Surface and Foul Water Calculation Pack

J3304 Greville Street

Ref: J3304-C-CA-0001

Revision: 04

Status: S9

Webb Yates Engineers Ltd
48-50 Scrutton Street
London. EC2A 4HH
020 3696 1550
london@webbyates.com
www.webbyates.com

Registered in England & Wales No.: 5393930

DOCUMENT CONTROL

Document number:	J3304-C-CA-0001		
Status:	For Information	**Reason for issue:**	For Building Control Approval
Date:	19.01.2021	**Revision:**	04

Author:	Angus Miller	**Signature:**	AM
Reviewer:	Angus Miller	**Signature:**	AM
Approver:	Andrew Lerpiniere	**Signature**	AL

REVISION HISTORY

Date	Status	Revision
09.09.2020	S9	00
10.11.2020	S9	01
13.11.2020	S9	02
18.11.2020	S9	03
19.01.2021	S9	04

1. INTRODUCTION

This document contains the surface and foul water calculations for the Greville Street development. The following calculations are included:

- Surface Water Attenuation
- Surface Water flow rates and pipe sizing
- Foul Water flow rates and pipe sizing

This document should be read in conjunction with documents:

- J3304-C-RP-0001
- J3304-C-DR-0090
- J3304-C-DE-0400
- J3304-M-DR-1B10
- J3304-M-DR-1000
- J3304-M-DR-1010
- J3304-M-DR-1020
- J3304-M-DR-1050
- J3304-M-DR-1060
- 248_1060
- 248_1065
- 248_1120
- 248_1121

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)	20.900	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	1440
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)
0	5	0.010

Model Details

Storage is Online Cover Level (m) 10.000

Pipe Structure

Diameter (m)	0.300	Length (m)	2.000
Slope (1:X)	100.000	Invert Level (m)	8.000

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	2.000	Upstream Invert Level (m)	8.000
Roughness k (mm)	0.600		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.040	0.040	1.4	0.0	O K
30 min Summer	8.037	0.037	1.3	0.0	O K
60 min Summer	8.030	0.030	0.9	0.0	O K
120 min Summer	8.025	0.025	0.6	0.0	O K
180 min Summer	8.022	0.022	0.5	0.0	O K
240 min Summer	8.021	0.021	0.4	0.0	O K
360 min Summer	8.019	0.019	0.3	0.0	O K
480 min Summer	8.017	0.017	0.2	0.0	O K
600 min Summer	8.015	0.015	0.2	0.0	O K
720 min Summer	8.014	0.014	0.2	0.0	O K
960 min Summer	8.012	0.012	0.1	0.0	O K
1440 min Summer	8.011	0.011	0.1	0.0	O K
15 min Winter	8.041	0.041	1.5	0.0	O K
30 min Winter	8.035	0.035	1.2	0.0	O K
60 min Winter	8.027	0.027	0.8	0.0	O K
120 min Winter	8.022	0.022	0.5	0.0	O K
180 min Winter	8.020	0.020	0.4	0.0	O K
240 min Winter	8.019	0.019	0.3	0.0	O K
360 min Winter	8.016	0.016	0.2	0.0	O K
480 min Winter	8.014	0.014	0.2	0.0	O K
600 min Winter	8.013	0.013	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.490	0.0	0.6	10
30 min Summer	21.599	0.0	0.8	18
60 min Summer	13.451	0.0	1.0	34
120 min Summer	8.197	0.0	1.2	64
180 min Summer	6.102	0.0	1.4	92
240 min Summer	4.943	0.0	1.5	126
360 min Summer	3.648	0.0	1.6	182
480 min Summer	2.934	0.0	1.8	244
600 min Summer	2.478	0.0	1.9	308
720 min Summer	2.158	0.0	1.9	368
960 min Summer	1.735	0.0	2.1	490
1440 min Summer	1.277	0.0	2.3	730
15 min Winter	33.490	0.0	0.7	11
30 min Winter	21.599	0.0	0.9	18
60 min Winter	13.451	0.0	1.1	32
120 min Winter	8.197	0.0	1.4	60
180 min Winter	6.102	0.0	1.5	96
240 min Winter	4.943	0.0	1.7	120
360 min Winter	3.648	0.0	1.8	184
480 min Winter	2.934	0.0	2.0	232
600 min Winter	2.478	0.0	2.1	314

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.012	0.012	0.1	0.0	O K
960 min Winter	8.011	0.011	0.1	0.0	O K
1440 min Winter	8.009	0.009	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	2.158	0.0	2.2	348
960 min Winter	1.735	0.0	2.3	476
1440 min Winter	1.277	0.0	2.6	716

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.065	0.065	3.5	0.1	O K
30 min Summer	8.062	0.062	3.2	0.1	O K
60 min Summer	8.052	0.052	2.3	0.1	O K
120 min Summer	8.040	0.040	1.4	0.0	O K
180 min Summer	8.034	0.034	1.1	0.0	O K
240 min Summer	8.030	0.030	0.9	0.0	O K
360 min Summer	8.025	0.025	0.7	0.0	O K
480 min Summer	8.023	0.023	0.5	0.0	O K
600 min Summer	8.022	0.022	0.5	0.0	O K
720 min Summer	8.020	0.020	0.4	0.0	O K
960 min Summer	8.019	0.019	0.3	0.0	O K
1440 min Summer	8.016	0.016	0.2	0.0	O K
15 min Winter	8.067	0.067	3.8	0.1	O K
30 min Winter	8.058	0.058	2.9	0.1	O K
60 min Winter	8.047	0.047	1.8	0.1	O K
120 min Winter	8.034	0.034	1.1	0.0	O K
180 min Winter	8.029	0.029	0.8	0.0	O K
240 min Winter	8.025	0.025	0.7	0.0	O K
360 min Winter	8.022	0.022	0.5	0.0	O K
480 min Winter	8.020	0.020	0.4	0.0	O K
600 min Winter	8.019	0.019	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	82.260	0.0	1.5	10
30 min Summer	52.687	0.0	2.0	18
60 min Summer	32.216	0.0	2.4	32
120 min Summer	19.115	0.0	2.9	62
180 min Summer	13.940	0.0	3.1	92
240 min Summer	11.098	0.0	3.3	124
360 min Summer	8.038	0.0	3.6	182
480 min Summer	6.390	0.0	3.8	244
600 min Summer	5.344	0.0	4.0	304
720 min Summer	4.617	0.0	4.2	356
960 min Summer	3.664	0.0	4.4	488
1440 min Summer	2.642	0.0	4.8	724
15 min Winter	82.260	0.0	1.7	10
30 min Winter	52.687	0.0	2.2	18
60 min Winter	32.216	0.0	2.7	32
120 min Winter	19.115	0.0	3.2	62
180 min Winter	13.940	0.0	3.5	92
240 min Winter	11.098	0.0	3.7	126
360 min Winter	8.038	0.0	4.1	182
480 min Winter	6.390	0.0	4.3	252
600 min Winter	5.344	0.0	4.5	306

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.018	0.018	0.3	0.0	O K
960 min Winter	8.016	0.016	0.2	0.0	O K
1440 min Winter	8.013	0.013	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	4.617	0.0	4.7	358
960 min Winter	3.664	0.0	4.9	486
1440 min Winter	2.642	0.0	5.3	730

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.074	0.074	4.6	0.1	O K
30 min Summer	8.070	0.070	4.1	0.1	O K
60 min Summer	8.059	0.059	2.9	0.1	O K
120 min Summer	8.048	0.048	1.9	0.1	O K
180 min Summer	8.040	0.040	1.4	0.0	O K
240 min Summer	8.035	0.035	1.2	0.0	O K
360 min Summer	8.029	0.029	0.8	0.0	O K
480 min Summer	8.026	0.026	0.7	0.0	O K
600 min Summer	8.024	0.024	0.6	0.0	O K
720 min Summer	8.022	0.022	0.5	0.0	O K
960 min Summer	8.020	0.020	0.4	0.0	O K
1440 min Summer	8.018	0.018	0.3	0.0	O K
15 min Winter	8.076	0.076	4.8	0.1	O K
30 min Winter	8.067	0.067	3.7	0.1	O K
60 min Winter	8.053	0.053	2.4	0.1	O K
120 min Winter	8.040	0.040	1.4	0.0	O K
180 min Winter	8.033	0.033	1.1	0.0	O K
240 min Winter	8.029	0.029	0.9	0.0	O K
360 min Winter	8.025	0.025	0.6	0.0	O K
480 min Winter	8.022	0.022	0.5	0.0	O K
600 min Winter	8.021	0.021	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.051	0.0	2.0	10
30 min Summer	69.074	0.0	2.6	18
60 min Summer	42.372	0.0	3.2	34
120 min Summer	25.103	0.0	3.8	62
180 min Summer	18.243	0.0	4.1	92
240 min Summer	14.466	0.0	4.3	122
360 min Summer	10.422	0.0	4.7	186
480 min Summer	8.255	0.0	5.0	244
600 min Summer	6.885	0.0	5.2	302
720 min Summer	5.934	0.0	5.3	366
960 min Summer	4.690	0.0	5.6	490
1440 min Summer	3.362	0.0	6.1	724
15 min Winter	107.051	0.0	2.2	10
30 min Winter	69.074	0.0	2.9	18
60 min Winter	42.372	0.0	3.6	32
120 min Winter	25.103	0.0	4.2	64
180 min Winter	18.243	0.0	4.6	92
240 min Winter	14.466	0.0	4.9	122
360 min Winter	10.422	0.0	5.3	176
480 min Winter	8.255	0.0	5.5	242
600 min Winter	6.885	0.0	5.8	310

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.020	0.020	0.4	0.0	O K
960 min Winter	8.018	0.018	0.3	0.0	O K
1440 min Winter	8.015	0.015	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	5.934	0.0	6.0	364
960 min Winter	4.690	0.0	6.3	494
1440 min Winter	3.362	0.0	6.8	702

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.081	0.081	5.5	0.1	O K
30 min Summer	8.077	0.077	4.9	0.1	O K
60 min Summer	8.065	0.065	3.5	0.1	O K
120 min Summer	8.052	0.052	2.3	0.1	O K
180 min Summer	8.046	0.046	1.8	0.1	O K
240 min Summer	8.039	0.039	1.4	0.0	O K
360 min Summer	8.032	0.032	1.0	0.0	O K
480 min Summer	8.028	0.028	0.8	0.0	O K
600 min Summer	8.026	0.026	0.7	0.0	O K
720 min Summer	8.024	0.024	0.6	0.0	O K
960 min Summer	8.022	0.022	0.5	0.0	O K
1440 min Summer	8.020	0.020	0.4	0.0	O K
15 min Winter	8.084	0.084	5.8	0.1	O K
30 min Winter	8.073	0.073	4.4	0.1	O K
60 min Winter	8.059	0.059	2.9	0.1	O K
120 min Winter	8.046	0.046	1.8	0.1	O K
180 min Winter	8.037	0.037	1.3	0.0	O K
240 min Winter	8.032	0.032	1.0	0.0	O K
360 min Winter	8.027	0.027	0.8	0.0	O K
480 min Winter	8.024	0.024	0.6	0.0	O K
600 min Winter	8.022	0.022	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.461	0.0	2.4	10
30 min Summer	82.888	0.0	3.1	18
60 min Summer	50.847	0.0	3.8	32
120 min Summer	30.123	0.0	4.5	62
180 min Summer	21.892	0.0	4.9	92
240 min Summer	17.360	0.0	5.2	124
360 min Summer	12.507	0.0	5.6	180
480 min Summer	9.906	0.0	5.9	242
600 min Summer	8.262	0.0	6.2	304
720 min Summer	7.121	0.0	6.4	362
960 min Summer	5.628	0.0	6.8	478
1440 min Summer	4.034	0.0	7.3	730
15 min Winter	128.461	0.0	2.7	10
30 min Winter	82.888	0.0	3.5	18
60 min Winter	50.847	0.0	4.3	32
120 min Winter	30.123	0.0	5.1	62
180 min Winter	21.892	0.0	5.5	94
240 min Winter	17.360	0.0	5.8	122
360 min Winter	12.507	0.0	6.3	182
480 min Winter	9.906	0.0	6.7	232
600 min Winter	8.262	0.0	6.9	304

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.021	0.021	0.4	0.0	O K
960 min Winter	8.020	0.020	0.4	0.0	O K
1440 min Winter	8.017	0.017	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	7.121	0.0	7.2	358
960 min Winter	5.628	0.0	7.6	472
1440 min Winter	4.034	0.0	8.1	726

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	8.089	0.089	6.5	0.1	O K
30 min Summer	8.084	0.084	5.8	0.1	O K
60 min Summer	8.071	0.071	4.2	0.1	O K
120 min Summer	8.057	0.057	2.7	0.1	O K
180 min Summer	8.049	0.049	2.0	0.1	O K
240 min Summer	8.044	0.044	1.6	0.1	O K
360 min Summer	8.035	0.035	1.2	0.0	O K
480 min Summer	8.031	0.031	0.9	0.0	O K
600 min Summer	8.028	0.028	0.8	0.0	O K
720 min Summer	8.026	0.026	0.7	0.0	O K
960 min Summer	8.023	0.023	0.5	0.0	O K
1440 min Summer	8.021	0.021	0.4	0.0	O K
15 min Winter	8.092	0.092	6.8	0.1	O K
30 min Winter	8.079	0.079	5.2	0.1	O K
60 min Winter	8.064	0.064	3.4	0.1	O K
120 min Winter	8.049	0.049	2.1	0.1	O K
180 min Winter	8.041	0.041	1.5	0.0	O K
240 min Winter	8.035	0.035	1.2	0.0	O K
360 min Winter	8.029	0.029	0.9	0.0	O K
480 min Winter	8.026	0.026	0.7	0.0	O K
600 min Winter	8.024	0.024	0.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.871	0.0	2.8	10
30 min Summer	96.703	0.0	3.6	18
60 min Summer	59.321	0.0	4.4	32
120 min Summer	35.144	0.0	5.3	64
180 min Summer	25.540	0.0	5.7	94
240 min Summer	20.253	0.0	6.1	122
360 min Summer	14.591	0.0	6.6	184
480 min Summer	11.557	0.0	6.9	246
600 min Summer	9.639	0.0	7.2	308
720 min Summer	8.307	0.0	7.5	358
960 min Summer	6.566	0.0	7.9	488
1440 min Summer	4.707	0.0	8.5	728
15 min Winter	149.871	0.0	3.1	10
30 min Winter	96.703	0.0	4.1	18
60 min Winter	59.321	0.0	5.0	32
120 min Winter	35.144	0.0	5.9	60
180 min Winter	25.540	0.0	6.4	92
240 min Winter	20.253	0.0	6.8	124
360 min Winter	14.591	0.0	7.4	180
480 min Winter	11.557	0.0	7.8	230
600 min Winter	9.639	0.0	8.1	298

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
720 min Winter	8.023	0.023	0.5	0.0	O K
960 min Winter	8.021	0.021	0.4	0.0	O K
1440 min Winter	8.018	0.018	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	8.307	0.0	8.4	372
960 min Winter	6.566	0.0	8.8	466
1440 min Winter	4.707	0.0	9.5	718

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)	20.900	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	1440
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.002

Time (mins) From:	To:	Area (ha)
0	5	0.002

Green Roof

Area (m^3) 80 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.001454	32	36	0.000294	64	68	0.000059	96	100	0.000012
4	8	0.001190	36	40	0.000240	68	72	0.000049	100	104	0.000010
8	12	0.000974	40	44	0.000197	72	76	0.000040	104	108	0.000008
12	16	0.000798	44	48	0.000161	76	80	0.000033	108	112	0.000007
16	20	0.000653	48	52	0.000132	80	84	0.000027	112	116	0.000005
20	24	0.000535	52	56	0.000108	84	88	0.000022	116	120	0.000004
24	28	0.000438	56	60	0.000088	88	92	0.000018			
28	32	0.000358	60	64	0.000072	92	96	0.000015			

Model Details

Storage is Online Cover Level (m) 10.000

Pipe Structure

Diameter (m)	0.300	Length (m)	2.000
Slope (1:X)	100.000	Invert Level (m)	8.000

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	2.000	Upstream Invert Level (m)	8.000
Roughness k (mm)	0.600		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.018	0.018	0.3	0.0	O K
30 min Summer	8.017	0.017	0.3	0.0	O K
60 min Summer	8.018	0.018	0.3	0.0	O K
120 min Summer	8.019	0.019	0.3	0.0	O K
180 min Summer	8.019	0.019	0.3	0.0	O K
240 min Summer	8.019	0.019	0.3	0.0	O K
360 min Summer	8.017	0.017	0.2	0.0	O K
480 min Summer	8.015	0.015	0.2	0.0	O K
600 min Summer	8.014	0.014	0.2	0.0	O K
720 min Summer	8.013	0.013	0.2	0.0	O K
960 min Summer	8.012	0.012	0.1	0.0	O K
1440 min Summer	8.010	0.010	0.1	0.0	O K
15 min Winter	8.019	0.019	0.3	0.0	O K
30 min Winter	8.016	0.016	0.2	0.0	O K
60 min Winter	8.020	0.020	0.4	0.0	O K
120 min Winter	8.021	0.021	0.4	0.0	O K
180 min Winter	8.019	0.019	0.3	0.0	O K
240 min Winter	8.017	0.017	0.3	0.0	O K
360 min Winter	8.015	0.015	0.2	0.0	O K
480 min Winter	8.013	0.013	0.2	0.0	O K
600 min Winter	8.012	0.012	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.490	0.0	0.2	11
30 min Summer	21.599	0.0	0.4	18
60 min Summer	13.451	0.0	0.6	50
120 min Summer	8.197	0.0	0.8	74
180 min Summer	6.102	0.0	0.9	106
240 min Summer	4.943	0.0	1.0	130
360 min Summer	3.648	0.0	1.2	194
480 min Summer	2.934	0.0	1.3	246
600 min Summer	2.478	0.0	1.4	314
720 min Summer	2.158	0.0	1.4	368
960 min Summer	1.735	0.0	1.5	492
1440 min Summer	1.277	0.0	1.7	726
15 min Winter	33.490	0.0	0.3	10
30 min Winter	21.599	0.0	0.5	35
60 min Winter	13.451	0.0	0.7	46
120 min Winter	8.197	0.0	0.9	72
180 min Winter	6.102	0.0	1.1	98
240 min Winter	4.943	0.0	1.2	128
360 min Winter	3.648	0.0	1.4	196
480 min Winter	2.934	0.0	1.5	258
600 min Winter	2.478	0.0	1.6	326

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.011	0.011	0.1	0.0	O K
960 min Winter	8.010	0.010	0.1	0.0	O K
1440 min Winter	8.009	0.009	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	2.158	0.0	1.7	362
960 min Winter	1.735	0.0	1.8	496
1440 min Winter	1.277	0.0	1.9	710

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.027	0.027	0.8	0.0	O K
30 min Summer	8.032	0.032	1.0	0.0	O K
60 min Summer	8.036	0.036	1.2	0.0	O K
120 min Summer	8.030	0.030	0.9	0.0	O K
180 min Summer	8.027	0.027	0.8	0.0	O K
240 min Summer	8.026	0.026	0.7	0.0	O K
360 min Summer	8.023	0.023	0.5	0.0	O K
480 min Summer	8.021	0.021	0.4	0.0	O K
600 min Summer	8.020	0.020	0.4	0.0	O K
720 min Summer	8.019	0.019	0.3	0.0	O K
960 min Summer	8.018	0.018	0.3	0.0	O K
1440 min Summer	8.015	0.015	0.2	0.0	O K
15 min Winter	8.031	0.031	0.9	0.0	O K
30 min Winter	8.037	0.037	1.3	0.0	O K
60 min Winter	8.034	0.034	1.1	0.0	O K
120 min Winter	8.029	0.029	0.8	0.0	O K
180 min Winter	8.026	0.026	0.7	0.0	O K
240 min Winter	8.024	0.024	0.6	0.0	O K
360 min Winter	8.022	0.022	0.5	0.0	O K
480 min Winter	8.020	0.020	0.4	0.0	O K
600 min Winter	8.019	0.019	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	82.260	0.0	1.1	17
30 min Summer	52.687	0.0	1.6	23
60 min Summer	32.216	0.0	2.0	36
120 min Summer	19.115	0.0	2.4	66
180 min Summer	13.940	0.0	2.7	96
240 min Summer	11.098	0.0	2.9	128
360 min Summer	8.038	0.0	3.1	190
480 min Summer	6.390	0.0	3.3	254
600 min Summer	5.344	0.0	3.5	304
720 min Summer	4.617	0.0	3.6	380
960 min Summer	3.664	0.0	3.8	504
1440 min Summer	2.642	0.0	4.1	732
15 min Winter	82.260	0.0	1.3	16
30 min Winter	52.687	0.0	1.8	22
60 min Winter	32.216	0.0	2.3	36
120 min Winter	19.115	0.0	2.8	70
180 min Winter	13.940	0.0	3.1	98
240 min Winter	11.098	0.0	3.3	128
360 min Winter	8.038	0.0	3.6	188
480 min Winter	6.390	0.0	3.8	260
600 min Winter	5.344	0.0	4.0	320

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.018	0.018	0.3	0.0	O K
960 min Winter	8.015	0.015	0.2	0.0	O K
1440 min Winter	8.013	0.013	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	4.617	0.0	4.1	374
960 min Winter	3.664	0.0	4.4	514
1440 min Winter	2.642	0.0	4.7	742

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.036	0.036	1.2	0.0	O K
30 min Summer	8.043	0.043	1.6	0.1	O K
60 min Summer	8.044	0.044	1.6	0.1	O K
120 min Summer	8.036	0.036	1.2	0.0	O K
180 min Summer	8.032	0.032	1.0	0.0	O K
240 min Summer	8.029	0.029	0.9	0.0	O K
360 min Summer	8.026	0.026	0.7	0.0	O K
480 min Summer	8.024	0.024	0.6	0.0	O K
600 min Summer	8.023	0.023	0.5	0.0	O K
720 min Summer	8.021	0.021	0.4	0.0	O K
960 min Summer	8.020	0.020	0.4	0.0	O K
1440 min Summer	8.018	0.018	0.3	0.0	O K
15 min Winter	8.040	0.040	1.4	0.0	O K
30 min Winter	8.047	0.047	1.8	0.1	O K
60 min Winter	8.041	0.041	1.5	0.0	O K
120 min Winter	8.034	0.034	1.1	0.0	O K
180 min Winter	8.030	0.030	0.9	0.0	O K
240 min Winter	8.027	0.027	0.8	0.0	O K
360 min Winter	8.024	0.024	0.6	0.0	O K
480 min Winter	8.022	0.022	0.5	0.0	O K
600 min Winter	8.021	0.021	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.051	0.0	1.6	15
30 min Summer	69.074	0.0	2.2	21
60 min Summer	42.372	0.0	2.8	34
120 min Summer	25.103	0.0	3.3	66
180 min Summer	18.243	0.0	3.7	94
240 min Summer	14.466	0.0	3.9	128
360 min Summer	10.422	0.0	4.2	188
480 min Summer	8.255	0.0	4.5	246
600 min Summer	6.885	0.0	4.7	312
720 min Summer	5.934	0.0	4.8	370
960 min Summer	4.690	0.0	5.1	488
1440 min Summer	3.362	0.0	5.4	730
15 min Winter	107.051	0.0	1.8	14
30 min Winter	69.074	0.0	2.5	20
60 min Winter	42.372	0.0	3.1	36
120 min Winter	25.103	0.0	3.8	68
180 min Winter	18.243	0.0	4.2	98
240 min Winter	14.466	0.0	4.4	140
360 min Winter	10.422	0.0	4.8	198
480 min Winter	8.255	0.0	5.1	256
600 min Winter	6.885	0.0	5.3	302

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.019	0.019	0.3	0.0	O K
960 min Winter	8.018	0.018	0.3	0.0	O K
1440 min Winter	8.015	0.015	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	5.934	0.0	5.5	356
960 min Winter	4.690	0.0	5.7	498
1440 min Winter	3.362	0.0	6.1	748

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.043	0.043	1.6	0.1	O K
30 min Summer	8.049	0.049	2.1	0.1	O K
60 min Summer	8.047	0.047	1.9	0.1	O K
120 min Summer	8.040	0.040	1.4	0.0	O K
180 min Summer	8.036	0.036	1.2	0.0	O K
240 min Summer	8.033	0.033	1.1	0.0	O K
360 min Summer	8.029	0.029	0.8	0.0	O K
480 min Summer	8.026	0.026	0.7	0.0	O K
600 min Summer	8.024	0.024	0.6	0.0	O K
720 min Summer	8.023	0.023	0.5	0.0	O K
960 min Summer	8.021	0.021	0.4	0.0	O K
1440 min Summer	8.019	0.019	0.3	0.0	O K
15 min Winter	8.049	0.049	2.0	0.1	O K
30 min Winter	8.052	0.052	2.3	0.1	O K
60 min Winter	8.046	0.046	1.8	0.1	O K
120 min Winter	8.038	0.038	1.3	0.0	O K
180 min Winter	8.033	0.033	1.1	0.0	O K
240 min Winter	8.030	0.030	0.9	0.0	O K
360 min Winter	8.026	0.026	0.7	0.0	O K
480 min Winter	8.024	0.024	0.6	0.0	O K
600 min Winter	8.022	0.022	0.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.461	0.0	2.0	14
30 min Summer	82.888	0.0	2.7	20
60 min Summer	50.847	0.0	3.4	34
120 min Summer	30.123	0.0	4.1	64
180 min Summer	21.892	0.0	4.5	94
240 min Summer	17.360	0.0	4.8	124
360 min Summer	12.507	0.0	5.2	186
480 min Summer	9.906	0.0	5.5	250
600 min Summer	8.262	0.0	5.7	308
720 min Summer	7.121	0.0	5.9	370
960 min Summer	5.628	0.0	6.2	498
1440 min Summer	4.034	0.0	6.6	734
15 min Winter	128.461	0.0	2.3	13
30 min Winter	82.888	0.0	3.1	19
60 min Winter	50.847	0.0	3.8	34
120 min Winter	30.123	0.0	4.6	70
180 min Winter	21.892	0.0	5.1	96
240 min Winter	17.360	0.0	5.4	132
360 min Winter	12.507	0.0	5.8	186
480 min Winter	9.906	0.0	6.2	256
600 min Winter	8.262	0.0	6.4	326

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.021	0.021	0.4	0.0	O K
960 min Winter	8.019	0.019	0.3	0.0	O K
1440 min Winter	8.017	0.017	0.2	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	7.121	0.0	6.6	364
960 min Winter	5.628	0.0	7.0	474
1440 min Winter	4.034	0.0	7.5	726

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	8.051	0.051	2.2	0.1	O K
30 min Summer	8.056	0.056	2.7	0.1	O K
60 min Summer	8.050	0.050	2.2	0.1	O K
120 min Summer	8.045	0.045	1.7	0.1	O K
180 min Summer	8.039	0.039	1.4	0.0	O K
240 min Summer	8.036	0.036	1.2	0.0	O K
360 min Summer	8.031	0.031	1.0	0.0	O K
480 min Summer	8.028	0.028	0.8	0.0	O K
600 min Summer	8.026	0.026	0.7	0.0	O K
720 min Summer	8.025	0.025	0.6	0.0	O K
960 min Summer	8.022	0.022	0.5	0.0	O K
1440 min Summer	8.020	0.020	0.4	0.0	O K
15 min Winter	8.054	0.054	2.5	0.1	O K
30 min Winter	8.056	0.056	2.7	0.1	O K
60 min Winter	8.049	0.049	2.1	0.1	O K
120 min Winter	8.042	0.042	1.6	0.1	O K
180 min Winter	8.037	0.037	1.3	0.0	O K
240 min Winter	8.033	0.033	1.1	0.0	O K
360 min Winter	8.028	0.028	0.8	0.0	O K
480 min Winter	8.025	0.025	0.7	0.0	O K
600 min Winter	8.024	0.024	0.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.871	0.0	2.4	13
30 min Summer	96.703	0.0	3.2	19
60 min Summer	59.321	0.0	4.0	36
120 min Summer	35.144	0.0	4.8	66
180 min Summer	25.540	0.0	5.3	96
240 min Summer	20.253	0.0	5.6	128
360 min Summer	14.591	0.0	6.1	192
480 min Summer	11.557	0.0	6.4	244
600 min Summer	9.639	0.0	6.7	306
720 min Summer	8.307	0.0	6.9	362
960 min Summer	6.566	0.0	7.3	492
1440 min Summer	4.707	0.0	7.8	728
15 min Winter	149.871	0.0	2.7	12
30 min Winter	96.703	0.0	3.6	18
60 min Winter	59.321	0.0	4.6	36
120 min Winter	35.144	0.0	5.5	72
180 min Winter	25.540	0.0	6.0	104
240 min Winter	20.253	0.0	6.4	134
360 min Winter	14.591	0.0	6.9	186
480 min Winter	11.557	0.0	7.3	256
600 min Winter	9.639	0.0	7.6	316

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
720 min Winter	8.022	0.022	0.5	0.0	O K
960 min Winter	8.020	0.020	0.4	0.0	O K
1440 min Winter	8.018	0.018	0.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	8.307	0.0	7.8	386
960 min Winter	6.566	0.0	8.3	500
1440 min Winter	4.707	0.0	8.8	750

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)	20.900	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	1440
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.055

Time (mins) From:	To:	Area (ha)
0	5	0.055

Model Details

Storage is Online Cover Level (m) 10.000

Pipe Structure

Diameter (m)	0.300	Length (m)	2.000
Slope (1:X)	100.000	Invert Level (m)	8.000

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	2.000	Upstream Invert Level (m)	8.000
Roughness k (mm)	0.600		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.099	0.099	8.0	0.1	O K
30 min Summer	8.094	0.094	7.1	0.1	O K
60 min Summer	8.078	0.078	5.1	0.1	O K
120 min Summer	8.064	0.064	3.4	0.1	O K
180 min Summer	8.056	0.056	2.7	0.1	O K
240 min Summer	8.051	0.051	2.2	0.1	O K
360 min Summer	8.044	0.044	1.6	0.1	O K
480 min Summer	8.038	0.038	1.3	0.0	O K
600 min Summer	8.034	0.034	1.1	0.0	O K
720 min Summer	8.032	0.032	1.0	0.0	O K
960 min Summer	8.028	0.028	0.8	0.0	O K
1440 min Summer	8.024	0.024	0.6	0.0	O K
15 min Winter	8.101	0.101	8.3	0.1	O K
30 min Winter	8.089	0.089	6.5	0.1	O K
60 min Winter	8.071	0.071	4.2	0.1	O K
120 min Winter	8.056	0.056	2.6	0.1	O K
180 min Winter	8.048	0.048	2.0	0.1	O K
240 min Winter	8.044	0.044	1.6	0.1	O K
360 min Winter	8.036	0.036	1.2	0.0	O K
480 min Winter	8.031	0.031	1.0	0.0	O K
600 min Winter	8.028	0.028	0.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.490	0.0	3.5	10
30 min Summer	21.599	0.0	4.5	18
60 min Summer	13.451	0.0	5.5	34
120 min Summer	8.197	0.0	6.8	64
180 min Summer	6.102	0.0	7.6	94
240 min Summer	4.943	0.0	8.2	122
360 min Summer	3.648	0.0	9.0	182
480 min Summer	2.934	0.0	9.7	240
600 min Summer	2.478	0.0	10.2	302
720 min Summer	2.158	0.0	10.7	366
960 min Summer	1.735	0.0	11.5	480
1440 min Summer	1.277	0.0	12.6	712
15 min Winter	33.490	0.0	3.9	10
30 min Winter	21.599	0.0	5.0	18
60 min Winter	13.451	0.0	6.2	34
120 min Winter	8.197	0.0	7.6	60
180 min Winter	6.102	0.0	8.5	94
240 min Winter	4.943	0.0	9.1	122
360 min Winter	3.648	0.0	10.1	186
480 min Winter	2.934	0.0	10.8	240
600 min Winter	2.478	0.0	11.4	302

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.026	0.026	0.7	0.0	O K
960 min Winter	8.024	0.024	0.6	0.0	O K
1440 min Winter	8.021	0.021	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	2.158	0.0	12.0	358
960 min Winter	1.735	0.0	12.8	486
1440 min Winter	1.277	0.0	14.2	714

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.168	0.168	19.5	0.3	O K
30 min Summer	8.158	0.158	18.0	0.2	O K
60 min Summer	8.124	0.124	12.3	0.2	O K
120 min Summer	8.099	0.099	8.0	0.1	O K
180 min Summer	8.086	0.086	6.1	0.1	O K
240 min Summer	8.077	0.077	4.9	0.1	O K
360 min Summer	8.066	0.066	3.6	0.1	O K
480 min Summer	8.059	0.059	2.9	0.1	O K
600 min Summer	8.053	0.053	2.4	0.1	O K
720 min Summer	8.050	0.050	2.1	0.1	O K
960 min Summer	8.044	0.044	1.7	0.1	O K
1440 min Summer	8.036	0.036	1.2	0.0	O K
15 min Winter	8.169	0.169	20.3	0.2	O K
30 min Winter	8.142	0.142	15.9	0.2	O K
60 min Winter	8.111	0.111	10.0	0.2	O K
120 min Winter	8.087	0.087	6.2	0.1	O K
180 min Winter	8.073	0.073	4.5	0.1	O K
240 min Winter	8.066	0.066	3.7	0.1	O K
360 min Winter	8.056	0.056	2.6	0.1	O K
480 min Winter	8.050	0.050	2.1	0.1	O K
600 min Winter	8.046	0.046	1.8	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	82.260	0.0	8.5	10
30 min Summer	52.687	0.0	10.9	18
60 min Summer	32.216	0.0	13.3	32
120 min Summer	19.115	0.0	15.8	62
180 min Summer	13.940	0.0	17.3	92
240 min Summer	11.098	0.0	18.3	122
360 min Summer	8.038	0.0	19.9	184
480 min Summer	6.390	0.0	21.1	240
600 min Summer	5.344	0.0	22.0	302
720 min Summer	4.617	0.0	22.9	364
960 min Summer	3.664	0.0	24.2	478
1440 min Summer	2.642	0.0	26.2	716
15 min Winter	82.260	0.0	9.5	11
30 min Winter	52.687	0.0	12.2	18
60 min Winter	32.216	0.0	14.9	34
120 min Winter	19.115	0.0	17.7	62
180 min Winter	13.940	0.0	19.3	92
240 min Winter	11.098	0.0	20.5	120
360 min Winter	8.038	0.0	22.3	182
480 min Winter	6.390	0.0	23.6	236
600 min Winter	5.344	0.0	24.7	298

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.042	0.042	1.5	0.0	O K
960 min Winter	8.036	0.036	1.2	0.0	O K
1440 min Winter	8.029	0.029	0.9	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	4.617	0.0	25.6	366
960 min Winter	3.664	0.0	27.1	482
1440 min Winter	2.642	0.0	29.3	732

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.209	0.209	26.1	0.3	O K
30 min Summer	8.187	0.187	22.6	0.3	O K
60 min Summer	8.144	0.144	16.3	0.2	O K
120 min Summer	8.113	0.113	10.5	0.2	O K
180 min Summer	8.099	0.099	8.0	0.1	O K
240 min Summer	8.088	0.088	6.3	0.1	O K
360 min Summer	8.075	0.075	4.7	0.1	O K
480 min Summer	8.067	0.067	3.8	0.1	O K
600 min Summer	8.061	0.061	3.1	0.1	O K
720 min Summer	8.056	0.056	2.7	0.1	O K
960 min Summer	8.050	0.050	2.2	0.1	O K
1440 min Summer	8.042	0.042	1.5	0.1	O K
15 min Winter	8.218	0.218	27.3	0.3	O K
30 min Winter	8.173	0.173	20.3	0.3	O K
60 min Winter	8.130	0.130	13.3	0.2	O K
120 min Winter	8.099	0.099	8.1	0.1	O K
180 min Winter	8.085	0.085	6.0	0.1	O K
240 min Winter	8.075	0.075	4.7	0.1	O K
360 min Winter	8.064	0.064	3.4	0.1	O K
480 min Winter	8.056	0.056	2.7	0.1	O K
600 min Winter	8.051	0.051	2.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.051	0.0	11.0	10
30 min Summer	69.074	0.0	14.2	17
60 min Summer	42.372	0.0	17.5	32
120 min Summer	25.103	0.0	20.7	62
180 min Summer	18.243	0.0	22.6	92
240 min Summer	14.466	0.0	23.9	124
360 min Summer	10.422	0.0	25.8	182
480 min Summer	8.255	0.0	27.2	242
600 min Summer	6.885	0.0	28.4	300
720 min Summer	5.934	0.0	29.4	362
960 min Summer	4.690	0.0	31.0	480
1440 min Summer	3.362	0.0	33.3	724
15 min Winter	107.051	0.0	12.4	9
30 min Winter	69.074	0.0	16.0	18
60 min Winter	42.372	0.0	19.6	32
120 min Winter	25.103	0.0	23.2	64
180 min Winter	18.243	0.0	25.3	94
240 min Winter	14.466	0.0	26.7	124
360 min Winter	10.422	0.0	28.9	184
480 min Winter	8.255	0.0	30.5	240
600 min Winter	6.885	0.0	31.8	300

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.048	0.048	2.0	0.1	O K
960 min Winter	8.042	0.042	1.5	0.1	O K
1440 min Winter	8.034	0.034	1.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	5.934	0.0	32.9	370
960 min Winter	4.690	0.0	34.7	486
1440 min Winter	3.362	0.0	37.3	710

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.249	0.249	31.0	0.4	O K
30 min Summer	8.223	0.223	27.9	0.3	O K
60 min Summer	8.163	0.163	19.5	0.3	O K
120 min Summer	8.126	0.126	12.7	0.2	O K
180 min Summer	8.109	0.109	9.7	0.1	O K
240 min Summer	8.097	0.097	7.6	0.1	O K
360 min Summer	8.082	0.082	5.6	0.1	O K
480 min Summer	8.073	0.073	4.4	0.1	O K
600 min Summer	8.067	0.067	3.8	0.1	O K
720 min Summer	8.062	0.062	3.2	0.1	O K
960 min Summer	8.055	0.055	2.5	0.1	O K
1440 min Summer	8.047	0.047	1.8	0.1	O K
15 min Winter	8.256	0.256	31.7	0.4	O K
30 min Winter	8.204	0.204	24.7	0.3	O K
60 min Winter	8.143	0.143	16.0	0.2	O K
120 min Winter	8.108	0.108	9.6	0.2	O K
180 min Winter	8.094	0.094	7.1	0.1	O K
240 min Winter	8.083	0.083	5.7	0.1	O K
360 min Winter	8.070	0.070	4.1	0.1	O K
480 min Winter	8.062	0.062	3.2	0.1	O K
600 min Winter	8.056	0.056	2.7	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.461	0.0	13.2	10
30 min Summer	82.888	0.0	17.1	18
60 min Summer	50.847	0.0	21.0	34
120 min Summer	30.123	0.0	24.9	64
180 min Summer	21.892	0.0	27.1	92
240 min Summer	17.360	0.0	28.6	122
360 min Summer	12.507	0.0	31.0	184
480 min Summer	9.906	0.0	32.7	244
600 min Summer	8.262	0.0	34.1	300
720 min Summer	7.121	0.0	35.2	364
960 min Summer	5.628	0.0	37.1	490
1440 min Summer	4.034	0.0	39.9	730
15 min Winter	128.461	0.0	14.8	11
30 min Winter	82.888	0.0	19.1	18
60 min Winter	50.847	0.0	23.5	32
120 min Winter	30.123	0.0	27.8	64
180 min Winter	21.892	0.0	30.3	90
240 min Winter	17.360	0.0	32.1	122
360 min Winter	12.507	0.0	34.7	184
480 min Winter	9.906	0.0	36.6	246
600 min Winter	8.262	0.0	38.2	296

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.052	0.052	2.3	0.1	O K
960 min Winter	8.047	0.047	1.8	0.1	O K
1440 min Winter	8.038	0.038	1.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	7.121	0.0	39.5	362
960 min Winter	5.628	0.0	41.6	480
1440 min Winter	4.034	0.0	44.7	718

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	8.301	0.301	35.4	0.4	O K
30 min Summer	8.261	0.261	32.1	0.4	O K
60 min Summer	8.184	0.184	22.6	0.2	O K
120 min Summer	8.139	0.139	14.9	0.2	O K
180 min Summer	8.118	0.118	11.2	0.2	O K
240 min Summer	8.104	0.104	8.9	0.1	O K
360 min Summer	8.090	0.090	6.5	0.1	O K
480 min Summer	8.079	0.079	5.2	0.1	O K
600 min Summer	8.072	0.072	4.4	0.1	O K
720 min Summer	8.067	0.067	3.8	0.1	O K
960 min Summer	8.060	0.060	3.0	0.1	O K
1440 min Summer	8.050	0.050	2.2	0.1	O K
15 min Winter	8.305	0.305	38.2	0.4	O K
30 min Winter	8.236	0.236	29.6	0.4	O K
60 min Winter	8.158	0.158	18.0	0.3	O K
120 min Winter	8.119	0.119	11.4	0.2	O K
180 min Winter	8.100	0.100	8.2	0.1	O K
240 min Winter	8.090	0.090	6.6	0.1	O K
360 min Winter	8.075	0.075	4.8	0.1	O K
480 min Winter	8.067	0.067	3.8	0.1	O K
600 min Winter	8.062	0.062	3.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.871	0.0	15.5	10
30 min Summer	96.703	0.0	19.9	18
60 min Summer	59.321	0.0	24.5	32
120 min Summer	35.144	0.0	29.0	62
180 min Summer	25.540	0.0	31.6	92
240 min Summer	20.253	0.0	33.4	124
360 min Summer	14.591	0.0	36.1	180
480 min Summer	11.557	0.0	38.1	242
600 min Summer	9.639	0.0	39.8	304
720 min Summer	8.307	0.0	41.1	362
960 min Summer	6.566	0.0	43.3	482
1440 min Summer	4.707	0.0	46.6	726
15 min Winter	149.871	0.0	17.3	11
30 min Winter	96.703	0.0	22.3	17
60 min Winter	59.321	0.0	27.4	34
120 min Winter	35.144	0.0	32.5	64
180 min Winter	25.540	0.0	35.4	92
240 min Winter	20.253	0.0	37.4	122
360 min Winter	14.591	0.0	40.4	184
480 min Winter	11.557	0.0	42.7	244
600 min Winter	9.639	0.0	44.5	306

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
720 min Winter	8.057	0.057	2.7	0.1	O K
960 min Winter	8.050	0.050	2.2	0.1	O K
1440 min Winter	8.042	0.042	1.6	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	8.307	0.0	46.1	366
960 min Winter	6.566	0.0	48.5	470
1440 min Winter	4.707	0.0	52.2	720

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)	20.900	Shortest Storm (mins)	15
Ratio R	0.440	Longest Storm (mins)	1440
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.047

Time (mins) From:	To:	Area (ha)
0	5	0.047

Green Roof

Area (m^3) 80 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.001454	32	36	0.000294	64	68	0.000059	96	100	0.000012
4	8	0.001190	36	40	0.000240	68	72	0.000049	100	104	0.000010
8	12	0.000974	40	44	0.000197	72	76	0.000040	104	108	0.000008
12	16	0.000798	44	48	0.000161	76	80	0.000033	108	112	0.000007
16	20	0.000653	48	52	0.000132	80	84	0.000027	112	116	0.000005
20	24	0.000535	52	56	0.000108	84	88	0.000022	116	120	0.000004
24	28	0.000438	56	60	0.000088	88	92	0.000018			
28	32	0.000358	60	64	0.000072	92	96	0.000015			

Model Details

Storage is Online Cover Level (m) 10.000

Pipe Structure

Diameter (m)	0.300	Length (m)	2.000
Slope (1:X)	100.000	Invert Level (m)	8.000

Pipe Outflow Control

Diameter (m)	0.300	Entry Loss Coefficient	0.500
Slope (1:X)	100.0	Coefficient of Contraction	0.600
Length (m)	2.000	Upstream Invert Level (m)	8.000
Roughness k (mm)	0.600		

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.092	0.092	6.8	0.1	O K
30 min Summer	8.086	0.086	6.0	0.1	O K
60 min Summer	8.072	0.072	4.4	0.1	O K
120 min Summer	8.059	0.059	2.9	0.1	O K
180 min Summer	8.052	0.052	2.3	0.1	O K
240 min Summer	8.048	0.048	1.9	0.1	O K
360 min Summer	8.043	0.043	1.6	0.1	O K
480 min Summer	8.037	0.037	1.3	0.0	O K
600 min Summer	8.034	0.034	1.1	0.0	O K
720 min Summer	8.031	0.031	1.0	0.0	O K
960 min Summer	8.028	0.028	0.8	0.0	O K
1440 min Summer	8.024	0.024	0.6	0.0	O K
15 min Winter	8.094	0.094	7.2	0.1	O K
30 min Winter	8.081	0.081	5.5	0.1	O K
60 min Winter	8.066	0.066	3.6	0.1	O K
120 min Winter	8.051	0.051	2.2	0.1	O K
180 min Winter	8.047	0.047	1.9	0.1	O K
240 min Winter	8.042	0.042	1.6	0.1	O K
360 min Winter	8.035	0.035	1.2	0.0	O K
480 min Winter	8.031	0.031	0.9	0.0	O K
600 min Winter	8.028	0.028	0.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	33.490	0.0	3.0	10
30 min Summer	21.599	0.0	4.0	18
60 min Summer	13.451	0.0	5.1	32
120 min Summer	8.197	0.0	6.3	62
180 min Summer	6.102	0.0	7.1	92
240 min Summer	4.943	0.0	7.7	126
360 min Summer	3.648	0.0	8.6	182
480 min Summer	2.934	0.0	9.2	244
600 min Summer	2.478	0.0	9.7	304
720 min Summer	2.158	0.0	10.2	366
960 min Summer	1.735	0.0	10.9	486
1440 min Summer	1.277	0.0	12.0	732
15 min Winter	33.490	0.0	3.4	10
30 min Winter	21.599	0.0	4.6	18
60 min Winter	13.451	0.0	5.8	34
120 min Winter	8.197	0.0	7.1	64
180 min Winter	6.102	0.0	8.0	98
240 min Winter	4.943	0.0	8.7	122
360 min Winter	3.648	0.0	9.6	186
480 min Winter	2.934	0.0	10.4	244
600 min Winter	2.478	0.0	10.9	310

Summary of Results for 1 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.026	0.026	0.7	0.0	O K
960 min Winter	8.024	0.024	0.6	0.0	O K
1440 min Winter	8.021	0.021	0.4	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	2.158	0.0	11.4	378
960 min Winter	1.735	0.0	12.3	502
1440 min Winter	1.277	0.0	13.5	724

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.146	0.146	16.4	0.2	O K
30 min Summer	8.138	0.138	14.8	0.2	O K
60 min Summer	8.115	0.115	10.8	0.2	O K
120 min Summer	8.096	0.096	7.5	0.1	O K
180 min Summer	8.083	0.083	5.7	0.1	O K
240 min Summer	8.075	0.075	4.8	0.1	O K
360 min Summer	8.065	0.065	3.5	0.1	O K
480 min Summer	8.058	0.058	2.8	0.1	O K
600 min Summer	8.053	0.053	2.4	0.1	O K
720 min Summer	8.049	0.049	2.1	0.1	O K
960 min Summer	8.044	0.044	1.6	0.1	O K
1440 min Summer	8.035	0.035	1.2	0.0	O K
15 min Winter	8.153	0.153	18.0	0.2	O K
30 min Winter	8.130	0.130	13.4	0.2	O K
60 min Winter	8.106	0.106	9.3	0.1	O K
120 min Winter	8.084	0.084	5.9	0.1	O K
180 min Winter	8.072	0.072	4.4	0.1	O K
240 min Winter	8.066	0.066	3.6	0.1	O K
360 min Winter	8.055	0.055	2.6	0.1	O K
480 min Winter	8.049	0.049	2.1	0.1	O K
600 min Winter	8.045	0.045	1.7	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	82.260	0.0	8.1	10
30 min Summer	52.687	0.0	10.4	18
60 min Summer	32.216	0.0	12.9	34
120 min Summer	19.115	0.0	15.3	62
180 min Summer	13.940	0.0	16.8	94
240 min Summer	11.098	0.0	17.9	122
360 min Summer	8.038	0.0	19.4	184
480 min Summer	6.390	0.0	20.6	242
600 min Summer	5.344	0.0	21.5	304
720 min Summer	4.617	0.0	22.3	362
960 min Summer	3.664	0.0	23.6	482
1440 min Summer	2.642	0.0	25.5	724
15 min Winter	82.260	0.0	9.1	9
30 min Winter	52.687	0.0	11.7	18
60 min Winter	32.216	0.0	14.5	34
120 min Winter	19.115	0.0	17.2	64
180 min Winter	13.940	0.0	18.9	92
240 min Winter	11.098	0.0	20.1	118
360 min Winter	8.038	0.0	21.8	182
480 min Winter	6.390	0.0	23.1	240
600 min Winter	5.344	0.0	24.2	308

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.041	0.041	1.5	0.0	O K
960 min Winter	8.035	0.035	1.2	0.0	O K
1440 min Winter	8.029	0.029	0.9	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	4.617	0.0	25.1	360
960 min Winter	3.664	0.0	26.5	478
1440 min Winter	2.642	0.0	28.7	752

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.189	0.189	22.6	0.3	O K
30 min Summer	8.168	0.168	19.5	0.2	O K
60 min Summer	8.138	0.138	14.8	0.2	O K
120 min Summer	8.110	0.110	9.9	0.2	O K
180 min Summer	8.096	0.096	7.5	0.1	O K
240 min Summer	8.086	0.086	6.1	0.1	O K
360 min Summer	8.073	0.073	4.5	0.1	O K
480 min Summer	8.066	0.066	3.6	0.1	O K
600 min Summer	8.060	0.060	3.0	0.1	O K
720 min Summer	8.056	0.056	2.6	0.1	O K
960 min Summer	8.050	0.050	2.1	0.1	O K
1440 min Summer	8.041	0.041	1.5	0.1	O K
15 min Winter	8.194	0.194	23.3	0.3	O K
30 min Winter	8.158	0.158	18.0	0.2	O K
60 min Winter	8.124	0.124	12.4	0.2	O K
120 min Winter	8.097	0.097	7.6	0.1	O K
180 min Winter	8.083	0.083	5.7	0.1	O K
240 min Winter	8.074	0.074	4.6	0.1	O K
360 min Winter	8.064	0.064	3.3	0.1	O K
480 min Winter	8.056	0.056	2.7	0.1	O K
600 min Winter	8.051	0.051	2.2	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	107.051	0.0	10.6	10
30 min Summer	69.074	0.0	13.8	18
60 min Summer	42.372	0.0	17.1	32
120 min Summer	25.103	0.0	20.3	62
180 min Summer	18.243	0.0	22.1	94
240 min Summer	14.466	0.0	23.4	124
360 min Summer	10.422	0.0	25.3	184
480 min Summer	8.255	0.0	26.7	244
600 min Summer	6.885	0.0	27.9	304
720 min Summer	5.934	0.0	28.8	358
960 min Summer	4.690	0.0	30.4	486
1440 min Summer	3.362	0.0	32.6	728
15 min Winter	107.051	0.0	11.9	10
30 min Winter	69.074	0.0	15.5	19
60 min Winter	42.372	0.0	19.1	34
120 min Winter	25.103	0.0	22.8	68
180 min Winter	18.243	0.0	24.8	96
240 min Winter	14.466	0.0	26.3	126
360 min Winter	10.422	0.0	28.4	182
480 min Winter	8.255	0.0	30.0	244
600 min Winter	6.885	0.0	31.3	294

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.048	0.048	1.9	0.1	O K
960 min Winter	8.042	0.042	1.5	0.1	O K
1440 min Winter	8.034	0.034	1.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	5.934	0.0	32.4	358
960 min Winter	4.690	0.0	34.1	488
1440 min Winter	3.362	0.0	36.6	724

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	8.218	0.218	27.3	0.3	O K
30 min Summer	8.199	0.199	24.0	0.3	O K
60 min Summer	8.153	0.153	18.0	0.2	O K
120 min Summer	8.121	0.121	11.8	0.2	O K
180 min Summer	8.104	0.104	8.9	0.1	O K
240 min Summer	8.095	0.095	7.3	0.1	O K
360 min Summer	8.080	0.080	5.4	0.1	O K
480 min Summer	8.072	0.072	4.3	0.1	O K
600 min Summer	8.066	0.066	3.7	0.1	O K
720 min Summer	8.062	0.062	3.2	0.1	O K
960 min Summer	8.054	0.054	2.5	0.1	O K
1440 min Summer	8.047	0.047	1.8	0.1	O K
15 min Winter	8.219	0.219	27.3	0.3	O K
30 min Winter	8.179	0.179	21.8	0.3	O K
60 min Winter	8.138	0.138	14.7	0.2	O K
120 min Winter	8.106	0.106	9.2	0.1	O K
180 min Winter	8.092	0.092	6.9	0.1	O K
240 min Winter	8.081	0.081	5.5	0.1	O K
360 min Winter	8.069	0.069	4.0	0.1	O K
480 min Winter	8.062	0.062	3.2	0.1	O K
600 min Winter	8.056	0.056	2.7	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.461	0.0	12.8	10
30 min Summer	82.888	0.0	16.7	18
60 min Summer	50.847	0.0	20.5	34
120 min Summer	30.123	0.0	24.4	62
180 min Summer	21.892	0.0	26.6	94
240 min Summer	17.360	0.0	28.2	124
360 min Summer	12.507	0.0	30.5	184
480 min Summer	9.906	0.0	32.2	242
600 min Summer	8.262	0.0	33.6	300
720 min Summer	7.121	0.0	34.7	362
960 min Summer	5.628	0.0	36.6	476
1440 min Summer	4.034	0.0	39.3	722
15 min Winter	128.461	0.0	14.4	10
30 min Winter	82.888	0.0	18.7	19
60 min Winter	50.847	0.0	23.1	34
120 min Winter	30.123	0.0	27.4	64
180 min Winter	21.892	0.0	29.9	94
240 min Winter	17.360	0.0	31.6	124
360 min Winter	12.507	0.0	34.2	192
480 min Winter	9.906	0.0	36.1	244
600 min Winter	8.262	0.0	37.7	302

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
720 min Winter	8.052	0.052	2.3	0.1	O K
960 min Winter	8.047	0.047	1.8	0.1	O K
1440 min Winter	8.038	0.038	1.3	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	7.121	0.0	38.9	366
960 min Winter	5.628	0.0	41.0	478
1440 min Winter	4.034	0.0	44.1	730

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	8.248	0.248	30.5	0.4	O K
30 min Summer	8.223	0.223	27.9	0.3	O K
60 min Summer	8.173	0.173	20.3	0.3	O K
120 min Summer	8.132	0.132	13.7	0.2	O K
180 min Summer	8.113	0.113	10.5	0.2	O K
240 min Summer	8.102	0.102	8.5	0.1	O K
360 min Summer	8.088	0.088	6.3	0.1	O K
480 min Summer	8.078	0.078	5.1	0.1	O K
600 min Summer	8.071	0.071	4.3	0.1	O K
720 min Summer	8.066	0.066	3.7	0.1	O K
960 min Summer	8.059	0.059	2.9	0.1	O K
1440 min Summer	8.050	0.050	2.2	0.1	O K
15 min Winter	8.256	0.256	31.7	0.4	O K
30 min Winter	8.212	0.212	26.1	0.3	O K
60 min Winter	8.151	0.151	17.2	0.3	O K
120 min Winter	8.115	0.115	10.7	0.2	O K
180 min Winter	8.099	0.099	8.0	0.1	O K
240 min Winter	8.089	0.089	6.4	0.1	O K
360 min Winter	8.075	0.075	4.7	0.1	O K
480 min Winter	8.067	0.067	3.8	0.1	O K
600 min Winter	8.061	0.061	3.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	149.871	0.0	15.0	10
30 min Summer	96.703	0.0	19.5	18
60 min Summer	59.321	0.0	24.0	32
120 min Summer	35.144	0.0	28.6	62
180 min Summer	25.540	0.0	31.2	92
240 min Summer	20.253	0.0	33.0	122
360 min Summer	14.591	0.0	35.6	184
480 min Summer	11.557	0.0	37.6	240
600 min Summer	9.639	0.0	39.2	304
720 min Summer	8.307	0.0	40.6	360
960 min Summer	6.566	0.0	42.8	486
1440 min Summer	4.707	0.0	45.9	732
15 min Winter	149.871	0.0	16.9	10
30 min Winter	96.703	0.0	21.9	18
60 min Winter	59.321	0.0	27.0	36
120 min Winter	35.144	0.0	32.0	64
180 min Winter	25.540	0.0	35.0	96
240 min Winter	20.253	0.0	37.0	124
360 min Winter	14.591	0.0	40.0	182
480 min Winter	11.557	0.0	42.2	242
600 min Winter	9.639	0.0	44.0	314

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
720 min Winter	8.056	0.056	2.7	0.1	O K
960 min Winter	8.050	0.050	2.2	0.1	O K
1440 min Winter	8.042	0.042	1.5	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
720 min Winter	8.307	0.0	45.5	360
960 min Winter	6.566	0.0	48.0	482
1440 min Winter	4.707	0.0	51.5	734

HR Wallingford
Working with water

Greenfield runoff estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Kristian Fitzgerald
Site name:	Greville Street
Site location:	Camden

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site coordinates

Latitude:	51.51947° N
Longitude:	0.10635° W

Reference:	6164609
Date:	2017-11-14T09:43:22

Methodology	IH124

Site characteristics

Total site area (ha)	.1

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	2	2
HOST class	---	---
SPR/SPRHOST	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm)	608	608
Hydrological region	6	6
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

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

Normally limiting discharge rates which are less than 2.0 l/s/ha are set at 2.0 l/s/ha.

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

Where flow rates are less than 5.0 l/s consents are usually set at 5.0l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite may be a requirement for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	0.15	0.15
1 in 1 year (l/s)	0.13	0.13
1 in 30 years (l/s)	0.36	0.36
1 in 100 years (l/s)	0.49	0.49

Job Title:	Greville St
Job Number:	J3304
Date:	13/11/2020
Type of Calcs	Surface Drainage
Done by:	AM

WEBB YATES ENGINEERS

RWP flow rate check to BS EN 12056-3

Max flow rates from lower open areas for RWP sizing
Q = r.A.C BS EN 12056-3 4.1

C=	1		
R=	0.021	l/s/m2	
A_1, gf colonnade =	23.5	m2	Take 50% of area of the wall. Per 4.3.4
A2, 2f lightwell =	13	m2	
A3 5f terrace =	66	m2	
A4, non green roof area	165	m2	

4.3.4 In areas where wind is taken into account in rainfall calculations, where rain driven against a wall by the wind can run down onto the roof or into a gutter, 50% of the area of the wall shall be added to the effective area of the roof.

Q1 gf	0.50	l/s	
Q2 2f	0.30	l/s	
Q3 f5	1.40	l/s	
Q3 f5	3.50	l/s	
Green roof max outflow	1	l/s	Refer SuDS strategy

Minimum flow rates are setout on the appropriate drawings and proposed supplier of above ground RWP's is to confirm their products meets these requirements.

Existing below gorund connections are assumed to be 100dia at 1 in 100. It is unlkely that they are any smaller or shallower than this.

As per pipe capacity table from https://www.cpda.co.uk/design/hydraulic-design/
The design flow rates will be directed to separate below ground connections and are within range of the discharge pipes.

PIPE FLOWING FULL Ks VALUE = 1.5mm

ks value 1.5mm	Pipe Size (mm)															
	DN 100		DN 150		DN 225		DN 300		DN 375		DN 400		DN 450		DN 500	
GRAD	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS	VEL	DIS
	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s	m/s	l/s
1/10	2.12	16.64	2.79	49.24	3.65	145.00	4.40	311.20	5.09	562.00	5.31	666.65	5.72	910.19	6.12	1202.28
1/20	1.50	11.77	1.97	34.82	2.58	102.53	3.11	220.05	3.60	397.40	3.75	471.39	4.05	643.60	4.33	850.14
1/30	1.22	9.61	1.61	28.43	2.11	83.71	2.54	179.67	2.94	324.47	3.06	384.89	3.30	525.50	3.54	694.14
1/40	1.06	8.32	1.39	24.62	1.82	72.50	2.20	155.60	2.54	281.00	2.65	333.32	2.86	455.10	3.06	601.14
1/50	0.95	7.44	1.25	22.02	1.63	64.84	1.97	139.17	2.28	251.34	2.37	298.13	2.56	407.05	2.74	537.67
1/60	0.86	6.79	1.14	20.10	1.49	59.19	1.80	127.05	2.08	229.44	2.17	272.16	2.34	371.59	2.50	490.83
1/70	0.80	6.29	1.05	18.61	1.38	54.80	1.66	117.62	1.92	212.42	2.01	251.97	2.16	344.02	2.31	454.42
1/80	0.75	5.88	0.99	17.41	1.29	51.26	1.56	110.03	1.80	198.70	1.88	235.70	2.02	321.80	2.16	425.07
1/90	**0.71**	**5.55**	0.93	16.41	1.22	48.33	1.47	103.73	1.70	187.33	1.77	222.22	1.91	303.40	2.04	400.76
1/100	**0.67**	**5.26**	0.88	15.57	1.15	45.85	1.39	98.41	1.61	177.72	1.68	210.82	1.81	287.83	1.94	380.19

Job Title:	Greville St
Job Number:	J3304
Date:	09/09/2020
Type of Calcs	Foul Drainage
Done by:	AM

Foul drainage calcs based on BS EN 12056-2 (2000)

Table 2 — Discharge units (DU)

Appliance	System I	System II	System III	System IV
	DU l/s	DU l/s	DU l/s	DU l/s
Wash basin, bidet	0,5	0,3	0,3	0,3
Shower without plug	0,6	0,4	0,4	0,4
Shower with plug	0,8	0,5	1,3	0,5
Single urinal with cistern	0,8	0,5	0,4	0,5
Urinal with flushing valve	0,5	0,3	-	0,3
Slab urinal	0,2*	0,2*	0,2*	0,2*
Bath	0,8	0,6	1,3	0,5
Kitchen sink	0,8	0,6	1,3	0,5
Dishwasher (household)	0,8	0,6	0,2	0,5
Washing machine up to 6 kg	0,8	0,6	0,6	0,5
Washing machine up to 12 kg	1,5	1,2	1,2	1,0
WC with 4,0 l cistern	**	1,8	**	**
WC with 6,0 l cistern	2,0	1,8	1,2 to 1,7***	2,0
WC with 7,5 l cistern	2,0	1,8	1,4 to 1,8***	2,0
WC with 9,0 l cistern	2,5	2,0	1,6 to 2,0***	2,5
Floor gully DN 50	0,8	0,9	-	0,6
Floor gully DN 70	1,5	0,9	-	1,0
Floor gully DN 100	2,0	1,2	-	1,3

* Per person.
** Not permitted.
*** Depending upon type (valid for WC's with siphon flush cistern only).
\- Not used or no data.

	WC	WB	BH	SH	SK	DW+WM	FG
6th floor	2	2					
5th floor	3	3					
4th floor	4	4					
3rd floor	4	4					
2nd floor	4	4					
1st floor	4	4					
Ground floor	3	3					
Basement	2	1	0	3	2	2	1
Total appliances	26	25	0	3	2	2	1
Discharge Units	1.8	0.3	1.3	0.4	1.3	0.8	1

Total Discharge units per appliance	46.8	7.5	1.2	1.2	2.6	1.6	1

Sum of Discharge units	61.9

K	0.5
Q (l/s) Max Foul Flow rate	3.93

$$Q_{ww} = K\sqrt{\Sigma DU}$$

Q_{ww} = Waste water flowrate (l/s)
K = Frequency factor
ΣDU = Sum of discharge units

Table 3 — Typical frequency factors (*K*)

Usage of appliances	*K*
Intermittent use, e.g. in dwelling, guesthouse, office	0,5
Frequent use, e.g. in hospital, school, restaurant, hotel	0,7
Congested use, e.g. in toilets and/or showers open to public	1,0
Special use, e.g. laboratory	1,2

Hydraulic capacity is given by the below table 11 from BS EN 12056-2

Table 11 — Hydraulic capacity (Q_{max}) and nominal diameter (DN)

Stack and stack vent	System I, II, III, IV Q_{max} (l/s)	
DN	Square entries	Swept entries
60	0,5	0,7
70	1,5	2,0
80*	2,0	2,6
90	2,7	3,5
100**	4,0	5,2
125	5,8	7,6
150	9,5	12,4
200	16,0	21,0
* Minimum size where WC's are connected in system II.		
** Minimum size where WC's are connected in system I, III, IV.		

Assuming worst case square entries, a DN 100 pipe is suitable for the primary stack.