min Winter	1.890	0.0	17.9	2552
5760 min Winter	1.488	0.0	19.1	3288
7200 min Winter	1.235	0.0	19.8	4032
8640 min Winter	1.061	0.0	20.3	4672
10080 min Winter	0.932	0.0	20.8	5256

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.016

Time (mins) From:	To:	Area (ha)
0	4	0.016

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	100.0	0.0	0.201	0.0	0.0
0.200	100.0	0.0			

Orifice Outflow Control

Diameter (m) 0.018 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 545 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.841	0.041	0.0	0.1	0.1	5.7	Flood Risk
30 min Summer	0.852	0.052	0.0	0.2	0.2	7.4	Flood Risk
60 min Summer	0.863	0.063	0.0	0.2	0.2	8.9	Flood Risk
120 min Summer	0.872	0.072	0.0	0.2	0.2	10.2	Flood Risk
180 min Summer	0.876	0.076	0.0	0.2	0.2	10.7	Flood Risk
240 min Summer	0.878	0.078	0.0	0.2	0.2	10.9	Flood Risk
360 min Summer	0.878	0.078	0.0	0.2	0.2	11.0	Flood Risk
480 min Summer	0.878	0.078	0.0	0.2	0.2	11.0	Flood Risk
600 min Summer	0.878	0.078	0.0	0.2	0.2	11.0	Flood Risk
720 min Summer	0.878	0.078	0.0	0.2	0.2	10.9	Flood Risk
960 min Summer	0.876	0.076	0.0	0.2	0.2	10.8	Flood Risk
1440 min Summer	0.873	0.073	0.0	0.2	0.2	10.3	Flood Risk
2160 min Summer	0.867	0.067	0.0	0.2	0.2	9.4	Flood Risk
2880 min Summer	0.862	0.062	0.0	0.2	0.2	8.7	Flood Risk
4320 min Summer	0.852	0.052	0.0	0.2	0.2	7.4	Flood Risk
5760 min Summer	0.845	0.045	0.0	0.2	0.2	6.4	Flood Risk
7200 min Summer	0.840	0.040	0.0	0.1	0.1	5.6	Flood Risk
8640 min Summer	0.836	0.036	0.0	0.1	0.1	5.1	Flood Risk
10080 min Summer	0.833	0.033	0.0	0.1	0.1	4.6	Flood Risk
15 min Winter	0.846	0.046	0.0	0.2	0.2	6.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	148.070	0.0	4.8	19
30 min Summer	95.640	0.0	6.3	33
60 min Summer	58.745	0.0	8.6	64
120 min Summer	34.854	0.0	10.3	122
180 min Summer	25.354	0.0	11.3	182
240 min Summer	20.120	0.0	12.0	240
360 min Summer	14.497	0.0	13.0	344
480 min Summer	11.487	0.0	13.7	396
600 min Summer	9.583	0.0	14.3	454
720 min Summer	8.261	0.0	14.7	520
960 min Summer	6.531	0.0	15.5	654
1440 min Summer	4.684	0.0	16.5	924
2160 min Summer	3.354	0.0	18.6	1324
2880 min Summer	2.645	0.0	19.5	1728
4320 min Summer	1.890	0.0	20.7	2504
5760 min Summer	1.488	0.0	22.3	3232
7200 min Summer	1.235	0.0	23.1	3960
8640 min Summer	1.061	0.0	23.7	4672
10080 min Summer	0.932	0.0	24.1	5352
15 min Winter	148.070	0.0	5.4	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.859	0.059	0.0	0.2	0.2	8.2	Flood Risk
60 min Winter	0.871	0.071	0.0	0.2	0.2	10.0	Flood Risk
120 min Winter	0.881	0.081	0.0	0.2	0.2	11.4	Flood Risk
180 min Winter	0.886	0.086	0.0	0.2	0.2	12.1	Flood Risk
240 min Winter	0.888	0.088	0.0	0.2	0.2	12.3	Flood Risk
360 min Winter	0.889	0.089	0.0	0.2	0.2	12.5	Flood Risk
480 min Winter	0.889	0.089	0.0	0.2	0.2	12.4	Flood Risk
600 min Winter	0.888	0.088	0.0	0.2	0.2	12.3	Flood Risk
720 min Winter	0.887	0.087	0.0	0.2	0.2	12.2	Flood Risk
960 min Winter	0.885	0.085	0.0	0.2	0.2	11.9	Flood Risk
1440 min Winter	0.879	0.079	0.0	0.2	0.2	11.1	Flood Risk
2160 min Winter	0.870	0.070	0.0	0.2	0.2	9.9	Flood Risk
2880 min Winter	0.862	0.062	0.0	0.2	0.2	8.8	Flood Risk
4320 min Winter	0.850	0.050	0.0	0.2	0.2	7.0	Flood Risk
5760 min Winter	0.841	0.041	0.0	0.1	0.1	5.8	Flood Risk
7200 min Winter	0.835	0.035	0.0	0.1	0.1	4.9	Flood Risk
8640 min Winter	0.831	0.031	0.0	0.1	0.1	4.3	Flood Risk
10080 min Winter	0.828	0.028	0.0	0.1	0.1	3.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	95.640	0.0	7.1	33
60 min Winter	58.745	0.0	9.7	62
120 min Winter	34.854	0.0	11.6	120
180 min Winter	25.354	0.0	12.7	178
240 min Winter	20.120	0.0	13.5	234
360 min Winter	14.497	0.0	14.6	344
480 min Winter	11.487	0.0	15.4	446
600 min Winter	9.583	0.0	16.0	476
720 min Winter	8.261	0.0	16.6	552
960 min Winter	6.531	0.0	17.4	704
1440 min Winter	4.684	0.0	18.5	998
2160 min Winter	3.354	0.0	20.9	1428
2880 min Winter	2.645	0.0	21.9	1840
4320 min Winter	1.890	0.0	23.3	2596
5760 min Winter	1.488	0.0	25.0	3344
7200 min Winter	1.235	0.0	25.9	4040
8640 min Winter	1.061	0.0	26.6	4752
10080 min Winter	0.932	0.0	27.1	5352

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.021

Time (mins) From:	To:	Area (ha)
0	4	0.021

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	148.0	0.0	0.201	0.0	0.0
0.200	148.0	0.0			

Orifice Outflow Control

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 801 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.839	0.039	0.0	0.3	0.3	17.9	Flood Risk
30 min Summer	0.849	0.049	0.0	0.4	0.4	23.0	Flood Risk
60 min Summer	0.860	0.060	0.0	0.4	0.4	27.8	Flood Risk
120 min Summer	0.869	0.069	0.0	0.5	0.5	32.3	Flood Risk
180 min Summer	0.874	0.074	0.0	0.5	0.5	34.4	Flood Risk
240 min Summer	0.876	0.076	0.0	0.5	0.5	35.5	Flood Risk
360 min Summer	0.879	0.079	0.0	0.5	0.5	36.6	Flood Risk
480 min Summer	0.879	0.079	0.0	0.5	0.5	36.9	Flood Risk
600 min Summer	0.880	0.080	0.0	0.5	0.5	37.0	Flood Risk
720 min Summer	0.880	0.080	0.0	0.5	0.5	37.0	Flood Risk
960 min Summer	0.879	0.079	0.0	0.5	0.5	36.9	Flood Risk
1440 min Summer	0.878	0.078	0.0	0.5	0.5	36.3	Flood Risk
2160 min Summer	0.875	0.075	0.0	0.5	0.5	34.8	Flood Risk
2880 min Summer	0.871	0.071	0.0	0.5	0.5	33.1	Flood Risk
4320 min Summer	0.864	0.064	0.0	0.4	0.4	29.9	Flood Risk
5760 min Summer	0.858	0.058	0.0	0.4	0.4	27.1	Flood Risk
7200 min Summer	0.853	0.053	0.0	0.4	0.4	24.7	Flood Risk
8640 min Summer	0.849	0.049	0.0	0.4	0.4	22.8	Flood Risk
10080 min Summer	0.846	0.046	0.0	0.3	0.3	21.3	Flood Risk
15 min Winter	0.843	0.043	0.0	0.3	0.3	20.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	148.070	0.0	11.4	19
30 min Summer	95.640	0.0	15.6	34
60 min Summer	58.745	0.0	24.0	64
120 min Summer	34.854	0.0	29.0	122
180 min Summer	25.354	0.0	31.8	182
240 min Summer	20.120	0.0	33.8	242
360 min Summer	14.497	0.0	36.6	360
480 min Summer	11.487	0.0	38.7	476
600 min Summer	9.583	0.0	40.3	520
720 min Summer	8.261	0.0	41.5	578
960 min Summer	6.531	0.0	43.5	702
1440 min Summer	4.684	0.0	45.6	968
2160 min Summer	3.354	0.0	55.4	1384
2880 min Summer	2.645	0.0	57.9	1784
4320 min Summer	1.890	0.0	60.7	2552
5760 min Summer	1.488	0.0	67.7	3336
7200 min Summer	1.235	0.0	70.0	4040
8640 min Summer	1.061	0.0	71.6	4760
10080 min Summer	0.932	0.0	72.5	5456
15 min Winter	148.070	0.0	13.1	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.855	0.055	0.0	0.4	0.4	25.7	Flood Risk
60 min Winter	0.867	0.067	0.0	0.5	0.5	31.2	Flood Risk
120 min Winter	0.878	0.078	0.0	0.5	0.5	36.2	Flood Risk
180 min Winter	0.883	0.083	0.0	0.5	0.5	38.6	Flood Risk
240 min Winter	0.886	0.086	0.0	0.5	0.5	40.0	Flood Risk
360 min Winter	0.889	0.089	0.0	0.5	0.5	41.3	Flood Risk
480 min Winter	0.890	0.090	0.0	0.5	0.5	41.8	Flood Risk
600 min Winter	0.890	0.090	0.0	0.5	0.5	41.8	Flood Risk
720 min Winter	0.890	0.090	0.0	0.5	0.5	41.6	Flood Risk
960 min Winter	0.889	0.089	0.0	0.5	0.5	41.2	Flood Risk
1440 min Winter	0.886	0.086	0.0	0.5	0.5	40.0	Flood Risk
2160 min Winter	0.880	0.080	0.0	0.5	0.5	37.4	Flood Risk
2880 min Winter	0.875	0.075	0.0	0.5	0.5	34.7	Flood Risk
4320 min Winter	0.864	0.064	0.0	0.4	0.4	29.9	Flood Risk
5760 min Winter	0.856	0.056	0.0	0.4	0.4	26.1	Flood Risk
7200 min Winter	0.850	0.050	0.0	0.4	0.4	23.1	Flood Risk
8640 min Winter	0.845	0.045	0.0	0.3	0.3	20.9	Flood Risk
10080 min Winter	0.842	0.042	0.0	0.3	0.3	19.4	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	95.640	0.0	17.9	33
60 min Winter	58.745	0.0	27.3	62
120 min Winter	34.854	0.0	32.8	120
180 min Winter	25.354	0.0	36.0	180
240 min Winter	20.120	0.0	38.2	236
360 min Winter	14.497	0.0	41.3	350
480 min Winter	11.487	0.0	43.6	462
600 min Winter	9.583	0.0	45.4	566
720 min Winter	8.261	0.0	46.8	656
960 min Winter	6.531	0.0	48.9	742
1440 min Winter	4.684	0.0	51.2	1050
2160 min Winter	3.354	0.0	62.3	1492
2880 min Winter	2.645	0.0	65.2	1904
4320 min Winter	1.890	0.0	68.5	2724
5760 min Winter	1.488	0.0	76.1	3464
7200 min Winter	1.235	0.0	78.6	4184
8640 min Winter	1.061	0.0	80.5	4920
10080 min Winter	0.932	0.0	81.6	5648

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.065

Time (mins) From:	To:	Area (ha)
0	4	0.065

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	489.0	0.0	0.201	0.0	0.0
0.200	489.0	0.0			

Orifice Outflow Control

Diameter (m) 0.031 Discharge Coefficient 0.600 Invert Level (m) 0.800

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 605 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.828	0.028	0.0	0.0	0.0	1.4	Flood Risk
30 min Summer	0.836	0.036	0.0	0.0	0.0	1.8	Flood Risk
60 min Summer	0.844	0.044	0.0	0.0	0.0	2.1	Flood Risk
120 min Summer	0.850	0.050	0.0	0.0	0.0	2.4	Flood Risk
180 min Summer	0.853	0.053	0.0	0.0	0.0	2.6	Flood Risk
240 min Summer	0.854	0.054	0.0	0.0	0.0	2.6	Flood Risk
360 min Summer	0.855	0.055	0.0	0.0	0.0	2.7	Flood Risk
480 min Summer	0.855	0.055	0.0	0.0	0.0	2.7	Flood Risk
600 min Summer	0.855	0.055	0.0	0.0	0.0	2.7	Flood Risk
720 min Summer	0.855	0.055	0.0	0.0	0.0	2.6	Flood Risk
960 min Summer	0.854	0.054	0.0	0.0	0.0	2.6	Flood Risk
1440 min Summer	0.851	0.051	0.0	0.0	0.0	2.5	Flood Risk
2160 min Summer	0.848	0.048	0.0	0.0	0.0	2.3	Flood Risk
2880 min Summer	0.844	0.044	0.0	0.0	0.0	2.1	Flood Risk
4320 min Summer	0.837	0.037	0.0	0.0	0.0	1.8	Flood Risk
5760 min Summer	0.832	0.032	0.0	0.0	0.0	1.6	Flood Risk
7200 min Summer	0.828	0.028	0.0	0.0	0.0	1.4	Flood Risk
8640 min Summer	0.825	0.025	0.0	0.0	0.0	1.2	Flood Risk
10080 min Summer	0.823	0.023	0.0	0.0	0.0	1.1	Flood Risk
15 min Winter	0.832	0.032	0.0	0.0	0.0	1.5	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	148.070	0.0	1.2	19
30 min Summer	95.640	0.0	1.5	34
60 min Summer	58.745	0.0	2.1	64
120 min Summer	34.854	0.0	2.5	122
180 min Summer	25.354	0.0	2.7	182
240 min Summer	20.120	0.0	2.9	242
360 min Summer	14.497	0.0	3.1	360
480 min Summer	11.487	0.0	3.3	416
600 min Summer	9.583	0.0	3.4	476
720 min Summer	8.261	0.0	3.5	538
960 min Summer	6.531	0.0	3.7	672
1440 min Summer	4.684	0.0	4.0	940
2160 min Summer	3.354	0.0	4.5	1344
2880 min Summer	2.645	0.0	4.7	1756
4320 min Summer	1.890	0.0	5.0	2512
5760 min Summer	1.488	0.0	5.3	3280
7200 min Summer	1.235	0.0	5.5	4032
8640 min Summer	1.061	0.0	5.7	4752
10080 min Summer	0.932	0.0	5.8	5448
15 min Winter	148.070	0.0	1.3	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	0.841	0.041	0.0	0.0	0.0	2.0	Flood Risk
60 min Winter	0.849	0.049	0.0	0.0	0.0	2.4	Flood Risk
120 min Winter	0.856	0.056	0.0	0.0	0.0	2.7	Flood Risk
180 min Winter	0.860	0.060	0.0	0.0	0.0	2.9	Flood Risk
240 min Winter	0.861	0.061	0.0	0.0	0.0	3.0	Flood Risk
360 min Winter	0.863	0.063	0.0	0.1	0.1	3.0	Flood Risk
480 min Winter	0.863	0.063	0.0	0.1	0.1	3.0	Flood Risk
600 min Winter	0.862	0.062	0.0	0.0	0.0	3.0	Flood Risk
720 min Winter	0.861	0.061	0.0	0.0	0.0	3.0	Flood Risk
960 min Winter	0.860	0.060	0.0	0.0	0.0	2.9	Flood Risk
1440 min Winter	0.856	0.056	0.0	0.0	0.0	2.7	Flood Risk
2160 min Winter	0.851	0.051	0.0	0.0	0.0	2.4	Flood Risk
2880 min Winter	0.845	0.045	0.0	0.0	0.0	2.2	Flood Risk
4320 min Winter	0.836	0.036	0.0	0.0	0.0	1.8	Flood Risk
5760 min Winter	0.830	0.030	0.0	0.0	0.0	1.5	Flood Risk
7200 min Winter	0.825	0.025	0.0	0.0	0.0	1.2	Flood Risk
8640 min Winter	0.822	0.022	0.0	0.0	0.0	1.0	Flood Risk
10080 min Winter	0.819	0.019	0.0	0.0	0.0	0.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	95.640	0.0	1.7	33
60 min Winter	58.745	0.0	2.3	62
120 min Winter	34.854	0.0	2.8	120
180 min Winter	25.354	0.0	3.1	178
240 min Winter	20.120	0.0	3.2	236
360 min Winter	14.497	0.0	3.5	348
480 min Winter	11.487	0.0	3.7	454
600 min Winter	9.583	0.0	3.8	536
720 min Winter	8.261	0.0	4.0	566
960 min Winter	6.531	0.0	4.2	720
1440 min Winter	4.684	0.0	4.4	1024
2160 min Winter	3.354	0.0	5.0	1452
2880 min Winter	2.645	0.0	5.2	1872
4320 min Winter	1.890	0.0	5.6	2676
5760 min Winter	1.488	0.0	6.0	3408
7200 min Winter	1.235	0.0	6.2	4176
8640 min Winter	1.061	0.0	6.3	4848
10080 min Winter	0.932	0.0	6.5	5552

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.438	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.005

Time (mins) From:	To:	Area (ha)
0	4	0.005

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	51.0	0.0	0.201	0.0	0.0
0.200	51.0	0.0			

Orifice Outflow Control

Diameter (m) 0.010 Discharge Coefficient 0.600 Invert Level (m) 0.800

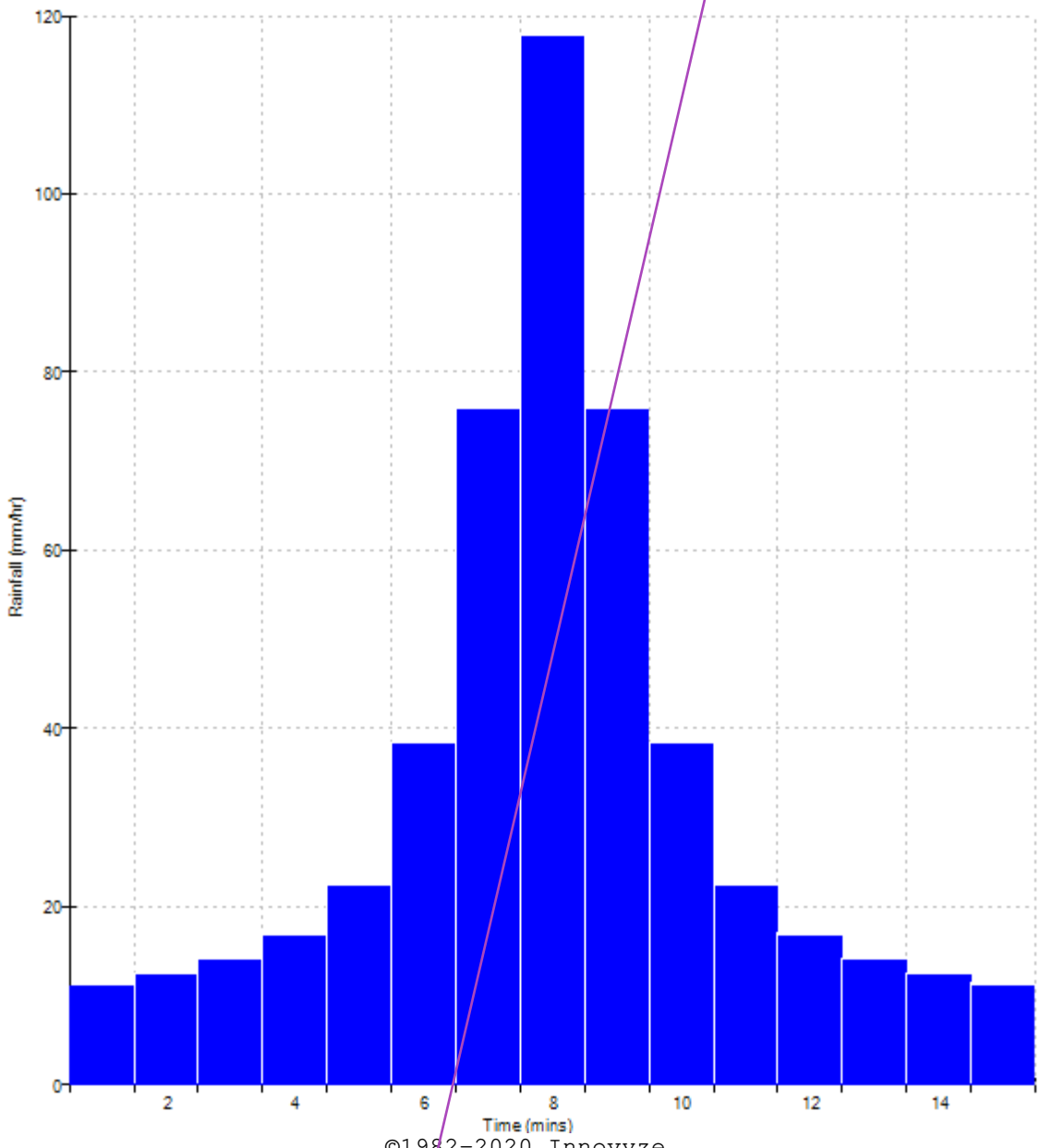
Unrestricted area calculations

Heyne Tillett Steel		Page 1
4 Pear Tree Court London EC1R 0DS		
Date 11/05/2021 17:33 File	Designed by smugnaini Checked by	
XP Solutions	Network 2020.1	

Rainfall profile

Storm duration (mins) 15

FSR Data	
Region	England and Wales
M5-60 (mm)	20.700
Ratio R	0.446
Peak Intensity (mm/hr)	117.702
Ave. Intensity (mm/hr)	33.306
Return Period (years)	1.0



Q1=3.6 x 0.75 x Av intensity x Area (Ha)=0.32 l/s

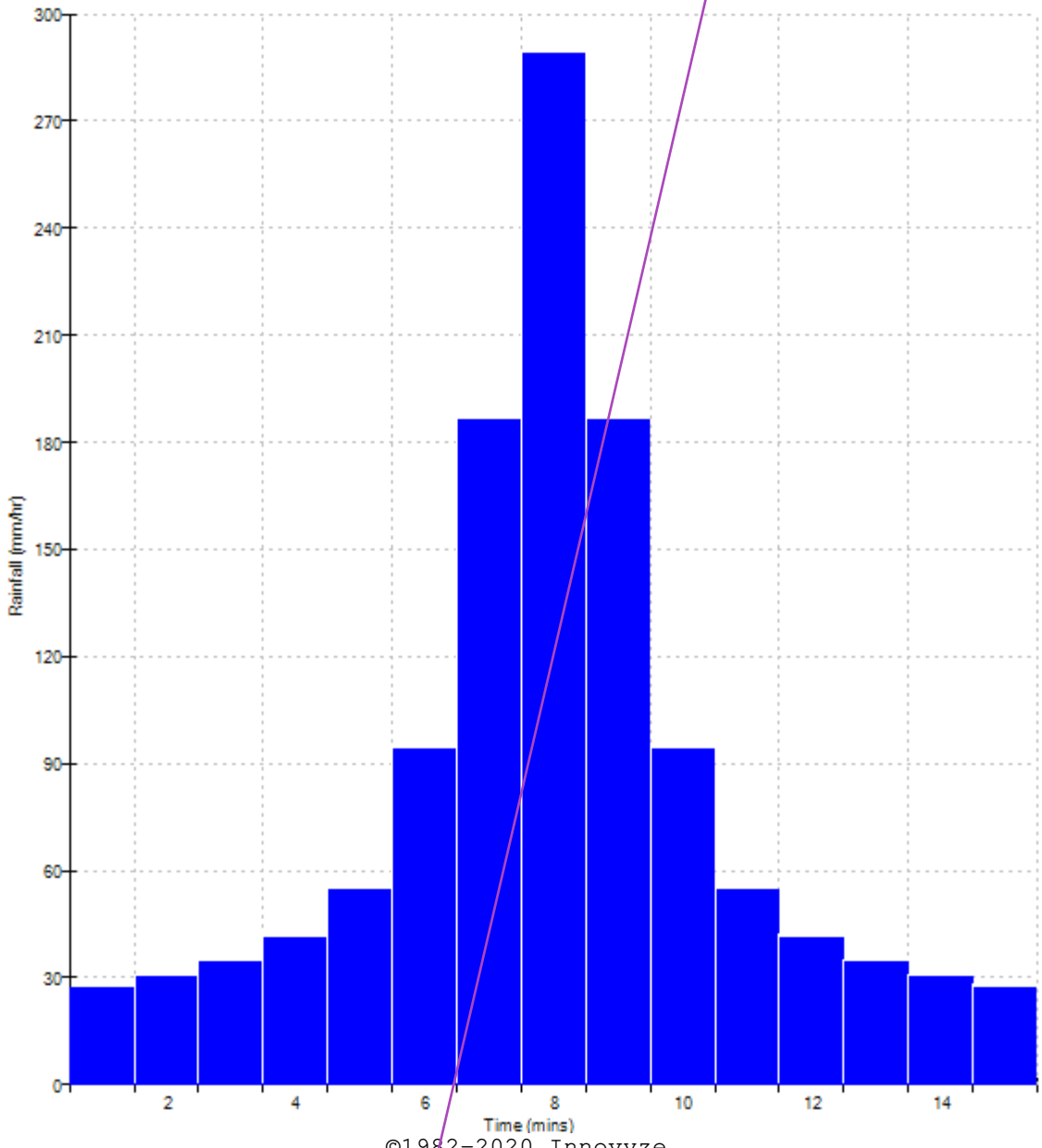
Calculated following the Modified Rational Method

Heyne Tillett Steel		Page 1
4 Pear Tree Court London EC1R 0DS		
Date 11/05/2021 17:34 File	Designed by smugnaini Checked by	
XP Solutions	Network 2020.1	

Rainfall profile

Storm duration (mins) 15

FSR Data	
Region	England and Wales
M5-60 (mm)	20.700
Ratio R	0.446
Peak Intensity (mm/hr)	289.086
Ave. Intensity (mm/hr)	81.801
Return Period (years)	30.0



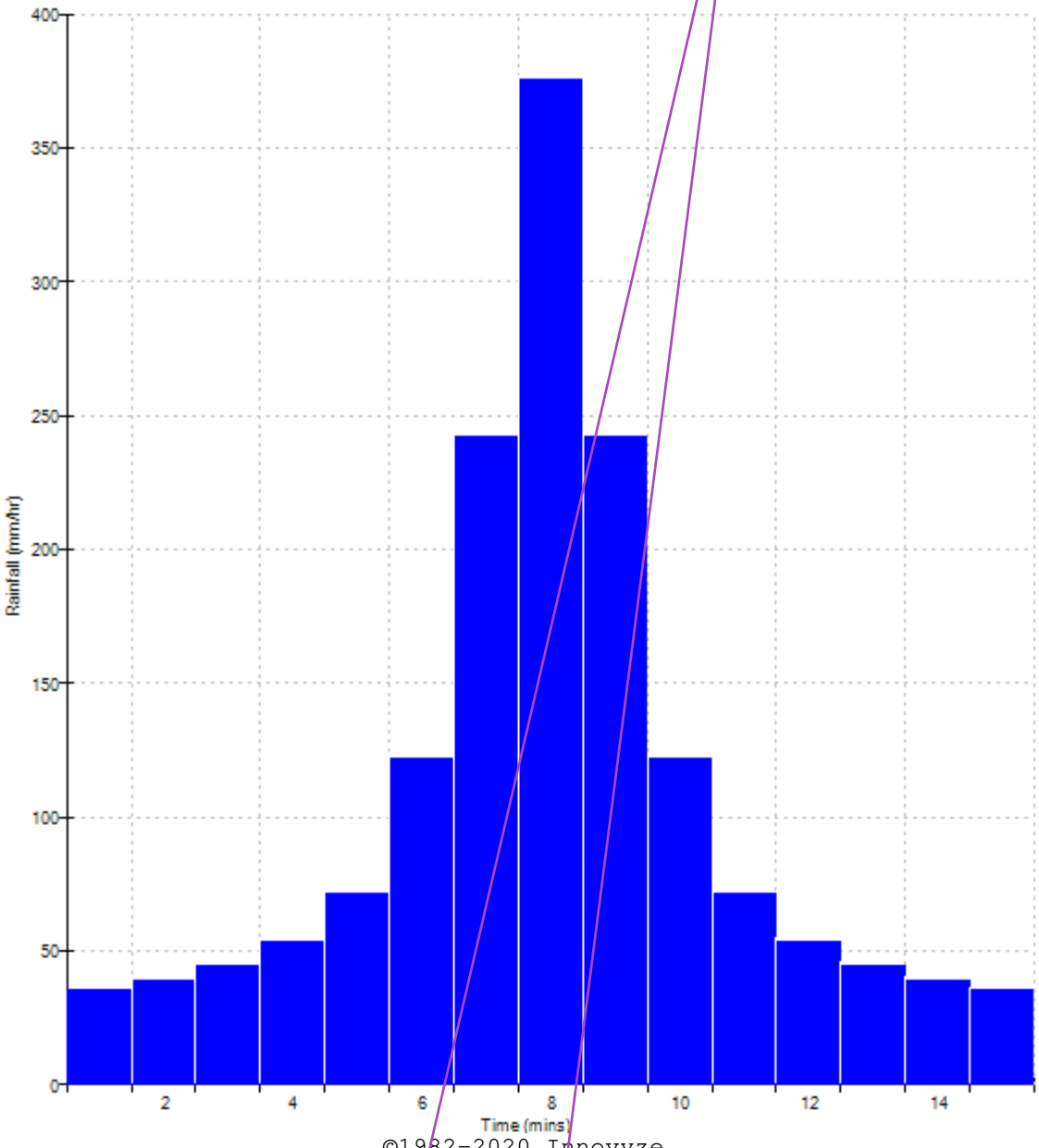
Q1=3.6x0.75 x Av intensity x Area (Ha)=0.79 l/s
Calculated following the Modified Rational Method

Heyne Tillett Steel		Page 1
4 Pear Tree Court London EC1R 0DS		Micro Drainage
Date 11/05/2021 17:34 File	Designed by smugnaini Checked by	
XP Solutions	Network 2020.1	

Rainfall profile

Storm duration (mins) 15

FSR Data	
Region	England and Wales
M5-60 (mm)	20.700
Ratio R	0.446
Peak Intensity (mm/hr)	376.136
Ave. Intensity (mm/hr)	106.433
Return Period (years)	100.0



Q100=3.6 x 0.75 x Av intensity x Area (Ha)6=1.03 l/s

Q10+40%cc= 3.6 x 0.75 x x Av intensity x 40% cc x Area (Ha)=1.44 l/s

Calculated following the Modified Rational Method

Appendix C – Pump Specification from Pump

HTS Surface water pump calculations via MicroDrainage

Heyne Tillett Steel		Page 1
4 Pear Tree Court London EC1R 0DS	SWPC 01 design	
Date 19/02/2021 16:03 File SWPC01.SRCX	Designed by SMugnaini Checked by CRudd	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.727	0.927	1.0	2.3	O K
30 min Summer	8.843	1.043	1.0	2.6	O K
60 min Summer	8.832	1.032	1.0	2.6	O K
120 min Summer	8.668	0.868	1.0	2.2	O K
180 min Summer	8.494	0.694	1.0	1.7	O K
240 min Summer	8.344	0.544	1.0	1.4	O K
360 min Summer	8.147	0.347	1.0	0.9	O K
480 min Summer	8.073	0.273	0.9	0.7	O K
600 min Summer	8.034	0.234	0.8	0.6	O K
720 min Summer	8.005	0.205	0.7	0.5	O K
960 min Summer	7.967	0.167	0.6	0.4	O K
1440 min Summer	7.922	0.122	0.4	0.3	O K
2160 min Summer	7.889	0.089	0.3	0.2	O K
2880 min Summer	7.870	0.070	0.2	0.2	O K
4320 min Summer	7.851	0.051	0.2	0.1	O K
5760 min Summer	7.840	0.040	0.1	0.1	O K
7200 min Summer	7.834	0.034	0.1	0.1	O K
8640 min Summer	7.829	0.029	0.1	0.1	O K
10080 min Summer	7.826	0.026	0.1	0.1	O K
15 min Winter	8.726	0.926	1.0	2.3	O K
30 min Winter	8.835	1.035	1.0	2.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	148.305	0.0	3.0	16
30 min Summer	95.717	0.0	3.9	26
60 min Summer	58.745	0.0	4.8	44
120 min Summer	34.828	0.0	5.6	76
180 min Summer	25.326	0.0	6.2	108
240 min Summer	20.093	0.0	6.5	138
360 min Summer	14.471	0.0	7.0	194
480 min Summer	11.463	0.0	7.4	250
600 min Summer	9.561	0.0	7.7	310
720 min Summer	8.240	0.0	8.0	370
960 min Summer	6.513	0.0	8.4	492
1440 min Summer	4.670	0.0	9.1	734
2160 min Summer	3.343	0.0	9.7	1100
2880 min Summer	2.635	0.0	10.2	1468
4320 min Summer	1.882	0.0	11.0	2180
5760 min Summer	1.481	0.0	11.5	2904
7200 min Summer	1.230	0.0	12.0	3656
8640 min Summer	1.056	0.0	12.3	4344
10080 min Summer	0.928	0.0	12.6	5096
15 min Winter	148.305	0.0	3.0	16
30 min Winter	95.717	0.0	3.9	27

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	8.789	0.989	1.0	2.5	O K
120 min Winter	8.534	0.734	1.0	1.8	O K
180 min Winter	8.294	0.494	1.0	1.2	O K
240 min Winter	8.129	0.329	1.0	0.8	O K
360 min Winter	8.037	0.237	0.8	0.6	O K
480 min Winter	7.991	0.191	0.6	0.5	O K
600 min Winter	7.961	0.161	0.5	0.4	O K
720 min Winter	7.939	0.139	0.5	0.3	O K
960 min Winter	7.911	0.111	0.4	0.3	O K
1440 min Winter	7.880	0.080	0.3	0.2	O K
2160 min Winter	7.858	0.058	0.2	0.1	O K
2880 min Winter	7.846	0.046	0.1	0.1	O K
4320 min Winter	7.833	0.033	0.1	0.1	O K
5760 min Winter	7.826	0.026	0.1	0.1	O K
7200 min Winter	7.822	0.022	0.1	0.1	O K
8640 min Winter	7.819	0.019	0.1	0.0	O K
10080 min Winter	7.817	0.017	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	58.745	0.0	4.8	46
120 min Winter	34.828	0.0	5.6	80
180 min Winter	25.326	0.0	6.2	112
240 min Winter	20.093	0.0	6.5	136
360 min Winter	14.471	0.0	7.0	192
480 min Winter	11.463	0.0	7.4	252
600 min Winter	9.561	0.0	7.7	312
720 min Winter	8.240	0.0	8.0	374
960 min Winter	6.513	0.0	8.4	492
1440 min Winter	4.670	0.0	9.1	734
2160 min Winter	3.343	0.0	9.7	1100
2880 min Winter	2.635	0.0	10.2	1468
4320 min Winter	1.882	0.0	11.0	2164
5760 min Winter	1.481	0.0	11.5	2856
7200 min Winter	1.230	0.0	12.0	3680
8640 min Winter	1.056	0.0	12.3	4368
10080 min Winter	0.928	0.0	12.6	5136

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.900
Region	England and Wales	Cv (Winter)	0.900
M5-60 (mm)	20.700	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.009

Time (mins) From:	To:	Area (ha)
0	4	0.009

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 7.800

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2.5	1.100	2.5	1.101	0.0

Pump Outflow Control

Invert Level (m) 7.800

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.0000	0.300	1.0000

TENDER FOR CONCRETE PUMP STATION
MOUNTING: Wet well / Guiderail

60-86 Royal College Street – Surface Water Packaged Pump Station SWPS 01

Reference	:	Concrete – NH60
No. of Pumps	:	2
Pump Type	:	NH60
Total Capacity	:	1.0 l/s
Head Generated	:	6.5 metres
Max. Solids Capacity	:	10mm
Impeller Design	:	Vortex
Motor Rating kW	:	0.48 kW
Motor Speed rpm	:	2900 rpm
Supply Voltage	:	**1-50-230 – Single Phase**
Full Load Current	:	4.0 amps
Method of Starting	:	DOL
Level Controls	:	Floats
Control Sequence	:	Duty/Standby
Length of Cable	:	**10 metres**. Other lengths available. Please advise
Depth of chamber	:	1500mm
Pump Outlet Branch	:	32mm
Pipes and Valves	:	40mm NB
Final Discharge	:	40mm NB
Pipe Materials	:	Galvanised Steel
Concrete Chamber	:	1500mm Dia –By Others
Installation of pumps	:	Included
Commissioning	:	Included at time of installation. Return visit extra
Access Cover & Frame	:	**Not Included**. 600 x 600mm clear opening required

Concrete chamber with, valves, and pipes fitted out. Access opening of 600 x 600mm required.

Duplex submersible drainage pumps, lifting chains, float level controls, **10 metres** of cable and an IP54 sheet steel auto-changeover control panel designed for wall mounting indoors.

All delivered to site with pumps and controls installed by our engineers.

PRICE: £3,534.00 + VAT

CLIENTS RESPONSIBILITY: Unloading at site. Cable containment between pump chamber and control panel. Provision of mains power to the panel. All connecting pipework.

Appendix D - Maintenance Plans

Drainage Inspection and Maintenance Strategy

This document has been prepared to support the inspection and maintenance of the proposed below ground drainage at the Royal College Street site. The drainage network comprises surface and foul water drainage systems:

- Surface water network will route rainwater towards the existing outfall from the site. Blue / blue-green roofs are proposed at the site and a pump will be located at basement level to collect part of the unrestricted flow rate, refer to report for further information.
- Foul water network from above ground level will be routed towards the outfall manhole via gravity and below ground appliances will be pumped to high level before discharging via gravity.

In accordance with CIRIA C625 it is recommended that a private SuDS maintenance agreement is undertaken as a simple contract by the Central North West London NHS Foundation Trust, who is going to be both the owner and maintenance provider. It is mainly to facilitate continuing maintenance of the SuDS that are in private ownership, which in the case of this development are the blue / blue green roofs. The maintenance requirements are in accordance with the CIRIA C753 SuDS Manual 2015 and product manufacturer's requirements.

Reference shall be made to CIRIA publication C753 (The SuDS Manual) and to the relevant maintenance guidance from the products manufacturers.

The following Drainage / SuDS measures are proposed within the development:

- General Drainage:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Inspect and identify areas that are not operating correctly. If required, take remedial action.	Monthly
	Inspect surface structures and covers removing obstructions and silt as necessary.	Monthly or as required
	Check there is no physical damage.	
	Remove overgrown vegetation 1m min. around structures and keep hard aprons free from silt and debris.	
Occasional Maintenance	Remove sediment from pre-treatment structures (e.g. gullies, channels silt traps).	Six-monthly or as required
	Remove cover and inspect inside, ensuring water is flowing freely and that the exit route for water is unobstructed.	Annually or as required
	Remove debris and silt.	
	Undertake inspection after leaf fall in autumn.	
Remedial Actions	Repair/rehabilitation of inlets, outlets, overflows and vents.	As required

Monitoring	Inspect all manholes, inspection chambers, inlets, outlets, overflows and vents to ensure they are in good condition and operating as designed.	Annually or after large storms.

- Green / Blue / Brown Roofs:

Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	During establishment, replace dead plants as required (for 12 months following installation).	Monthly
	Mow grasses (where required) and remove resultant clippings.	
	Remove fallen leaves and debris from deciduous plant foliage.	Six Monthly
	Remove nuisance and invasive vegetation, including weeds.	
	Remove debris & litter to prevent clogging of inlet drains and interference with plant growth.	
	Noxious weed treatment (3 times a year).	
Occasional Maintenance	Replace dead plants as required (typically in the Autumn).	Annually
	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes, and roof structure for proper operation, integrity of waterproofing and structural stability, act where required.	
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources, act where required.	
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system, act where required.	
	Inspect underside of roof for evidence of leakage, act where required.	
	Inspect and document the presence of wildlife.	
Remedial Action	Inspect and carry out essential recovery works to return the feature to full working order.	Following all significant storm events

- Flow control Structures:

Maintenance Period	Maintenance Task	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action (for 3 months following installation).	Monthly
	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Six Monthly
	Remove sediment from pre-treatment structures.	
Monitoring	Inspect and carry out essential recovery works to return the feature to full working order.	Following all significant storm events

- Inlets, Outlets and Inspection Chambers:

Maintenance Period	Maintenance Task	Frequency

Regular Maintenance	Inspect surface structures and covers removing obstructions and silt as necessary.	Monthly or as required
	Check there is no physical damage. Remove overgrown vegetation 1m min. around structures and keep hard aprons free from silt and debris.	
	Remove cover and inspect inside, ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn.	Annually
Occasional Maintenance	**Check topsoil levels are 20mm above edges off baskets and chambers to avoid mower damage.**	As necessary
Remedial Work	**Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.**	As required
	Repair physical damage is necessary.	

- Pump Installations:

Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	Visual inspection of the unit. Rise and inspection of the pump. Seal chamber oil check. Level control equipment cleaned and tested. Inspection and test of Control Panel functionality. Motor Insulation tested and recorded.	Annually or as agreed with manufacturer to maintain efficient and reliable system in operation
Remedial Action	Repair / rehabilitation of inlets, outlets, vents and other components.	As required or stated by manufacturer
Remedial Action	Repair / rehabilitation of inlets, outlets, overflows or damage to tank.	As required

Habitat Management Plan for (DRAFT)

1. **Landscape Management Objectives**

2. **Background to the Management Plan**

3. **Review of the Management Plan**

4. **Maintenance Programme**

5. **Maintenance and Monitoring**
   - Initial 10 weeks
   - Establishment Period 1-2 yrs
   - Maintenance Period 3-5 yrs

Appendix A: Bauder Biodiverse Green Roof Specification

1. Landscape Management Objectives

The landscape and habitat management plan for 70-86 Royal College Street is based on the initial biodiversity specification for the roof areas. The key components of which are:

- An increasing number of flora and fora species present on the site.
- A mixtures of habitats created by different depths of substrate and surface finishes

To be read in conjunction with the roof plan of the green roof areas.

2. Back ground Information

Extract from the Camden Planning Guidance for Green Roofs and Walls:

Development Policy DP22 states that schemes must incorporate green or brown roofs and green walls wherever suitable. Due to the number of environmental benefits provided by green and brown roofs and green walls, where they have not be designed into a development the Council will require developers to justify why the provision of a green or brown roof or green wall is not possible or suitable.
The Council will expect all developments to incorporate brown roofs, green roofs and green walls unless it is demonstrated this is not possible or appropriate. This includes new and existing buildings. Special consideration will be given to historic buildings to ensure historic and architectural features are preserved.
10.4 Green and brown roofs are roofs that are specially designed and constructed to be waterproof and covered with material to encourage wildlife and to help plants grow. They can be left without planting - 'brown' or planted with a range of vegetation - 'green' depending on the depth or the soil or substrate.
Substrate is a layer of material which supports the roots and sustains the growth of vegetation.
There are three main types of green and brown roof:
1. Intensive roofs 2. Semi intensive roofs 3. Extensive roofs.
10.7 Extensive Roofs are generally light weight, with a thin layer of substrate and vegetations. They can be further sub divided into 3 types:
These either take the form of Sedum mats or plug planted Sedum into a porous crushed brick material. Sedum roofs are relatively light weight and demand low levels of maintenance. They can be more readily fitted on to existing roofs.
Sedum is a type of vegetation. They are generally short plants with shallow roots and thick leaves.

Brown roofs should create habitats mimicking local brownfield sites by using materials such as crushed brick or concrete reclaimed from the

site. However, these materials are very heavy and cannot hold water for irrigation. Therefore it is preferable to use materials of known quality and water holding capacity. The brown roof is then planted with an appropriate wild flower mix or left to colonise naturally with areas of dead wood or perches for birds.
Green roofs are usually formed by planting a wild flower mix on an appropriate layer of material. There are various techniques for the creation of this type of roof.

3. Review of the Management Plan

The flora and fauna on the roofs is likely to evolve over time. It is therefore highly likely that the plan be required to change and along with it the maintenance requirements. To facilitate this the plan calls for monitoring in the second summer with a review of the plan and maintenance for years three to five. This process to be repeated after five years.

4. Maintenance Programme

2 visits per year in Spring/summer and autumn for five years.
Additional monitoring visit in summer of second and fifth year.

Work to be carried out by Bauder Green Roof Maintenance.

Note: None of the green roof are designed to be trafficked in any way, the roofs should not be accessed by anyone except for repair or essential maintenance works, any damage to the surface finishes of the roofs should be reported to Bauder immediately.

Initial 10 weeks (directly after installation)
The green roofs,
Seeded biodiverse roofs are designed to need a minimum of maintenance. However, some intimal watering will be required during the first 10 weeks after installation if there is insufficient rain fall.

- Watering of seeded areas (after the seed has germinated) should be regular (every day) when there are periods without rainfall, this can be reduced as the planting become more established.
- Watering should be carried out with a fine mist sprinkler or rose. Care should be taken not to wash out the seed with excessive water or pressure.
- Efforts should be made to not to traffic the roof during watering.

Establishment Period (Yrs 1-2)
Maintenance. During the first 2 years maintenance visits should be twice yearly (spring/summer and autumn)
Maintenance Works
All Areas, every visit work required:

- Pebble Border: remove all vegetation from Pebble borders
- Outlets: check outlets are clear and free from slit and detritus
- Remove unwanted and invasive grass and weeds.
- Fertilise if required spring/summer visit as per Bauder Specification

Monitoring
Summer of year 2

- Assess the % failure of seeding. If failed area larger than 5m2 should be reseeded in the following spring or autumn.

From these assessments the management plan for the following 3 yrs can be adjusted.

Maintenance Period (Yrs 3-5)
Maintenance. During the years three to five maintenance visits should be twice yearly (spring/summer and autumn)

Maintenance works all areas every visit:

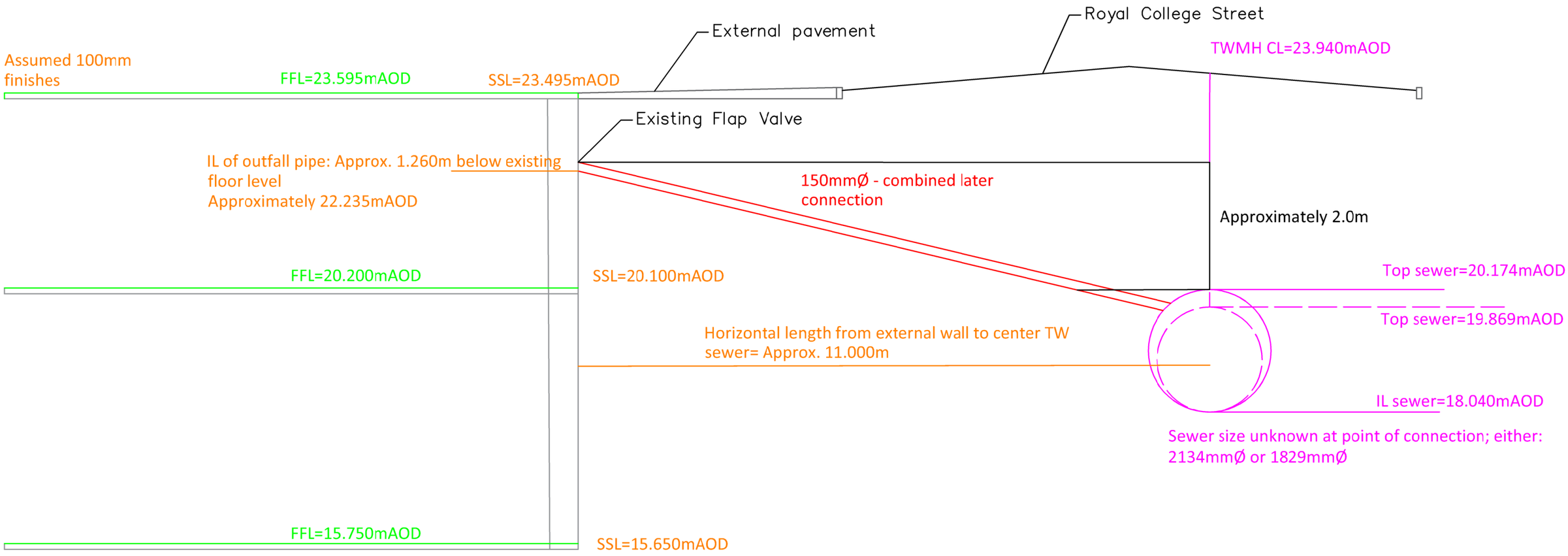
- Pebble Border: remove all vegetation from Pebble borders
- Outlets: check outlets are clear and free from slit and detritus
- Remove unwanted and invasive grass and weeds.
- Fertilise in spring/summer visit if required as per Bauder Specification

Monitoring
Summer of year 5

- Assessment of the number of original plant species still present on site, plus additional species which may have colonised the roofs.
- Assessment of the success of the wet area, log piles. Stone and sand areas with details of what species are flourishing in these areas.

From these assessments and reference to the Camden BAP (2012-2017) the management plan for the following 5 yrs can be adjusted.

Appendix E – Detail connection to Sewer



Job	Royal College Street	Date	04-08-2020
Title	Sewer Flooding Analysis - Section	Eng.	SMu
Job No.	2222 Sheet SK029	Rev.	P1

HEYNE TILLETT STEEL

Appendix F – Updated Camden proforma

Camden GREATERLONDONAUTHORITY LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	Royal College Street
Address & post code	60-86 Royal College Street, NW1 0TH
OS Grid ref. (Easting, Northing)	E 529389 N 183873
LPA reference (if applicable)	
Brief description of proposed work	Demo of existing MOT centre to build hospital.
Total site Area	1190 m^2
Total existing impervious area	1190 m^2
Total proposed impervious area	760 m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	no
Existing drainage connection type and location	combined outfall to combined trunk sewer in Royal College Street
Designer Name	Sophie Mugnaini
Designer Position	Civil Engineer
Designer Company	Heyne Tillett Steel

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	Made Ground
Bedrock geology classification	London Clay
Site infiltration rate	N/A m/s
Depth to groundwater level	2.48 m below ground level
Is infiltration feasible?	no

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	Y	Y
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	N	N
7 discharge rainwater to the combined sewer.	Y	Y

2c. Proposed Discharge Details

Proposed discharge location	Thames Water sewer in Royal College Stree
Has the owner/regulator of the discharge location been consulted?	ceived yet and, Camden will be informed as

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	0.5			
1 in 1	0.43	10.7	18	2.95
1 in 30	1.16	26.4	33	3.42
1 in 100	1.6	34.2	42	3.66
1 in 100 + CC			64	4.07
Climate change allowance used		40%		
3b. Principal Method of Flow Control		blue roofs and a pump at basement		

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	see report		0
Infiltration systems	0		0
Green roofs	157	138	67.2
Blue roofs	906	650	41.2
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	0	0	0
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	0		0
Total	**1063**	**788**	**108.4**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	Section 3.5 of FRA and SuDS Strategy report
Drainage hierarchy (2b)	section 5.1 of FRA and SuDS Strategy report
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	section 5.1 of FRA and SuDS Strategy report
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Planning condition response report Appendix B
Proposed SuDS measures & specifications (3b)	Planning condition response report Appendix B
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	Appendix A of FRA and SuDS Strategy report
Detailed drainage design drawings, including exceedance flow routes	figure 5, Appendix B of FRA and SuDS Strategy report
Detailed landscaping plans	Appendix A of FRA and SuDS Strategy report
Maintenance strategy	Planning condition response report Appendix C
Demonstration of how the proposed SuDS measures improve:	
a) water quality of the runoff?	section 5.1 of FRA and SuDS Strategy report
b) biodiversity?	section 5.1 of FRA and SuDS Strategy report
c) amenity?	section 5.1 of FRA and SuDS Strategy report